

INTRODUCTION

Throughout history, technological advances have had their part in the process of human evolution. Areas like education, economics, health, research and work are closely linked to these technological changes, that have both positive and negative effects on people's lives.

These waves of technology have presented themselves in four major industrial revolutions that have shattered economic, social, cultural and labor paradigms in every country in the world.

The first one appeared in the 18th Century (1760–1840) with the invention of the steam engine and the construction of the railroad. The Second Industrial Revolution came in the late 19th and early 20th Centuries, defined by chain or mass production. The Third Industrial Revolution started in the 1960s; its importance lies in the invention of the computer and the Internet.

Today, we find ourselves before a fourth industrial revolution dubbed Industry 4.0, which is characterized by the complete automation of industrial production systems through augmented reality, process' digitalization, robotic technologies, and the Internet of Things –autonomous communication among devices through a network.

It is extremely complex to define Industry 4.0 since there are currently more than 300 definitions trying to explain the meaning of this phenomenon. Despite this, these concepts share certain elements that allow us to have a general idea of its meaning without seeking to establish a particular viewpoint. However, to have a minimal notion of its scope, Industry 4.0 refers to a new model of organization in production chains where the interaction among actors (suppliers and customers) directly influences the production processes using Information and Communication Technologies (ICT).

The Industry 4.0 phenomenon is coupled with the implementation of new information technologies that will have both positive and negative repercussions in all areas involving people. Therefore, the use of new ICT brings new factual situations that the law must regulate, specifically regarding the protection of labor rights. Industry 4.0 undertakes a digital transfor-

mation that involves mainly employers –companies– and necessarily workers. Consequently, this evolution in labor relationships that involves the use of new information technologies must be regulated by law from the perspective of labor and social security.

This Fourth Industrial Revolution has established two positions regarding the effects that may arise in the world of work and social security. The first position states that the use of completely automated processes with intelligent machines will lead to the displacement of the workforce by robots in industries, resulting in a massive loss of employment and precarious lives for workers and their dependants. Meanwhile, the second position holds that job posts that can be easily automated will indeed disappear in this digital age, but new sources of employment will be created at the same time, since they will be needed to develop and implement new technologies for production processes; emphasizing the fact that people’s re-education will be the key to obtaining these new jobs.

Regardless of any of these positions, it is true that the possible future reality of work will be reflected in the loss of jobs and sources of employment that, at the same time, will result in a decrease in social insurance coverage for people affected by the companies’ implementation of these technologies.

The standpoints for Industry 4.0 in each country are different not only because they have different economies and populations, but because of the lack of knowledge on how to deal with this global phenomenon.

For instance, in Romania there are important development opportunities within the context of Industry 4.0. To appreciate the true potential of Industry 4.0, Romania needs to plan its digital transformation. One of the most important things is, admittedly, the creation of an appropriate legal framework, such as the adoption of the Digital Single Market telework strategy and the promotion of artificial intelligence.

Meanwhile, companies in Spain are lagging behind the global industry in terms of digitalization. This country shows a lack of digital culture and adequate training; and also current Spanish labor and social security regulations do not have the necessary regulatory framework to accommodate the new forms of work and the emergence of artificial intelligence within Industry 4.0.

In Chile, the labor market is quite precarious. In fact, it has even been pointed out that it is a country with a flexi-precariousness model. While there are several economic areas where these new forms of work have appeared in Chile, the most conspicuous one is undoubtedly passenger transportation through applications like Uber and Cabify, as well as the legal loopholes generated by their use or by a lack of legislation on the matter.

In Brazil, the scope of the General Social Welfare System is a positive factor in the face of labor changes stemming from new technologies, since it includes all workers, whether urban or rural, in a labor relationship or self-employed. Therefore, changing the way work is performed will not be a factor for the absence of social protection, especially if legislation adopts measures to ensure that the worker is registered in the “new” job.

In France, although the term Industry 4.0 is not used, there is a growing concern to pursue the necessary labor reforms to ensure the pairing between technological transformations and digital workers’ social protection in the new era. So, the digital revolution is not considered as a threat posed by the loss of jobs or the obsolescence of labor institutions, but as a challenge and an opportunity to generate new, more creative jobs. To this effect, in recent years France has introduced reforms that allow digital platform workers to benefit from social coverage and certain fundamental rights. Not all digitized posts are covered by France’s new legal measures because some go beyond the national legal framework (micro-tasks on behalf of companies that are not established in French territory).

