

SECOND PART

INTERNATIONAL CASE STUDIES

MEXICO AND INDUSTRY 4.0

Ángel Edoardo RUIZ BUENROSTRO*
Ángel Guillermo RUIZ MORENO**
Stephanie CALVILLO BARRAGÁN***

SUMMARY: I. *Introduction.* II. *The emergence of the Industry 4.0 phenomenon in Mexico.* III. *The rise of Industry 4.0 and its rapid evolution.* IV. *Impact of Industry 4.0 in Mexico on matters of labor and social security.* V. *Conclusions.* VI. *Research sources.*

I. INTRODUCTION

Work rescues us by giving life a real meaning; that is why decent employment and the social security system that come with it are inevitably bound to keep the pace up on social and economic changes in the world of work, both employment and labor; specially when everything is being transformed by the so-called *Industry 4.0*; a new disruptive economic and production model with an uncontrollable exponential growth that produces transcendent changes.

Industry 4.0, or the Fourth Industrial Revolution, represents a radical change of legal paradigm in the existence of the 21st Century's Social Law, because its repercussions put the conception of work as we, labor lawyers, once conceived it, at risk. That risk persists in the social security's protective active system, originated from the unusual phenomenon of *intelligent automation* in the production of goods and services, which will predictably end up

* Doctor of Law in Research, undergraduate and postgraduate studies Professor at the Benemérita Universidad de Guadalajara (UDG, Mexico) and other national and Latin American Universities.

** Doctor of Law, National Researcher for CONACYT and Program coordinator of the Doctorate in Law in Research of the Benemérita Universidad de Guadalajara.

*** Candidate Doctor of Law and teacher at the Benemérita Universidad de Guadalajara.

destroying hundreds of thousands of jobs and occupations in our country, during the following decade and those to come.

It is urgent to implement a restructure of the national labor legal system and public policies in accordance with the current reality in Mexico, foreseeing the changes involved in this unprecedented global industrial revolution, defending the *working class* and trying to achieve sustainable social welfare in Mexico.

II. THE EMERGENCE OF THE INDUSTRY 4.0 PHENOMENON IN MEXICO

We start from the following premises: human work gives a sense of belonging and relevance in life. Social law historically and legally emerged from the First Industrial Revolution as a right of social classes. This kind of revolutions in production of goods and/or services, emerging and expanding, have generated notable advances in the most diverse areas of our current societies thanks to innovation and favourable impact in terms of progress and collective human development. We will verify why the right to work and employment, as well as the right to access social security, are considered irrevocable and inalienable human rights in articles 23 and 24, and also 22 and 25, respectively, of the United Nations” «Universal Declaration of Human Rights».¹

Indeed, when the Industrial Revolutions have happened, everything has changed, even though they initially provoke uncertainty; without exception, all of them have ended up being beneficial for the societies in which they are produced and where they are replicated, as long as the human being is considered as the focus of the ends of improvement, since economy and society itself were transformed due to the positive implications caused by the new production system.

For instance, labor law arose from the First Industrial Revolution as a demand for the State to protect the operator against the *mechanization of factory system*; this legal discipline was called by some industrial law because its content tried to regulate the industry sector – and the French jurist George Scelle named it a *social class legislation* – It served as a starting point for the legal regulation of normal employment and originated the so-called social right.²

¹ Cfr. Asamblea General de la Naciones Unidas, “Declaración Universal de los Derechos Humanos”, 217 (III) A, proclaimed in Paris, 10 december 1948, <http://www.un.org/es/universal-declaration-human-rights/>, This document is, in fact, the source of all of the existing International Treaties, Agreements and Covenants on Human Rights on the planet.

² García Oviedo, Carlos. *Tratado Elemental de Derecho Social*. Librería General de Victoriano Suárez, Madrid, 1934, pp. 3 a 5.

Afterwards, during the Second Industrial Revolution, towards the mid-20th Century, the labor phenomenon of the workers' *unionization* gained strength, they joined forces to attain better benefits and greater social protection through collective bargaining.³ The Third Industrial Revolution started in 1971 with the *microprocessor* and ended around the middle of the first decade of this century. During this stage, in less than half a century there was a profound technological transformation, both in the productive and social areas, thanks to the *technological evolution and innovation* that globalized the economy – although with a notorious capitalist approach of the neoliberal system. Thus arises the Internet, the technological “network of networks”, towards the penultimate decade of the last century, radically changing human communication when popularized.

Yes, being interconnected through the Internet impacted social habits and customs. Since today the Internet is within reach of more than four billion users on the planet – we are talking about more than half the world's population – and this number of users increases exponentially in Mexico because, according to confirmed data from 2018, it is used by more than 79.1 million Mexicans in our country,⁴ that is, two thirds of the population.

Likewise, *most employment sources have become highly technified* and their main feature is having greater labor flexibility due to several phenomena that impact on employment through a series of legal or illegal tricks, which generate job instability and low wages, including *tercerización laboral* (outsourcing), *trabajo de muchedumbre* (crowdsourcing),⁵ *mecenazgo colectivo* (crowdfunding),⁶ corporate relocation,⁷ and flexicurity.⁸

³ Obtained data from Méndez Gutiérrez del Valle, Ricardo, *Las revoluciones industriales*, Instituto Geográfico Nacional, Ministerio de Fomento de España, https://www.ign.es/espmapi/figuras_industria_bach/pdf/Industria_Fig_01_texto.pdf.

⁴ Cfr. Martínez, León A., “7 gráficos sobre los usuarios de Internet en México en 2018”, *El Economista*, 17 May 2018, <https://www.eleconomista.com.mx/tecnologia/7-graficos-sobre-los-usuarios-de-internet-en-Mexico-en-2018-20180517-0077.html>.

⁵ Cfr. Meza, Héctor, “De la colaboración al crowdsourcing”, *Forbes México*, July 21st 2014, <https://www.forbes.com.mx/de-la-colaboracion-al-crowdsourcing/>.

⁶ See data about crowdfunding —which encourages capital investment and entrepreneurship in Mexico— in the Crowdfunding México web link, <http://www.crowdfundingmexico.mx/>

⁷ The corporate relocation phenomenon is studied more in-depth in Pérez Ventura, Juan, “¿Qué es y cómo funciona la deslocalización de empresas?”, *United Explanations*, May 31st, 2013, <http://www.unitedexplanations.org/2013/05/31/la-deslocalizacion-o-como-abaratar-costes-en-un-mundo-global/>.

