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E-LEARNING AND EDUCATION DURING COVID-19 PANDEMIC

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Introduction

As time passes, many are the new innovations and developments that occur in the various sectors of the multiple industries which we live in. The arrival of Covid-19 has led to the deterioration of many of these, which no longer have the same efficiency, cash flows and relevance that they had before. On the other hand, not all industries are in it together. Some of them exploited this drastic scenario in order to improve their worldwide importance. One of the underlying industries in question is the 'e-learning' one, which employs combinations of methodologies such as computer hardware, software, platforms and education theory and practice to facilitate learning. Being a subject which includes technology, its improvement over the years has been quite radical and powerful. Nowadays, e-learning is one of the fastest growing industries because of the restrictions imposed by the Governments, due to the ongoing pandemic, regarding the closure of schools, universities and other educational facilities. The solution proposed and implemented which has substituted the traditional teaching method has been the one promoted by the use of online platforms and other online/offline tools in order not to impede the formal education patterns historically established throughout the centuries. Not only e-learning offers a contemporary solution to this issue, but it will also affect future's educational programs and methodologies. For these reasons, the following paper, provides and extensive analysis on the subject with the intent to inform, provide an overview and better understand e-learning and its implementation during these latest years. The first chapter focusses on explaining and defining e-learning, therefore the research comprehends its history along with its definition, types, advantages and current trends that are to be implemented and further developed by experts. Following, chapter number two is structured so as to introduce the general effects of Covid-19 into the educational system with particular attention pointed towards worldwide countries' approaches and solutions in utilizing e-learning methodologies in the aforementioned industry. Moreover, because of the general transition to online education, it is important to understand the main methodologies and related platforms that have been used during the pandemic. On this last topic, the last paragraph of the second chapter analyzes more in-depth the core and most used online platforms in Italy. Lastly, in order to better understand people's perspective on e-learning and its implementation in the Italian territory, chapter three reports a survey conducted on the aforementioned matters.

CHAPTER I: DEFINING E-LEARNING

1.1 Background, History and Definition

Education has always been one of the core pillars of evolution. Since ancient times, humanity always tried to pass knowledge from individuals to others in order to benefit society, to improve and develop its current situation and, generally speaking, to lead to a better condition as a whole. For this reason, education has come a long way from employing the first schools and academies to what is currently used for educational purposes. Nowadays, Educational technology (EduTech or EdTech) is becoming more and more relevant, introducing new methods for delivering and implementing knowledge. Educational Technology can be defined as the combined use of computer hardware, software, and educational theory and practice to facilitate learning[1] . It is based on various disciplines such as communication, education, psychology, sociology, artificial intelligence, and computer science and it represents the general framework encompassing other fields, namely: e-learning, computer-based training, m-learning, online learning and many others (each of these specializing in specific aspects and possessing different features)[2]. The **Association for Educational Communications and Technology (AECT)** defined educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources"[3]. Therefore, its implementation has improved since its early applications. Looking briefly at some of these changes in innovation during time we can see that writing slates and blackboards have been used for at least a millennium[4], whereas the use of media has been traced back to the first decade of the 20th Century[5] (introducing the use of movies for educational purposes), along with the first teaching machines in the 1920s and slides projectors in educational institutional settings in 1950. Moving in the mid 1960s, Stanford University psychology professors, Patrick Suppes and Richard C. Atkinson, experimented with using computers to teach arithmetic and spelling via Teletypes to

[1] Robinson, Rhonda; Molenda, Michael; Rezabek, Landra. "Facilitating Learning" (PDF). *Association for Educational Communications and Technology*. Retrieved 18 March 2016.
[2]instructional technology, information and communication technology (ICT) in education, learning technology, multimedia learning, technology-enhanced learning (TEL), computer-based instruction (CBI), computer managed instruction, computer-based training (CBT), computer-assisted instruction or computer-aided instruction (CAI)
[3] Richey, R.C. (2008). "Reflections on the 2008 AECT Definitions of the Field". *TechTrends.* **52** (1): 24–25.
[4] *Biruni, Muhammad ibn Ahmad; Sachau, Eduard (1910). Alberuni's India. An account of the religion, philosophy, literature, geography, chronology, astronomy, customs, laws and astrology of India about A.D. 1030. London: K. Paul, Trench, Trübner & Co.*
[5]Saettler, P. (1990). *The evolution of American educational technology.* Englewood, CO: Libraries Unlimited.

elementary school students in the Palo Alto Unified School District in California[6]. In addition, the first experiments in online education have been attempted in these years, although Internet was yet not part of the reality. By the 1980s, lots of institutions offered the possibilities to access course contents and to participate in distance learning courses using computers' networking. Moreover, the implementation of the first e-learning systems and the usage of videoconferences increased the popularity of technology-based educational systems. The advent of World Wide Web and the improvements in Internet functionality gave the major boost in the sector, allowing new ways of providing online/technologic educational methods such as the huge variety in platforms used nowadays for online teaching. Especially these days, where the Covid-19 pandemic has forced many schools to close, leading to a major participation in remote learning.

