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The Dark Side of Digitalization: Information and Communication Technology Influence on Human Learning Processes

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Abstract: *In academia and mass media, Information and Communication Technology (ICT) is largely and commonly seen as a main facilitator of learning processes. As ICT eases access to information and knowledge, independent of geographic area and field of interest, and contributes significantly to the development of various human skills and competencies, its influence in lifelong learning is mainly recognized as a positive one. On the other side of the story, digitalization comes with some challenges, exerted both at the individuals' and communities' level. Modern classes with digital screens, with laptops for the teachers or tablets for each student, which aim to improve the learning process or make it more attractive, are becoming more and more common. This leads to the fact that the traditional way of learning is rapidly replaced by the new technology approaches. Students speak less, they type more; they don't remember things, they have their browser where they can find all the needed answers or solutions. In this spirit, this paper reviews the effect of digitalization on human thinking, trying to elucidate the ways in which trends like big data, information overload, and fake news are affecting humans' intellect, understanding capacity, attention span, active presence in learning communities and magnifying cognitive biases like exposure problem, backfire effect, strawman fallacy etc. After the in-depth literature review on the topic, some suggested solutions for educators and providers of e-learning software are formulated, as a consistent adaptation of attitudes, teaching materials, ways of providing information and software functionalities is necessary in order to transform the so-called "dark" effects of ICT in brighter ones.*

Keywords: *e-learning; ICT impact; negative influence; learning process; digitalization.*

INTRODUCTION

In the 21st century, Information and Communication Technology (ICT) has become the main set of tools through which people are socially, economically and culturally empowered as individuals and easily connected as nodes in various types of networks. [7] [15] In order to adapt themselves to an ever-changing life and work environment, people need to learn faster and more than in the past, depending mainly on ICT for this purpose. The use of technology allowing people to learn anytime and anywhere is coined in academia, media and software industry as eLearning. Initially used to designate instruction delivered via a computer in teaching and learning, usually in a structured, formal environment [30], the term eLearning is now extended to basically *any learning process mediated by Internet and/or a digital device*. eLearning represents the use of ICT in education, regardless if learning takes places individually or in a group, online or offline, synchronous or asynchronous, mediated by computers or by other devices, connected or not in a network. [17] Structured or not, the eLearning processes are not necessarily offered by an educational institution anymore – the individuals are pressed to life-long learn by themselves, and organisations outside academia must evolve into learning structures in order to succeed. [16] eLearning is facilitated by usual educational technologies, such as platforms for online/blended university courses, which present the content in a multimedia format, using text, videos, images and discussion forums [8], but also by Web 2.0

applications - YouTube, Wikipedia, Twitter, WordPress, RSS feeds or blogs [8], mobile devices - smart phones and tablets [1], augmented reality, 3D visualization, handheld and wearable devices, AI [10] and virtual games [11]. We can say that the ICT tool are nowadays ubiquitously and intensively used in learning processes.

The remainder of this paper is structured as follows. Section I outlines the main benefits of using ICT in learning. Section II extensively reviews the negative effects of ICT on learning processes, as presented by relevant literature in the field. At the end of the paper, we also offer some recommendations about how the relevant actors in the educational area should adapt their offer in order to overcome the drawbacks of ICT use in learning.

I. ICT USE IN LEARNING - BENEFITS

The beginning of the 21st century brought with it the widespread use of ICT, which generated a new paradigm of education. [7] With the appearance and advances of new technologies as Web 2.0 and 3.0, virtual games, AI etc., ICT transformed profoundly our learning habits and cognitive processes. We live now in a world where any person with access to the Internet has the opportunity to enter online educational courses, offered by some of the best academic institutions in the world, or to learn independently, at his/her own pace, using a variety of free educational content posted by peers in various social networks. Anyone can search through the content of thousands of published books or view comments, images, charts, videos that refer to specific topics.

Because the main point that comes to mind when talking about using ICT in the educational segment is eLearning, here are some positive aspects of using technology in the learning process. Speaking about the true value which eLearning brings, it is summed up to some essential aspects. The main point is that World Wide Web contains a wide variety of information, and learners can find information just about anything. Another aspect is that it provides support not only for the traditional university subjects, but also for all the virtually existing areas of interest. eLearning has transformed traditional education, thus encouraging the idea that education does not end at graduation but rather is a life-long process.

