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# Retos de la formación profesional del diseñador industrial en la Cuarta Revolución Industrial (4RI)

## *Challenges of the professional training of the industrial designer in the Fourth Industrial Revolution (4RI)*

## *Desafios da formação profissional do designer industrial na Quarta Revolução Industrial (4RI)*

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## Resumen

En este artículo se abordaron los retos que tiene la formación profesional del diseñador industrial ante el desarrollo de la Cuarta Revolución Industrial (4RI). Esta idea surgió luego de que se identificara que el diseñador industrial requiere renovación profesional para orientarse en el manejo y desarrollo de nuevas tecnologías y de nuevos materiales, para dar soluciones a necesidades sociales e industriales en la era de la transición entre humanismo y posthumanismo.

Se aportó el supuesto de la conformación del diseñador 4.0, holista e integrativo, como constructor de híbridos humanos y humanoides: *bio-orgs, cyborgs, silorgs y symborgs*. Se sostuvo que el diseño industrial es la profesión del futuro, pues el mercado profesional está demandando nuevos perfiles con formación en dicha área, como lo son los diseñadores: visuales, interactivos, *bio-tecno*, UX (*User eXperience*) y UI (*User Interface*); para los campos de la inteligencia artificial, internet de las cosas, realidad

aumentada, big data, robots, *blockchain*, realidad virtual, drones, impresión 3D y avatares.

Esto exige la actualización de los planes de estudio universitarios, que permitan una preparación interdisciplinaria en la conformación de comunidades de innovación promovidas con un aprendizaje imaginativo, creativo y de conocimiento ontológico, epistemológico, tecnológico y científico.

**Palabras clave:** diseño industrial, formación profesional, Revolución Industrial 4.0.

## Abstract

In this article the challenges of the professional training of the industrial designer before the development of the fourth industrial revolution (4RI) were addressed. The central idea was that the professional renewal of the industrial designer is required, now oriented towards the management and development of new technologies and new materials to provide solutions to social and industrial needs in the era of the transition between humanism and posthumanism.

The assumption of the conformation of the designer 4.0, holistic and integrative, was contributed as a constructor of human and humanoid hybrids: bio-orgs, cyborgs, silorgs and symborgs. It was argued that industrial design is the profession of the future, because the professional market is demanding a new generation of designers: visual, interactive, bio-techno, UX (User eXperience) and UI (User Interface), for the fields of artificial intelligence, Internet of Things, Augmented Reality, Big Data, Robots, Blockchain, Virtual Reality, Drones, 3D Printing and Avatars.

State requires the updating of university study plans, under an interdisciplinary argument in the formation of innovation communities promoted with an imaginative, creative learning and ontological, epistemological, technological and scientific knowledge.

**Keywords:** industrial design, professional training, industrial revolution 4.0.

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## Resumo

Neste artigo foram abordados os desafios da formação profissional do designer industrial antes do desenvolvimento da 4ª Revolução Industrial (4RI). Essa idéia surgiu depois de ter sido identificado que o designer industrial precisa de renovação profissional para orientar-se na gestão e desenvolvimento de novas tecnologias e novos materiais, para fornecer soluções às necessidades sociais e industriais na era da transição entre o humanismo e o pós-humanismo.

O pressuposto da conformação do designer 4.0, holístico e integrativo, foi contribuído como construtor de híbridos humanos e humanóides: bio-orgs, cyborgs, silorgs e symborgs. Foi argumentado que o design industrial é a profissão do futuro, já que o mercado profissional exige novos perfis com treinamento nesta área, assim como os designers: visual, interativo, bio-techno, UX (User eXperience) e UI (User Interface) ); para os campos da inteligência artificial, internet das coisas, realidade aumentada, dados importantes, robôs, cadeias de blocos, realidade virtual, drones, impressão em 3D e avatares.

Isso requer a atualização dos planos de estudos universitários, que permitem uma preparação interdisciplinar na formação de comunidades de inovação promovidas com aprendizagem imaginativa e criativa e conhecimento ontológico, epistemológico, tecnológico e científico.

**Palavras-chave:** *design industrial, treinamento profissional, Revolução Industrial 4.0.*

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## Introduction

The current world is changing at a speed never before seen in science and technology. Before, changes took longer to be applied by society; Now, innovations are socialized faster. In less than two decades we recorded an exponential growth of scientific and technological contributions in different fields of knowledge, such as in the cases of nanoparticle development, biotechnology, electromagnetics, robotics, virtual reality, and so on.

