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ON THE RELATIONSHIP BETWEEN SOCIETY AND HIGHER EDUCATION: WHAT PATH SHOULD WE TAKE?

Abstract

The current network society, with its primacy of information and communication technologies, is challenging the higher education model. The needs and expectations of today's students differ from those of students in the past, and educational practices should adapt to modern times. But what changes will we see in the relationship between societal transformation and the higher education system? In this research paper, we set out a quantum-based approach in order to analyze this relationship and to advance the understanding about the role that distance education will play in the future. Under this perspective, we provide an illustration that allows for the representation and evaluation of future scenarios.

Keywords: higher education; network society; ICT/new technologies; quantum approach; future; distance education.

Word count: 9398.

Introduction

Almost two decades ago, Windschitl (1998) outlined a research agenda for the world wide web, or www, and classroom research. He also advocated more research on student communication via the web. Years later, Greenhow et al. (2009) discussed changes in the nature of the web 2.0 (read-and-write), in comparison to web 1.0 (read-only), which provided learners with an array of new tools and choices.

Previously, Castells (1996) had introduced the idea that the development and implementation of information and communication technology (ICT) should force higher education organizations to respond to the societal trends of the knowledge economy. Nowadays, we refer to a new social structure, the so-called “network society” (Castells, 2010). In the network society, virtuality, which can be understood in this context as the reliance on technology for the provision of learning content and for communication between students and lecturers, is an essential dimension of our reality. Moreover, “timeless time” becomes a key characteristic of our way of communicating (Castells, 2010). This might provide distance education (DE) with an even more relevant role in the future. Castells (2016) illustrates the potentiality of change in this new form of society with reference to social movements, while Moore and Kearsley (2012) provide examples of the value of “asynchronicity” for DE students (see Moore and Kearsley, 2012, p. 140). The words (and photos) of the photographer Eric Pickersgill aptly describe the current technology-based context in which we live (see “Removed”, available at <http://www.removed.social/about>):

The joining of people to devices has been rapid and unalterable. The application of the personal device in daily life has made tasks take less time [...] In similar ways that photography transformed the lived experience into the photographable, performable, and

reproducible experience, personal devices are shifting behaviors while simultaneously blending into the landscape by taking form as being one with the body [...] This has never happened before and I doubt we have scratched the surface of the social impact of this new experience.

Castells (2014) clarifies that ours is not a virtual society; rather, as there is a close connection between virtual networks and networks in real life, it can be considered a “hybrid world”. In our view, this new form of society and the hybrid world in which we are immersed might contribute to the transformation of both higher education and the role of DE and, accordingly, higher education institutions. Therefore, we open our paper with the question: “What path should we take?” Then, we attempt to shed light on the relationship between the transformation of society and higher education by developing a conceptual framework grounded in a quantum approach. This approach enables us to analyze the future of higher education and discuss possible future scenarios.

Transformations of society, higher education, distance education, and organizations

Society, higher education, and distance education

Our society has undergone a transformation, first from an industrial to a knowledge society (Lai, 2011), and then from a knowledge society to a network one (Castells, 2010). While a knowledge society is, by its very nature, a “learning society where innovation is continuous and embedded in the culture” (Huijser et al., 2008, p. 8), a network society is characterized by a culture of real virtuality and also by timeless time, i.e., according to Castells, the type of time that occurs when, in a given context, there is a systematic perturbation in the sequential order of the social practices performed in that context. In a reversal of the term “virtual reality”, Castells (2010, 2014) refers to the concept of “real

virtuality”, wherein the virtual environment is a fundamental part of and facilitates social practices, sharing, mixing and living in society.

In the last ten to fifteen years, technological advances have dramatically changed our daily lives, both personal and professional. We have seen, for example, rapid innovation in services such as transportation, accommodation and catering, with the appearance and development of Uber, a worldwide online transportation network, Airbnb, an online homestay network, and Uber Eats, an online food order and delivery service.

We also observe how young people seem to prefer social network and multichannel communication to traditional and even e-mail communication (Greenhow et al., 2009).

As Castells (2014) mentions, social networking sites are living spaces connecting all dimensions of people’s experience, transforming culture and transcending time and space.

People live their physical lives but increasingly connect on multiple dimensions through social networking sites. This trend seems notably difficult to reverse. Commenting on this subject twenty years ago, Hitt (1998) pointed out that “we will expect people to be continuously online while traveling or moving around within cities” (p. 220) (see also Flynn, 1997). Interestingly, when seen this way, it might be considered that virtual life is indeed “more social” than physical life (Castells, 2014).

On the relationship between higher education and society, one of the most important challenges concerns the internet and the web, and how they transform the “Classroom” (Greenhow et al., 2009). Hitt (1998) continued (p. 220): “Given these characteristics of the new technology likely to be available by the year 2010, the process of how we teach students most likely will be dramatically different from that in 1997. Not only will we have virtual cases and have easier access to much more information, but machines may replace a lot of what we do in the classroom”. In this context, Lai (2011) refers to the concepts of “changing needs” and “changing learners”.

