# Preface

The passing of time has determined great evolutionary or revolutionary changes in science and in the new information technologies, to improve the quality of life of humanity. In the 20th century, the modernization of science and education has been a constant in all latitudes of the world, from the expansion of personal computers to interactive multimedia telephony, through which mixed reality can be accessed, as well as home automation, telecare, virtual campus, and so on.

The technological changes of the twentieth century spontaneously brought changes in urban and rural populations, where it was easy to verify the social studies in which possible solutions were indicated and aimed at the generation of geographic, digital, labour gaps, etc. among citizens. Now, there are temporary circumstances, in which these social transformations coincide with the passage from one century to another, and even join the change of a millennium. They are those moments in which a kind of double screening of human knowledge and its technological creations takes place. That is to say, everything that is discarded for the future and makes up museum pieces. Others, on the other hand, are rescued to continue developing them for the good of the human being and his environment. Besides, and as is well known since the 20th century, health and education are the two fundamental pillars, in communities considered culturally and socially advanced.

However, in the last years of the new millennium and although we are going through the era of the expansion of communicability, we have been direct witnesses of how this temporal factor and that normality in the evolutionary process have been altered by financial, commercial, climatological, health, etc. In other words, **the modernization of science and education oriented towards the world population pyramid has been affected by three great earthquakes, in the two decades of the new millennium: First, dot-com bubble and dot- com crash, the second, with its epicentre in the great international financial or banking crisis, and the third, the pandemic.** That is, events that accelerate the metamorphosis of thought and survival actions, with greater or lesser acceptance of changes, by the inhabitants of local and global communities.

To these two events, the perennial destabilizing elements of the social balance have been added: Acceleration in the concentration of great financial wealth, restrictions on access to secular education, increase of the digital or technological gap, the promotion of the automation of industrial tasks, fractures in the private and state labour market (that is, employees subject to constant continuous training versus public employees, with little or no professional updating or evaluation), and so forth. The purpose of all this is to undermine the structural bases of the gradual and constant evolution of societies, governed by authentic democracy, which is fostered through the educational system. These two telluric movements of the new millennium, unexpected and unforeseen, by the vast majority of the population have opened new structural cracks in the two fundamental pillars of modern societies: Education and health.

And precisely, in emergency situations, the cracks become more visible. **Education is not an exception to reality, although efforts are made to make it once again have a central axis, in the communities.** So much so, that in the midst of the pandemic, in many places the routine of classes, exams, presentation of final research papers, etc., have continued to develop, thanks to the democratization of the Internet, open software and applications for text communications, voice and video over Internet (VoIP), chats, etc., adapted for group telecommunications or teleconferences, such as: Cisco Webex, FaceTime, FreeConference, Google Hangouts, Google Meet, Jitsi Meet, Line, Microsoft Skype, Skype Meet Now, Tox, Viber, Whatsapp and Zoom. Examining each one of them, we can see that they come from the software and hardware sector, commercial or not, but widely distributed worldwide: Apple, Cisco, Google, Microsoft, and so forth.

Now, regardless of the positive or negative evaluations, of millions of students, teachers, tutors, etc. that for the first time have been immersed in the e-learning process, for example, it continues to be verified that the moment of interacting with interactive systems, **the Achilles heel, was, is and will continue to be the original content, according to the local context of the user;** literacy in the use of new technologies; the varied and chaotic set of social media channels to access "serious" training content; the availability or personal access to the latest generation technological devices, to name a few examples. Here it is important to differentiate e-learning from r-learning (compulsory readings in individual or cooperative learning mode).

Today there are myriad digital or analog channels of unidirectional, multidirectional, interactive communication, etc., to emit and receive information. Although all of them have increased over time, in global emergencies, countless teachers and students fail to differentiate between information, training, instruction and education, in the continuous loop of the teaching and learning process. Consequently, the channels, the media and the communication process are negatively affecting users (students and teachers) due to a large avalanche of trivial, false, manipulative data, etc., circulating on the network, without considering the aspect of veracity of the same. Digital data that through dynamic and/or static media, could reinforce the educational process of multimedia classrooms, such as the use of augmented reality, e-book, podcasting, and so forth. This does not happen for a myriad of reasons.

One of them is that applications have been promoted with social networks that a priori are visually pleasing but the image of banality (photos and videos) predominates over written or oral text. That is, original textual content, with a serious theoretical and experimental base, aimed at didactics. Today, the narcissism of the digital image prevails over the originality of the text. The creativity and practicality to find real and valid solutions is disappearing in the future generations, who interact with modern technological devices on a daily basis.

In the face of this reality, **many young users try to detoxify themselves from social networks, resorting to the original or first mobile models,** that is, with the basic functions for calls and receiving / sending SMS, for example. Those models are currently intended for the elderly. This temporary setback shows that the abusive use of technological means of communication requires an analysis of the consequences they bring about in human beings. Therefore, it also affects the fashion of resorting to transmedia or inverted classroom as a didactic solution in university classrooms as well as in secondary schools, aimed at ICT disciplines. These are two of the many educational consequences verified under the pandemic.