Italy is a country with a long-standing industrial tradition and its manufacturing companies have been the driving force behind the country’s growth and development, thus becoming one of the pillars of economic growth. However, Industry 4.0 has brought back the need to formulate new industrial policy plans that allow the country to successfully deal with challenges arising in this sphere. Thus, on September 21st, 2016, the Italian government presented the “*Piano Nazionale Industria 4.0*” which outlines various plans of action to address this phenomenon.

Mexico still lacks innovative public policies in terms of Industry 4.0 and an adequate legal framework to responsibly, pertinently and effectively address the disruption of artificial intelligent robotics that will inevitably affect decent employment by changing the basis of traditional labor relations, thus eliminating hundreds of thousands of jobs that will be taken over by robots. This compels the search for new collective forms of protection and strategies to answer the specialized public service of social security, which is essentially a human and social right to be demanded from the State so that the Mexican population can attain a dignified standard of living, with human beings always at the centre of the debate, above all technological tools.

In view of the above, the general objective of this endeavor is to examine the challenges workers and society in general face with the incorporation of Industry 4.0 in Mexico and the world from a multidisciplinary, labor and social security perspective. This will be done through a study of Com-

parative Law with the intention of formulating legal proposals that allow labor and social security protection for workers.

In this context, and due to the great importance of the topic, the “Multidisciplinary Social Security and Social Development” academic body, affiliated to the School of Law and Social Sciences of the Universidad Autónoma del Estado de Morelos (UAEM, Mexico), in collaboration with the Institute for Legal Research from the Universidad Nacional Autónoma de México (UNAM), took on the task of convening renowned researchers from various countries to join an international work team and participate in a collective production centered on Industry 4.0, labor and social security.

Each of the participants prepared a chapter for the book, using comparative law methodology, addressing case studies of the countries involved in the research project, based on the following categories of analysis:

- The reference framework for the implementation of Industry 4.0 in his or her country;
- National problems towards a 4.0 society;
- Legal labor and social security provisions that enable the protection of workers against Industry 4.0; and
- Proposals for legal reforms that provide a possible solution to national problems.

It should be noted that each chapter includes a proposal regarding the implementation of Industry 4.0 in the analysed country.

In order to discuss the preliminary documents that later evolved into the chapters that appear in this publication, a workshop for co-authors to present the topics contained in this work was held on September 12th and 13th, 2018, at the facilities of the *Universidad Autónoma del Estado de Morelos*, in Mexico.

This exercise consisted in making joint observations on papers written, in order to transform them from independent chapters of a collective work into a joint research project.

The selection and review of the final papers was carried out through blind peer reviews by UNAM’s Institute for Legal Research, with the valuable support of Alfredo Sánchez Castañeda Ph.D who directed the corresponding reviews.

In view of the above and following an in-depth adaptation process of the submitted papers, this collective work consists of eleven chapters of ex-

cellent quality written by national and international specialists, divided into three parts:

I. General Section

II. International case studies

III. Mexico and its problems regarding Industry 4.0

The “General section” consists of two chapters and focuses on providing a broad context for defining Industry 4.0, its effects on labor law and the consequences that will affect people’s lives, as well as the skills required for future jobs.

In the first chapter, “Social security and industry 4.0”, I had the opportunity to collaborate by discussing the advantages and disadvantages of Industry 4.0 in the world of work and social security. In it, I analyse the problems that might exist in social security systems and the need to establish a new form of insurance to counter the effects of the Fourth Industrial Revolution.

The second chapter, written by Dr Alfredo Sánchez-Castañeda, is titled “The Fourth Industrial Revolution (Industry 4.0), the less work there is, the newer the posts and a cyclic necessity: the protection of wage-earning and non-wage-earning workers”. It analyses the possible creation and/or disappearance of jobs because of new technologies and robotics, focusing on new non-standardized forms of employment, as well as the need for restructuring labor law and the role the State will assume in light of these new transformations caused by technological advances in the sphere of labor.

The second part of the book, “International case studies”, aims to conduct a comparative law study among different countries in the current context of the Fourth Industrial Revolution’s technological developments and their impact on the world of work and social security. This allows us to contrast similarities and differences in such legal systems in question, in order to improve the Mexican system. To this end, five countries are analysed, each with its own chapter: Brazil, Chile, France, Mexico and Romania.