⁸ Cfr. Diego, Julián de, “La flexiseguridad como motor de la reforma laboral europea”,

All of these trends, in both labor occupations and business, have been impacting labor and employment relationships all around the globe; current inertia points out that the phenomenal impact will continue until reaching an extraordinary alteration of formal labor relations, which is a harsh scenario where specialized autonomous occupations, through remote work platforms, will eventually be the main income source for Mexican workers and many within the world's population; a worrying issue for which social security systems must prepare.

III. THE RISE OF INDUSTRY 4.0 AND ITS RAPID EVOLUTION

Known now as Industry 4.0, the *Fourth Industrial Revolution* is a concept coined by German teachers Henning Kaggermann, Wolf-Dieter Lukas and *Wolfgang Wahlster*, at the *Hannover Fair for Digital Technology*, in 2011,⁹ a polyvalent conceptual term that reveals the huge technological and industrial progress that evolved and revolutionized the organization of *global value chains* in Germany and all of Europe, as well as in other continents. This is the result of the convergence of innovative and disruptive developments realised in recent years.

It is true that technology can be very useful for us, however, the problem with its use is that there is no way of telling what kind of decisions we will make while operating it; obviously, morality and ethics have an important role in the deep change of productive schemes in our contemporary societies.

Industry 4.0, in few words, is an amalgamation of digital, physical and biological technologies, coupled with the use of genetic engineering, nano- and neurotechnologies, which are capable of creating, through the combination with artificial intelligence, fully autonomous mechanized factories; therefore, this will necessarily impact the labor market in a profound and radical way, using the process of *intelligent robotization of the goods and services industry*.

All of this is described in the introduction of the book *The Fourth Industrial Revolution*, Klaus Schwab, creator and executive director of the World Economic Forum, *WEF*, a prestigious global forum dedicated in 2016 to the subject of “Mastering the Fourth Industrial Revolution”:

El Cronista, 22 August 2017, <https://www.cronista.com/columnistas/La-flexiseguridad-como-motor-de-la-reforma-laboral-europea-20170822-0004.html>.

⁹ More information about this Fair on the website <http://www.hannovermesse.de/home>

Out of the multitude of diverse and fascinating challenges of today, the most intense and important thing is how to understand and shape the new technological revolution, which is nothing else but a transformation of humanity. We are at the beginning of a revolution that is changing the fundamentals of the way we live, work and relate. In its scale, range and complexity, what I consider to be the Fourth Industrial Revolution is nothing like anything mankind has experienced before.¹⁰

Immediately after, the German, Schwab – without any doubt the most visible authority of the complex Industry 4.0 subject – adds the following insights:

The Fourth Industrial Revolution is not defined by a set of emerging technologies itself, but by its transition to new systems built above the infrastructure of the (former) digital revolution. The *Fourth Industrial Revolution*, not only consists of intelligent and paired machines and systems, its range is wider, at the same time there are waves of advances in fields extending from genetic sequencing to nanotechnology, and from renewable energies to quantum computing. *It is the fusion of these technologies and their interaction through physical, digital and biological domains that makes the Fourth Industrial Revolution fundamentally different from the previous ones.*¹¹

Indeed, according to the promotional advertisement from the German world-wide channel *Deutsche Welle's website*, published on March 1st, 2018, a couple of documentaries about Industry 4.0 are shown, for the viewer to watch through the Internet in *DW Documental*, entitled: *Robots take charge* (parts 1 and 2), which allude what is to come in the next years:

Society is facing a radical change. And this has a name: Industry 4.0 is nothing less than a revolution in today's labor society. Artificial intelligence is gaining ground... *Soon there will be more intelligent machines and robots in the world than human beings. It is something that goes far beyond automotive production. The robots make surgical interventions and reproduce works of art.* Industry 4.0 may be the biggest challenge for the world, says Klaus Schwab, founder of the World Economic Forum in Davos, and warns of a top-down revolution that will turn millions of people into losers that no one will need anymore.¹²

¹⁰ Schwab, Klaus, *La cuarta revolución industrial*, trad. Portafolio México, Penguin Random House, Grupo Editorial México, 2017, p. 13.

¹¹ Schwab, Klaus, *op. cit.*, pp. 13 y 20.

¹² Martens, Klaus, *Relevo de Turno. Los Robots se hacen cargo (2/2)*, DW Documental, YouTube, 1 March 2018, https://www.youtube.com/watch?v=GOAiR8Z9w_c.

We think that in Mexico we should not ignore this powerful message, for we have been able to confirm that the phenomenon is developing at a global scale and full speed on three continents: Europe, Asia and America; so the bias towards the intelligent automation of manufacturing will inevitably lead to the *replacement* of human labor, a matter that, in Japan, has been called for five years as “The revolution of robots”, with the purpose – among other things and with a human approach on technology – of ending with *karoshi*,¹³ the sudden death caused by the overwork of the Japanese, a concept that is part of their peculiar culture and work idiosyncrasy.

This will be like that because the mechatronic systems (that is: systems that combine physical and tangible machinery with data and digital processes) have been capable of making better decisions and also have no problem in cooperating with each other and interacting with human beings, this will transform them, once all of the goods and services processes are automated, into a true factory – *intelligent, autonomous and robotized* – that will end up displacing human labor from millions of current jobs; shall this project advance at the same rate it does; towards the middle of this 21st Century some calculations estimate that only a third of the total world population will have a job and will be able to survive relying on the income obtained from their paid work.

Also, Klaus Schwab himself illustrates that in the *WEF* in Davos, held in January 2016, there was already a glimpse of what the most enthusiastic participants have in mind when they discuss Industry 4.0, which is the sum of the *interaction* of Artificial Intelligence, quantum computing, nanotechnology, neurotechnology, robotics, biotechnology, energy storage systems, drones and 3D printers, and the Internet of Things (IoT), which are its main agents – yet not the only ones.