Although we are witnessing transformations in technology, what is important in this context is not the technology itself but how environments are being transformed by this technology. Indeed, as environments are being transformed by technology (Castells, 2014), through the right kind of technologies, the effort required for engagement and learning can be reduced (Fischer, 2014).

One fashionable term in recent times is “competency”. In this regard, we have observed the emergence of desired technological competencies, especially for students, teachers, researchers and administrators. Following Mossberger et al. (2003), people need two types of skills so as to have effective access to contemporary ICT: technical competence and information literacy. But should we assume that these competencies will be an inherent ability in future generations? Is there a need for the education sector to re-organize syllabi so as to strengthen these competencies?

It is worth considering that societal demand for competencies goes beyond digital skills, and includes abilities such as critical thinking, emotional intelligence and cognitive flexibility (Thiestad, 2017). Moreover, required competencies will transform as society does. In this respect, it is expected that nearly 35% of the skills demanded for jobs will change by 2020 (World Economic Forum, 2017). Baldwin (2016a, 2016b) emphasizes the rapidly changing scenario in the global economy, which will require new (as yet largely unpredictable) skills and competencies. With a disruptive transformation of the society and the economy, many jobs and skills might become obsolete and the importance of digital skills will increase (Robinson et al., 2015). This is an important challenge to bear in mind.

Two additional aspects of the network society with a potential impact on higher education are, first, the massive capacity for the acquisition, storage and retrieval of information,

and second, the possibility of digitally modifying information and data. These aspects have distorted our idea of the limits of knowledge and subsequently affected the teacher-scholar role (see Dennis et al., 2002).

One consequence of this rapidly changing scenario is the need for lifelong learning: people should update their knowledge and skills during their working life, an outcome of the knowledge society. The transformation from mass communication to mass self-communication has played a part in altering the process of social change (Castells, 2014). This, together with the diversification of the student profile, poses a new challenge: a need for cross-curricula and trans-disciplinary projects. In fact, the range of e-learning systems usage has expanded to include higher and lifelong education as well as in-company re-education to improve employees' competency (Jee et al., 2014). Online and new forms of DE play a key role in this process.

In this regard, John Cochrane (2014) in his blog warns of the pressures that will face universities and classes offering nothing more than “the deadly boring hour and a half lecture in a hall with 100 people by a mediocre professor teaching utterly standard material” to their campus students. Moore and Kearsley (2012) provide some historical background that helps contextualize a number of new forms of learning. These authors distinguish five generations of DE identifiable by the communications technology employed (i.e., Correspondence, Broadcast radio & television, Open universities, Teleconferencing, and Internet/Web).

In our hybrid world and in the network society, we face the challenge of a strong demand for people to be innovative, creative or entrepreneurial, as well as having the ability to lead, to collaborate in a multidisciplinary context, and to identify and solve collective

problems (Greenhow et al., 2009). These are necessary abilities for dealing with a constantly changing society and gaining competitiveness in the global market.

Nonetheless, the interaction between the global and the micro context should be considered. As Castells (2010) points out: “The network of decision implementation is a global electronic macro-network, while the network of decision-making and the generation of initiatives, ideas, and innovation is a micro-network operated by face-to-face communication concentrated in certain places” (pp. 36-37). These two means of communication—virtual and face-to-face—might well co-exist in the future, but it is not yet clear which will predominate. In the context of education, Jee et al. (2014) set out a taxonomy of mixed reality including real to virtual environments (see Figure 1 in Jee et al., 2014).

A key element in our society is the speed of change, and this is also true for higher education. We are witnessing the growth of nontraditional types of learning, ranging from blended learning to learning based on any number of technological resources (electronic, mobile, etc.). Of late, even artificial intelligence is being introduced in the education sector (Titlestad, 2017). As Deming et al. (2012) highlight, online education is the fastest growing segment in higher education; in fact, it is becoming a crucial element in the strategic decisions of education institutions (Witthaus et al., 2016).

Interestingly, with web-based tools, scholarship is shared with a wider audience than in the traditional scenario (Greenhow et al., 2009). The rise of virtuality in our society and the replacement of the clock time of the industrial age with timeless time play an important role here, making it more likely that people living in the network society will engage in DE at some point in their lives.

Within this context, it can be argued that the way in which education will be understood by future generations of students will change in the next few years (Márquez-Ramos and Mourelle, 2016). Incoming generations of students have had continuous contact with such technologies, and as a result are referred to as “digital natives” (Prensky, 2001); in fact, some advances in neuroscience research indicate that technology may affect the development of the brain during adolescence (Lai, 2011). However, Prensky’s “digital native” proposition is viewed by some as a myth (Helsper and Eynon, 2010; Kirschner and De Bruyckere, 2017; Nature, 2017). In this vein, given the confusion surrounding the term digital native, Gallardo-Echenique et al. (2015) proposed unifying the concept about students in the “digital era” under the term “digital learners”.