Having this in mind, we can surely state that e-learning is part of the educational technology and it is considered as one of its branches. But what is the correct definition of e-learning? And what does it mean in practical terms? Well, while there are many definitions regarding this subject, it can be defined as 'A learning system based on formalized teaching but with the help of electronic resources'[7] or '…as a network enabled transfer of skills and knowledge, and the delivery of education is made to a large number of recipients at the same or different times.'[8]. Similarly, is has been affirmed that '**E-learning** refers to a learning system that we can obtain through the internet using an electronic device. We also call it **online learning** or **online education**. The *'E'* in E-learning stands for *'Electronic.'* Hence, the original term '**electronic learning**.'[9]. Even though some experts do not agree on this last definition because of some slight differences in the operation processes between e-learning and online-learning. Therefore, the difference between traditional teaching and e-learning revolves on the usage of computer/online (technology-based) devices. Comes with no surprise that up until the 2000s, where only early and 'primitive' applications of EduTech were employed, the majority of the educational process was still hardly anchored to physical

[6] Suppes, P.; Jerman, M.; Groen, G. (1966). "Arithmetic drills and review on a computer-based teletype" (PDF). *The Arithmetic Teacher*. **13** (4): 303–309. doi:10.5951/AT.13.4.0303. Archived from the original (PDF) on 2016-03-05. Retrieved 2015-09-04.
[7] "What Is E-Learning? Definition of E-Learning, E-Learning Meaning." *The Economic Times*, economictimes.indiatimes.com/definition/e-learning.
[8] Id. 7
[9] "What Is E-Learning? Definition and Examples." *Market Business News*, 20 Dec. 2019, marketbusinessnews.com/financial-glossary/e learning/#:~:text=E%2Dlearning%20refers%20to%20a,the%20original%20term%20'electronic%20learning.

presence and other types of processes were seen insecure and unconfident. However, the principles of the subject were already seen in the 19th Century. Even long before the advent of the Internet, distance courses on specific subjects or topics were offered to students. In 1840's, Isacc Pitman[10] used to teach using shorthand via correspondence[11]. Although this method was used for speeding writing, it shows an early adoption of innovative characteristics in the educational framework, which had its turning point in the 20Th Century, and even more in the 21st Century. There is some controversy regarding who funded and coined the expression 'e-learning', some believe that in 1998 Jay Cross, an American futurist, was the first who used it informally referring to one of his colleagues: "People just don't see it although it's right in front of them. The next big thing in education isn't e-commerce, it's eeeeee-learning."[12]. However, he still highly contributed in spreading and popularizing this expression worldwide. The term 'E-learning' was first mentioned, in a professional context, by Elliott Marsie[13] during the Techland conference at Disneyworld[14]: 'E-learning is the use of network technology to design, deliver, select, deliver and extend learning'[15], even though its first implementation is traced back with the creation of the very first electronic learning machine (testing machine) by Sidney Pressey in 1924[16] : the Automatic Teacher. This machine enabled students to test them-selves and to proceed with the test, only by selecting the correct answer. Then, in 1954 BF Skinner[17] (professor at Harvard University) came up with some relevant inventions, specifically with the first 'teaching machine' (GLIDER) that not only permitted to test one's knowledge, but also provided the correct answer so as to properly learn from one's mistakes. However, one of the most important timelines about e-learning is in 1960, where computer-based training program (CBT program) was introduced to the world. Professor Don Bitzer from the University of Illinois created the first computer-based education tool, called PLATO (Programmed Logic for Automatic Teaching Operations), which was supposed to improve literacy by providing computer-based education