Out of such technologies, let us take 3D printing as an illustrative example, in order to measure the magnitude, depth, speed and results offered, allowing Schwab himself to explain:

Also called *additive manufacturing*, 3D printing consists of creating a physical object by printing layer by layer of a 3D model or digital drawing; this is the opposite of subtractive fabrication, which is the way things have been done so far, subtracting layers from a piece of material until the desired shape is obtained. On the contrary, *3D printing starts with loose material and then builds an*

¹³ Cfr. Gorvett, Zaria, ‘Qué es el ‘karoshi’, la muerte por exceso de trabajo que en Japón es un problema de salud pública’, *BBC.NEWS*, October 9th, 2016, <http://www.bbc.com/mundo/vert-cap-37391172>.

object in three-dimensional mesh using a digital template. Unlike serial manufactured goods, 3D printed products can be easily customized.¹⁴

The future, then, has come and is here to stay. Because the basic principle of Industry 4.0 for companies is to have the capacity to create intelligent networks that will be able to control themselves throughout the whole “value chain”. To put it in a simple way we will explain it figuratively, exemplifying with an orchestra: the company will be able to operate without having a human person as director of the figurative orchestra (the intelligent automated company), since it will be able to play alone without needing an individual to direct or monitor it, tell it what or how to do it better, tell it to turn on, suspend or turn off, it will do things as planned and with additional advantages: it will be able to work continuously, it will not get tired or get pregnant, nor will demand vacations, payment of overtime, compensation and not to mention all kinds of pensions.

Due to this enormous technological disruption, the drastic change will imply that political, economic and social models should accompany this new and unprecedented productive reality, since it is necessary to understand what is happening to adopt more collaborative forms of interaction between governments and societies. Thus, Industry 4.0 is closely linked to an advanced production phenomenon that will play a transcendental role in the coming years, as a result of the research and innovation of new disruptive technologies,¹⁵ it is capable of creating *new markets and also totally new products*, instead of improving those whose obsolescence is predicted.

What does Industry 4.0 represent to future companies? For a better context on this answer, in 2017, the Massachusetts Institute of Technology (MIT) established a very illustrative list of the 10 most disruptive technologies, which may be an example:

- 1) The end of body paralysis, using electrodes connecting the brain and the affected part;
- 2) Fast and smart charging of electric vehicles, so they can move around 24 hours a day without using any other fuel.;

¹⁴ Schwab, Klaus. *op. cit.*, p. 31.

¹⁵ Cfr. Castillo, Mario, “Tecnologías disruptivas en la era digital. Las tendencias mundiales y el futuro de América Latina”, *ILPES y CEPAL*, Santiago, 12 December 2016, https://www.cepal.org/sites/default/files/events/files/01_mario_castillo_-_tecnologias_disruptivas_en_la_era_digital.pdf.

- 3) Facial recognition and body tracking, used in China for various purposes;
- 4) A new era of smart photography, capable of taking 360-degree photos;
- 5) Photovoltaic energy cells, to harvest sunlight at 100 percent efficiency.
- 6) Gene therapy 2.0, curing the patient's illness by changing damaged genes.
- 7) The *genetic Wiki*, which will create a cellular and genetic atlas of the human body with the purpose of more accurate diagnostic
- 8) Firewalls and systems created to avoid the latent risk of cyber-attacks and prevent hacking in networks;
- 9) *Machine learning*, that allows the faster understanding and solution of a problem; and,
- 10) New era computing: the functional quantum computers are applied in the field of Artificial Intelligence and big data, as well as the operation and creation of artificial neural networks.¹⁶

The speed of changes is such, that the MIT said that by 2018 there will be an advance in other sectors in surprising ways in 10 topics:

- 1) Metal 3D printing, for all kinds of spare parts;
- 2) Intellectual genes based on genetic risk score for drug creation;
- 3) Carbon dioxide-free (no-CO₂) natural gas, a less polluting energy in the planet;
- 4) Accurate and instantaneous translators in smartphones (Google Translate) or through Pixel Buds headphones that translate another language in real time;
- 5) Ultra-tech or smart cities, designed for latest technologies;
- 6) Artificial intelligence raised to "the cloud" for a wider and unrestricted market, not only for the exclusive use of technological giants;
- 7) Artificial embryos created from human stem cells, a topic with multiple ethical considerations;
- 8) Cryptographic financial privacy through the use of cryptocurrencies;
- 9) Robots with creative imagination, independent of humans; and,

¹⁶ Remírez, Diego, "Las 10 tecnologías más disruptivas de 2017 según el MIT", FORBES México, August 29th, 2017, <https://www.forbes.com.mx/10-tecnologias-mit/>.

- 10) Jump to quantum computing, for the creation of: molecules, proteins, electrolytes, solar cells, conversion of light into liquid fuel, also revolutionizing binary common computers.¹⁷

If we had to reduce what Industry 4.0 implies to a word, we believe that this word would be *disruption*, that is, *the abrupt rupture of what already exists*. To a point where it is not enough to be *innovative*, you have to be *disruptive*.

Nonetheless, disruptive technology evolves much faster than the rate at which its products can adapt to the current market; However, its constant increase mitigates the risk new inventions imply because a *new market will be generated thanks to the evolution of the product itself*, the replacement of which is assured and its eventual placement in a fixed segment or “market niche”. The simplest and clearest of examples are smart cell phones or smartphones, whose versions evolve year after year leaving behind the previous model – already technologically overpowered – and a satisfied consumer will become a captive customer: he will buy the newest, more useful and sophisticated model, leaving the previous one obsolete due to its apparent obsolescence.

That is why the Industry 4.0 phenomenon will inevitably impact individual, family and obviously social behaviours globally, and Mexico cannot be the exception; however, it will affect formal employment and will impact notably on the future of human labor and its social protection mechanisms – both in social welfare and social security – generating even larger social gaps in income inequality; this will influence national and regional geopolitical security, as it also will in the current existing moral and ethical frameworks, since not only will *what* and *how* things should be done in the social sphere change, but also perhaps the most transcendental: *who we are* in the current social context.

This technological revolution has positive implications for *the creation of value, business models, auxiliary services and work organization*. However, in order to benefit from all this, companies must follow a series of steps grouped into five strategic areas as main statements in the value chain: 1) data generation and input; 2) data analysis; 3) human-machine interaction; 4) flexible production; and 5) intellectual property. Professor Marc Sachon – academic director of the International Center for Logistics Research and the IESE

¹⁷ “Las 10 tecnologías más disruptivas que marcarán el año, según el MIT”. El Mercurio, Uruguay, March 2018, <https://www.elpais.com.uy/el-empresario/tecnologias-disruptivas-marcaran-ano-mit.html>.

