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# Transformations of Revolution 4.0: Organizational Psychology in the Era of Robotization and Artificial Intelligence

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## INTRODUCTION

The human need to transform its context, remodel society and evolve in the face of the challenges of the contemporary scenario is intrinsic to the dynamic nature of civilization.(Sakurai, & Zuchi, 2018). Since the beginning of time, humanity has been constantly seeking innovations and adaptations to face the complex dilemmas that arise throughout its journey. At the epicenter of this constant search is the ability to reshape the production of goods and services, since the way we produce and consume is inextricably intertwined with our progress and collective well-being.

History records distinct periods of industrial revolutions that, driven by technological advances, economic changes, and social transformations, not only transformed the face of production but also redesigned the fundamental structures of society (Junqueira, 2020). Given the imperatives of the present, the need persists, and the current Revolution 4.0, or Industry 4.0, represents the most recent stage in this evolutionary process, aiming to remodel the way we produce and live, redefining the frontiers of innovation and the interconnection between the physical and the digital. In this scenario, the search for transformation produces impacts in a multifaceted way; in which they reverberate in different ways in the sectors of society (Junqueira, 2020).

## HISTORY OF INDUSTRIAL REVOLUTIONS

In view of this, each evolutionary phase, represented by the Industrial Revolutions, was a crucial milestone in this process of adaptation and reinvention. Regarding the First Industrial Revolution, in the 18th century, this witnessed the transition from an agrarian economy to one based on industry, highlighting mechanization and the steam engine, which allowed such advances to act as catalysts for this period, marked by changes in production practices, urbanization and the emergence of factories.(Sakurai, & Zuchi, 2018).

While the economic benefits were evident, with mass production providing greater efficiency and productivity, this transition to an industrial model was not without significant social and labor challenges (Junqueira, 2020). In the field of social inequalities, industrialization accentuated socioeconomic disparities. Factory owners reaped substantial economic benefits, while workers faced reduced wages, exhausting hours, and dangerous working conditions. These disparities contributed to the emergence of a deeper division between social classes. At the same time, the organization of work was also impacted, with mechanized production.
leading to specialization and repeatability in job functions. While this specialization increased efficiency, it often led to monotony and worker alienation from the end product(Sakurai, & Zuchi, 2018).

In response to these adverse conditions, labor movements and unions emerged, seeking better working conditions, fair wages, and labor regulations. Protests and strikes became fundamental instruments in the fight for labor rights, leaving a lasting legacy in the way labor relations would be approached in the following decades (Junqueira, 2020).

Therefore, the Second Industrial Revolution, 19th century and early 20th century, distinguished itself

through electrification, mass production and the implementation of assembly lines. Innovations such as electricity, mass production and the application of steel and oil significantly boosted the growth of heavy industry and the expansion of the manufacturing sector (Junqueira, 2020). Therefore, it brought with it economic benefits, but also substantial challenges.

In this context, factories evolved into centers of mass production, leveraging efficiency and significantly increasing productivity. However, this revolution also brought considerable social challenges. Urbanization intensified, leading to changes in the living conditions of urban populations. The concentration of workers in industrial centers resulted in often unsatisfactory housing conditions, contributing to disparities(Sakurai, & Zuchi, 2018).

In light of this, labor challenges such as task specialization became a hallmark of assembly lines. While this model of production increased efficiency, it often resulted in monotonous and alienating working conditions. Workers faced exhausting workdays and, in some cases, a lack of adequate regulations regarding workplace safety.(Sakurai, & Zuchi, 2018).

Consequently, the emergence of trade union and workers' movements played a crucial role in the fight for better working conditions. Strikes and demonstrations became essential means of pressing for workers' rights, leaving a remarkable legacy in the history of labor relations.(Sakurai, & Zuchi, 2018).

Regarding the Third Industrial Revolution, also recognized as the digital revolution, It began in the second half of the 20th century, highlighted by electronics, information technology and automation. The digitalization of production processes, the development of computers and the automation of tasks boosted efficiency and productivity in industries.

This period represented a remarkable transition, where the incorporation of digital technologies redefined the paradigms of industrial production and had a profound impact on the management and execution of tasks.(Sakurai, & Zuchi, 2018).

The digitalization of production processes, the development of computers and industrial automation were the cornerstones of this evolutionary phase. The economic benefits were notable, with improved production efficiency and the creation of new sectors, such as technology-based services. However, the social challenges associated with automation and computerization became evident. The replacement of traditional jobs by digital technologies raised concerns about the reskilling of the workforce and the need to adapt to new work paradigms.(Sakurai, & Zuchi, 2018).

In the workplace, automation has transformed job requirements, demanding a new range of skills and abilities. As a result, the reorganization of work and the emphasis on knowledge-based professions have marked a significant transition. The need to address the challenges of structural unemployment and ensure fair working conditions have emerged as areas of critical concern in this period of the second industrial revolution.(Sakurai, & Zuchi, 2018).

