Impact of Digitalization on Education in the Knowledge Economy

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Abstract. *Due to the accelerated pace with which developments in information and communications technology are taking place, digital society and the digital economy have become real and, in turn, are generating specific challenges. In this environment, digital skills and competencies are essential in order to achieve professional success and the personal development of any individual. Through this paper, we aim to bring to light the basic concepts in the field of digital technology and at the same time, the topical implications on the educational processes. The main objective of the paper is to reflect the impact of digitalization on the education sector both in the European context and in Romania. The importance of the topic under consideration can be justified with many arguments, but we will mainly appeal to the need to meet the objectives proposed by the 2020 Strategy in the field of education, research and development at European level and in Romania. Considering the previous premises, in the paper, we will present information about the concepts of digitalization and digitization and the implications in the field of education. The realization of this paper is based on the study of the specialized literature, of the official documents published by the European Commission offices and of the statistics issued by the specialized bodies.*

Keywords: *digitalization; digitization; digital age; Higher Education Institutions; knowledge economy; strategy; digital skills.*

Framing the digitalization phenomenon

In this paper, we will analyze the impact that the digitalization phenomenon has on the field of education, especially in Romania, compared to the other Member States of the European Union. The problem analyzed is important both from the point of view of achieving the objectives included in the Europe 2020 Strategy and from the perspective of positioning Romania in this picture of education at the European level. In this regard, we will present the current state of the phenomenon of digitalization in Europe, discuss the existing strategies to increase the degree of digitalization in the field of education and finally draw conclusions on the perspectives generated by the intensification of digitalization in this sector. This topic is intensely debated in the literature by both academics and experts from the European Commission and more by professionals in the labor market. What we have proposed is to present the most up-to-date points of view and arguments regarding the subject analyzed so as to make a significant contribution to the field of research of the topic.

Like any latest trend, the issue of digitalization brings confusion and debate about its significance. In this case, the confusion arises between the terms of "digitalization" and "digitization" because they come from the same sphere but still have different interpretations. Thus, the expression of "digitization" is understood as the process of retrieving analog information and encoding it so that computers can recognize, process, store and then transmit it to users (Bloomberg, 2018). In business, digitization is important both for the analogical approach of information and for streamlining "paper-based" processes - where "paper-based" is nothing more than a metaphor. It is important to remember, that „the information" is what we digitize, not „the processes" - this is where digitalization comes in (Bloomberg, 2018). The expression "digitalization" or "digital transformation" refers to "changes associated with the application of digital technology in all aspects of human society". Digitalization is also accepted as "the ability to transform existing products or services into digital variants, thus offering advantages over the tangible product" (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017, p.64). The process of digitalization influences some other organizational processes, especially organizational change and transformational leadership (Bratianu, 2011; Bratianu & Anagnoste, 2011; Lefter, Bratianu, Agapie, Agoston, & Orzea, 2011).

This distinction between the two concepts is necessary because their usefulness and effects differ. Depending on what we aim to achieve, we will resort to the implementation of one of the two processes, either digitization or digitalization. The correct understanding of the two processes is necessary for the general public knowledge but especially for those who are going to be involved in such a transformation that involves the innovations in the digital domain. The implementation of the two processes captures different aspects in terms of resources, technologies and the nonlinear integrators of the organizational capital (Bloomberg, 2018; Bratianu, 2013, 2018).

In this paper, we will discuss in particular the phenomenon of digitalization as this is needed in more and more organizations as well as in HEIs. Adapting HEIs to mass digitalization is vital as the clients of these institutions are mostly from the younger generations, people who are complementary to digital technology, and more than that they are indivisible. Digital technology integrates into the lives of individuals from an early age and begins to accompany them permanently, which forces the educational system to adapt to these generations needs. The existence of digitization is now a facility / an advantage offered by HEIs, but it is expected that in the future digitalization will be a criterion of existence or non-existence of these institutions (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017; Tihinen & Kääriäinen, 2016).