Program – also reminds us, following the 1988 prophesy that, Harvard professor Shoshana Zuboff stated in terms of technology, about the value chains of technological advance:

All of the processes that can be automated will be automated; everything involved in the manufacture of products that can be computerized, will be computerized; and, all sensors, digital apps and devices that can be used for surveillance, control and distributed decision making will be used exactly for that purpose.¹⁸

It is obvious that the most advanced countries will make technological changes more quickly, and while it is initially possible that countries with emerging economies can benefit from some of the inventions, in the end they will have to adopt the new technologies... although they will have to pay the cost for its use because it will be the intellectual property of others. That is precisely why we should invest in research, in Mexico, right now.

About the disruptive innovation developed and to be developed, the World Intellectual Property Organization (WIPO) announces its World Innovation Index 2017, in which it states categorically that: Switzerland, Sweden, the Netherlands, the United States of America and United Kingdom, lead the annual ranking;¹⁹ And in this list, at the Latin American regional level, are located: Chile in 46th place, Costa Rica in 53rd, and Mexico occupies 58th place, WIPO affirms: no Latin American country presents better results in innovation, regarding their levels of development.²⁰

In a few words: in Mexico we are still stagnating and producing goods and services with systems from the late 20th Century.

On the other hand, considering several scoring factors, according to the classification made by the specialized magazine in business and finance FORBES Mexico, the most advanced countries in projects and achievements in Industry 4.0 are the United States (in America), Japan (in Asia) and Germany (in Europe).²¹

¹⁸ Sachon, Marc. “Los cinco puntales de la cadena de valor en la industria 4.0”, *IESE Business Insight. Business Knowledge*, Madrid, <http://www.ieseinsight.com/doc.aspx?id=1941&ar=5&idioma=1>.

¹⁹ Organización Mundial de la Propiedad Intelectual (OMPI), Índice Mundial de Innovación 2017: Suiza, Suecia, los Países Bajos, los EE.UU. y el Reino Unido encabezan el ranking anual, Geneva, June 15th, 2017, http://www.wipo.int/pressroom/es/articles/2017/article_0006.html.

²⁰ *Idem*.

²¹ Forbes Staff, “¿En qué consiste la cuarta revolución industrial?”, *FORBES México*,

These three countries, along with others who have joined the project of artificial intelligence in their respective continents, with the fixed purpose of achieving *intelligent industrial robotization*, will also be the managers of one of the most controversial premises of change; because although it is true that Industry 4.0 has the potential to raise global income levels and improve the quality of life of entire populations, it is also true that the *achieved transformation* will only benefit those who are able to innovate and adapt to it.

We should add that many countries' populations have benefited from the arrival of the *digital world* thanks to the possibility of making payments, listening to music or requesting a taxi from a ubiquitous and cheap cell phone; however, these benefits have not displaced traditional methods and, on top of that, organized crime has also wreaked havoc on users who trusted too much or knew little about the enormous potential of these transformations.

There is, above this last point, a proper cultural and educational matter we must never lose sight of, especially when not everyone sees the future with optimism: the polls for academic opinion reflect the concerns of employers and workers' unions about the so-called technological Darwinism, a scenario where those who do not adapt to change quickly will not survive. And if the change happens at full speed, the effect can be more devastating, than the one generated by the previous Industrial Revolution.

In this regard, Elizabeth Garbee, researcher at the *School for the Future of Innovation in Society*, in the Arizona State University, warns:

In the game of technological development, there are always losers. And one of the forms of inequity that worries me the most are values. There is a real risk that the technocratic elite will see all the changes that come as a justification of their values... This type of ideology severely limits the perspectives put in the table for decision making (policies), which in turn exacerbates inequity. The enthusiasm is not unjustified, because these technologies represent amazing advances. But enthusiasm is no excuse for ingenuity and history is full of examples of how technology overrides the social, ethical and political frameworks we need to make a good use of it.²²

February 26th, 2016, <https://www.forbes.com.mx/7-de-cada-10-empresarios-ve-positiva-la-cuarta-revolucion-industrial/>.

²² Quoted by Perasso, Valeria, "Qué es la cuarta revolución industrial (y por qué debería preocuparnos)", *BBC Mundo*, 12 October 2016, <http://www.bbc.com/mundo/noticias-37631834>, Date of consultation: July 5th, 2018.

We agree with the opinion of Elizabeth Garbee. Therefore, about having adequate ethical and political frameworks, we propose that a *political option* for Mexico is to carry out an *open, technical and democratic national debate, regarding the objectives of this new economy*, to assume and define responsibilities after analysing the pros and cons. And with respect to the complex *ethical issue* of the consequences of such a radical change, it should be properly pointed that, with that change, business productivity will be increased by decreasing its operating expenses and the companies' profit will be greater; However, inequality in the distribution of income will also bring all kinds of problems (unemployment, labor conflicts and social protection losses, among many other issues to be solved), which will generate ethical business dilemmas, geopolitical insecurity, and legal insecurity in the protection of personal data and intellectual property, among a multiplicity of ethical issues of social significance.

Perhaps for that reason, in the 2016 edition of the WEF of Davos, the theme of “dominating” (sic) this unpublished Industrial Revolution 4.0 was addressed,²³ because surely the price to pay for the benefit obtained was already in mind, apart from the purely social impact; this is demonstrated by the interventions of the experts in the WEF, since the economic benefits of moving forward are at risk due to the multiple existing national and international protectionist measures – particularly by non-tariff barriers, and the typical regulations of world trade that have been exacerbated since the financial crisis of 2007. This complex issue is a huge challenge that Industry 4.0 itself must also *master* if it really seeks to consolidate and legitimize itself socially, otherwise it will not advance as its authors predict.²⁴

It is obvious that with the use of Information and Communication Technologies (ICTs), *formal employment is being seriously threatened* by a peculiar phenomenon that is not only political, economic, social, cultural, legal and even ethical, but also it is a matter of enormous individual and collective human involvement. This phenomenon of production of goods – and above all, of services – known as “intelligent automation” or “total robotization of industries” has already displaced hundreds of thousands of human beings from their usual activity in factories and other work environments,

²³ Cfr. “La cuarta Revolución Industrial, el tema en Davos 2016”, El Financiero Bloomberg, Youtube, January 21st, 2016, https://www.youtube.com/watch?v=HtwPkg_3dAY. Watch the appearance of Joe Biden, former vicepresident of the United States, in Davos' World Forum in 2016, a forum that discussed as a main theme the Industry 4.0.