Under this understanding, and with the advent of the Fourth Industrial Revolution (4RI), is concerned about the professional performance of the industrial designer. Innovations in new technologies and new production materials are modifying the labor market, which now requires industrial designers versed in the management of virtual reality articulated with physical reality to respond to social and economic demands.

Taking into account this problem, this article aims to identify the challenges of the professional training of the industrial designer within the 4RI. For this, the assumption is made that the borders of professions such as graphic design and industrial design should be blurred, in order to obtain a new design professional, the designer 4.0 (D 4.0). It is a designer capable of adapting easily to diverse functions, imaginative, that is the bridge between the innovations needed by humanism and the emerging demands of posthumanism.

The development of the article is divided into four parts:

a) Industrial design before the advent of the new world. At this point it is noted how humanism is disrupted from the scientific and technological development, giving opening to an overcoming of human capabilities with posthumanism.

b) Disruption of industrial design in the 4RI. Here is how the 4RI demands a renewed industrial design professional, who is a direct participant in the innovations required in different fields of professional performance, such as: robotics, virtual reality, 3D printing, among others.

c) Megatrends of the industrial design based on the drivers. At this point, the need for D 4.0 is raised, with an interdisciplinary training and vision to contribute to the construction of intelligent processes, systems and organisms.

d) The industrial designer between humanism and posthumanism. Here the questions of the challenges in the transit of designer 4.0 between humanism and posthumanism are discussed.

Finally, the conclusions mention that the curricula must be updated at the pace of scientific development and the demands of the industrial world, since now the professional market demands a range of holistic and integrative designers.

**Industrial design before the advent of the new world**

With the same dynamism that science and technology does, industrial design is transformed within the 4RI of the 21st century. It is a modern profession that goes through a transition from the idea of man as machine creator to the idea of the homo gubernator (García, 2017, p.1), based on industrial development based on the fusion of physical, digital and biological technologies . It is a profession that consolidates quickly; in the medium term future it will acquire relevance in the era of the biorobot, because it will form part of the economic scenario with the generation of material and immaterial systems and processes for the diversification of physical and symbolic consumption. However, its importance will fall mainly in its participation to design the improvement of human capacities through the use and development of new materials and convergent technologies nano-bio-info-cogno in the design of corporal bionic implants, parts of the bionic brain, devices for mind uploading, biotechnological pieces for the configuration of the bio-orgs (homo sapiens modified proteinically), cyborgs (homo sapiens- cybernetic organism), silorgs (human organisms of silicon) and symborgs (symbolic organisms). Industrial design is a profession of the future.

The world is transformed exponentially in terms of scientific-technological developments, demanding industrial design professionals who overcome the academicist dogma focused on the contemplation of the past and the objectual inertia of corporeality. It requires an industrial designer prepared for a posthumanism, which in turn fulfills as agent of the deconstruction of the finite certainties of a postmodern life that now transits

between physical reality and virtual reality, and as a neo-professional tracer of Jungian archetypes from the future. This represents a challenge of magnitude not yet valued by the universities that still reproduce a teaching that corresponds to industrial revolutions of the past, and a learning based on competences that represent a dam for a free, creative and imaginative learning fueled by scientific hybridization and technological expressionism as divertimentos of the reason and of the affectivity.

The use and application of digital technology, increasingly present in contemporary society, will not only impact on the volume of consumption, but also in its way of producing it and the formal expression of its design. The proposal of more and better systems, processes and consumer goods is latent, which means that as consumers we will have access to more elections with greater freedom (Brynjolfsson and McAffe, 2016, p.27), this is important because the offer is diversify and the products, with increasing competitive advantages, will give buyers the option to select from a wide range. It also means that the level of social commitment and professional performance of the designers will be more necessary. The technological, social and cultural demands, in terms of academic training, will be greater; Professional learning will not be local, but global. The profession of the industrial designer, like the markets, maintains a logic of interconnection marked by the current era, defined by technology and the development of knowledge.