Today, more than ever, the efficient use of digital technologies and learning resources in education and training is considered a key factor in achieving the educational objectives of the Europe 2020 Strategy. The role of digital technologies and resources is to improve and add more value to the learning and teaching processes. To this end, teachers and students can access an increasing number of digital technologies and resources and use collaborative platforms to improve teaching and learning practices. However, despite the obvious benefits of incorporating technologies and digital resources into formal education, political challenges remain. In the member countries of the European Union, numerous national policy initiatives have been implemented to integrate digital technologies and resources into education. However, surveys and studies, for example, those conducted by the European Commission, O.C.D.E. and the World Economic Forum,

stress that there is still a gap in the integration of digital technologies and resources in European education systems (Bejinaru, 2018). Regarding the formulation of public policies in this area, according to Novak, Purta, Marciniak, Ignatowicz, Rozenbaum, and Yearwood (2018), there are several areas of action that governments should focus on in order to benefit from digitalization, collaborating with other stakeholders, especially with businesses and individuals who are pushing for change. These directions of action are summarized in Figure 1 and will be discussed across sections.
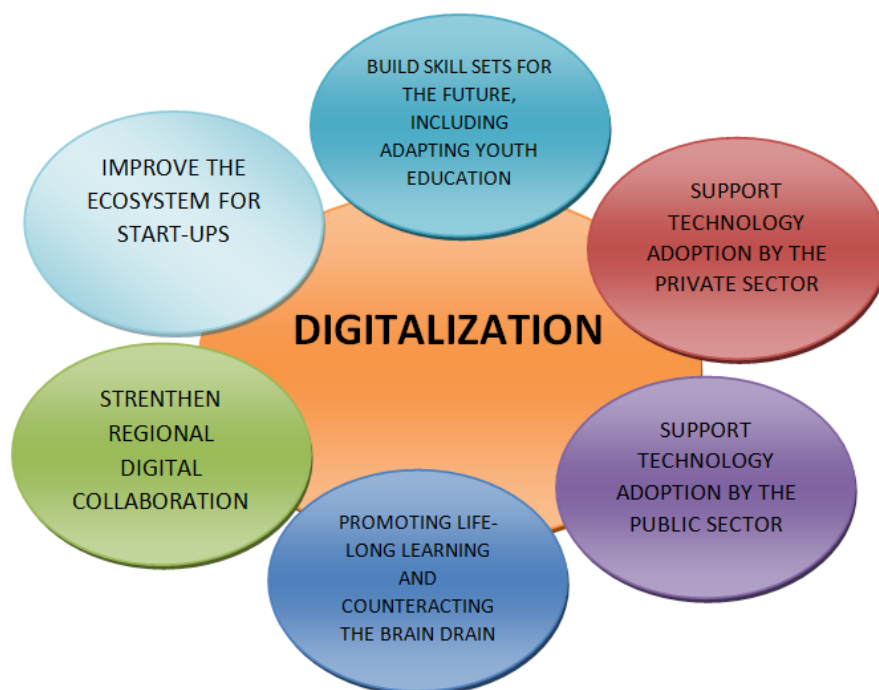
Figure 1. Applicable policies for increasing the level of digitalization,
(Novak et al., 2018)

The question is how universities should prepare for global digitalization? Because at this point arises an issue of compatibility, of bridging the traditional system with the future system. Professional voices say that in order to adapt to the global technological advancement, universities should urgently rethink and upgrade their mission and strategy, and become intelligent organizations (Bratianu, Vasilache, & Jianu, 2006). HEIs must engage for the target of becoming competitive by embracing technology innovations and shifting as many of its activities to the digital work-zone. Primarily, HEIs should support the implementing of digital-based processes for their own functional system and further to provide digital teaching and digital learning channels. The latest technological advancements that are impacting the economy can be linked directly or indirectly to HEIs either as sources which produce the innovations or as vectors of dissemination through research publications or through collaborations with the industry (Hapenciuc, Bejinaru, Roman, & Neamtu, 2016). Thus, even if HEIs move forward and embrace digitalization their core missions, of teaching and researching, continue but are upgrading their tools (Trippl, Sinozic, & Smith, 2012).

Nowadays, HEIs are at the heart of European agenda policies as they are considered main actors for the innovation systems and major stakeholders in generating and disseminating knowledge (Bejinaru, 2017a). Paradoxically, they are though increasingly questioned about their ability to address the challenge of fast business, technological development, and social change. For the scope of making these organizations more competitive and more sustainable over time, universities must elaborate a vision-building process and introduce governance models of strategic governance of their internal affairs and external relations (Elena-Pérez, Saritas, Pook, & Warden, 2011).