[10] "Isaac Pitman." *Wikipedia*, Wikimedia Foundation, 27 Feb. 2021, en.wikipedia.org/wiki/Isaac_Pitman.
[11] *The Evolution and History of Elearning*. www.talentlms.com/ebook/elearning/history-of-elearning.
[12] *Jay Cross*. 10 Feb. 2021, en.wikipedia.org/wiki/Jay_Cross#cite_ref-8.
[13] *Elliott Masie*. 4 Jan. 2021, en.wikipedia.org/wiki/Elliott_Masie.
[14] *The History of e-Learning.* e-student.org/history-of-e-learning/.
[15] "What Is ELearning?" *Explore the ELearning World with Us*, 29 Apr. 2020, www.ispringsolutions.com/blog/what-is elearning?utm_source=google&utm_medium=cpc&utm_campaign=it_en_blog_suite&utm_term=what+is+e+learning&utm_content=106443814256&ad_group=what_is_elearning&gclid=Cj0KCQjw9YWDBhDyARIsADt6GbxkNMxeRzLw1ks2XKrkHtQZcKVnCnzLvphRzBb3ad-wfnPhzeRlgcaAvsoEALw_wcB.
[16] *Sidney L. Pressey*. 8 Feb. 2021, en.wikipedia.org/wiki/Sidney_L._Pressey.
[17] *B. F. Skinner*. 30 Mar. 2021, en.wikipedia.org/wiki/B._F._Skinner#Scientific_inventions.

to students[18]. For this reason, lots of experts considered PLATO as a direct ancestor of modern e-learning systems, and soon became the basis in modern multi-user computing (not only for the students attending the Illinois University, but also for other schools in the area). Later on, in 1960s, Patrick Suppes (professor at Stanford University) and Richard C. Atkinson conducted some experiments in using computers to teach mathematics and reading to children in Palo Alto[19] and therefore specialized their research in Computer-assisted Instruction (CAI), usually associated with Computer-managed Instruction (CMI). Computer-managed instruction is an instructional strategy whereby the computer is used to provide learning objectives, learning resources, and assessment of learner performance. Computer-managed instruction (CMI) aids the instructor in instructional management without actually doing the teaching[20]. Suppes, in 1966 came up with the IBM 1500 Instructional system, providing substantial courses materials in order to implement CAI. Approaching the '70s, the **Advanced Research Projects Agency Network**[21] (ARPANET) was founded, which was the first 'packet-switching' network (method of grouping data transmitted over a digital network into packets) that implemented the TCP/IP (Transmission Control Protocol and Internet Protocol) protocol suit. Even if ARPANET's purpose was only educational, it is considered as the originator of modern Internet. Additional e-learning tools and delivery methods expanded with the implementation of the 'Apple II series', which is a series of home computers directly manufactured by Apple.Inc. In 1977, Apple II, designed by Steve Wozniak, was launched. The device had some particular and unique features with respect to the products at that time, for instance its ease of use, expandability, color graphics and sound features really grasped the attention of individuals (especially youngsters), putting a lot of effort in education as the primary intended application for the new hardware. In 1979, Apple partnered with Bell & Howell and established the Apple Education Foundation. The foundation donated computers to students and awarded grants to those who developed software for educational purposes[22]. This enabled a huge expansion in the sector, not only permitting individuals to have their own computer in their properties and in public/private institutions such as schools, but also granting the possibility to learn and get access to certain subjects and topics that were not possible to be offered up until that time. As a matter of fact, between 1981 and 1986, the

[18] Id. 14
[19] Pelfrey, Patricia A. (2012) *Entrepreneurial President: Richard Atkinson and the University of California, 1995–2003*.Berkley: University of California Press. p. 21. ISBN 9780520952218. Retrieved 14 October 2020.
[20] *(PDF) Gender Differences in Technology Acceptance in* ...www.researchgate.net/publication/271302941_Gender_differences_in_technology_acceptance_in_selected_South_African_companies_Implications_for_electronic_learning.
[21] *Arpanet*. 22 Mar. 2021, en.wikipedia.org/wiki/ARPANET.
[22] Id. 14