We should bear in mind the role of higher education in shaping the lives of young people (Huang, 2009), or of digital learners. As such, core skills must be delivered, with one of the most important being the development of the aforementioned thinking skills—both critical and creative. As Huang (2009) points out, these skills become crucial in order to “survive” in a continuously changing society; in particular, this author stresses that creativity is not only an ability but also the willingness to accept change and newness.

In fact, it is easy to picture a future scenario in which new generations of students have a preference for high-quality DE, in place of traditional, face-to-face forms of higher education. This seems a realistic development since, for example, some accredited institutions accept credits gained through virtual MOOC (Massive Open Online Course) education. Given the large number of MOOCs already out there, they represent a good example of how timeless time might promote the role of DE. Authors such as Mazoue (2013), Fischer (2014), and Santandreu Calonge and Aman Shah (2016) provide analyses of and reflections on the MOOC phenomenon.

According to Mazoue (2013), MOOCs represent the latest stage in the evolution of open educational resources. In this stage, addressing the quality of the learning experience is key for credibility and acceptance. Hew and Cheung (2014) provided a review of the published literature focusing on the use of MOOCs. In page 53, these authors concluded: “MOOCs may be a viable avenue for people who are interested in a particular topic to learn something but are not really interested in gaining a credential. However, we doubt it can completely replace face-to-face teaching and learning in on-campus universities or colleges”. More recently, a good indication of the potential quality of this type of DE course is that MicroMasters are already offered on the edX platform (see Pugh, 2017).

Fischer (2014) argues that the biggest contribution of MOOCs is that they have generated a broad and lasting discourse about learning, teaching, and education in which not only academics participate, but also the media, university administrations, and politicians. Indeed, along this discourse, Fischer (2014) distinguishes between MOOC enthusiasts (who tend to exaggerate or hype the benefits of these courses) and skeptics (who underestimate them). However, he claims that “both the hype and the underestimation are based more on assumption and beliefs than theoretical groundings and qualitative and quantitative data” (Fischer, 2014, p. 150). Although it might be argued that such courses are opening up new learning opportunities (see, for example, Cui, 2015), further research is needed to understand the role that MOOCs (or the next generation of MOOCs) might play in the future.

On the same subject, Santandreu Calonge and Aman Shah (2016) state that there is a mismatch between newly graduated students’ skills and what potential employers of those graduates require. These authors see MOOCs as a complimentary mechanism through which this skills gap might be bridged, showing that the disruptive potential of MOOCs

is being harnessed through collaborations between corporations, MOOC platforms providers, and higher education institutions.

Some of the challenges that higher education might face in the future are associated with challenges that science will experience in the network society and in a hybrid world. In this context, Van Noorden (2014), for example, explains how academic social networks such as ResearchGate and Academia.edu have reached levels of membership that were not expected even a few years ago. What is more, Bohannon (2016) describes how Sci-Hub, the world's largest pirate website for scholarly literature, has experienced explosive growth, meaning that the scientific community is watching the nature of scholarly communication change before its eyes.

The ever-growing membership of social media sites means that humankind is now almost entirely connected. In this context, the internet ensures the production, distribution, and use of digitized information in all formats and students are seen as informed critical thinkers; however, there is a gap between social change and an understanding of that change (Castells, 2014). This gap might have important consequences for higher education.

Importantly, the 2030 Agenda for Sustainable Development released by the United Nations in 2015 expresses concern about the future of education, and several of its goals reflect this. A central objective is to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (goal 4). On this point, the “Education 2030: Incheon declaration and framework for action for the implementation of sustainable development goal 4” (2015, p. 41) states in target 3 – point 43 that “A well-established, properly regulated tertiary education system supported by technology, open educational resources and distance education can increase access, equity, quality and relevance, and can narrow the gap between what is taught at tertiary education institutions, including

universities, and what economies and societies demand. The provision of tertiary education should be made progressively free, in line with existing international agreements”. This is in line with Santandreu Calonge and Aman Shah’s (2016) perspective, who see MOOCs as a mechanism through which the existing “skills gap” may be bridged. However, there is an important concern regarding just how free and open MOOCs will be, and as Fischer (2014) mentions, the premium services of MOOCs (e.g., providing mentoring, feedback, and certification) will have to be paid for.

To sum up, it seems clear that changes happening in the network society are affecting higher education and DE in a way that is not entirely foreseeable, and that many challenges remain unexplored. In light of this, we will consider two potential scenarios in our illustration of a quantum-based approach for analyzing the future of higher education: real (face-to-face) environments and virtual (DE).

The present and future of higher education organizations

The twenty-first century society needs people able to work with knowledge and networks in a creative and innovative manner (Lai, 2011). This leads us to the role of higher education organizations: it is our belief that they must adapt their teaching-learning process to meet the demands of the society and the hybrid world in which we live. At this point, we should note how imperative it is that the novelty of new technologies does not make higher education institutions lose sight of their main objectives: equipping students with knowledge and abilities, as well as preparing them to participate in and enrich the network society. In this regard, virtual platforms and related technology can have a significant impact on the functioning of higher education institutions (Belleflamme and Jacqmin, 2016).