The discipline of industrial design must go hand in hand with the technological and scientific development of the current years because there is a big gap between what is taught in university classrooms and what is required during professional action in the workplace. The fields of work of industrial designers persist in the manufacturing and service industries, but now skills, capacities and knowledge are required in topics related to cutting-edge technology, fusion of the physical, digital and biological worlds (Schwab, 2017 p.14 ), among other basic cultural knowledge, such as languages, because industries are changing dynamically. It is about making competitive the professional training to avoid that the professionals are subcontracted in the industry or displaced by the robotic technologies, or, they need to be trained by their contractor being already in professional

action (Reyes and Pedroza, 2015, p.35) . This slows the labor insertion and economic growth of nations, and undermines the prestige of educational institutions.

**Disruption of industrial design in the Fourth Industrial Revolution**

The 4RI[1] It started a couple of decades ago with the emergence of digital technology and communication systems incorporated in all industries. The objective example that represents the beginning of this moment in the history of humanity is the cell phone, because it incorporates for the first time technologies that facilitate communication between people through electronics and interconnectivity systems; appears, well, the digital world.

The 4RI is a new way of organizing the means of production, the processes and all the organizational structures of the manufacturing and service industries. Through applications derived from scientific progress and technological development, a new way of doing is formulated in the business environment. The 4RI involves a transformation of processes, objects and consumer goods, as well as the way to acquire them, through a sudden break with the old methods of production that flourished during the Third Industrial Revolution.

In the context inherent to the professional practice of the industrial designer, the 4RI means a disruptive change that modifies the methods, processes, designs, technologies, companies, systems and human relations. In the social aspect, it represents changes, towards other styles of life, of systems of communication with others, as well as of the ways in which we conceive and relate to things. Regarding human identity,[2] a relationship between humans and non-human organisms is generated as an assembly of a

[1] En cuanto a los procesos de producción y transformación, la Cuarta Revolución Industrial, es también denominada Industria 4.0. En otros contextos también se reconoce como Revolución 4.0.

[2] Es oportuno situar el cambio de pregunta existencialista que surge en el posthumanismo: "La identidad humana se plantea diferente si la pregunta pretende responder quién es el hombre no obstante los cambios a los que se ve sometido, que sí pretende hacerlo a quién soy yo a pesar de los cambios a los que me veo sometido. La tradición filosófica moderna se ha enderezado más hacia la pregunta quién soy yo, esto es, sobre la primera persona, que sobre la tercera persona o la pregunta sobre quién es el hombre" (Velázquez, 2009, p. 581).

subject-system in the posthumanist era.[3] In education, this revolution modifies teaching and learning processes, methods, educational technologies and curricula. It is, from our point of view, a scientific-industrial revolution and a radical change of paradigm, because it involves nothing less than a transformation of humanity (Schwab, 2017, p.13). It is a new way of seeing, living and understanding reality, of relating to others, of living in the world and in the universe.

The transformations that occur in each system of things or objects of everyday life within the framework of the 4RI occur at great speed, exponentially, continuously and disruptively. In the educational institution, training of professionals, these disruptive transformations should lead to consider at least three aspects for the definition of their profession concept: speed, breadth and impact. For Schwab this implies:

Speed: Contrary to the previous industrial revolutions, this is evolving at an exponential rate, rather than linear. This is the result of the multifaceted and deeply interconnected world in which we live and of the fact that new technology engenders, in turn, newer and more powerful technology.

Amplitude and depth: It is based on the digital revolution and combines multiple technologies that provoke unprecedented changes in paradigms in economics, business, and social environments. Not only what and how to do things are changing, but who we are.

Impact of systems: This is the transformation of complex systems between (and within) countries, companies, industries and society as a whole (Schwab, 2017, p. 15).

[3] Un hibrido ensamblado entre naturaleza y tecnología, como menciona Braidotti: "El devenir posthumano es, en consecuencia, un proceso de redefinición del sentimiento de conexión hacia el mundo compartido y el medio ambiente: sea urbano, social, psíquico, ecológico o planetario. Éste expresa múltiples ecologías de la pertinencia, mientras que provoca la transformación de las coordenadas sensorial y perceptiva, con el fin de reconocer la naturaleza colectiva y la apertura hacia el exterior de aquello que aún llamamos sujeto. En efecto el sujeto es un ensamblaje móvil en un espacio de vida compartido que no controla ni posee, sino que simplemente ocupa, atraviesa, siempre en comunidad, en grupo, en red. Para la teoría posthumana el sujeto es una entidad transversal, plenamente inmersa e inmanente en una red de relaciones no humanas (animales, vegetales, virales). El sujeto encarnado zoe-centrado es presa de conexiones relacionales de tipo viral y contagioso que lo interconectan a una vasta gama de otros, partiendo de los eco-otros para incluir el aparato tecnológico" (2015, p. 9).