It has become obvious that today, HEIs are allocated many tasks from the external environment coming from different categories of stakeholders (Bejinaru, 2010). In this situation, HEIs must be selective and accurate in providing the necessary attention for connecting the adequate response reaction to each category of stakeholders, whether we speak about students and their families; private firms and public institutions; the State and all the national and local governments; and not least, the community (Prelipcean & Bejinaru, 2016).

HEIs have to respond to many roles and further on to continuously diversifying challenges. The accelerated change is really inconvenient for large structures like the HEIs and requires the surpass of many barriers in the adaptation process. In order to accomplish easier their objectives, HEIs should always foresee the results and the path towards them. Considering the global level, the majority of prestigious HEIs, known as world-class universities are renowned for their impressive research programs and results published in international journals. There is ample evidence that this type of HEIs, like research universities, are engines of intellectual, technological and economic development (Bejinaru, 2017a). However, Perez, Johnson, and Kleiner (2017) scenario foresee that the Golden Age of Information has yet to come and this explains the features of this period like the cheap or free knowledge transfers, the customers' options to belong to virtual communities and increasing requests for customization. Consequently, the combination of these no-constraints activities and free resources generates "a fertile ground for unlimited innovation" that further generates economic, social, environmental and political types of value. We consider that as an extension of the presented phenomena, digitalization has become a popular trend characterized by opportunities and challenges that are increasingly present in business activities, in developed and developing countries and, therefore, in the Romanian economy too (Reis, Amorim, Melão, & Matos, 2018).

The phenomenon of digitalization in education

In recent years, digitalization has changed and provoked the whole society, creating new working skills, modern cultural conditions, and innovative tools for communication and entrepreneurship (Newell & Marabelli, 2015). In a knowledge economy, where knowledge becomes a strategic resource, digitalization connects with intellectual capital (Bejinaru, 2017b), services and states, facilitating business processes, partnerships, interaction, leading to the creation of complex networks (Pînzaru, 2015).

The digitalization process in education is a strong trend in terms of reforming and modernizing the global educational environment. Digitalization in the educational process involves translating text, images, video, and audio into a digital format that can

be played by the computer. Digitalization tools can be the computer, the internet, the smartphone, the scanner, the digital camera, the projector, the printer, etc. Means of digitalization can be the online admission process, the online exam, the sharing of online / web knowledge, digital support materials (in different formats like ppt, pdf, doc), social groups, digital publications, etc.

When discussing the digitalization phenomenon, it should be noted that different analysts and forecasters, especially British, including Tim Berners-Lee - one of the inventors of the World Wide Web considers the transition of education in the digital scene as a turning point in the history of education (Stuart, 2014). It is known that the United Kingdom was the first in the world when we discuss the introduction of software engineering and information technology into the compulsory education program for pupils aged 5 to 16 since 2015. This initiative started from the 2020 Strategy, adopted in 2014, which focuses on intensifying the use of digital technologies. Within this strategy, ambitious goals were set to produce impressive achievements in the field of education, with the main aim of integrating state-of-the-art digital solutions, resources, and methods into the activities of the educational institutions in the European Union (Machekhina, 2017).

Given that the use of information and communication technology (ICT) has proven to have a remarkable impact on economic development, the so-called "digital divide" phenomenon has become a matter of great interest to researchers and policymakers. Differences in the dissemination and implementation of ICT can lead to an increase in disparities in the European Union in terms of economic development. Thus, a large number of studies have focused on measuring and analyzing the nature of the digital divide between states (Billon, Lera-Lopez, & Marco, 2010).

The literature has emphasized the role of income, namely the Gross Domestic Product, in explaining the adoption of technologies such as the Internet and personal computers (Beilock & Dimitrova, 2003; Chinn & Fairlie, 2007; Dewan, Ganley, & Kraemer, 2005; Quibria, Shamsun, Tschanh, & Reyes-Macasaquit, 2003). However, some studies have also shown the relevance of other non-economic factors such as competition, telecommunications infrastructure and human capital (Andonova, 2006; Quibria, Shamsun, Tschanh, & Reyes-Macasaquit, 2003). In the same vein, the various combinations of ICTs that model various digitalization models can be explained by a wide range of variables. These include revenues, as well as other non-economic institutions and factors that indicate a relationship between the digitalization models and the different levels of development (Billon, Lera-Lopez, & Marco, 2010).