## INDUSTRY 4.0

Finally, the current stage, the Fourth Industrial Revolution or Industry 4.0. A revolution driven by the convergence of digital technologies such as the Internet of Things (IoT), artificial intelligence, big data and cloud computing. This revolution aims to create smart factories, where the interconnection of cyber-physical systems and advanced automation not only optimize production, but also enable greater personalization and sustainability ((2019).

The emergence of Industry 4.0 represents a significant milestone in industrial evolution, outlining a paradigm that has gained notable prominence in recent decades ((Gimenez, & dos Santos, 2019).

This concept, revolution 4.0, was pioneered in 2011 in Germany as “Industrie 4.0” by a consortium of representatives from various sectors, including business, politics and academia. This initiative aimed primarily to strengthen Germany’s competitiveness in the global manufacturing industry scenario by promoting leadership in technological innovation ((Gimenez, & dos Santos, 2019).

The essence of Industry 4.0 lies in the search for the synergistic integration of advanced technologies, such as those mentioned above (Internet of Things (IoT), artificial intelligence, big data, cloud computing and cyber-physical systems). The goal is to transform production processes by developing intelligent, highly efficient and adaptable factories.(dos Santos et. al., 2019). This industrial revolution

advocates the digitalization and automation of manufacturing procedures, fostering the interconnection of machines, systems and assets. This scenario aims to facilitate autonomous decision-making and production optimization, culminating in achieving higher levels of operational efficiency(dos Santos et. al., 2019).

## CHALLENGES OF INDUSTRY 4.0

The developments of the current industrial revolution go beyond the operational sphere, presenting the potential to instigate new business models, services and products, with significant economic implications (Oztemel, & Gursev, 2020). In this scenario, the discussion about the Fourth Industrial Revolution has intensified, focusing particularly on the implications it will have on the labor market and the functional profiles of organizations.

Kagermann et al. (2013) emphasize that the Fourth Industrial Revolution will lead to a growing need for complexity management and problem solving within the workforce.

Therefore, the direct relationship between Industry 4.0 and process automation has a direct impact on the job market, fundamentally changing the nature of work as we know it ((Gimenez, & dos Santos, 2019). A study conducted by the consultancy McKinsey (Bughin et. al., 2017) reveals that, in a period of ten to fifteen years, the adoption of technologies related to automation and artificial intelligence will transform the job market, as machines become increasingly intelligent, as well as the interaction between Man and machines (Bughin et. al., 2017).

Nevertheless, the Fourth Industrial Revolution brings with it a series of social and ethical challenges, particularly in the field of work psychology. The distinctive features of this revolution, namely automation and digitalization, have the potential to cause large-scale unemployment and significantly change employment relationships, which may impact the mental and emotional health of workers, as well as raise major ethical issues (Cavalcante, 2018).

The occurrence of mass unemployment resulting from the replacement of workers by machines emerges as one of the main social challenges of Industry 4.0 (Cavalcante, 2018). According to Cavalcante (2018), Job losses can induce stress, anxiety and uncertainty among workers, affecting their psychological well-being and mental health. The scarcity of employment opportunities can lead to a political-social sphere with the possibility of greater dependence on social programs, such as social assistance and unemployment benefits, which can consequently affect the dignity of workers.

Changes in employment relationships can also have an impact on workers' mental and emotional health. According to studies (Graglia, & Lazzareschi, 2018), the introduction of new technologies and the redefinition of roles and responsibilities can generate anxiety regarding job security, adaptation to new tools and processes, as well as pressure to acquire new skills.

Furthermore, the replacement of workers by machines raises relevant ethical questions regarding the responsibility of companies regarding the social impact of their decisions. Cruz (2020) points out that it is imperative that organizations consider the human impact of their automation and digitalization strategies, in order to ensure the implementation of support measures for affected workers, such as professional retraining programs, psychological support and retraining for new roles (Cruz, 2020).

In view of these challenges, it is important for companies and competent bodies to carefully consider the social and ethical implications of the Fourth Industrial Revolution. Promoting healthy work environments, implementing psychological support programs and ensuring opportunities for retraining and professional reconversion are essential to mitigate the negative impacts on workers and society as a whole (Graglia, & Lazzareschi, 2018).

In summary, the Fourth Industrial Revolution poses significant social and ethical challenges, especially with regard to the psychology of work. Understanding and addressing these issues responsibly is essential to ensuring that the transition to Industry 4.0 takes place in a fair and sustainable way for all stakeholders.