Concepts such as efficiency, speed, collaboration, competitiveness, breadth, impact, flexibility, interconnection, among others, give guidelines for the reformulation of a more agile and dynamic way of doing things. They also allow for innovation and evolution. Teaching and traditional learning are now determined by the conditions of the technological, economic and cultural context of this new paradigm. The digital interconnection and the processes directed by the information and communication technologies, as well as the smart factories, are essential features of this new way of living reality in a connected industry. The 4RI represents the end of the predominance of the electronic automation characteristic of the Third Industrial Revolution, the overcoming of the continuous or chain manufacturing of the Second Industrial Revolution, as well as the motor force and the mechanical power of the First Industrial Revolution.

The fundamentals are based on the union of intelligent production systems in all stages of the development of a product or process, in order to generate impact and benefit in efficiency and productivity. There are four elements on which the 4RI is based: instantaneity, virtualization, decentralization and modularization.

Instantaneity: The processes related to the value chain of objects and services, from production to consumption, involve very short times. While the lack of merchandise is being reported in the departmental store, it is starting production in the factory. Monitoring and decision making is in real time.

*Virtualization*: The use of virtual media, such as the internet, through devices and applications in the production system, facilitates remote monitoring because applications (apps) connect the individual in any task, from placing an order in the supermarket , until observing what is the "stock" of production or in the supply chain.

*Decentralization:* Decision making does not fall on a person, department or company; falls on the set of businesses that form the productive system, from the operative, to the CEO,[4] even the machine that is usually robotic. Through data analysis, cyberphysical systems are, in the 4RI, the main decision makers in the production chain.

[4] CEO: *Chief executive order*. Traducido al español significa: “Oficial ejecutivo en jefe”.

Modularization: Production is carried out in modules or in parts, according to the production request, using the necessary resources for the requested production in real time, thus avoiding warehouse and excess production costs in relation to the actual request of the markets.

Megatrends of industrial design based on impellers

The word tendency comes from the intransitive verb propender. It is the inclination or tendency that has a thing to something. For the Royal Spanish Academy (RAE), the word tendency can be understood in three meanings: "The propensity or inclination in men and in things towards certain ends"; "The force by which one body leans towards another or towards some things", and "The religious, economic, political, artistic idea, etc., which is oriented in certain directions" (RAE, 2014). According to this, and in composition with the mega prefix (which means large), the definition of megatrend, for our purposes, is the great economic, scientific, cultural or social idea that is oriented in a certain direction. Understand, as a megatrend, that inclination we have towards some ideas of different foundation that encompass a current ideology.

For the German Schwab (2017) there are three main technological drivers to consider, not only for the design of new products, but for the total development of humanity. Three great drivers that fused define the trends towards which the human journey has been shaped for the following years. All three are deeply interrelated and the different technologies benefit from each other thanks to the discoveries and advances that each group is achieving. It's about the physical drivers, the digital drivers and the biological drivers. In the current era, these three technological drivers represent the starting point from which other scientific developments continue to be promoted.

There are different examples of impellers with physical characteristics: advanced robotics, 3D printing or additive manufacturing, autonomous vehicles and new materials. Advanced robotics is already a reality in manufacturing companies, in medical services, in the aerospace industry, in the agricultural sector and even in everyday life. Robots represent the man-machine collaboration in benefit of multiple tasks that facilitate daily life. The biomimicry incorporated in these developments promotes greater flexibility of

robotic machines because they are inspired by the patterns and strategies of nature. On the other hand, in relation to additive manufacturing, it is already counted, in different universities, with incipient machines that are used in teaching and in academic projects.

The digital impellers symbolize the essence of the 4RI. They allow communication and interrelationships throughout the world to take place. The Internet of Things (IoT) is one of the main connections between physical and digital applications (Schwab, 2017, p.34); enables the relationship between people and objects, spaces and services, through platforms with virtual applications. Some examples such as parking sensors, computers, tablets, smartphones and printers are facilitating human activities and have already been appropriated by users naturally. Services such as the purchases of the pantry or the transfer service in taxis promote through the IoT the so-called economy on demand or collaborative consumption. Through developments such as M2M and physical objects we have some successful physical-digital incorporations: Waze or Siri would not be what they are if they were not contained in a physical object: a mobile device. As Brynjolfsson & McAffe state:

> The exponential, digital and recombinatory powers of the second era of machines have enabled humanity to create two of the most important unique facts of our history: the emergence of real and useful artificial intelligence (AI), and the connection of the majority of people on the planet through a common digital network (...) Combined are more important than anything since the Industrial Revolution, which forever transformed how physical work was done (2016, p. 86).