Lately, the phenomenon of digitalization has agitated and provoked the whole society, has generated new demands on working skills, modern cultural conditions, and innovative tools for communication and entrepreneurship. Within the knowledge economy, where knowledge becomes a strategic resource (Bolisani & Bratianu, 2017), digitalization becomes a dynamic interface for intellectual capital (Bejinaru & Iordache, 2011) corporations, services and states, facilitating business processes, partnerships, and interaction, leading to the creation of complex networks (Pînzaru, 2015). This results in the emergence of a new economy, in which individuals become "ambulatory data generators" not only from a social point of view but also from an organizational point of view.

The progress of the digital economy can be analyzed especially in the context of the Digital Agenda for Europe, part of the Europe 2020 Strategy, one of the seven EU initiatives that distinctly approach digitalization, whose provisions are applied to Romania under the name of the Digital Agenda for Romania 2020 (Rada, 2015, p. 36). Although there is such a national strategy, there are various problems related to the development of the digital economy at the national level and the most important of these is the lack of a national strategy aimed at digitizing the business environment (Hadad, 2018).

According to the "Index of the Digital Economy and Society (DESI) 2017 - Romania", which measures the progress of the EU states in terms of the evolution of the digital economy and society, there are five major elements that group more indicators that are presented in table 1. Regarding these indicators, it is known that in the case of Romania compared to the rest of the EU member states, our country ranks 28th, that represents the last place according to the DESI indicators. Of the five indicators, Romania ranks last for four of them. However, the only best-performing indicator for our country is "connectivity", for which 12.5% are registered, which places Romania 9th. The digital division between states is still large and keeps Romania away from the average digital progress registered by the member countries of the European Union.

Table 1. DESI indicators

Indicator	Indicator
1. Connectivity	Broadband, mobile broadband, broadband speed, and prices
2. Human capital	Basic skills and use of the Internet, advanced skills and development
3. Use of internet	Use of content, communication and online transactions by citizens
4. Integration of digital technology	Business digitalization & e-commerce
5. Digital public services	e-Govern

The second indicator that Romania occupies the last place is that of "human capital", which measures the basic competencies and use of the Internet, as well as the advanced and development skills in the digital field. Although the number of people identified with online activity is increasing, their level of digital literacy is low and so our country remains in the last place at this indicator. This is a worrying reality as it can generate, according to statistics, a crisis of skills, and even more a crisis in the field of labor. In this context, it is advisable for Romania to implement strategies to increase the level of digital skills from the basic to the advanced, especially since just over half of the Romanians are regular Internet users (56%), compared with 79% in the EU and 28% of Romanians are currently in higher levels of digital skills (the US level is 56%) (Hadad, 2017).

The widespread adoption of digital technologies has created a new demand for digital skills, encompassing a wide range of skills and knowledge; ranging from accessing interfaces and basic manipulation of spreadsheets to advanced analysis and programming programs. Broadly speaking, we distinguish between three types of digital skills, among which:

- Skills for practitioners: the skills needed for the development, design, installation, management, and marketing of ICT systems, most often required by workers employed in the ICT sector.
- User skills: capabilities that allow workers to use ICT as tools in their workplaces, most often outside the ICT sector, which may involve the use of generic software or specialized ICT tools.
- Leadership skills in the field of e-learning: encompassing both ICT technologies and managerial skills, allowing professionals to adapt businesses and organizations to adapt to ICT technologies, as well as finding new ways to conduct business or business, identify opportunities for innovation (Berger & Frey, 2016).

To reduce qualification mismatches, industry associations should work with governments and educational institutions to provide up-to-date and up-to-date information on employment opportunities, career prospects and evolving skills requirements in the industry. To achieve these objectives, it is essential to initiate multi-party partnerships (Bratianu & Bejinaru, 2017).

It could be said that the modern education system is facing a crisis of skills. The educational process does not sufficiently contribute to students' personal initiatives to learn something new, to set goals in connection with their knowledge and the real world, to use their imagination to seek creative answers to standard questions rather than using stereotype models. In this sense, the educational process of the future must offer more than just the transfer of knowledge and invest in the students' thinking, creativity and innovation (Lupan & Bejinaru, 2019).