As noted, lifelong learning has become crucial in the network society and higher education institutions must therefore be ready to help their students develop lifelong learning competencies. Lifelong learning, as well as being important for its own sake, creates an increased demand for graduate and postgraduate studies. This represents an additional challenge for higher education institutions stemming from new societal demands.

In terms of the emergence of ICTs and the network society in the higher education field, there are at least three stages that any educational institution must go through (Collis and van der Wende, 2002): first, the establishment of institution-wide technological infrastructure; second, a rich pedagogical use of this infrastructure; and third, the strategic use of ICT focused on the different target groups in higher education. In their study, Collis and van der Wende (2002) stated that, in many cases, the second phase was still under development. Thus, we should currently be focusing on ensuring the satisfactory completion of the second phase and actively engaging in the development of the third one, where learning analytics—i.e., the collection, analysis and reporting of data about learners and their contexts in order to understand and optimize learning and the environments in which it occurs—plays an important role (see, e.g., Tynan, 2016). In addition, a promising approach is that from an international university that provides DE in Spain (exclusively online): Burgos (2017) mentions that a “transgenic” learning might be a required revolution in big data and learning. By making use of information about the users’ behavior and interactions as well as efficient monitoring and personalized counselling by a tutor, the learning performance of every user might be improved.

The third stage is critical, as the target groups do not merely comprise traditional learners but will also include lifelong learners from a globalized hybrid world, thus creating a need

to design institutional and governmental policies on the strategic use of ICT for these different groups. However, in the network society and in a hybrid world, it is unclear whether this third phase will be the end goal.

As mentioned above, current and future learning environments might involve both physical (face-to-face) and virtual (distance) scenarios. In this sense, we have witnessed a transformation in the technologies used to support the learning process as well the administrative functions in higher education institutions. But does this necessarily indicate the effectiveness and efficiency of ICTs? The physical change is obvious: lecture halls and seminar rooms equipped with computers (with internet access) and projectors, use of multimedia devices, development of virtual platforms, repositories and electronic devices, lectures delivered with the help of technology, etc. While these physical changes are evident, do they entail a simultaneous change regarding the philosophy of the teaching-learning process? Have we really fundamentally changed the way we think or learn? In short, is ICT simply a cosmetic change or does it represent a real change?

A paradox arises here: while new technologies are omnipresent in our daily lives, they are still not widely-used in higher education organizations. Is such a change only a matter of time? Conscious of the uncertainty inherent in the future, our illustration incorporates two types of higher education institutions that may potentially exist in the future. First, we will consider institution A, representing an institution that relies on traditional forms of education (which we denote as “local” as it is usually located close to the student’s home); and second, we will consider institution B, representing a highly-esteemed educational organization providing high-quality DE (which we denote as “virtual”).

On the transformation of students and lecturers

If technological infrastructure is increasingly present in higher education institutions and current students were born in a digital era, should lecturers be the primary focus for transformation? There is a pressing need for them to develop new skills so as to adapt to the new reality; a new learning environment is in operation and the skills required for the labor market environment are rapidly changing.

The role of lecturers is being transformed into one of knowledge facilitators, guides and counselors; in addition, the “teacher-student” relationship is expected to undergo a shift towards increasing collaboration. It seems that it is not only a matter of using more digital technologies, but also of being competent in both the disciplines taught and the technologies used. Indeed, there is a general consensus on the urgent need for lecturers to (re)train (UNESCO, 2016). Moreover, it could be argued that lecturers should adopt new pedagogies according to available digital technologies.

It is worth mentioning here a major problem in higher education institutions: the paradox of a predominantly “technophobic faculty” preparing students for the network society. Many faculty members that hold senior positions are from a generation born before the advent of this new technology and it is not clear what sort of training should be offered to help them gain additional skills.

Most experts consider learning to learn using new technologies one of the main aims of higher education and lifelong learning. In this sense, (re)training should focus on teaching students to learn after they leave the institution, bearing in mind the fact that today’s technologies will probably not be the ones of the future; furthermore, even the jobs that students are being prepared for today might no longer exist in a not-too-distant future (UNESCO, 2016).

At this point, it is worth drawing attention to a number of experiences of teaching enhancement programs. For example, Manchester Metropolitan University has launched the “#1minuteCPD” project aimed at improving digital skills. Based on tasks that can be watched, tried or read in one minute, its main objective is to provide resources for the professional development of teaching staff in a flexible and time-efficient manner. Another example is the partnership project between Penn State University, the National Aeronautics and Space Administration (NASA), and the National Science Teachers Association in the United States, called “Teacher Learning Journeys”. The initiative is based on a badging system that supports personalized professional development for science lecturers; the system helps meet the needs of workers and employers, and enables an assessment of professional development.

As educators’ degree of digital literacy ranges almost as widely as their ages (millennials, baby-boomers, and traditionalists), there is no simple, general solution for updating their training. In any case, teaching enhancement programs should be tailored to lecturers’ level of expertise and fitted into their workload as easily as possible. The training should primarily focus on acquiring an understanding of technologies and the production of digital content.