²⁴ Cfr. CEAL, *Algunas Conclusiones Foro Económico Mundial Davos, Colombia, 28 January 2016*, <http://ceal.co/algunas-conclusiones-foro-economico-mundial-davos-2016/>.

but this phenomenon is to grow exponentially and millions of people will soon be affected.

This *workforce displacement* is an unprecedented phenomenon for humanity, undoubtedly the product of human creativity and research through the use of artificial intelligence, advanced computation designs and the development of innovative and disruptive software designed for the total automation of industrial processes in repetitive tasks. The paradox of this issue is that all this happens when, in most of the world, the fundamental human rights of every individual to work and have access to social security are recognized at a constitutional and legal level.

This phenomenon has affected not only the peculiar way of *doing*, but also of *understanding* to better regulate the subordinate employment of the 21st Century. The implementation of the use of high technology of the most diverse nature in so many environments confirms what Martin Ford says: *robots and these technologies are a real threat of a future without employment.*²⁵

Of course, the main German promoters of the Fourth Industrial Revolution, Henning Kaggermann, president of the German Academy of Science and Engineering; Wolf-Dieter Lukas, of the Federal Ministry of Education and Research in Germany; and Wolfgang Wahlster, director of the German Research Center for Artificial Intelligence, know that Industry 4.0 will only work globally if alternatives are sought to help countries with emerging economies.²⁶ Because at the end of the day, we all know that the market needs buyers, but the unemployed will not be that.

That is why Industry 4.0 as a concept is not only a revolution of the industry, but also is a paradigm shift in the labor market and global trade, which entails a series of enormous social consequences and implications that need to be objectively analysed from all possible angles: political, economic, social, cultural, anthropological, sociological, psychological, medical, financial, actuarial, etc., and also without ignoring their necessary philosophical, philological, historical, legal and ethical analysis, topics specific to social sciences and humanities.

²⁵ Ford, Martin, *El ascenso de los robots. La amenaza de un futuro sin empleo*, trad. de Andrea Gálvez de Aguinaga y Víctor Manuel Cuchi Espada, Mexico, Ediciones Culturales Paidós, 2016.

²⁶ Martens, Klaus, *Relevo de Turno. Los Robots se hacen cargo (1/2)*, DW Documental, YouTube, March 1st, 2018, <https://www.youtube.com/watch?v=8w8Ra18Yiaw>.

IV. IMPACT OF INDUSTRY 4.0 IN MEXICO ON MATTERS OF LABOR AND SOCIAL SECURITY

One of the biggest challenges presented in Mexico by Industry 4.0, is that in this interconnected world we prioritize the urgent over the important. A clear example of this is that we do not recognize the most important social problems as a country and that, when we finally recognize them, we opt for easy ways out, however inadequate for our peculiar national idiosyncrasy.

A couple of examples will help us understand the issues raised:

- *In labor law matters*, two different sample statements: the first one is that in 2017 a constitutional reform was made to shift labor justice administration to the Judicial Power, disappearing *de jure* – although not *de facto* – both federal and local Conciliation and Arbitration Boards, that are tripartite bodies dependent on the Executive Power, this without considering neither time nor costs of such unusual change for which the country was not prepared.²⁷ The second matter is that Mexico was the last country in Latin America and the Caribbean to ratify Convention 98 of the International Labour Organization (ILO) on the application of the principles of the right to unionise, and to collective bargaining, on 20 September 2018,²⁸ This is despite the fact that our country was a world pioneer in recognizing Social Rights in our Constitution.
- *In terms of social security*, the individual pension capital model, accepted on July 1st, 1997 for employment, without an adequate constitutional framework, in the vast majority of cases will cover puny pensions of between once and thrice the minimum wage to the insured, which will impact not only in the life quality of the pensioner and his family, but also in our national economy.²⁹

These examples illustrate for themselves that Mexican Social Law for political reasons, is often late and wrong when trying to regulate the reality

²⁷ Decreto de reforma y adición a los artículos 107 y 123 de la Constitución Política de los Estados Unidos Mexicanos, published in Diario Oficial de la Federación, 24 February 2017, http://dof.gob.mx/nota_detalle.php?codigo=5472965&fecha=24/02/2017.

²⁸ Visit the website: <https://aristeguinoticias.com/2109/mexico/mexico-ultimo-pais-en-al-en-ratificar-convenio-98-oit-modelo-de-corporativismo-ya-no-es-sostenible-alcalde/>

²⁹ *Cfr.* Ruiz Moreno, Ángel Guillermo, *Las Afore, el sistema de ahorro y pensiones mexicano*, 7ª edición, Mexico, Porrúa, 2017.

of the country. If we adequately analyse the phenomenon of Industry 4.0 and its possible consequences, everything shows the likely threat of a future without employment, even though we have been aware of these changes for at least a decade.

In this context, it is to assume that Mexico has already understood several things: 1) the country is not prepared to adapt the enormous challenge that the aforementioned technological advance imposes on us, because the market is already transforming, with or without legal regulation by the State;³⁰ 2) *the manufacturing sector is the country's driving force*, in which there has been a strong and constant foreign investment, and it is precisely this sector the one prioritizing this Fourth Industrial Revolution;³¹ 3) in Mexico, *manufacturing represents 32 per cent of the Gross Domestic Product, and also represents 35 per cent of the total volume of exports*;³² and, 4) that Industry 4.0, apart from allowing the employer to save up to 30 per cent of the total costs, will completely change the business, since intelligent manufacturing will shortly be the new model of production and commerce, that is, *the new way of doing business*.³³

In that order of ideas, Martin Ford, in his book *The Rise of Robots*, makes a disturbing account of the effects of increasing automation in the economy and the way to earn a living in the near future:

In recent years the selection and hiring of personnel is being threatened; the salaries of recently graduated students have been decreasing at the same time to the point that more than half of them are forced to perform jobs for which a degree is not needed. In fact, as I will demonstrate in this book, many of the jobs for trained professionals – including lawyers, journalists, scientists, and pharmacists – have been significantly affected due to the advancement of information technology; and they are not the only ones. This indicates that

³⁰ Robotics forums, conventions and massive events, at a national and international level, have taken place in the country for more than five years. One example to prove that is a gathering of young people from more than a hundred countries, the so-called *FIRST Global Challenge-2018*, in Mexico City, <http://www.aztecauno.com/mundialderobotica>

³¹ Cfr. Secretaría de Economía, *De enero a diciembre de 2017 México registró 29,695.0 millones de dólares de Inversión Extranjera Directa*, Gobierno Federal de México, February 21st, 2018, <https://www.gob.mx/se/prensa/de-enero-a-diciembre-de-2017-mexico-registro-29-695-0-millones-de-dolares-de-inversion-extranjera-directa?idiom=es>.