The declared approach to education will force us to reconsider the curriculum and integrate the conceptual and current innovations. The new curricula should stipulate not only the compulsory transfer of knowledge but also focus on achieving students' goals, stimulating creativity, imagination and teamwork, regardless of the location of the team members. Finally, it should be noted that today's global education has undergone major transformations, caused by the integration of new digital technologies into the academic activity and the search for efficient implementation models, which will compromise traditions and innovations, is active.

Strategic directions for implementing digitalization

In order to implement a successful digital transformation, HEIs should develop a wide range of capabilities in their field of action, depending on the educational programs they offer, the projects they implement and the strategic vision they follow (Carcary, Doherty, & Conway; Reis, Amorim, Melão, & Matos, 2018). In fact, digital technology is 'abusively' requesting a lot of attention throughout all means and thus easily accedes to the core of our activity. This is a strong motivation for organizations as HEIs to reconsider their position on the market, to revise their strategy and even to upgrade their vision and mission not to remain trapped in the past. Unlike business organizations for which digitalization drives the diminishing of entry-barriers and disrupts existing value-chains, industry structures, and business models, HEIs have the field advantage that cannot be easily overcome (Bankewitz, Aberg, & Teuchert, 2016; Schwab, 2016).

First of all, HEIs must become themselves digital organizations in order to provide digital teaching, digital learning, digital experiences, and finally, digital skills for their students. Becoming digital organizations requires digital endowments and specialized staff. It is important that the necessity of change is well understood, is approved and accordingly prepared by all parties involved. Organizational change, implemented in such large structures is likely to meet a certain resistance to change, which might be caused by a different type of factors. Passive factors refer to the individuals' habitude to their work style as well as a certain level of convenience with the daily work routine. On the other hand, there are active factors which include an offensive attitude towards new and alternatives methods or ways of developing tasks. "In this category, we also include the cultural inertia, which means the fear to act differently from the other members of the community" (Bejinaru & Baesu, 2013, p.128). At this point, HEIs should focus on understanding the main drivers of digitalization which are promising to lead to positive results and popularize them (Figure 2).

Figure 2. Drivers of digital transformation in HEIs (Digarc, 2018)

Changes in the economic, political, social and cultural fields lead, without mistake or delay, to changing priorities in the field of higher education. Organizations that really want to prepare for a successful future, leverage technology and data to transform processes and upgrade systems - in order to achieve, what is now called -the digital transformation. Further, we present the main drivers that should motivate HEIs to pursue this goal actively.

1. Enhanced competitiveness: To achieve this goal, two types of action must be used. On the one hand, the decrease in the number of students must be compensated with better efficiency of institutional operations. On the other hand, attracting students (from a decreasing pool) can be done by increasing the attractiveness of the services offered and by aligning with the candidates' preferences regarding the digital experience.

2. *Control of costs*: The financial management of the institutions must-have in the foreground the reduction of costs. Moreover, more attention is needed to justify tuition fees so that the cost/benefit ratio is a positive one for both students and the university. An alternative to reducing costs is one that saves on staff time and simultaneously reduces the volume of materials needed for file storage, which is called the spiral administrative method of controlling costs. The emergence on the market of SaaS solutions greatly facilitates the access of HEIs managers to acquire and implement them without spending their time and money with specialized teams or with the IT department. SaaS solutions (Figure 3) are easy to use and contribute to saving time and have a very high return on investment.


Figure 3. Examples of SaaS solutions (Digarc, 2018)

3. *Improved user experience*: Studies show that, on average, 4 out of ten students access at least two digital devices during a regular day at school. Students who have grown up using smartphones are often at odds with the outdated technology in their schools. Therefore, it has become a necessity for universities to resort to upgrading websites so that they become more friendly with students, and they can obtain the necessary information from any smart device and at any time. Offering a digital experience that meets the expectations of students is a good strategy to attract and keep them connected with the university.

4. *Increased agility*: The process of digital transformation involves more than just software. It is about identifying the interests and needs of institutions in their decision-making process in order to adapt to the market. The use of technology is an agile and flexible way of facing the high-level demands of students, faculty, and staff. World-class HEIs continuously search for new ways of improving their processes and mostly those evolving the students' journey during the educational path. In this context, continuous improvement of user experience is generated by the innovative use of technology in order to keep students, staff and faculty, productive and satisfied.