number of American public schools with computers intended for instruction grew from about 15,000 to about 77,000, or from about 18 percent of the total to almost 96 percent [23]. Furthermore, a boost in the sector was given by the introduction of the 'World Wide Web' by Tim Berners-Lee in 1989[24]. Generally speaking, it can be defined as an information system that stores data, documents and web resources which are identified by web addresses (known as URLs) and can be interlinked by links that are accessible over the Internet[25]. During the '90s many schools and colleges began delivering courses online, helping solving distance-related educational issues that hindered many students from attending universities and colleges. Plus some of these institutions focused uniquely on online-courses, such as the first online high-school in 1994 CompuHigh,the respective university Jones International University in 1999[26] or the Massachusetts Institute of Technology (MIT) OpenCourseWare project which provided free course materials and lectures . E-learning's performance has been further improved by the first 'learning management system' (LMS) and 'Sharable Content Object Reference Model' (SCORM), which is a collection of standards and specifications for web-based electronic educational-technology[27] that became popular in the early 2000s. Its purpose was to facilitate communication between the client side content and the run-time environment using Javascript (a programming language used in web development). Another event that highly improved e-learning's experience is the introduction of 'Massive open online course', known as MOOC, in 2008. The online course's goal was to create an unlimited community of people that had the chance to join and participate in the course via Web[28], not only receiving courses' material but also having the possibility to interact with the professors, TAs and between each other. This procedure became more and more relevant as time passed and indeed 2012 was considered to be 'the year of the MOOC' [29] as an increasingly amount of investors associated with top universities (like Harvard and MIT) emerged, leading to the establishment of Coursera, Udacity and edX (major MOOC providers). Nonetheless e-learning is still developing and improving as technology advances.

[23] *Computers in American Education: Trends and Status*. www.princeton.edu/~ota/disk2/1987/8731/873104.PDF.
[24] *World Wide Web*. 31 Mar. 2021, en.wikipedia.org/wiki/World_Wide_Web.
[25] Tobin, James (12 June 2012). *Great Projects: The Epic Story of the Building of America, from the Taming of the Mississippi to the Invention of the Internet*. Simon and Schuster. ISBN 978-0-7432-1476-6.
[26] Id. 21
[27] "Sharable Content Object Reference Model." *Wikipedia*, Wikimedia Foundation, 21 Jan. 2021, en.wikipedia.org/wiki/Sharable_Content_Object_Reference_Model.
[28] Kaplan, Andreas M.; Haenlein, Michael (2016). "Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster". *Business Horizons*. **59** (4): 441–50.
[29] Pappano, Laura (2 November 2012). "The Year of the MOOC". *The New York Times*. Retrieved 18 April 2014.

Data showed Academic E-learning Market size was valued at USD 103.8 Billion in 2019 and is expected to grow CAGR 11.23% by 2025[30], implying that the industry is on a path of exponential growth which will continue to expand with time.

1.2 Types of E-learning

As we can see there has been a lot of progress during time in e-learning implementation methods and its acceptability and usage over countries and years. This means that in the current days there exists a multivarious number of types and categories of e-learning, depending on different factors. Some typologies have tested more effective than others, but their effectiveness and efficiency relies on geographical, cultural, behavioral, course content, personal taste and so on. A specific e-learning course implementation may work in that particular context for one of those reasons, or vice-versa. Some educational experts have identified different types of e-learning according to learning tools, whereas others have divided types based on their metrics (e.g. synchronicity and learning content). Overall, we can summarize with ten different types:

- Computer Managed Learning (CML)
- Computer Assisted Instruction (CAI)
- Synchronous Online Learning
- Asynchronous Online Learning
- Fixed e-learning
- Adaptive e-learning
- Linear e-learning
- Interactive Online Learning
- Individual Online Learning
- Collaborative Online Learning

[30] Reports, V. (2020, December 02). Academic E-Learning Market CAGR 11.23% by 2025: Valuates Reports. Retrieved from https://www.prnewswire.com/in/news-releases/academic-e-learning-market-cagr-11-23-by-2025-valuates-reports-807219794.html

Alternatively, some educational scientists classified types of e-learning in simpler manner: computer-based e-learning and internet-based e-learning. This method of classification could be seen as more accurate because it differentiates e-learning from online learning, the two of which are often incorrectly used interchangeably. Some forms of e-learning such as CML and CAL are not required to take place online, but they are considered types of e-learning nonetheless[31]. Let's briefly describe each of these ten categories.

-Computer Managed Learning (CML):

As the name suggests, CML (know also as Computer Managed Instruction or CMI) uses computers as the main educational mean. Operating through information databases, which contain specific learning topics and a number of ranking parameters that help the system to identify the differences between the preferences of each student, computers manage the learning process. Therefore, there establishes a two-way communication between the device and the student that will be analyzed in order to see if the student reached the desired learning goal. If not, the process will be repeated, so that the individual has unlimited opportunities to well understand and learn the topic in question. While CAI uses the computer as an active and a tutorial tool, CML computers role is to record-keep and doesn't provide any instruction to the learner. Rather, it takes the responsibilities of the teacher, like: evaluating response sheets, gathering and sharing data of each student, finding the resource options more suitable for each, monitoring the learning progress and so on[32].