The biological drivers have represented one of the largest scientific developments of the 4RI. Subject to the ethical question, genetic sequencing and the Human Genome Project have set the standard for the management of the genetic components that lead to the study of the causes of diseases such as cancer: a pandemic of humanity. In the same way in the intervention in matter of gestation and improvement of animal and vegetal species.

The design profession, generator of human creative potential and taught in academic and educational institutions, has the virtue of being the source of innovation. Innovation, a disciplinary product of design as a creative process, originates (or should be) in the

academic institution, because it is the space where, through the accumulation of knowledge, it is problematized, intellectualized and proposed. If the Industrial Revolution (1RI) of nineteenth-century England is glaring because it inaugurated the industrial style of mercantile production, it instituted radical changes in the living conditions of human groups, while at the same time modeling the relationships within the family structure , labor and institutional (Fugellie, 2015), the 4RI, will not be an exception. The 4RI represents an unprecedented disruptive change that will potentiate what had already been modified by the 1RI. It took centuries for humanity to arrive at the 1RI; to 4RI, just decades.

**Tabla 1.** Revoluciones industriales en la historia

| Movimiento | Temporalidad | Características esenciales |
|---|---|---|
| Revolución agrícola | - 2500 (a. C) | Uso de la energía animal, tecnología simple. |
| Primera Revolución Industrial (1RI) | Siglo XVIII | Poder mecánico, máquina de vapor. |
| Segunda Revolución Industrial (2RI) | Siglo XIX | Fabricación en cadena, líneas de producción rígidas. |
| Tercera Revolución Industrial (3RI) | Siglo XX | Fabricación flexible, automatización electrónica. |
| Cuarta Revolución Industrial (4RI) | Inicia en el año 2010 | *Smart factories*, industria conectada, Industria 4.0. |

Fuente: Elaboración propia.

Throughout its history, design has been characterized as a set of disciplines that, configured, form a profession. Professional design provides society with support in relation to their needs related to material culture (Reyes, 2015, page 55). The World Design Organization (WDO), formerly ICSID,[5] defines industrial design in the following way: "Industrial design is a strategic problem-solving process that drives innovation, develops commercial success and leads to a better quality of life through products, systems, services and innovative experiences" (WDO, 2017, p. 2).

[5] ICSID: International Council of Societes of Industrial Design.

> The same organization, expanding the definition, specifies the design as:
> Industrial Design bridges the gap between what is and what's possible. It is a trans-disciplinary profession that harnesses creativity to resolve problems and co-create solutions with the intent of making a product, system, services, experience or a business, better. At its heart, Industrial Design provides a more optimistic way of looking at the future by reframing problems as opportunities. It links innovation, technology research, business, and customers to provide new value and competitive advantage across economic, social and environmental spheres[6] (*Ibidem*).

In the definition offered by the WDO (NGO), leader as a design group, it can be seen that the design conception it promotes goes beyond considering design as a simple profession that defines products of material culture. Professional design aims to support what leads through products, systems, services and innovative experiences to a better quality of life. This definition has been updated in the last five years, as can be seen in the book Profession and professionalism in industrial design (2015, p.55). This is so because it is an eminently contemporary profession, which corresponds naturally to the scientific and technological advances of the moment. Design as a profession must be co-responsible in the macro trends dictated by the time.

On the other hand, although the WDO affirms that the impact of the design profession goes beyond the objects and products, and reaches systems, services and innovative experiences, the essence of the profession is framed in the object and the product . From there, the design of the 4RI must act. For the construction of objects or products, the semiotic design theory of Bense and Walter (1975) considers the object or product a "designed object". In the understanding that an object is such, its composition takes into account three fundamental dimensions and in balance: the semantic dimension (the form), the pragmatic dimension (use and function) and the syntactic dimension (the materials and the construction processes)

[6] Traducción: "El diseño industrial cierra la brecha entre lo que es y lo que es posible. Es una profesión transdisciplinaria que aprovecha la creatividad para resolver problemas y co-crear soluciones con la intención de mejorar un producto, sistema, servicio, experiencia o negocio. En su corazón, el diseño industrial proporciona una forma más optimista de mirar el futuro al replantear los problemas como oportunidades. Vincula la innovación, la investigación tecnológica, los negocios y los clientes para proporcionar un nuevo valor y una ventaja competitiva en todas las esferas económicas, sociales y medioambientales".