Also, using eLearning tools, learners have the power to personalize their education. According to Daphne Koller, a professor at Stanford University, quoted in [8], online courses usage helps learners in a very pragmatic way, because it allows them to replay parts of a lesson if they did not master certain aspects, without having to feel embarrassed by the fact that they understand some concepts slower. In addition, the lecturer can see where students have problems, relying on the frequency with which students access and replay specific parts of an online lesson. With the help of this information, that wasn't available some years ago, teachers can make precise adjustments to the curriculum, making them more effective.

Referring to the use of ICT in the learning process, we can generally outline the following positive aspects:

- *Acquiring knowledge and skills* - ICT facilitates the way the individual gets information; helps forming study/reading habits; accelerates academic success by facilitating access to information; improves managerial and professional qualifications; increases the motivation of students to carry out their activities and helps them to produce high-quality work because they learn many things independently and do more in a short time; [19], [21]
- *Increased social skills* – level of interaction between learners, their peers, and facilitators increases, as people feel freer to ask questions, intervene with comments, rate their colleagues' and instructor's content etc. [28];
- *Access to information anytime and anywhere* - anyone can access the information anytime and anywhere as long as the required technology, Internet connection and/or the appropriate devices are on hand. This widespread availability of ICT helps students to self-organize their learning processes, which leads to an increase in their autonomy and a transformation of educators into facilitators. [23] Also, ICT coverage in disadvantaged areas helps in reducing the digital divide and sustaining the development of underprivileged people;

- *Promoting lifelong learning* - the availability of free online courses promotes lifelong learning and enables people to acquire new skills to redirect their career paths [8];
- *Access to broader areas of knowledge* – not only traditional academic subjects are available online, but countless other fields of interest.

II. ICT USE IN LEARNING – CHALLENGES AND DRAWBACKS

The impact of the Internet on the human mind has been intensively analysed in the literature, from Carr onwards. It has been demonstrated by different authors, such as Thomas Nichols, that using the Internet in an unmanaged manner is a real challenge. [5] Thus, many studies have shown that, by increasing exposure to the World Wide Web, individuals become more:

- *Shallow* - A large number of psychological, neurobiological and educational studies confirm Nicholas Carr's view: online presence promotes brief, un-immersed, and superficial reading. In [2], it is shown that an individual in the middle of reading an article on the Internet is easily distracted by the notification of receiving an email, advertisements on the website, a new Like on Facebook, etc. According to media analyst Marshall McLuhan, media channels are not just passive channels of communication. They provide information for the thought process, but at the same time they affect the brain processes. Our mind is increasingly learning to receive the information as it is distributed by the Internet: in a dynamic flow of particles that emerge and rapidly quench, being replaced almost instantly by others. The brain thus begins to have problems processing information from traditional sources such as books or print media, as it becomes increasingly difficult to go through long articles that require attention for a long time. Changing concentration and rapid transition from one information / task to another, leads to automatic, less rigorous thinking and a decrease in productivity and creativity. As a result, a weakening of cognitive processes, abstract vocabulary, reflection ability, critical thinking and imagination occurs, as psychologist Patricia Greenfield of the University of California, Los Angeles, presented in an article in Science journal. [13] Plus, a study that has been taking over the Internet for some time shows that the vast majority of those who use the Internet frequently suffer from a condition called "digital amnesia". It is also more and more common that in recent times we no longer store information because of the so-called "Google effect" [4] - we feel safe when we know that any response is just a click away, which makes us to treat the Internet as an extension of our own memory;
- *Manipulated and vulnerable at the same time* - the concept of fake news is more and more common, and MIT studies show us that on Twitter fake news run six times faster, compared to the true ones. [9] We are more and more exposed, we can say that we are even assaulted by the news, coming to us in bunches, without being filtered by journalists (information overload), and unfortunately, a large part of the population accessing the online environment to get informed cannot differentiate true and false news anymore. Cognitive biases and logical fallacies as exposure problem, confirmation bias, backfire effect, strawman fallacy, correlation implies causation, bandwagon effect may occur due to this constant exposure to truth mixed with lie and can affect learning processes; [32]
- *Bored* – a need for constantly updated information affects individuals, and this eternal desire and World Wide Web-inspired entertainment started to be required also while being offline. People are always and impatiently looking for new things; the degree of boredom being raised to maximum odds.