The first chapter of this second part belongs to Drs Ángel Guillermo Ruiz Moreno, Ángel Edoardo Ruiz Buenrostro and Stephanie Calvillo Barragán from the meritorious *Universidad de Guadalajara* with their paper, titled “Mexico and Industry 4.0”. It analyses the problems in Mexico in regard to the Fourth Industrial Revolution. The authors discuss the consequences that hyper-technology will have on national public policies since a shift is foreseen in educational, cultural, social and economic spheres. Among other things, this shift will transform the production of goods and services and, therefore, the current social security system.

The chapter titled “Romania and Industry 4.0”, presented by Dr Dan Top of Valahia University of Targoviste (UVT, Romania), addresses the opportunities and challenges Romania faces in this new technological era, highlighting the importance of the positive effects of digitalization on workers, both at work and in their everyday lives. The author states that Romania needs to plan its digital transformation, but for this to happen, it is necessary to adapt its regulatory framework, naming as an example, that it did not adopt a law on telework, because it was not passed by the Romanian parliament.

The third chapter, “Chile and Industry 4.0”, was prepared by Dr Pablo Andrés Arellano Ortiz of the *Pontificia Universidad Católica de Valparaíso* (PUCV, Chile). In it, he critically analyses the regulatory challenges that the Chilean State faces with the new labor market within the Fourth Industrial Revolution, especially in the areas of labor and social security. The author points out that Chile is a country that is not exempt from these new atypical forms of work, which means that adapting the regulations that protect workers’ rights is essential to balance the positive and negative effects of Industry 4.0.

Dr Zélia Luiza Pierdoná from the *Universidade Presbiteriana Mackenzie* (UPM, Brazil), through her chapter titled “Brazil and industry 4.0: impacts on public pensions”, analyses the Brazilian social protection system in view of the challenges posed by the arrival of Industry 4.0. At the same time, the implementation of the Fourth Industrial Revolution in Brazil is relatively slow when compared to other countries with similar characteristics. Even then, challenges can already be seen in the labor market and consequently in the social protection of workers who can be replaced by new technologies, as well as in the reduction of social benefits for the same reasons.

To conclude the second part of this collective book, in “France and the 4.0 industrial revolution”, Dr Bárbara Palli of the *Université de Lorraine* (UL, France) develops a reference framework for the implementation of Industry 4.0 in the country and the problems created by this technological transition, not only in France, but also throughout Europe. As well, she analyses the current legal provisions regarding the protection of workers’ rights in the light of digitalization. The author concludes with possible reform proposals concerning the new forms of work in this digital era and her subsequent reasoning.

The third part of this collective work is called “Mexico and the problems related to Industry 4.0” and it consists of four chapters in which the central subjects are the current and future problems that the Mexican government, companies and workers will face in the areas of education, labor

and trade unions with the incorporation of new technologies from the previously mentioned Fourth Industrial Revolution.

In this context, the first chapter is titled “Industry 4.0 and trade unions”, written by Dr Carlos Reynoso Castillo from the Universidad Autónoma Metropolitana (UAM, Mexico). Here, he elaborates a detailed analysis on the consequences of the new organization of labor, which stems from Industry 4.0’s technological advances and in turn has direct repercussions on the trade unions that represent workers’ rights in Mexico.

Dr María Ascensión Morales Ramírez from the *Universidad Nacional Autónoma de México* (UNAM) wrote the second chapter, named “Young people and their integration into Industry 4.0”. This chapter deals with general aspects the Mexican State needs to prioritize in terms of the connection between school and work, so that young people are not left out of the labor market as a result of new job mutations in Industry 4.0.

Dr Julio Ismael Camacho Solís of the *Universidad Autónoma de Chiapas* (UNACH, Mexico) contributes with the third chapter of this section, called “Social inclusion in digital work”. He states the problems entailed in the implementation of new technologies in the world of work and the consequences that this might have on workers’ rights if there is no harmonization between labor and social security legislation in light of the Fourth Industrial Revolution and the effects emanating from it.

To conclude this section and the work itself, Dr Ana Esther Escalante Ferrer of the UAEM participates with her paper, entitled “The challenge of higher education in the light of Industry 4.0”. In it, she provides an accurate analysis of the changes public higher education faces with the emergence of technological advances of Industry 4.0 and the need to reconsider a shift in education for Mexico, in order to re-train human capital, making it possible for them to perform new and future tasks.

On a personal note and on behalf of my colleagues, I would like to thank all the authors of this collective work since its publication would not have been possible without the effort, dedication and professionalism of each one of them.

Last, but not least, I would like to thank the UNAM’s Institute for Legal Research for opening its doors to us and being the publishing house that gave life to this collective work.

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