Smart smartphones, social networks, transmedia, mixed reality, the metaverse, etc., added to the latest technological innovations, remain one of the biggest problems since the origin of multimedia systems, which is the lack of educational content suitable. In other words, personalized content created by specialized teachers, autonomously and/or collaboratively.

Although the algorithms developed by artificial intelligence would already allow educational content to be produced, it is not the ideal solution due to a high number of variables that remain in the human being and that cannot be managed correctly through current computers.

Furthermore, it is a reality that endures over time and without a solution, despite the crises of the new millennium. In the first of them, the appropriate alternatives would supposedly be sought so that financial entities would be transparent in their actions, avoiding a new global debacle. In the second, alternative plans should be promoted in the face of health emergencies. In both cases, it is found that they are unrealizable hypotheses, given the power of malfunctioning systems, which are perennially cloistered in social structures, starting with education.

For this reason, it is necessary to look carefully at the sciences, from their origins and their constant evolution, over time. Analyzing in detail the fundamental components to revalue them and make them available to all, so that humanity can successfully face the new challenges. **These are challenges that will surpass science fiction, when quantum computing is democratized, to cite an example.** Also discover in the new media those elements that can safeguard the veracity of the information. Simultaneously, draw the attention of the new generations to the sciences, in order to create original and innovative environments, for each one of them. In other words, that they feel fulfilled in their contexts of studies and/or experiences, without the need to invade and harm other areas of knowledge, which are not within their competence.

In this sense, **the human being must recover his natural and acquired capacities in the formative stage, as it was before the emergence of social networks.** A stage where he manages to understand the importance and respect of the context in which he is immersed, the limitations and the effects derived from the correct use or misuse of new technologies, the new horizons of true information, etc., always based on a critical constructive analysis before the computer reason.

The present book is oriented in this sense, presenting not only the positive factors, but also the negative ones in order to avoid them. This is the primary moral duty pursued. However, **telling certain truths for a better future, in our days, is sometimes equivalent to the total or partial eclipse of the ideas, experiences, results, methodologies, techniques and strategies compiled for more than four decades, in the field of education and the modernization of the sciences.**

Finally, the use of humour is to de-dramatize the complexity of the consequences of the issues discussed. In addition, in other cases, some topics or examples are presented from different points of view, throughout the entire text, in order to achieve a greater degree of understanding, given the infinity of variables that make up the scientific universe, education and social consequences, derived from both contexts. Below, you will find each individual chapter as it pertains to the information laid out above.

In Chapter 1, the notion of “context” is analyzed and included as a new category when designing interactive systems, efficiently communicative, with the latest generation of technology. That is to say, the distance and interrelation of the designer with the real world, particularly, from the sociological and computer point of view, with a special emphasis on the development of content for education, in emergency situations. In it, the notion of communicability is updated and the main successes and failures are presented, given the use of new concepts belonging to the field of new technologies, the communicability and design for the quantic-nanotechnological-self-sufficient era. The main errors in the one-to one relationship between meaning and signifier of these new concepts in the field of human-computer interaction and all its derivations, from the 21st century, are also disclosed. Finally,

the social factors of humanistic computing that harm the heuristic and neutral evaluation of the new millennium are listed.

In Chapter 2, we analyze the importance of the evolution of the notion of perspective and communicability between engineers and artists. In addition, some digital and interactive practical cases are investigated in the 3D reconstruction of innovative and old inventions and/or mechanisms, based on stored designs, on paper. There is a review of digitized personal designs, with a high degree of creativity and originality, between Western and Eastern culture. Simultaneously and independently of the STEAM knowledge (Science, Technology, Engineering, Art, and Math) of the potential users of interactive systems, the main advantages of including computer animations for educational purposes are presented. Finally, it is verified how the contents related to human ingenuity and that belong to the universal cultural heritage, serve to promote the latest advances in new technologies among the various generations of users that range from hypertext to the metaverse.

Chapter 3 investigates the importance of "visual reality", formative and informative, in multimedia systems. In addition, the emulated and simulated representation of the real world is examined, through computers and art, until the generation of the so-called "empty reality" for the metaverse. A historical study is also carried out on the bifurcation of a divergent modality between contemporary elitist fine arts and experimental ICT artists. At the same time, the main advantages of graphic design in visual communication and interactive systems are revealed through the works of Escher. Finally, there is a heuristic evaluation with users of Escherian works, in the field of social media and interactive systems, aims at education, entertainment and video games.

Chapter 4 reviews the new horizons of the main components of new network technologies. The analysis begins using the technique of the inverted pyramid that ponders the commercial aspects in the evolution of information technology, with the human being as the central axis. A human being, who is considered in his various roles in front of the computer devices that go from the end user, through the programming of interactive systems to the direction and management of the resources of new technologies. Finally, the use of a new technique called "inverted cornucopia" (analysis of the abundance of neologisms and their metamorphosis) is disclosed to examine in scientific information portals the professionalism of the representatives of the educational context, who are related to ICTs, from a transversal perspective of sciences.