The less pink side of the Internet and the way in which its usage affects the individuals is also discussed in [29]. Aspects identified by the author address seven major challenges: Internet dependence; inappropriate influence of online conversations; inappropriate influence of illegal, immoral, criminal and other inappropriate content; lack of face-to-face interaction; facilitation of fraud; plagiarism and rising hacking rate. Similarly, the negative aspects of adolescent's online behaviour were examined in [14]. Risks and opportunities have been discussed in the general terms that concern the addiction and harassment, along with health-related problems aspects.

On the large scale of ICT use, the pressure of *getting everything around us automated* represents a real challenge. For the next years, digitalization is seen as the biggest influencer for the future of many jobs. An OECD report published in 2016 [25] estimates that over 9% of the jobs available within the state members can be fully automated, thus the human being is at risk of replacement, while over 25% of all jobs will be subject to major changes in the way the execution of tasks takes place, targeting excessively the automation of work processes. Through the synthesis of information from various studies, in [26] it is estimated that about half of the current jobs will be significantly influenced by digitization. The trend will not only affect low-skilled jobs rewarded with low wages and also not just those from the industry sector. Dependence on explicit, widely available knowledge, repetitive tasks, manual data transfers, the existence of many employees with a similar job, or the possibility of outsourcing the work are just a few of the risk factors associated with digitization. For communications-based jobs, the replacement of the human individual with chatbots/social bots is seen as possible. Referring to the educational sector, the authors in [27] notice that the pressure exerted by automation and digitization is not naturally absorbed, and describes education providers as inertial, transmitting and using outdated information. The pressure of digitization also affects the employees. It has been shown that individuals who cannot develop high-level skills and cannot resist the pressure of ICT use at work, do not have enough autonomy, feel threatened, insecure, confused, resulting in job failures or quits. [20]

Another challenge is the rapid evolution of technologies. In [15], it is stated that computers have made the financial system so complicated that few people manage to understand it. As AI techniques improves, we may soon be at a time when no one can understand finances. Also, the biotech and *infotech* revolutions will give us control over the world inside us and will allow us to design life itself. We will learn how to “construct” the brain, extend lives and kill our unwanted thoughts. Nobody knows what the consequences will be as people were always much better at inventing tools than at wisely using them. Since AI really represents a challenge for mankind, it is necessary to mention the following aspects. People have two types of abilities: physical and cognitive. In the past, machines competed with people primarily on physical skills, and at that point people had a big advantage over machines - their cognitive skills. Thus, because manual jobs in agriculture and industry have been automated, new jobs have emerged that require some sort of cognitive skills that only humans possess: learning, analysing, communicating and, above all, understanding human emotions. However, currently things are a little different. AI begins to outperform human tasks in more and more of these abilities, including the understanding of human emotions. We do not know any third field of activity - beyond physical and cognitive - where people will be able to keep a safe margin forever. In Yuval Harari’s own words, “as AI continues to improve, human employees will need to repeatedly learn new skills and change their profession” [15] – p. 35

Beyond the challenges presented above, negative aspects related to ICT use can also be identified.

The first negative aspect refers to *addiction*. [19] Individuals are tempted to use the Internet and smart devices in an unlimited way, not just for information and learning. People become addicted to the Internet when they completely separate themselves from their real life. Today, this phenomenon is very common especially among young people. Many Internet users are changing their lifestyle drastically just to spend more time online and this starts to be very frightening.

