



Contributions of Technology to Distance Learning: How the University will need to reinvent itself to face the challenges of the 21st Century

As contribuições da tecnologia ao ensino à distância: como a universidade terá que reinventar-se para fazer frente aos desafios do século XXI

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ABSTRACT:

The objective of this work is to explore alternatives to superior learning, making it attractive, affordable, effective and viable, whilst engaging companies to develop market driven virtual universities. A virtual university, using technological resources as artificial intelligence, virtual reality, augmented reality and gamification, arises as the solution to address students and market needs. Methodology applied is qualitative, allowing the exploration of new solutions based on existing technologies. Contribution to society is an inexistent university model completely virtual, unlimited and asynchronous.

Keywords: Distance learning, artificial intelligence, superior learning.

RESUMO:

O objetivo deste trabalho é explorar alternativas à universidade, fazendo-a atrativa, de baixo custo, efetiva e viável, buscando o engajamento de empresas para soluções de ensino voltadas ao mercado. Uma universidade virtual utilizando recursos como inteligência artificial, realidade virtual, realidade aumentada e gamificação, surge como solução para endereçar a necessidade dos alunos e mercado. A metodologia aplicada é qualitativa, permitindo a exploração de soluções baseadas em tecnologia. A contribuição social será um modelo inexistente de universidade virtual, ilimitada e dessincronizada.

Palavras-Chave: Ensino à distancia, universidade virtual, inteligencia artificial.

1. Introduction

As mentioned by Prineas and Cini (2011), technology makes possible the existence of online education. As technology pushes society to reinvent itself promoting deep and disruptive changes on the way activities are done, it is a natural expectation that all areas of activities are affected by the extreme transformation the human being undergoes. Learning activities in general, are no different and will also go through disruptive changes. The traditional brick and mortar universities, with long standing practices of classroom teacher-students relationship maybe at the end of their cycle and will also need to be re-thought.

The consequences of the technological push on the traditional learning practices are still under analysis by several scholars as it will be analyzed in this work but an immediate consequence that is also expected is that students may be benefited by the cost reduction brought to this long standing relationship, that will also need to reinvent itself, given the challenges students, teachers and the market go through.

Despite of this change, universities continue working as student / teacher relationship was more than one thousand years ago, as highlighted by Kaplan & Henlei (2016), in which students gathered around their professors, who delivered lectures, reading texts and transmitting knowledge.

Practice has been the same since then, except for the fact that books became more common since Guttenberg created the press in 1439. Books became more accessible to everybody and learning became available further enabling the learning process, which can also be considered distance learning, as Kaplan & Henlei (2016) call out.

Distance learning has always been a good option for those with limited time or resources to physically attend classes, as students will have access to the classes generally printed (or texts online), and can accommodate their studies to the availability, provided the limits imposed by the universities on duration of courses.

Virtual technology, according to Yip et al. (2019), is very common nowadays and its resources are becoming widely used, including its applications to the learning process, either face to face or distance learning. Students can be immersed into a different setting that will allow them to actively participate in the proposed activities.

Virtual technology, continue Yip et al. (2019), can "transport students through virtual reality", or allow students to experience virtual images appearing on their devices that can pop-up in their personal devices. The main advantage of augmented reality (AR) is the fact that it does not require expensive software or hardware and can be used through mobile devices or personal computers. Augmented Reality allows the combination of both, physical and virtual (digital) information live and that can be done, according to Cabrera-Almenara et al. (2019), through the use of QR codes, 3D images and GPS positioning. As technology evolves, other resources will be incorporated to AR.

Despite of acknowledging that the use of advanced technology in education has its benefits, Yip et al. (2019), refer to challenges as such as inexistence of well-designed interfaces, that would allow the expected results of "increased student's attentiveness and, as a result, facilitated motivation and aroused students' interest in learning in this discipline".

Another important aspect in favor of the usage or technologic resources, according to Carey (2015), is the creation of The University of Everywhere, resolving the overwhelming problem of how to "provide a personalized, individual education to large number of people at a reasonable price", since the exclusive opportunity to have face to face education will be accessible to all and not only for those that have enough resources to pay for it, as highlighted by Selingo (2013), since costs have been out of control with a declining quality, while the market demands for better, more productive and less expensive higher education.

Informal learning through self-education, is a reality after the uprising of the internet, as highlights Rizzotto (2018), in which websites offering tutoring, reference encyclopedia and others, become hubs of free knowledge in the planet, available to all. But resources could be better used, provided the way subjects are taught would change.