-Computer Assisted Instruction (CAI):

Also known as Computer Assisted Learning (CAL), CAI is a type of e-learning which blends the usage of computers and traditional teaching. Its methods encompass a combination of multimedia such as text, video, sound and graphics to enhance the learning experience[33]. As already stated, CAI and CML and two related topics. However, the main value of CAI is interactivity, allowing students to be active learners instead of passive ones thorough various mechanisms. Nowadays, most schools use CAI to improve students' skills and knowledge.

[31] Tamm, S. (2021, January 21). All 10 types of E-LEARNING Explained: E-Student. Retrieved April 23, 2021, from https://e-student.org/types-of-e-learning/

[32] Singh, Jatinder. *Computer Managed Learning.* jatinderjyoti.in/ict/notes/COMPUTER_MANAGED_LEARNING.pdf.

[33] Id. 31

-Synchronous Online Learning:

Thanks to technology and online learning developments, synchronous online learning has taken the lead as the main e-learning method, especially during Covid-19 pandemic. This type of e-learning can be defined as online or distance education that is implemented in real time, often with a set class schedule and login requirements time frames[34]. Since it happens 'in real time', synchronous learning, is the online implementation of traditional lectures. Both students and professors usually employ virtual-rooms, online chats, videoconferences, teleconferences and other live (real time) tools that allow direct interaction between the two counterparts. Moreover, it avoids some common disadvantages that come as a byproduct of non-traditional educational methods, such as: social isolation, poor-communication between teachers and students and static lectures. This is why the majority of institutes use this procedure as a way to counter the pandemic educational effects.

-Asynchronous Online Learning:

In Asynchronous Online Learning, real-time communication does not take place. This means that students still have the possibility to study and access course material, lecture and assignments and more but the process is implemented according to individual's personal schedule. That's why asynchronous learning is considered to be more student-centered. More flexibility, easier pacing and higher affordability are the strengths of this specific type of e-learning, since students have different schedules each one of them can arrange their timeframes to their personal needs as long as they meet a given deadline. However, this method might lead to an increase in isolation and apathy due to low direct interactions with colleagues and teachers. Common methods of asynchronous online learning include self-guided lesson modules, pre-recorded video content, virtual libraries, lecture notes, and online discussion boards or social media platforms[35].

-Fixed e-learning:

This type of e-learning focuses on delivering information, course material and lectures (and any other type of material that e-learning offers) in the same manner independently of any external/internal factor. In this case, 'fixed' refers to the content of the information that individuals receive which does not change nor updates with time, because it's already pre-

[34] Best_Schools. (2021, February 18). Synchronous Learning vs. Asynchronous Learning. Retrieved from https://thebestschools.org/magazine/synchronous-vs-asynchronous-education/

[35] Id. 34

determined by professors. An example may be Youtube educational videos, which once uploaded cannot be changed, but rather only re-watched as many times as wanted. This method of learning is increasingly being relegated to the annals of history[36], but is viewed as one of the worst types of e-learning since it doesn't exploit and utilize at its prime all the advantages that come from real-time communication and adaptability to different students.

-Adaptive e-learning:

At the other extreme, adaptive e-learning offers a new, innovative and student-based e-learning approach that adapts from individual to another. It is based on the thought that every person is endowed with a different level of educational needs and capabilities. Because of this difference, adaptive e-learning makes sure that every individual is provided with the correct means for maximizing his/her own potential. For this reason, students may choose between different 'difficulty levels' and may even improve on their weaknesses, which can be identified by e-learning systems, trough quizzes and questions. This field is continuously under development because of its importance.

-Linear e-learning:

Linear e-learning departs from the adaptive e-learning method. As we have seen, the latter offers the possibility to choose the different educational levels depending on one's needs. The former instead structures its content in a precise and organized manner, without the possibility of 'skipping' any step during the process. In other words, linear e-learning provides a step-by-step learning process, which is why it is very popular among beginners, so that students devote the right amount of time in the fundamentals. On the other hand, for particularly skilled students it isn't the correct approach, since it would only be a waste of time. Plus, with time it's becoming more and more obsolete and irrelevant. An example of linear e-learning may be TV or radio educational programs.