³² Celis, Fernanda, “La Industria 4.0 cambiará por completo a los negocios”, *FORBES México*, October 13th, 2016, <https://www.forbes.com.mx/la-industria-4-0-cambiara-por-completo-a-los-negocios/>

³³ Cfr. Martínez, Guillermo, “Manufactura 4.0: un nuevo modelo de negocio”, *Énfasis Logística México*, November 7th, 2016, <http://www.logisticamx.enfasis.com/articulos/76434-manufactura-40-un-nuevo-modelo-negocio>.

we are heading for a transition that will subject society and the economy to a great tension.³⁴

Following these ideas and applying them to Mexico, the potentially devastating impact is a scenario of unemployment or underemployment that will affect society, whose economy will pay at a very high price. *The market requires buyers* and, without a fixed income, the virtuous circle between productivity, wage increases and increases in consumer expenses could collapse the national economy, so the market would have to be restructured in time for better sustainability. In this regard, Martin Ford points out: “*In Silicon Valley, the expression disruptive technology is used indiscriminately, because there is no doubt that technology has the ability to eliminate entire industries and alter specific sectors of the economy and the labor market.*”³⁵

So, the correct question to ask in such a disturbing scenario is not whether Industry 4.0 has already arrived in Mexico, because that is obvious considering our inevitable geographical proximity to the United States; the correct question – and the one that we Mexicans should answer – is be: how will Industry 4.0 affect Mexico in terms of employment and social security?

Since the beginning of the 21st Century, Mexico has undoubtedly followed the theme of Industry 4.0 from the most diverse sectors, among them:

- The *governmental sector*, the Presidency of the Republic³⁶ and the Federal Secretary of Economy³⁷ are pending, alongwith the other national public agencies;
- The *employer sector*, it is a priority to follow up the issue of industrial technology, global trade and business innovation, supporting economically – along with public dependencies – innovative disciplinary and transdisciplinary research as well as business entrepreneurship;

³⁴ Ford, Martin. *op. cit.*, pp. 19-20.

³⁵ *Ibid.* p. 21.

³⁶ Mexico was guest of honor in the Hannover Industrial Fair (Germany), in its 2018 edition, the first country in Latin America and the first Spanish speaking country that received such honor. Cfr. PROMÉXICO, “¿Qué tienen en común México, la Cuarta Revolución Industrial y el Foro Económico Mundial en Davos? Que el mundo está hablando de las tres”, *Gobierno Federal de México*, January 24th, 2018, <https://www.gob.mx/promexico/articulos/mexico-dando-forma-a-la-cuarta-revolucion-industrial?idiom=es>.

³⁷ NOTIMEX, *Cuarta Revolución Industrial será una realidad en México: Siemens*, 20 minutos. February 18th, 2018 <https://www.20minutos.com.mx/noticia/334018/0/cuarta-revolucion-industrial-sera-una-realidad-en-mexico-siemens/>. Mexico’s Federal Secretary of Economy and the industrial enterprise Siemens are working jointly in the *Alianza México 4.0* initiative.

- The *trade union sector*, national workers' organizations have barely begun to understand the enormous fragility of their situation in the face of future unemployment, underemployment and the precariousness of work caused by the possible reduction of employment posts, which will make unionising not only difficult, but also collective bargaining, without losing sight of the evident fragmentation that the union sector will suffer medium and long terms; and,
- The *national education sector*, there has been a decision to create committees of experts focused on the theme of Industry 4.0, holding congresses, courses and forums with the participation of specialists who analyse this complex topic; universities and technological institutes for five years have undertaken the task to make adjustments for the creation of new careers that educate young people for the hyper-technological future that awaits us, as well as to renew curricula and the content of subjects that address the topics of this Fourth Industrial Revolution.

As we can see, the inevitable job change in employment is already occurring in Mexico, it is beginning to change towards new forms of work that are not regulated by the Federal Labor Law, and it is oriented towards autonomous and distance work through computers connected to the Internet.

This new work modality will turn most of those who, with a computer, tablet or cell phone used as a digital communication tool wherever they are located and connected to the Internet, into digital nomads, who will do very specific tasks to obtain, in exchange for their intellectual effort, sufficient income to live; provided, of course, they have a digital expertise focused on a specific topic that exploits some specific skill or ability from the individual and qualified occupation market, and as long as that service is required by a third party with needs to receive specialized collaborations and the contractor has enough money to pay for the intellectual support received.

Thus, the *workplace* as we know it would cease to exist, because instead of an office, workers will work from home, a park, a cafeteria or in the car itself, at any time and place as long as there is an Internet connection, and they will be able to do so even through their cell phone. Currently, millions of people work like this.

Legally analysing this unstoppable phenomenon, the human right to work will subsist, although current Labor Law will require reforming the virtual reality complex, because we know that legal science is chasing reality to try and regulate it the best way possible, so it must evolve at the same

pace, in order to avoid leaving the current legal framework and the working class's tuition behind.

We must point out that *human work will not disappear*, because it is inherent and consubstantial to the nature of individuals and is socially useful. *Work* is established as a fundamental right of every individual according to the first paragraph of article 5 of our Mexican Federal Constitution; However, *work subordinated to an employer in exchange for a salary* – that is: formal or decent employment – will undergo an inevitable transformation due to the intrusion of the phenomenon of intelligent robotization, an inevitable consequence of the aforementioned disruptive technological transformation, being an unprecedented event in the history of mankind.