It is noticeable, according to Cabrera-Almenara et al. (2019), that the favorable attitude from the students with regards to the AR in education, impacts education given the increased motivation through learning demonstrated by them. The seamless interaction between the two worlds (real and virtual) in education will enhance the "effectiveness and attractiveness of teaching and learning" (Kesim and Ozarslan, 2012).

1.1. Framework

While Kesim and Ozarslam (2012), affirm that "augmented reality has power to change how we use computers" and clearly states the potential of its use in education, making the "impossible possible", it is understandable that the need to further explore the potential of available technological resources and evaluate how the future of the university will be, considering the potential computing resources bring.

Based on Carey (2015) and Selingo (2013), the future looks very promising when all possibilities are considered, having the traditional brick and mortar schools created the need to change for better. An important movement from traditional and incoming players in the area, indicate the new university is moving towards the direction of Carey (2015) University of Everywhere.

Organizations like Coursera, Saylor Academy, Open University and Udacity offer courses that can either be accepted as credits in universities or can be accepted in the market as nano degrees. The initiative led by Harvard and MIT, cannot be ignored, given the relevance of the two institutions, despite of the fact that the edX courses generally are not accepted as credits.

Rizzotto (2017), concludes that the keys to improve how people learn are personalized learning, experiential learning and mastery-based learning, all mixing artificial intelligence, immersive technologies and in the long term, approaching the learning process as "interactive worlds that students can navigate at their leisure, marking a huge design-shift for education as it proceeds to become more akin to entertainment than a passive obligation". Students will be able to further explore the subjects they learn, as they will be virtually in relation with the topics studied.

All this put together, and based on Doyle (2015), Selingo (2013), Carey (2015), Rizzotto (2017) and Rouhiainen (2016), a trend exists to drive the traditional learning towards a more self-centered approach, in which the students will need to interact with computers or mobile devices, in a smart distance learning environment, understanding as highlighted by Rouhiainen (2016) that e-learning, a distance learning based on interaction with computers, does not occur by chance and instead required careful planning.

Kaplan and Haenlein (2016) classify online distance learning, according to the number of participants in addition to time dependency. With regards to the number of participants, online distance learning can be classified as unlimited or limited, while with regards to the time dependency standpoint, it could be asynchronous or synchronous. Despite of the fact that this classification is meant to focus on distance learning, it also applies to traditional learning.

Synchronous learning, whether traditional classroom or distance learning, requires students to slot certain periods of time to their schedule, without any flexibility to accommodate course requirements, regardless of the number of participants. It translates the current traditional practices with pre-scheduled classes or lectures, in which students attend or not, into a distance learning environment. With regards to the distance learning, the main benefit would be the fact that students would not need to physically attend classes. Limitations with regards to the number of attendees, according to Kaplan & Haenlein (2016), are dependent to the physical space to accommodate students or the nature of the course (lecture or specific class).

Asynchronous learning, also according to Kaplan & Haenlein (2016), regardless of being traditional classroom or distance learning, provides more flexibility to the students, while requires discipline and engagement to complete each stage of the learning process. Evidently, if traditional classroom learning is considered, a limitation applies for the number of participants, for the same reason presented for synchronous learning, being the number of seats available the reason.

Given its own nature, the asynchronous unlimited distance learning (MOOC-Massive Open Online Course), proposed by Kaplan and Haenlein (2016) seems to be the ideal solution to the challenges faced by current and prospective college students, matching with the innovative technologies being proposed for University of Everywhere, as per Carey (2015), in which students would access subject materials and programs, through artificial intelligence, virtual reality and augmented reality resources available in their mobile devices or computers, from anywhere according to their availability, avoiding unnecessary moves to brick and mortar traditional universities and taking the required time for each subject to be completed.

Asynchronous unlimited distance learning also provides opportunities for online lectures delivered by experts, with online attendance, moderated by either senior students or tutors. Needless to say that these lectures can make use of visual resources enriching the subjects presented to the audience.

Regardless of the technological development and the wide options offered for distance learning, challenges exist, coming from educational authorities, diploma validation and resistance from the academic world. Use of distance learning is widely accepted in working environments but academically, acceptance is not a fact, as highlighted by Carey (2015) and Selingo (2013) that also refers to a risk-averse and self-satisfied industry, declaring that the American higher education is broken.

Traditional universities may accept credits for distance learning courses or modules offered by Coursera, according to Carey (2015), but online course enterprises are further moving to the

education to for professional world, having even nano degrees offered by Udacity, accepted by the professional market, without any higher expectation to become an academic, high education, initiative.