Thus, from the ideal postulates of these authors and of Schwab himself (2017), it would be affirmed that the designs of the immediate future would have to be configured from the base of the technological drivers and the design theory, Germans both.[7]

**The industrial designer between humanism and posthumanism**

The industrial designer of the current era has to develop in times of interrelation between humanistic and post-humanist paradigms. Each paradigm has its cognitive and evaluative commitments, this reminds us of Kuhn, with his essay on Scientific Revolutions:

> […] normal science gets lost again and again, and when that happens, that is, when the profession can no longer steal from the anomalies that subvert the current tradition of scientific practice, then extraordinary investigations begin, which eventually lead to the profession to a new set of commitments, to a new base on which to practice science. The extraordinary episodes in which there is a change in professional commitments are known as scientific revolutions (2006, p. 64).

As we have maintained so far (and taking up the Khunian idea of subversion to tradition), the disruptive change produced by the 4RI occurs in all dimensions of social reality: technological, scientific and productive, forcing us to think consciously about the formulation or the reformulation of the industrial design profession in accordance with this new reality. According to the megatrends and precepts of design theory, the designer trainer (the teacher), the institution (the university, the school), the designer (the professional, the student), the employer (industry or company in its different categories), the political sector (government) and society (NGOs and civil society) must make their role conscious in this scenario. As we observed in the previous section, physical, biological and digital drivers define trends in design. In global matters, the trends are defined according to the risks that are foreseen for the next years from now.

The World Economic Forum (2017) publishes in four major groups the main risks to which humanity faces: social risks (RS), economic risks (ER), technological risks (RT), geopolitical risks (RGP) and environmental risks ( RMA). The presents grouped as follows:

[7] Además de los fundamentos del diseño postulados por Wong en su obra (2002).

**Tabla 2.** Factores de riesgos mundiales 2017

| FACTOR DE RIESGO | CLASIFICACIÓN |
|---|---|
| Cambio climático | RMA |
| Auge de la urbanización | RGP |
| Enfermedades crónicas en aumento | RS |
| Crecimiento de la clase media en las economías emergentes | RS |
| Degradación del medioambiente | RMA |
| Movilidad geográfica en aumento | RS |
| Cambios en el panorama internacional de gobierno | RGP |
| Dependencia cibernética en aumento | RT |
| Aumento del sentimiento nacional | RS |
| Intensificación de la polarización en las sociedades | RS |
| Traspaso del poder | RGP |
| Aumento de la desigualdad de ingresos y riquezas | RE |
| Envejecimiento de la población | RS |
| Eventos meteorológicos extremos | RMA |
| Fracaso de la mitigación del cambio climático y la adaptación a este | RMA |
| Fracaso de los gobiernos a nivel regional o mundial | RGP |
| Fracaso de la planificación urbana | RMA |
| Colapso o crisis del estado | RS |
| Falta de gobernanza nacional | RGP |
| Migración involuntaria a gran escala | RS |
| Inestabilidad social profunda | RS |
| Conflictos interestatales | RGP |
| Desempleados o subempleo | RS |
| Ataques cibernéticos | RT |

Fuente: Elaboración a partir de la Encuesta de percepción sobre los riesgos mundiales 2016, del Foro Económico Mundial (WEFORUM, 2017)

As noted, these risks encompass the totality of social life. The world experiences a contrasting reality between lags and ruptures, old unsolved problems in continuous growth and accelerated changes that transform life on the planet. The challenges are not few: the old worries are added to the new enigmas. On the one hand, poverty, inequality, inequality, migration, violence, unemployment, etc.; and on the other hand, the scientific and technological revolutions generate planetary upheavals such as climate change and the disruption in the identity of the human, transhumanist and posthumanist arguments that debate about the survival or not of the human being emerge.

Behind the old and emerging tensions is the problem of population growth, today the human population amounts to 7550 million inhabitants figure that according to estimates of the World Bank will amount to 11 184 million inhabitants for the year 2100.