It is possible to forecast that, as the hyper-technological change of Industry 4.0 advances, there will no longer be written contracts, but electronic ones; except for a few exceptions, such contracts will not be for formal employment, but for personal services not subordinated to an employer; their validity will be limited to a specific task or work for a preset time, with the specific characteristics of an independent work, we cannot omit that *this will cause stability in employment to no longer exist* and, consequently, that contractual negotiation between employers and unions will be very limited.

In such scenarios, the old formula of legally regulated employment will not apply, in such subordination and *salary remuneration* were sufficient to guarantee the *jure instatum* legal presumption of the existence of an employment contract subordinated to an employer. The signatory parties of the contract of professional services for a fee will become a *client* and a *service provider*, respectively, instead of employer and operator. Thus, the current formula of the legal presumption about the existence of an ordinary labor relationship, established in Articles 20, 21 and 33 of the *Ley Federal del Trabajo* – regulatory of Section A of Article 123 of the Mexican Political Constitution – will be obsolete. and inapplicable because of the nature of the work substantially changing due to the unavoidable impact of Industry 4.0.

On the other hand, about the pernicious effects on employment, we add that ICT are used both in ordinary subordinate work, as well as in the daily work of public servants; therefore, *the impact of this phenomenon on the national bureaucratic law that regulates it at its three levels: federal, local and municipal will be inevitable*. Currently, we note a non-minor statistical fact: the country's public employees jointly add up to, in round numbers, over five million.³⁸

³⁸ Cfr., Martínez Muñoz, Aleida, “¿Sabes cuántos servidores públicos hay en México?”, IEXE Escuela de Políticas Públicas, Mexico, <http://www.iexe.edu.mx/blog/sabes-cuantos->

Because of this, Industry 4.0 also represents a huge challenge for the Mexican State itself, as it is the largest employer in the country, especially when the routine administrative tasks are the trades or jobs that will be more susceptible to be automated. In this thread of ideas, the government sector should invest in intelligent technology for its daily operation and, consequently, liquidate hundreds of thousands of public servants, who will suffer these profound changes over the years. This requires the design of *public policies in line with the new labor reality and social security*.³⁹

Thus, the unstoppable implementation of Industry 4.0 will affect both the current labor relations, and collective bargaining between employers and their workers' unions in terms of social security; there is to add that with equal strength *it will affect the current Mexican social security systems*, so there will be a need to rethink modifying this social protective system. And if formal employment decreases, then it becomes necessary to look for alternative sources of financing for this indispensable specialized public service that has brought a lot of welfare to Mexican society during its three quarters of a century of fruitful existence.

The big question to all this is: how will they protect all those unfortunate ones who are to be unemployed and replaced because of automation and their respective families, by extension? And this question is pertinent since in Mexico, historically and legally, a very peculiar phenomenon has been happening: since January 19th, 1943 – the date on which the original *Ley del Seguro Social* was published⁴⁰ – *there is definitely not a way of understanding employment without linking it to social security*.

An irrefutable proof that *social welfare* should be the protective system linked to employment and not social security, is in the name of our Constitution's Title Six: "Labor and Social Welfare", a Title that is reduced to a single precept: the already mythical constitutional Article 123. Without entering into conceptual problems or delimitations on the field of legal regulation of each social protective system, in our written work we have always maintained – and many work and social security experts agree on this – that the concepts of work and employment are not synonymous; because at least

servidores-publicos-trabajan-en-mexico.html Date of consultation: 5 July 2018. In this document, IEXE informs that, with the exception of medics, nurses, pólíce officers and teachers, around 4'925,493 Federal, State and Local public servers work in Mexico as of today.

³⁹ INEGI, *Estadísticas a propósito del Día de la Administración Pública (23 de junio)*, INEGI, Aguascalientes, June 21st, 2017, http://www.inegi.org.mx/saladeprensa/aproposito/2017/publica2017_Nal.pdf.

⁴⁰ Ley del Seguro Social, January 19th, 1943.

in Mexico, work is contemplated in Article 5, while employment is regulated by Article 123, both precepts of our Mexican Political Constitution. Therefore, it is logical that each of the articles and systems should have their own legal regulation.⁴¹

In this regard and as a proposal to meditate, the aforementioned constitutional precepts should be adequately regulated so each one counts with a specific social protection system:

- a) *Work* of all sorts, including independent work or self-employment, and informal work, this would be protected by the *classic social assistance* and have a proper *social protection floor*;⁴² this does not impede in any way the *free access to the national social security system, because it is a human right of all and for all individuals*, being also a public service whose only responsible guarantor is the Mexican State. and,
- b) *Subordinate or formal employment* must be protected through social welfare as its own system of labor protection, according to its own legal nature; and in addition, it should have a specialized public *social security* service that covers employers, the operator and its immediate family, coverage based on the theory of social risk in the *Ley del Seguro Social por México*, and extendible to the rest of Social Security.⁴³

Standing before a complicated reality of mass unemployment caused by Industry 4.0, it is a good idea to *legally separate, once and for all, formal employment from social security*, since by *removing the link between social security and work* and adopting new rules of access to insured social groups, rational benefits, and looking for a renewed way of financing; it is feasible to maintain this right, that the current generations could not live without.

V. CONCLUSIONS

We are at a crucial moment for the future of the country, because by properly combining protective systems it would be feasible to achieve a genuine *uni-*

⁴¹ Ruiz Buenrostro, Ángel Edoardo, *Bases mínimas para una seguridad social universal. La unificación de los seguros sociales en México*, Mexico, Porrúa, 2017, pp. 41-44.

⁴² Cfr. Schwarzer, Helmut et al.(coords.) *La Estrategia de Desarrollo de los Sistemas de la Seguridad Social de la OIT. El papel de los Pisos de Protección Social en América Latina y el Caribe*. OIT, Lima, 2014, http://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/documents/publication/wcms_317898.pdf.

⁴³ Ruiz Moreno, Ángel Guillermo. *Nuevo Derecho de la Seguridad Social*, *op. cit.*, pp. 482 ff.

versal social security, even implementing a *social protection floor* which Mexico has already recognized, but still does not dare to implement.⁴⁴

With the adoption of a reform to the Mexican social security's legal framework, adequate coverage could be given to the self-employed sector—Most of them, people who work behind a computer through the Internet—and in the same way, the income would be extended to anyone who wants to and has the possibility of voluntarily joining this specialized national system, because in reality *it has never been free*.