It is also worth mentioning, however, that lecturers should consider where and when technology should be present during the teaching and learning process (Kirschner and De Bruyckere, 2017). It seems clear that communication networks and technologies must play an active role in the teaching and learning process, but the future use of technologies depends on them being correctly employed and implemented. Indeed, the value of being continuously online for formal learning is not unanimously accepted. For example, Michael G. Moore confesses to being uncertain regarding learning through mobile technologies (see Moore and Kearsley, 2012, p. 87). As Kirschner and De Bruyckere

(2017) recently point out, “in times when schools are promoting using tablets and laptops and BYOD (bring your own devices), it is [...] imperative that teachers know when to use which devices and when not to” (p. 140).

On the search for a new higher education model

Novelties in higher education and its functions

One question arising in the discussion on the role of ICT posed by Márquez-Ramos and Mourelle (2016), is whether internet, web-based and mobile devices are complementary tools or substitutes for traditional higher education. Collis and van der Wende (2002) claimed that web-based systems (web 1.0 at that time) were a complementary tool of traditional educational practices. More recently, Belleflamme and Jacqmin (2016) pointed out that the precise nature of the impact of the sort of education offered by virtual platforms—MOOCs in particular—will depend on whether their users view such platforms as substitutes for or complements to the traditional education system. Meanwhile, the revolution in higher education continues and, in this context, Pugh (2017) describes a new world of “unbundled” learning and explains how new education models allow for flexible and innovative online credentials. In a more flexible education environment, it seems clear that higher education institutions will have to deal with the concepts of “loyalty”, i.e., when students take all the courses of a degree at one specific institution, and “poaching”, i.e., when students start a degree at one institution before transferring elsewhere (see Nunan, 2005).

As mentioned above, internet, web-based and mobile devices are transformers of higher education environments. Therefore, a key concern is how the teaching function is transformed with ICTs (see also Balasubramanian et al., 2009). Although there are already great many related initiatives out there, and academics are investing significantly

in research programs that aim to explore and better understand learners' experiences of using technologies (Helsper and Enyon, 2009; Newman and Beetham, 2017), novelties in higher education functions are not entirely foreseeable. Australia provides an interesting example of how future directions and uses of DE might change depending on the environment (Nunan, 2005).

An additional example of a change in a higher education model is the European Higher Education Area, where students now take a leading role and work autonomously, and the teacher acts as a manager and catalyst for knowledge (Márquez-Ramos and Mourelle, 2016). This is also an example of change regarding how learning should be facilitated in higher education: the previous focus on the teacher has shifted to the student, who plays an active role in the construction of knowledge, either individually or collaboratively.

Apart from other positive aspects, the use of virtual and social media for educational purposes can “foster the development of more equitable, effective, efficient, and transparent scholarly and educational processes” (Veletsianos and Kimmons, 2012, p. 167); in the same vein, the use of digital technology generates societal benefits by means of “broadening access to education and scholarship for the common good” (Veletsianos and Kimmons, 2016, p.1). In this context, the mainstream forms of higher education (education for employment and for research) are only two of many possibilities. Students can also seek education for leadership, for example, or for personal meaning (see Ford, 2017), as well as for technological training and development (for a discussion of the technological function of higher education, see de Moura Castro and Levi, 2015).

Moreover, there is growing interest surrounding an additional, nontraditional function of higher education: its role in economic development (Ford, 2017). The so-called “entrepreneurial university model” approach should be taken into account, as higher

education institutions also contribute to the economic dimension of regional development (Tripl et al., 2015).

Potential and challenges of space-time for higher education: virtuality and timeless time

A space-time model combines space and time into a single continuum. Such models are interpreted with space consisting of three dimensions and time as one dimension, the fourth dimension. The potential of virtuality and timeless time in the space-time model for higher education is clear. In this regard, one change that experts claim is the future “unbundling” (or fragmentation) of educational offerings and accreditation of learning results (i.e., students can receive certificates for components of courses or micro-courses), as opposed to the traditional “bundled” system; it is already a reality in the academic context and becomes particularly important when the lifelong learning dimension is accounted for.

However, are all higher education institutions capable of implementing this sort of (unbundled) teaching-learning model? In this regard, it is also important to consider the complementarity with traditional “bundled” components. As Horn (2014) mentions, although teaching content might be “unbundled”, there will be a need for subcomponents that *bundle* things together (e.g., coaching, mentoring, communities, personal learning plans, and employer connections). Therefore, although unbundling may well be the future of education, its implementation may be complex and require careful planning.

The material and human resources involved in this sort of education are costly. Institutions with more resources can create these technology-intense courses for huge audiences, which confer benefits in terms of marketing and advertising, and may create extra supply for in-person (or additional online) degrees. Economic considerations are important when addressing the challenges of space-time for higher education, and for DE

in particular. In his blog, Cochrane (2014) states that MOOCs are a nearly zero marginal cost business, but currently have high fixed costs. In addition, a distinction between “less selective” and “elite” higher education institutions can be made, as these two types of institutions might be differently affected by the increasing number of MOOCs. Whereas MOOCs could displace less selective institutions by providing a similar experience with more flexibility and at lower cost, elite higher education institutions might focus on preserving their exclusivity (The Economist, 2014).