An economic element was also identified by Carey (2015). If traditional universities accept credits for online distance learning courses, revenues are reduced, which is not on the best interest of the universities or their stakeholders. As such, the practice does not receive any incentive. It is a fact that costs for students rise, having become a lifetime saving activity for a family to have their children attending universities when they finish high school. University costs are increasing out-of-control but quality is not up to the mark, as Selingo (2013) mentions, and that is not aligned with the international competition demand.

An interesting study published by the State University (2017) explains the reasons for which students drop out of College. Amongst several reasons, financial limitations contribute for that, while students start working and reach the conclusion that making money at the present time, giving up their studies at college to dedicate more time to their jobs. This scenario, according to Carey (2015) and Selingo (2013), represents the reality of students that coming from families with financial limitations, struggle to afford university costs and are forced to work while attending classes, bearing a huge responsibility to complete their studies, while universities ignore their needs, continuing focusing on wealthy students.

Morais (2017) in an excellent study about the difficulties students face to join and continue their superior studies, concludes that despite of the fact that the financial aspect is one of the motivational drivers for students to drop-out of college, that should not be the only aspect that needs to be revisited, indicating aspects the lack of knowledge with regards to the course students join, meaning students can work to help them continue their studies if they are motivated to do so.

Existing options and possibilities, about feasibility of asynchronous unlimited distance learning are:

Written classes sent to students, either via regular mail or email, with students responding exercises and tests through the same media. This is the original media for distance learning, still existing, but slowly being phased out for a more dynamic and online option, given the existing technological possibilities;

Written and video classes made available to students via internet. This could be done using texts pre-edited to be read by students, pre-recorded video classes that students can watch at any time, or a mix of both. Although using technological resources, this media simply represents the traditional learning process, with the difference that students can read the material or watch the classes at their own pace. Although limited innovation can be noticed in this option, it also somehow represents how some universities have been conducting the learning process: students attend some lectures and are required to read enormous quantities of books and texts, whether online or off-line, while they are not in class.

Non-linear distance programs, in this option students can select the subjects they want to study, according to the course chosen, as long as required dependencies among subjects is observed. For each subject successfully completed, students obtain credits that will allow them to choose other subjects necessary to achieve the completion of the course.

It is interesting to observe that while universities, given their financial interests, are resistant to adopt distance learning as a viable option for students with limited alternatives to attend classes, as highlighted by Carey (2015), companies see online learning as a viable and effective way to train their employees, including the use of artificial intelligence and augmented reality.

Benesova and Tupa (2017) mention the high costs and the need to prepare employees for the new technological reality as the main reasons for not having the vision of using new approaches and technologies to provide education and training, while the need to innovate in education, is due to the fact that in the future, some professions will no longer exist and will have to be replaced. It is expected that new technologies and computing programs will do most of the activities performed by the human being and the need of a qualified workforce will become a basic requirement for the companies.

In addition, Education 4.0, according to Benesova and Tupa (2017) and Armstrong and Taylor (2014), while combining technological resources and bringing augmented or virtual reality to the learning world, will boost the educational process, promoting a deep learning experience to students.

One of the points for questioning will be related to the learning evaluation process, since it is a challenge to evaluate how much students have learned. Carey (2015), highlights that even nowadays it is very difficult to establish a system that is absolutely fraud proof and the very same challenge can be expected in the new university.

Several ways for learning evaluation already exist: from a digital proof standpoint of granting open badges and credentials for each stage concluded to tests performed in front of a computer screen in which each key stroke would be monitored by a tutor via video camera. The question, though, continues Carey (2015), is whether even these evaluations will be necessary, since the deep learning process using student immersion on the subject will propitiate adequate learning, while recording each stage accomplished by the student.

While acknowledging the challenges to have grades obtained via distance learning studies, not only by the market but also by governmental authorities, the need to demonstrate and prove the robustness of the newly designed university model will be a challenge, eventually overcome as technology evolves.

2. Methodology

Elements that constitute the methodology used are presented below.

2.1. Methodology framework

While several studies have already been developed on the topic, this research aims a broad analysis of the existing studies that approach superior learning from different perspectives, but with a special focus in the usage of technology, being it artificial intelligence, virtual reality, augmented reality and gamification. According to Hakak et al. (2019), it will also target the identification of alternatives for the expensive superior learning offered by traditional brick and mortar universities, looking for opportunities to project a college that could be accessed from anywhere at any time, at a reasonable cost. That would not only attract a high number of students, as well as would allow them to continue their superior studies, minimizing financial related drop-out rates.

In addition, by looking for partnership with companies, the proposed virtual university would also customize its offer to the market needs.