Whereas, with the adoption of an *innovative social protection floor*, the rest of the population would have the option of a *generic social protection*, integrated by different specific protective systems, namely:

- a) The *national system of social protection in universal health*;
- b) Social assistance paid by the State treasury, managed by the State;
- c) *Social labor welfare* for subordinate employees, a system created through collective bargaining; and,
- d) *Complementary social protection systems*, such as private life, disability, major medical expenses and unemployment insurances, etc.

Whatever we Mexicans decide to do in this regard, we must act as soon as possible; legislating and complementing operational public policies at a national level, because the Mexican State must react quickly to this contingency. While making these decisions, it should not be overlooked that the eventual replacement of individuals by intelligent machines and robots has moved people from the technological industry to look for ideas to sustain social protection. An example of this, is American billionaire, Bill Gates, owner and founder of Microsoft, the world's largest personal computer and software company, who surprised everyone when, on February 17th, 2017, in an interview for Web magazine Quartz Media, suggested that *robots that do work pay taxes*.⁴⁵

Of course, an intelligent robot is not a person and therefore cannot be taxed as such; however, the owners of these machines are human beings and obtain considerable savings by replacing people with robots and automated

⁴⁴ Cfr. OIT, *México y OIT firman convenio de protección social*, Noticias ONU, Geneva, 18 June 2013, <https://news.un.org/es/story/2013/06/1274761>.

⁴⁵ El Mundo, *Bill Gates opina que los robots deben pagar impuestos*, El Mundo, Madrid, Spain, February 2017, <http://www.elmundo.es/tecnologia/2017/02/20/58aab904ca4741657a8b45dd.html>.

machines, in the production processes of their companies. Therefore, they must pay higher taxes to contribute to public spending.

Bill Gates, as a pioneer and now a guru of information technology, argues with great reason that there may be a great inconvenience to consider in the future: *the eventual slowdown of the Industry 4.0 phenomenon*, that is, the fact that there will be fewer companies investing in automation, if they have to pay other taxes for using robots. However, he also believes that in the medium and long term, it would become the most manageable situation to alleviate the unemployment that the huge displacement of people will create; because those affected can be redirected to other sensitive activities that are complicated to automate, focused on social services, and improving the quality of social life, such as dedicating oneself to the care of children, the elderly, the disabled or the sick.⁴⁶

Of course there may be other options to finance our social security, among them: creating new taxes, raising taxes, or opting for the so-called *universal basic income*,⁴⁷ an alternative model with the premise that the State can grant every person in the community a basic income. This last topic will not be further discussed because of its enormous complexity and space reasons.

In the legal field, due to the massive use of the Internet and computer media, computer *security is necessary*, giving citizens legal certainty regarding the protection of their personal data, in addition to supporting the enormous investment from third parties that is required to carry out the necessary technological research to materialize Industry 4.0 throughout the country.

It is therefore imperative to legislate on Digital Law, to better address and regulate the issues of the National Industry 4.0 in Mexico. Not only we should have a *substantive federal regulation* that allows the creation of legal doctrine in technologies – because it is true that the Third Industrial Revolution forced us to contemplate, out of legal science, issues such as the use of

⁴⁶ Cfr. Delaney, Kevin J, “The robot that takes your job should pay taxes, says Bill Gates”, Quartz, Quartz Media LLC, February 17th 2017, <https://qz.com/911968/bill-gates-the-robot-that-takes-your-job-should-pay-taxes/>. Ver vídeo de la entrevista a Bill Gates.

⁴⁷ We recommend to readers interested on knowing what *universal basic income* is, the document: Artero López, Jesús Manuel *et al.*, ¿Es viable financieramente una renta básica universal en Andalucía?, Departamento de Economía e Historia Económica, Universidad de Sevilla, España, 2016, <http://ustea.es/new/wp-content/uploads/2017/11/Es-viable-financieramente-una-Renta-B%C3%A1sica-Universal-en-Andaluc%C3%ADa.-JM-Artero-L%C3%B3pez-y-otr@s.-US.pdf>.

electronic money, electronic trade, electronic signature, and electronic payment and transfer systems. However, legislating, for example, on electronic crimes, the use of crypto currencies or the eventual dematerialization of credit titles is a priority.⁴⁸ Millennials should collaborate to their own future, because in Mexico there is talent to spare.

It would also be urgent to create, in parallel to the substantive aspect, a *procedural federal legislation in the area of Digital Law* that includes such aspects as: administrative and judicial electronic procedures; elements of evidence – both in the presenting and in its objection – and basic rules that must be observed by jurisdictional resolutions in this matter; all in all with the idea of granting legal security in the administration of justice and being able to systematize the criteria used by the federal courts that process means of challenge or litigation for the aforementioned Law.

Finally, when it comes to the transformations that have generated technological changes due to the industrial revolutions in the production of goods and the supply of services, not only will society resent its impact but also the country's authorities. For that reason, the *State* must intervene in order to regulate once and for all the empire that is proper to the market, creating a new legal framework according to the needs of the country, alleviating as far as possible the unfavourable effects for the national working class.

The changes forged by Industry 4.0 not only will affect those working in the productive sector; at the same time, they have already had a profound impact on every conceivable area of contemporary societies, although they had a different impact among developed countries and emerging ones.

Out of the disruptive transformations generated by the implementation of new technologies in virtually the entire planet, there is a great concern on how to *preserve a social welfare system* that does not slow down the progress of this new industry. At the same time, it should be of use to all Mexicans in the most diverse sectors; hence the urgent need to anticipate events to take advantage of this technological progress, from all areas: political, social, economic, cultural, academic and legal.

It will be necessary to *reach a consensus and achieve social legitimacy* when making adjustments, legal changes and public policies; which will be achieved by providing the population with accurate and timely information about Industry 4.0. Particularly, emphasis should be placed on education and seek to redistribute income and social security to the workforce that

⁴⁸ Durán Díaz, Óscar Jorge (coord.), *Derecho y Medios electrónicos. Temas selectos*, México, Porrúa, 2012.

will be replaced in their usual jobs by automated machinery equipped with artificial intelligence.

We must never forget that technology is just a tool for facilitating the existence of human beings, being a great myth that intelligent robots *think*. Intelligent robots are programmed exclusively to act according to the programs of their creators, who in the end are also human beings.

All in all, the economic destitution in which part of the Mexican population would fall into, is a problem worth preventing, rather than solving.

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