**Tabla 3.** Crecimiento de la población mundial (2017-2100).

| | Población (millones) | | | |
|---|---|---|---|---|
| Región | 2017 | 2030 | 2050 | 2100 |
| Mundo | 7 550 | 8 551 | 9 772 | 11 184 |
| África | 1 256 | 1 704 | 2 528 | 4 468 |
| Asia | 4 504 | 4 947 | 5 257 | 4 780 |
| Europa | 742 | 739 | 716 | 653 |
| Latinoamérica y el Caribe | 646 | 718 | 780 | 712 |
| Norte América | 361 | 395 | 435 | 499 |
| Oceanía | 41 | 48 | 57 | 72 |

Fuente: United Nations, Department of Economic and Social Affairs, Population Division (2017), *World Population Prospects: The 2017 Revision*. Nueva York: United Nations.

The population growth will be uneven between the continents. The largest population growth will be in the continents of Asia and Africa. This means that the geopolitical, military, economic, cultural, scientific and technological breach will continue, as well as the transgression of freedoms and human rights. The industrial development of the 4RI is not only social, it is also military. The technological innovations of terror and murder as a means of control and territorial invasion will increase their power with biochemical and biotechnological devices.

In socio-technical terms, if in the postindustrial society the importance of the technical component of knowledge increased (Bell, 2006, p.173), the importance of technology increases in the society of the 4RI. If in that educational institutions promoted the preponderance of knowledge within the training model, the importance of knowledge and use of the information and communication media with their planetary impacts is now added. The professional training of the industrial designer is challenged to respond to the challenges of human problems and posthumanist enigmas; it must be oriented towards solving problems and innovation, creating learning communities connected to the real

world and with the epistemology and ontology of technology, promoting a phenomenological and at the same time practical thought, and it must be based on the teaching-learning relationship. learning and research.

The training of the industrial design professional has to position itself as the profession of the future because it has a socially added value in the megatrend of the changes initiated with the 4RI. In this sense we propose the idea of the designer four point zero (D 4.0). This industrial designer is a new kind of designer in accordance with the hybrid world in the age of artificial intelligence. Companies with greater technological advances demand an integral designer. The new demands of designers are: visual designer, interactive designer, bio-techno-designer, designer UX (User eXperience) and UI (User Interface). For this reason, the curricula of universities must be renewed, leaving in the past the artificial division between design activities, as happens between the graphic designer and the industrial designer, and consider the idea of the training of the designer D 4.0.

The D 4.0 has a fertile field of professional performance that demands solutions, creativity, imagination and knowledge, among the areas of work opportunity linked to the 4RI are the following: artificial intelligence, internet of things, augmented reality, big data, robots , blockchain, virtual reality, drones, 3D printing and avatars.

## Conclusions

The professional training of the industrial designer has to be reformed and updated according to the demands of the 4RI that a holistic, multidisciplinary and versatile designer demands, that provides knowledge and a creative, hybrid and imaginative learning for the generation of innovations that dynamize the society and to the market.

Academic professional training has to overcome its ostracism. Teaching is still largely directed at an object and service production corresponding to the past industrial revolutions. The 4RI demands that the cathedral academic communities emerge from

their obscurantism and link themselves to the dynamics of scientific-technological development and to the nascent era of posthumanism.

The cultural, social and economic richness of posthumanism is convergent with the potentialities of design, because the designer is the innovation specialist based on imagery, talent and cognitive commitment. The construction of artifacts, processes, systems and experiences in the era of the biorobot by a specialist that mediates between the human and the technological is essential. D 4.0 will be the specialist between humanism and posthumanism. The D 4.0 has the following challenges: freedom from academic ties; open new fields of performance beyond the objectual and the services linked to the Second and Third Industrial Revolution; erase artificial boundaries between design activities to potentiate design as a techno-scientific discipline; acquire an identity based on holistic and integrative innovation; develop socio-learning communities connected between different disciplines to develop designs of processes, systems and factual and symbolic constructions with an ontological, epistemic, psychological, social and technological incorporated vision; be a participant in the favorable impact on the solution of traditional problems and alternative enigmas, and position themselves in the medium future as a constructor of technological archetypes incorporated in human nature (recharged humanism) and non-human artifacts and organisms with new materials (posthumanism).

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