In a future scenario that might be characterized by the predominance of virtual learning, how will higher education organizations with limited budgets survive? And how will they adapt in terms of size, location, and so on? Will students and their families be able to afford higher fees? Also, one possible future scenario might be characterized by a higher education system with fewer universities and greater competition, as a result of globalization and the network society. Some authors even raise the possibility of a future context characterized by free access to a degree-granting curriculum, as an extreme extension of the free online courses currently available (Mazoue, 2013).

What seems important is the implementation of a higher education model that is capable of meeting the demands imposed by a hybrid world. There is a need for new skills and abilities suited to the labor market; as a result, itineraries, curricula and teaching practices might change. A number of additional changes might relate to efficiency, increasing transparency and accountability, and improving performance in teaching and research (Lai, 2011).

In a network society and in a hybrid world, the so-called “digital divide” and “cyber-imperialism” should also be taken into account (Huijser et al., 2008). Digital divide creates inequalities. In this vein, Robinson et al. (2015) point out: “As the internet

matures, forms of digital exclusion proliferate” (p. 570). These authors distinguish digital disparities that consider not only internet use, but also digital inequalities related to skills, participation, and efficacy.

Cyber-imperialism refers to the fact that content creation on the web is currently dominated by the developed, English-speaking world. This has generated debate on the decolonization of universities and knowledge in Africa and Latin America, for example. This question is crucial in terms of the production, ownership and diffusion of knowledge. We should thus pay particular attention to potential unwanted effects in terms of inequality. The concept of cultural imperialism has been a matter of long-standing debate and is an issue of particular interest in the field of education and knowledge. In this respect, some examples include the initiative from the Literature Department at the University of Nairobi aimed at tackling the inherited colonial education system (Thiong'o, 1986), accounting for the fact that literature is a key instrument of culture, or the large number of collaborative projects carried out by indigenous and non-indigenous researchers and organizations (Smith, 2008).

In order to study the relationship between the changes experienced by society, higher education, DE, and related organizations, and (very likely) the current higher education model, we follow Márquez-Ramos and Mourelle (2016) in supporting a quantum-based model as a suitable and powerful approach for analyzing the dynamic change the higher education institutions are undergoing. This approach is based on that suggested by Lord et al. (2015), grounded in organizational theory; they integrate quantum theory with a concept of the future as a flow to the present, in what they call a quantum approach to time and change (QATC).

The application of a quantum approach to organizational and societal issues is quite recent and innovative, and it presents a number of advantages over traditional specification

models. An important feature is that it allows for the possibility of creating multiple future scenarios: in our case, regarding higher education. Thus, we present below an illustration that enables the complex relationship between society and higher education to be modeled.

Modeling the relationship between society and higher education: An illustration

Márquez-Ramos and Mourelle (2016) emphasize that the future is not just a continuation of the past. In fact, the past represents just one possible outcome and we should bear in mind that the future may involve a different framework. We are used to basing expectations of future events on past occurrences: it seems reasonable and convenient, mainly for reasons of data availability. Nevertheless, it is not just a matter of data or samples; phenomena change and we cannot expect a model based on the past to work perfectly when applied to the future.

It is worth noting that researchers usually rely on linear approximations to model nonlinear phenomena (see, e.g., Hardesty, 2010 for a better understanding of what a nonlinear phenomenon is). However, throughout this paper, we have set out multiple reasons that explain why it would be hard to predict the future of higher education based on the current state of society, specifically reflecting on the difficulties of predicting the future of higher education in the context of a network society and in a hybrid world. Higher education phenomena are clearly being transformed in an environment characterized by technology advances.

We attempt a more in-depth analysis of the relationship between society and higher education by providing an illustration that considers this relationship as quantum in nature. A more complex environment requires the use of more sophisticated techniques, and the quantum approach is a suitable one for our purpose. Previously, Collis and van

der Wende (2002) provided an application of the relationship between web-based (web 1.0) technologies and change in higher education. We go one-step further and we illustrate the complexity of this relationship in a network society using a QATC.