Chapter 5 presents the bidirectional triad of competence, knowledge and capacity (CKC) is analyzed in the final users. In the study of the various generations of users, the various objectives pursued when using interactive systems (online and off-line), whether intelligent or not, are detailed, and which range from consulting generic information through training to entertainment or pastime. In addition, a historical and project analysis is carried out towards the immediate future, of the present triadic interrelation, in order to maintain a successful and qualitative educational process, considering as fundamental variables the end user, emerging technologies, information technology, interactive design, gamification, entertainment and tourism.

In Chapter 6, we present the main current limits and future challenges in science education, specifically, through new information technologies (IT) and new social media. In addition, the social factors that positively and negatively influence science education, from childhood to adulthood, are disclosed. Simultaneously, through a historical analysis, a parallelism is established between the past and the present, with a projection towards the future of technological innovation and engineering, resorting to the Renaissance, as a generator of new synergies, in the face of global crises. It also examines some of the main linguistic aspects in the new media, as instruments of quality in scientific education, considering the alphabet as the basis of Western civilization.

Chapter 7 presents the main areas of science that will impact the social diffusion of quantum computing are analyzed. The analysis begins by outlining some of the fundamental notions of this new technology and its need to be adapted to the common knowledge of citizens, in order to understand its potential, from the perspective of communicability and informatics. The educational aspects that must be reformed and / or improved to increase interest in the study of science, and in particular towards this new paradigm of digital and interactive information, are also disclosed. Finally, the results of a heuristic experiment based on science fiction and with users of new technologies belonging to generation Z are disclosed.

Chapter 8 presents the true and fictitious components are presented, which humanly underlie the metamorphosis between opportunities and challenges related to the context of new technologies. A guide and an effective heuristic evaluation mechanism are also developed, based on communicability, to quickly detect the degree of veracity of information on the Internet related to university education. In this first investigation, the examination is carried out in the "human capital" of educational entities. Besides, in the field of challenges, a first set of challenges is established that derive from the experiences of global and local crisis situations. Finally, the consequences of concentrating the power of action and digital transformation in few and small groups are presented.

Chapter 9 presents a novel quadrangular and bidirectional interrelation in the field of science and the modernization of education: ESIHISE (Evolution of the Sciences, Informatics, Human Integration and Scientific Education). To this evolutionary interrelation we add a diachronic and synchronic vision, always placing the human being as a user of new technologies, at the centre of all these interrelationships. In addition, we describe the origin of these interrelationships in the sciences, their evolution or revolution, over time, until currently known, the tactics used for the loss of human capacities (natural and/ or acquired) in the face of the infodemic of intelligent networks, as well as the generation of divergent parallel lines, between scientific theory and the reality of research and teaching environments. Finally, cases of analysis compiled over three decades are presented, through the use of storytelling, to avoid the phenomenon of "fleeting kites", which never provide practical and real educational solutions, in normal and abnormal teaching situations.

In Chapter 10, we present the first set of strategies called "CFC" (comics for crises) to encourage the use of comics in emergency situations (health, extreme weather events, seismic events, wars, among others) that prevent face-to-face classes. The purpose is to maintain the group contact of the students and as a means of information, training, entertainment and creativity. Furthermore, an instrument of catharsis of lived experiences. The research promotes the critical-constructive analysis of the evolution of the comic through time to investigate the evolution of design and content, in the various media of social communication, from the 20th century. Finally, an experimental methodology and results obtained in the tasks that go from the systematic analysis of the main components of the comic to the creation of a comic strip, through the use of analogical and/or computerized supports, are disclosed.

Chapter 11 presents research work consists of a revision of the main components of the evaluation methods, from the educational, technological, and scientific perspective. It highlights the interrelation of mathematics, the media, and the social sciences in the generation of new educational paradigms. The advantage of diachronic and synchronic storytelling is also disclosed, to confront historical and current realities, in secular European institutions, which have an international projection and are aimed at education. Finally, the contributions of the formal, natural, and social sciences are investigated in the generation of evaluation methods, techniques and instruments that range from usability engineering, through user experience to the expansion of communicability.

The book concludes with Chapter 12 presenting work about the evolution and involution of some pedagogical, sociological, technological and neuroscientific aspects related to the role of pre-university teachers, in nursery schools, schools, institutes, high schools and high schools are investigated. The purpose is to establish the existing limits in school performance and analyze some of the causes of school failure at an early age. Simultaneously, some of the main human factors are presented, which increase the existing divergences between the university and pre-university context, resorting to visual synthesis, with the use of keywords. Several true examples are also analyzed that reflect the lack of merits and human talent to carry out the work of a teacher and that constitute educational anti-models. Finally, it is emphasized that the reality examined, described and verified in the work is mainly focused on European borders, with extension to some countries of the American continent.

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