## CONSTANT ADAPTATION IN INDUSTRY 4.0

The incessant dynamics of technological changes in the contemporary era of Industry 4.0 imposes substantial challenges not only for institutions, in the political-social sphere, or for workers in general,

but it also directly affects work and organizational psychologists, requiring constant adaptation. This demand encompasses several aspects, from updating professional skills to understanding the psychosocial impacts on work dynamics.(Heloani, & Captain, 2003).

In this scenario, the introduction of advanced technologies such as artificial intelligence, automation and real-time data analysis creates an environment where organizations and occupational psychologists are forced to continually keep up to date. This pressure to keep up with the rapid pace of change can result in stress and professional overload and a new reformulation of their approach in general.

The need for continuous updating encompasses not only the assimilation of the psychological nuances associated with human-machine interaction, but also the ethical application of artificial intelligence in recruitment. This constant demand for learning and adaptation can generate a feeling of information overload in professionals.

The pressure to constantly update oneself can, in turn, have implications for the professional health of occupational psychologists. The need to quickly assimilate new knowledge and technologies can lead to feelings of inadequacy, anxiety and even burnout. The constant rush to stay relevant can negatively impact the psychological well-being of professionals.(Heloani, & Captain, 2003).

When it comes to psychosocial interventions, the speed of change can make it difficult to implement these interventions effectively. The ability of occupational psychologists to keep up with changes in group dynamics, emotional needs and psychological challenges faced by workers may be compromised, impairing the effectiveness of their interventions.(Heloani, & Captain, 2003).Constant adaptation can also create a generational gap, with younger professionals more inclined and prepared to quickly adopt new technologies, while those with more experience may feel disconnected or resistant to change. Managing this gap effectively becomes an additional challenge.

Furthermore, the rapid obsolescence of knowledge can make knowledge management within organizations challenging. The transfer of skills and experiences among team members can be hampered by the constant need for adaptation, creating knowledge gaps that can affect the effectiveness of operations (Cavalcante, 2018).

To overcome these challenges, it is imperative to develop organizational cultures that promote constant adaptation. Creating an environment where continuous learning is encouraged and valued requires not only offering training opportunities, but also fostering a mindset of openness to change at all levels of the organization (Cavalcante, 2018).

## PSYCHOLOGY IN THE CONTEXT OF ORGANIZATIONS IN INDUSTRY 4.0

In this context, despite the aforementioned challenges, work and organizational psychology emerges as a field of study and intervention of utmost importance to address the psychological and organizational demands arising from the 4.0 revolution. Work psychology can play a crucial role in promoting healthy and sustainable work environments amid technological and organizational transformations.(Bughin, et. al., 2017).

This contribution is materialized through interventions aimed at preventing and treating psychological problems, promoting socio-emotional skills and adapting to new work paradigms. At the same time, it aims to ensure the safeguarding of workers' mental health, thus guaranteeing quality of life at work and healthy adaptation to the changes imposed by the 4.0 revolution (Junqueira, 2020).

To illustrate, Burnout syndrome, manifested by emotional exhaustion, depersonalization and low professional achievement, emerges as one of the main psychological challenges faced by workers in the context of the 4.0 revolution (Barlach, & Malvezzi, 2008). Workaholism is also a major issue, as digital hyperconnection and pressure for productivity can result in work overload and difficulty disconnecting from the professional environment (Barlach, & Malvezzi, 2008).

Additionally, the transition to new roles within the scope of automation and artificial intelligence can induce anxiety and insecurity in workers, often requiring professional requalification and adaptation to new work models (Kagermann, & Wahlster, 2013). The transformation of labor relations, characterized by the integration of self-employed workers into online platforms, also entails de-

psychological challenges, since the safeguarding of labor rights often proves insufficient ( Kagermann, & Wahlster, 2013).

One of the main challenges is the skills gap, where the demand for professionals with technology skills exceeds the supply. In this sense, Work Psychology can play an active role in the development of training and qualification programs, with a view to updating and acquiring new skills by workers, encouraging their adaptation to the new demands of the labor market (Junqueira, 2020).

Additionally, organizational psychology can contribute to the identification of competencies-- keys necessary for success in the Industry 4.0 era, assisting in the selection and development of talents aligned with the needs of organizations (Junqueira, 2020).

Another relevant challenge is the limitations of cybersecurity, which is becoming a growing concern with digitalization and connectivity. Rapid technological evolution and the interconnection of devices and systems in Industry 4.0 significantly increase exposure to cyber threats, such as hacker attacks, data theft, and disruption of operations (Cruz, 2020).

**Interventions of Work and Organizational Psychology**

In this context, in promoting an organizational culture oriented towards cybersecurity and raising employee awareness of threats and safe practices in the workplace, the approach of Work Psychology to the challenge of cybersecurity can integrate several intervention strategies:

I. Awareness and training:Organizational psychology can develop programs but also awareness and training for employees, aiming to promote understanding of cyber risks and the adoption of safe practices in the use of technologies and systems. This may include simulations of cyber attacks and the dissemination of information on how to identify and report potential threats (Cruz, 2020).