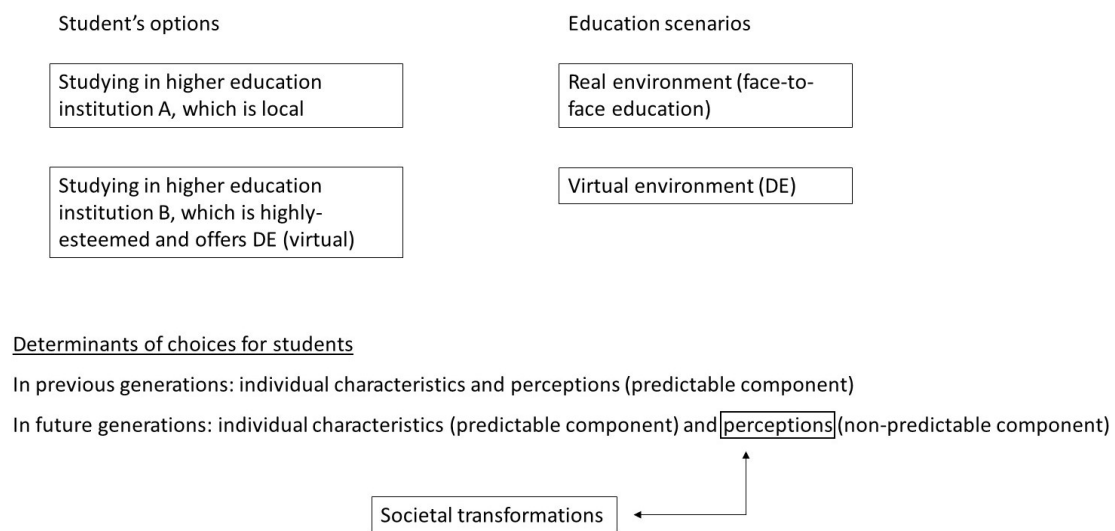
It is important to note that, in our illustration, we do not account for the cost perspective, which might affect students' perceptions and lead to increasing engagement in the monitoring of student satisfaction with their study experiences (Nunan, 2005). We should also draw attention to the effect of the "principle of interference" when gathering the data required to answer a research question. Educational researchers might want to gather data from individuals to find out about their perceptions of higher education institutions, e.g., in an attempt to understand students' perceptions of and satisfaction with the institution and their experience of their studies. However, if students become aware of the researcher's presence, this could influence their answers.

To illustrate the QATC, we are opting for a "future scenarios" avenue, which is in line with previous related previous research (e.g., Nunan, 2005; Altman, 2007). This allows us to represent the forms of education that might predominate in the future. As with the societal transformation discussed above, two forms of education—traditional (face-to-face) and virtual (distance)—may well co-exist in the future. Of course, it remains to be seen which one of these forms will predominate, but both are considered in our illustration.

Similarly, we consider the diversity of learning provided by two different categories of higher education institutions, i.e., a traditional higher education institution (closer to the student's home) and a highly-esteemed higher education institution providing high-quality DE (virtual), oriented towards large audiences and exploiting the potential of timeless time.

Note that both education providers and education consumers operate according to their perceptions of the environment (Nunan, 2005). In this illustration, we focus on education consumers, i.e., students. Figure 1 depicts the choice between the two categories of higher education institutions.

Figure 1. The process of a student selecting a higher education institution at which to study.



Source: Own elaboration.

Figure 1 summarizes the example chosen for our illustration of the process whereby students select a higher education organization at which to study. The importance of uncertainty in the analysis of the relationship between higher education and society justifies the use of frameworks that can account for emergent (and non-predictable) phenomena. This is the case of the QATC, which takes into account not only uncertainty, but also the nonlinear nature of any economic, social or human event (Márquez-Ramos and Mourelle, 2016).

In our illustration, on the one hand, a potential student might choose to study at a “local” higher education institution A, which is focused towards traditional teaching. On the other

hand, the same potential student might opt to study in B, a highly-esteemed higher education institution that specializes in offering high-quality virtual degrees (i.e., it specializes in DE). Under the two scenarios considered (i.e., virtual or face-to-face education), it is not easy to predict which decision the potential student will take.

Next, in a model aimed at reflecting the relationship between (the transformation of) society and higher education, we draw attention to the fallacies we may fall into when predicting the future of higher education organizations, or of a higher education model, if we do not use an appropriate approach. In our illustration, the problem to be solved might describe what determines the higher education choices of potential students (see “Determinants of choices for students” in Figure 1). Conversely, the problem to be solved should consider (simultaneously) societal transformations that correlate with “Determinants of choices for students” (in our illustration, through a non-predictable component).

The model thus consists of both a predictable and a non-predictable part. The predictable part of the model would cover elements of the higher education universe that are assumed to vary to a lesser extent or which change more gradually over time, as would be the case, for example, with infrastructure or quality indicators. As for the non-predictable part, this would include the elements that are more difficult to control and measure, as they are likely to depend on, at least partially, nonlinear phenomena.

In our illustration representing the process of a student selecting a higher education organization at which to study, we should consider the fallacies that might arise as a consequence of assuming that the determinants of this choice do not differ from one generation of students to the next, thus incorrectly basing expectations of future events on past occurrences.

Take the following example: although there are massive amounts of information available nowadays on objective indicators of university “quality” (e.g., rankings based on research, whether higher education institutions are leaders in publishing in the hard sciences or in the Web of Science journals, or whether they have produced a certain number of Nobel laureates) that may help shape students’ preferences, other issues, like their social and economic environment, could also influence students’ choices. Individual characteristics determining specific choices on where to study might be included in the predictable component for both present and future generations of students (denoted in Figure 1 as “individual characteristics”).