2.2. Methodology design

Fonseca (2002), explains that methodology is the systematic study of the organization and the ways to be followed aiming to achieve the science progress. As such, methodology represents the study of ways and instruments used for a scientific research.

While developing this project, the focus will be the comprehension of a social group, characterizing the qualitative research that does not need to be concerned with the numeric representation.

Also, according to Fonseca (2002), this methodology can be described, amongst other factors, for the hierarchy of the actions to describe, comprehend and explain. When compared with quantitative methods, qualitative research presents a higher emphasis in the interpretation of the object, as well as the importance of the context in which this very same object is inserted. At the same time in which the theoretical framework and the hypothesis in this type of research, the sources to collect information are larger, given the fact that the bibliographic volume available for the research is also largely available.

In addition, the justification for the qualitative methodology, as mentioned, supports the broad description of the complexity of a certain problems, as explains Richardson (1999), including the analysis of different variants, enabling the comprehension and classification of dynamic processes experienced by social groups.

According to its nature, this research will be basic, since, according to Gerhardt and Silveira (2009), besides including statements and universal interests, it has the objective the creation of new knowledge, useful for the science development, without the need of the practical application.

With regards to the outreach, this will be an exploratory work, considering its purpose to promote broader familiarity with the proposed problems, according to Gil (2007), turning the research more explicit, allowing, besides, the broader bibliographic research.

As for the procedures, this research is documental, through a deeper analysis of materials that have not been, so far, scientifically explored. This type of research, according to Silva and Grigolo

(2002), makes use of materials that have not received any deeper analysis.

3. Results

Too many factors contribute for the complete need of the learning process change as it is known today, requiring the complete redesign of the superior learning.

Those factors are:

financial limitations of students preventing them to join the courses or forcing them to drop out of school;

limited time to attend face to face classes due to the schools rigid schedule and time taken for students to move from their location to the university;

lack of empathy between students and professors making the learning process extremely painful;

the already delegated self-learning method in which students, despite of being enrolled in a traditional universities, attend some classes but are asked to read a large number of books at home, leading them to ask why in some cases, are they sent far from their families for a learning process that will be mostly remote anyway;

the fact that the new generations are very much tech savvy, prone to self-learning through updated technology resources, which will allow them, at their turn, to learn at their own pace, oriented to their interests;

the labor environment, requiring professionals with knowledge that could be applied to the updated resources used by companies that, on top of the demand created, will also enable and promote partnership between companies and universities to customize high learning opportunities for the employees, in order to equip them with the high level knowledge required in the current environment.

Change in the superior learning process is not only needed for the reasons above but it will also happen as a result of the disruptive technology that is already modifying how we interact with each other and with the world in general.

Distance learning will also change, and it is changing, as a result of the disruptive technologies. As initiatives like Udacity or the Open University, we understand how deep is the change on how people are studying today when compared with the first decade of the third millennium.

These changes will not stop there. Interaction with computers or mobile devices will allow those computing equipment to learn what the individual likes and what he does, while artificial intelligence will propose the next steps in any area of the social life, including an enhanced opportunity for distance learning.

4. Conclusions

The proposed model of the university will not be a mix of enhanced traditional and distance learning, but instead, a completely virtual university, with high quality classes in virtual environments where students:

will interact with other students, collaborating in real time or off-line;

will have the opportunity to learn in a virtual environment, based on artificial intelligence resources, developed based on the knowledge and experience of professors that are experts in their areas of knowledge;

will live the experience of dealing with the subjects being studied, and that includes the participation in experiences, experiments and factual moments of history;

will be evaluated by an electronic system as they progress in each subject being studied, receiving grades or badges for the completion of each stage;

will have the opportunity to select the career they want to follow and as such, design the entire course, being subjects for major and minor degrees, as well as the rhythm in which they will be able to deliver the completion of each subject;

will pay an affordable price, based on cost and mark-up, without need to bear with expenses of a brick and mortar university;

will have their university degrees obtained through the re-modeled virtual university, accepted by the market and recognized for their excellence by government authorities.

As society evolves and observes how the environment changes, it is obvious that the educational model will also change and that does not represent the translation of the traditional classroom into a student-teacher relationship via internet but instead a completely different learning environment.

Traditional brick and mortar universities may continue to exist, but unless they completely customize their offer, students may have serious problems to enter the labor market, despite of the expensive course they attended and the degree obtained.

Given the evolving technology, as observed in this research, opportunities for further developments and researches are possible and advisable, to ensure superior learning evolves, keeping itself up to date not only with technology but mainly with the society.

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