From a social perspective, this technological dependency has depreciated the occurrence of human interaction that is normally the base of classroom learning. Apart from the family, schools serve as a primary form of socialization. If society's social formation base changes due to technology dependency, it is inevitable that society will also change, and it will also affect the way its members process information, learn and interact. [8] Referring to effective communication between individuals, we can say that reading and writing are relatively recent inventions, as physical communication has evolved over the centuries. And, as journalist Chris Anderson said during a TED discussion: during a classroom communication between the teacher and his student, not only words are transferred. Physical gestures, visual contact and body language are aspects that cannot be transferred or understood through technological means, such as e-mail or PowerPoint. [8] Therefore, the resonance of physical communication in the human brain is usually much deeper than reading a printed source or writing an answer. And if we still mentioned writing, with the technological evolution it’s obvious that we find the absence of handwriting. Students and pupils lack classical notes, which are replaced with

notes on their laptop or tablet. In the era of technology, the pen is replaced by the keyboard. We are writing less by hand and this can slow down our brains, as more and more studies show [6], demonstrating that handwriting increases concentration, improves memory and may even drive away anxiety.

Another negative aspect is the *lack of dedicated attention to those things we are about to learn*. When we use technology to learn and especially use content on the Internet, we are invaded by different options where you just have to click somewhere and get the access to your desired content - this makes it increasingly difficult to absorb and store information. Also, in many articles on this topic, it is underlined that people who read text with hyperlinks, understand less than those who read the traditional text. [5] People who are permanently distracted by emails, notifications, and other messages understand less than those who can focus without being disturbed by any notification.

The bad influence of the online interactions is another negative aspect of ICT use. Online communication has its benefits, but the big problem is the very possible chance of building a friendship with inappropriate people. [29] There is also the possibility of joining a wrong social group, with an increased risk for developing psychological problems, related even to a criminal behaviour. In this sense, exposing negative influences leads to aggressive behaviour and erroneous ethical behaviour. At the same time, the use of the Internet can create an isolated social environment, thus endangering the quality and quantity of interpersonal relationships between individuals, increasing the negative impact on health and social life. Thus, online communication is seen as detrimental to the development of social skills. [28]

Being a system so open and difficult to control, it is easy for anyone, including young people, to access, obviously, non-educational materials. And here we are talking about pornographic materials, materials that instigate hate, defamatory statements, and the exposure of online harassment. Many of these can be included in the so called “cyber-bullying”. Digital technology allows the use of multiple devices for harmful and intimidating behaviour to be spread and repeated. Digital platforms offer aggressors the means to reach a vast audience, making it harder to punish those people, whose identity is often anonymous. [18] Also, at this level, another problem is online content piracy. We are talking about an exaggerated piracy in the growing online environment.

With the rapid progress of the technological dependency, a number of smart devices have emerged on the market. So, we are talking about another issue, that includes technical difficulties [3], caused by device interface incompatibility or simply the lack of wireless Internet connection. This problem has led to major decreases in the percentage of eLearning usage.

And for the time being, only schools or people who can afford these tools, which are not at all cheap (laptops, smartphones, smartboards or projectors), can have privileged access to eLearning. Once these tools are obtained, there are also other necessary costs, such as Internet subscriptions and platform purchase fees. Although progress has been made with the government allocating funds for the acquisition of technology devices in classrooms, eLearning is currently an educational luxury. [8]

By balancing the above presented elements, we can see that there are many challenging and negative aspects of using ICT in learning processes. Undoubtedly there are huge advantages that technology brings, but unfortunately few of us succeed in discerning good things from bad things when we use technology. Until we manage to use only what is beneficial, we are facing one of the major impacts of ICT in education - moral decay. This includes access to inappropriate material, privacy breaches, unrestricted access to pornography, harassment and abuse of all natures, and other things that were mentioned above.

III. RECOMMENDED SOLUTIONS

The trends mentioned above impose, on one side, the adjustment of educators’ and also software development companies’ offer and, on the other hand, an increased level of awareness about the way in which technological tools are contextualized and adapted in order to obtain the maximum possible benefit from their use. As an expensive software solution for learning does not necessarily guarantee an increase in the knowledge sharing in an organisation [27], and to much technology can

be as destructive to learning as too little [16], an optimal mix between ICT-assisted and face-to-face learning should be presented to learners.