In the network society and in a hybrid world, characterized by students’ unlimited access to information, where the teaching and learning process is bound neither by time nor location, the perceptions of future generations of students regarding higher education institutions cannot be predicted with total certainty. As such, this becomes part of the non-predictable component when considering future generations of students.

It is worth mentioning the relation between our illustration for the QATC and existing DE institutional models. Specifically, it relates to Otto Peters’ work in that education is best understood as the application of certain techniques derived from society in the delivery of instruction. According to Peters, “it becomes clear that distance study is a form of study complementary to our industrial and technological age” (see Moore and Kearsley, 2012, p. 208). Our framework, however, is unique as it accounts for a non-predictable component in higher education that might be simultaneously affected by and continuously interact with (non-predictable) societal transformations. Note that even if it were the case that the (relevant and omitted) non-predictable component was correlated with the predictable component, it could generate bias in the estimation of the effect of the predictable component on higher education outcomes.

What seems clear from this research is that the potential for a more open, distance-based and flexible education, where learners are not constrained by the time and place of study, should not be overlooked. Our illustration provides a first indication of what a quantum model applied to the future of higher education and DE would look like in practice. In addition, in this paper, we have addressed some challenges that arise when attempting to answer the question of what path we should take.

Conclusions and further research

In a world where viable and sustainable options for the provision of higher education are at stake, and an understanding of the role and importance of ICTs in education has become a *sine qua non* for learning and teaching, this paper has explored the role of higher education in the network society, a term popularized by the Spanish sociologist Manuel Castells. We believe that this article is a timely contribution that seeks to generate debate and encourage reflections on the importance of ICTs in facilitating technology-assisted learning, in an era when such technologies have become unavoidably ubiquitous.

In a hybrid world (see Castells, 2014) dominated and guided by ICTs, we can observe how these emergent technologies transform our environment. We have such unlimited access to information that it has arguably gone beyond our control. It has been widely noted that higher education and society continuously interact, prompting changes in many aspects. One particular consequence concerns the challenge that the current, so-called network society poses to educational practices. In fact, students are already displaying new needs and expectations. But is technology-based learning really the most appropriate and effective way for students to learn?

Current and future learning environments involve both physical and virtual scenarios; ICTs mean that the teaching-learning process is bounded neither by time nor by location.

A remarkable growth in technology-based educational practices is accompanying the traditional educational model. Two crucial questions then arise: what will the higher education model look like in the future? And what changes will we see over time in students, the teaching-learning process and higher education organizations?

We provide an illustration of a quantum-based model that can be used to model the relationship between higher education and the transformation of society; it allows us to consider future scenarios for the education model. What is clear in any potential context is that higher education organizations must meet the demands of society, especially regarding the development of competencies, given the great value of lifelong learning. In addition, the future model should not lose sight of the main objectives in education: to achieve more effective learning and better learning outcomes.

Methodologically speaking, we rely on previous research by Lord et al. (2015), who noted that most classical models are unable to account for emergent phenomena. A past-based method entails certain disadvantages in that it does not usually take into account the high uncertainty and the nonlinear nature of any economic, social or human event. Failing to account for this can have important consequences, such as forecast errors and biases, and subsequent effects on the decision-making process. Therefore, we find the quantum approach an appropriate tool for studying the relationship between higher education and society.

The current research reveals the complexity of such an analysis, and as such, it represents a challenge. At the same time, it may help to reflect on what higher education organizations are doing at present and what they want for the future in light of changing societal conditions and in order to best serve the members of society that will shape higher education in the future: the students.

Lastly, there are two important questions that remain open for future research in higher education:

a) How will the network society transform higher education?

Our illustration offers insights into the complexity of this relationship, highlighting the key need to account for non-predictable factors. Ours is a simplified approach to quantum analysis in that it sets a limited number of scenarios and considers only two types of higher education institutions.

In particular, we consider two distinct scenarios for higher education in the future: DE (virtual) and face-to-face education. We are aware, however, that many higher education and distance learning institutions currently embrace a combination of the two in blended learning. In addition, diversification of the student profile is possible, and it might play an important role in shaping higher education, as shown by Santandreu Calonge and Aman Shah (2016), who highlight the role that MOOCs might play in reducing the mismatch in graduate skills. This example also shows how virtual platforms and technology significantly affect the functions of higher education. Indeed, as Ford (2017) argues, “the simple fact that higher education has shifted over the centuries in terms of its mission provides some reason to believe that it could, once again, adopt a new form” (p. 559).

b) How will future generations’ understanding of higher education differ from that of the current generation?

In our illustration, we have suggested that future generations’ understanding of higher education might differ from that of previous generations. Clearly, this is not something that we can predict with absolute certainty, and we cannot know how students’ perceptions and preferences will change, if they do. We do know, however, that conclusions derived from previous analyses in which uncertainty and nonlinearities were

not considered might not reflect the reality of future cohorts of students (and educators). As Kirschner and De Bruyckere (2017) recently conclude, solid empirical research is needed and it should not be based on imaginary generational differences. Likewise, implications based on assumptions that may not hold in the future should not be written in stone given our ever-changing social environment.

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