Implementing the four type of strategies, the results of the digital transformation will be visible in a relatively short time as future students will contact the institution, firstly online. Thus, the first impression of the potential students about our university is generated by the quality of the digital experience, when accessing its website. If there is a successful digital transformation, the effects will certainly be notable very quickly and in a positive way. Moreover, there are already studies on this subject, and these indicate that 80% of the candidates for higher education programs judge a university according to the website. The study shows that 70% of the information that interests them and that can subsequently influence them in the choice they make is in the online academic catalog (Figure 4) (Navitas, 2017).
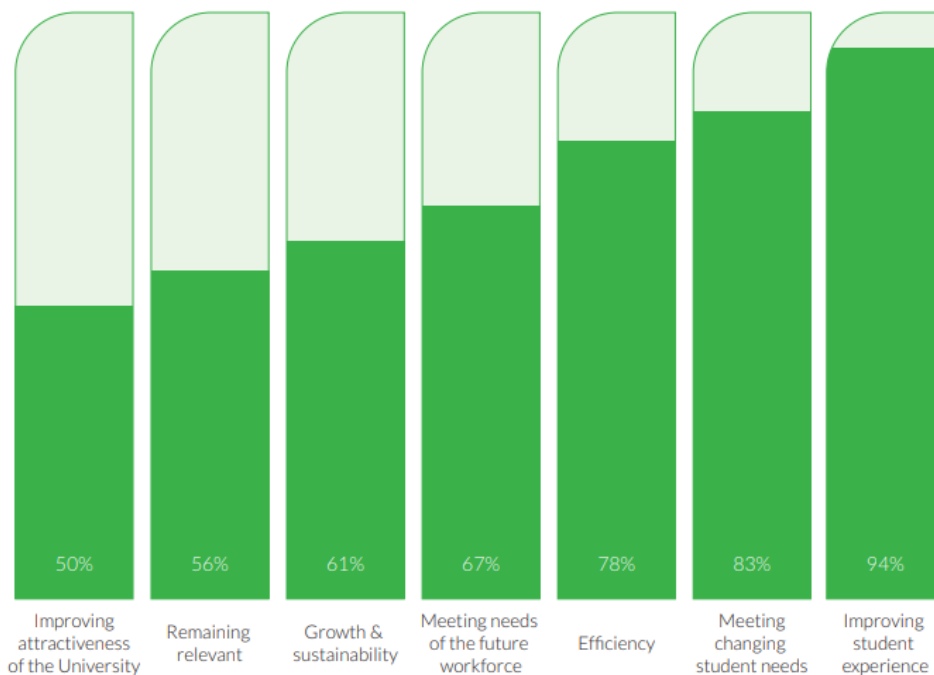
Figure 4. The effects of digital transformation in education
(Navitas, 2017)

In this sense, the conclusion is that using the most up-to-date technology and updating the data in the virtual academic catalog will produce a fast and successful digital transformation.

Conclusions

Digitalization is currently one of the most important trends that change society and business. There is no doubt that the digital economy is profoundly changing the methods of companies manufacturing and delivering goods and services worldwide. Thus, in the education sector, digitalization can be implemented at the levels: administrative, teaching-learning, evaluation, research, development and for the benefit of society. Although it brings many advantages such as time savings, transparency, overcoming

geographical barriers, continuous flow 24x7, minimizing human error, mass digitalization also generates disadvantages such as high degree of dependence, risks of physical and mental nature, the use without the responsibility of some processes, neglect of basic human skills and others.

In the process of adaptation, HEIs must focus on improving largely on their traditional mission of teaching and learning. Today, the society is asking for much more from universities regarding their contribution. They must develop a third mission that concerns the provision of services to society and the more active involvement in the triple helix university-state-industry. In this context, universities should contribute more to the development of students' digital skills, especially in countries with emerging economies such as Romania and the lowest levels of DESI indicators.

In a world of rapid and unpredictable change, leading to a turbulent business environment, HEIs must not only adapt to all these changes but become driving forces for change and leaders in building new contracts. Universities should develop strategies to increase their intellectual capital and become digital organizations. In the new economic and social landscape, universities should be able to become leaders of change and innovation. In conclusion, we consider it important to monitor the fundamental transformations induced by the advance of the digital age, especially on the educational process in the universities in Romania and worldwide.

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