II. Promoting a culture of security: Work psychology can work to foster an organizational culture that values cybersecurity, encouraging open communication about incidents and vulnerabilities, and promoting shared responsibility for protecting the organization's digital assets (Cruz, 2020).

III. Cybersecurity-related stress management: Exposure to cyber threats can generate stress and anxiety in employees. In this sense, organizational psychology can develop psychosocial support strategies to help employees deal with the emotional and psychological impact of cybersecurity concerns (Cruz, 2020).

IV. Employee engagement and participation: Work psychology can promote the active participation of employees in identifying vulnerabilities and proposing solutions to improve cybersecurity, promoting a sense of responsibility and involvement in protecting the organization's digital assets (Heloani, & Captain, 2003).

In short, cybersecurity represents a significant challenge in the Industry 4.0 era, and Work Psychology can play a crucial role in promoting safe practices, awareness, stress management and employee engagement to face cyber threats and protect organizations' digital assets. It is worth noting that the actions of professionals in this context are organized and planned according to the practice scenario and adapting to the reality faced.

Additionally, organizational psychology also plays a fundamental role in managing change and promoting the well-being of workers in the face of the transformations arising from Industry 4.0. Thus, psychosocial intervention strategies may include support for adaptation to new technologies, management of stress and anxiety related to organizational changes, as well as the promotion of a positive environment. healthy and motivating work environments (Heloani, & Captain, 2003).



Professionals in the field play a crucial role in managing organizational change, contributing to the proper transition of employees in the face of new demands. CitingHeloani, & Captain (2003) it is clear that well-designed intervention strategies are essential to minimize the negative impacts of change and encourage workers to adapt.

One of the key strategies is the promotion of effective communication. In this context, Organizational Psychology can develop strategies that include informative meetings, specialized training and the dissemination of information through internal communication channels (Heloani, & Captain, 2003).These measures aim to inform employees about the changes, clarifying the expected impacts and benefits.

resulting consequences.

Another crucial point is the active participation of employees in the change process. The aim of professionals is to promote participation through the creation of working groups, change committees and other forms of involvement (Junqueira, 2020). Direct collaboration of employees in the decision-making process can significantly increase acceptance and adaptation to new requirements.

It is important to recognize that change can cause stress and anxiety among employees. In this sense, Organizational Psychology plays a vital role in developing psychosocial support strategies, aiming to mitigate the emotional and psychological impacts of change (Junqueira, 2020). This approach not only contributes to adaptation, but also promotes the well-being and mental health of employees.

Additionally, Organizational Psychology can play a crucial role in developing the skills needed to face the new demands imposed by change (Coelho-Lima, & Yamamoto, 2011). The implementation of training and qualification programs is an effective approach to assist employees in acquiring new skills and abilities required to adapt effectively to new demands ( Coelho-Lima, & Yamamoto, 2011).

In short, Work Psychology, through its intervention strategies, can contribute significantly to promoting adaptation, skills development, cybersecurity and well-being of workers in the face of the challenges presented by the 4.0 Revolution, playing a crucial role in building more productive, healthy work environments adapted to the demands of the digital age.

## CONCLUSION

Industry 4.0 therefore represents an innovative phase in the evolution of the production of goods and services, driven by technological advances that redefine the limits of innovation and interconnection between the physical and digital. However, this industrial revolution is not without its challenges, especially in the social and ethical spheres, particularly in the context of work psychology.

Thus, the incessant dynamics of technological changes in Industry 4.0 pose substantial challenges not only to institutions in the political-social sphere and to workers in general, but also directly to work and organizational psychologists, requiring continuous adaptation. Therefore, the need for constant updating encompasses not only the assimilation of the psychological nuances associated with human-machine interaction, but also the ethical application of artificial intelligence in the workplace.

It is important to note that replacing workers with machines raises important ethical questions regarding the responsibility of companies regarding the social impact of their decisions and the promotion of healthy work environments. Furthermore, implementing psychological support programs and ensuring opportunities for retraining and professional reconversion are essential to mitigate the negative impacts on workers and society as a whole. Understanding and addressing these issues responsibly is essential to ensure that the transition to Industry 4.0 occurs in a fair and sustainable manner for all stakeholders.

In short, the transition to Industry 4.0 poses a substantial challenge to the psychology of work and organizations, requiring support and training to effectively address technological changes and their psychosocial impacts on work dynamics. Adequate preparation is essential, considering that continuous adaptation and the ethical application of artificial intelligence in the workplace are crucial elements to ensure quality of life at work and healthy adaptation to the transformations resulting from the 4.0 revolution.



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