When talking about organizations and their need for an appropriate learning environment, organizations have to address dysfunctional behaviour in two ways: firstly, by reviewing the ICT infrastructure (ICT availability); and secondly, by reviewing the organizational climate [16]. In a few words, using ICT creates more opportunities for managing knowledge and enhancing workplace learning, but can also act as an obstacle if technologies are not used properly. In order for ICT devices and software to fully support workplace learning and not be an obstacle, the real needs and competency level of the targeted groups of learners should be determined. Also, if an organization wishes to improve its learning abilities, it is necessary at an early stage to review existing tools and identify those that are not being used or used improperly. Before introducing a new tool, the organization must test its adequacy for the target group, verify its compliance with existing systems, with the subcultures and the climate of the organization. Members of the organization should have both cognitive ability and motivation to learn how to make full use of the tool. Training of staff is essential for the proper use of new technologies, thereby avoiding employees' reluctance to use them. [16] It is also essential for users to be motivated and to understand that such tools make their daily activities easier. But the most important thing that should help employees to overcome the negative aspects of using ICT in their daily workplace learning processes is to build a strong confidence in the helping nature of ICT, without being stressed and overwhelmed. As recommended in [31], the so-called calm side of ICT must be exploited.

When it comes to the educational area, things are more complex. Thus, for a user to have a learning process enriched with social characteristics, he/she should have: an active role in the tailoring of teaching material, immediate access to relevant content, and the possibility to communicate with experts who share their knowledge. [3] This view extends training beyond formal boundaries and provides a social environment for users. This enables collaboration and knowledge sharing and reduces the incidence of negative aspects presented in the second section of the paper. This approach also supports the new e-learning paradigm called Flipped Learning (FL). [12] FL develops the concept of the flipped class method, where lessons are viewed at home, and tasks based on the theoretical part are completed in the classroom. The FL concept brings some cultural changes: (1) blending social learning with formal learning; (2) rethinking the learning process - defining new attractive ways for presenting information, to gain maximum understanding; (3) stimulating the creation of learning communities through which students can share their experience and (4) collaborative learning - students can improve their own abilities on a particular topic by interacting with colleagues and teachers anywhere, anytime, minimizing drawbacks like loss of attention, boredom, superficiality etc. Surprisingly, this new paradigm can greatly improve the face-to-face interaction between students and teachers. Khan (founder of KhanAcademy.com - a library with over 3,500 courses) explained how his lectures inspired teachers to do the opposite, which means that teachers will give students the opportunity to go through the learning materials at home, while using the classes to work with students and to help to them better understand the material. [8] This is a method by which eLearning could break the formal barrier between learners and teachers, increasing the interaction between them in the classroom. It is especially valuable because ICT tools cannot support the entire cycle of knowledge transfer, as "tacit knowledge can be acquired only through shared experience, such as spending time together or living in the same environment" [24, p. 9]. At the same time, knowledge is difficult to be detached from the person who shares it or from the context in which it is embedded.

Suggested solutions to respond to the social and ethical issues introduced by the Internet involve various strategies, including the participation of government and society in supporting the educational system in addressing problems, raising awareness of Internet risks for adolescents by including the appropriate topics in school curricula and emphasizing the important roles that parents can have in addressing these social issues.

IV. CONCLUSIONS

The act of human learning has been profoundly transformed due to the intensive use of the ICT. Attracted by features such as abundance of information, the ability to navigate endlessly in the pages of browsers, through facilities like infinite scrolling, and instant response to any question offered by Google, individuals have become less concentrated, more superficial, bored and hard to be co-interested in long-lasting, deep cognitive processes. Also, the innumerable forms in which ICT provides information, through a large variety of tools and in a multitude of formats, are stressful for the individuals and difficult to be managed by organizations.

In this context, it is essential to synchronize and harmonize the human factor, technology and organizations involved in learning, through coherent strategies and policies for ICT integration in pedagogical teaching and learning activities. Education providers need to alternate the use of ICT and the traditional ways of working individually and in teams, while eLearning software developers need to adapt to the requirements of this new, dynamic way of working. The adoption of eLearning solutions in organizations should be preceded by a thorough evaluation of the profiles, needs and expectations of learners. After implementation, managers must carefully follow the impact of ICT tools in organizational knowledge transfer and fine-tune the learning process, in order to obtain the desired results.

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