[36] Keegan, L. (2020, September 04). All 10+ Different Types of e-Learning REVEALED! □ [2021]. Retrieved from https://skillscouter.com/types-of-e-learning/

-Interactive Online Learning:

If in linear e-learning blocks the two-way communication between the parties, interactive online learning solves this issue. It allows senders to be receivers and vice-versa[37], giving therefore to students the possibility to customize settings and offer any sort of feedback. Generally speaking, it expands students' freedom along with their chances of skipping course materials and lectures. Examples of interactive online learning may be changing the speed of a video, switching its subtitles, or even leaving a review in the comment section.

-Individual Online Learning:

Individual learning has been the most used type of learning for thousands of years. It involves self-studying (individual studying) of the course's materials and it requires to meet the learning goals on his/her own. The same methodology applies for individual online learning, every session that does not involve a group of people united for achieving a common goal is based on this type o e-learning. While it limits communication and teamwork, it gives a major individual flexibility.

-Collaborative Online Learning:

This type of e-learning is one of the most used one, because of its effectiveness. Collaborative online learning, as the name suggests, involves the participation of multiple individuals that collaborate to reach common learning objectives(e.g. Team projects, online product development…). This method utilizes and promotes the effectiveness of different points of view, strengths and opinions that come from different participants. Moreover, it improves the communication, time management and adaptability of the underlying people along with augmenting their skills in teamwork. For these reasons collaborative online learning (also known as e-collaboration) is increasing in importance.

Another e-learning procedure which has appeared and gained relevance in these latest years is known as **'blended learning'** which utilized a mixture of multiple methodologies such as online synchronous and asynchronous learning with traditional in presence lectures therefore exploiting various approaches in order to engage its users' attention and participation within a more integrated environment.

[37] Id. 31

1.3 Emerging and upcoming Trends:

As we have seen changes in technology and online accessibility have highly contributed in developing and improving e-learning's industry. Moreover 2020 has left the world with a pandemic that still currently has to be solved. The arrival of COVID-19 forced to find solutions against social distancing restrictions on education and working, increasing the importance of e-learning even more. The global e-learning market is constantly growing, expecting by 2025 to reach a total market value of $325 billion[38], this means that new developments in the industry are expected (along with a further increase in the sector). **Online training** data have shown that there has been a jump from 77% to 98% in the employment of virtual training used in companies, experiencing a 24% increase in profit margins [39]. As 2021 unfolds, more emphasis on **Train-the Trainer programs** will happen. Because of the pandemic, traditional trainers were not used to implement this different learning approach and probably didn't have any experience in it. For this reason these types of programs aim at filling this gap in the virtual environment. Since people showed interest in continuing WFH (Work from Home) even after the pandemic, **microlearning** (training methodology) becomes fundamental. Long training sessions of learning are not effective anymore, pivoting to a quicker, shorter and more concentrated type of learning (microlearning) where huge contents are divided in small and meaningful parts, allowing to consume e-learning's content in 10-15 minutes time span. Optimizing professional and educational development on a daily basis. This widespread use of microlearning is further favored by the use of mobile devices, that do not require much time and effort in using[40], plus it perfectly fits in the digital culture. On this last topic, another emerging trend is the transition from 'mobile-ready' e-learning to **'mobile-first' training**. Usually the majority of training were build having in mind the desktop user and then was adapted to mobile devices. This transition puts attention in creating courses or training programs first for mobiles and then to computer users. As workers and students are attending courses at home and probably will continue this way even in the future, mobile experience becomes crucial for educational purposes. In fact, mobile learning (also known as m-learning) focuses mainly on the development of mobile applications and software

[38] Pappas, C. (2020, July 13). Top 20 ELEARNING statistics for 2019. Retrieved April 23, 2021, from https://elearningindustry.com/top-elearning-statistics-2019

[39] Bleich, C. (2020, December 03). 8 eLearning trends and predictions for 2021. Retrieved April 23, 2021, from https://elearningindustry.com/elearning-trends-predictions-2021

[40] Severino, V. (2021, January 25). E-learning trends 2021. Retrieved April 23, 2021, from https://www.formalms.org/articles/22-elearning-trends-technology/229-e-learning-trends-2021.html

platforms used to create digital content in the form of digital textbooks for e-learners and access to educational resources through mobile devices[41]. Since these devices have now firmly established in the day-to-day lifestyle of people, they form a much easier and quicker method for the learning experience. Providing learning material anywhere and whenever is needed. **Experimental learning** such as the implementation of Virtual Reality, Augmented Reality and Mixed Reality (VR, AR and MR) is becoming one of the most revolutionary and interesting e-learning trends that will completely change the educational process. The use of these technologies allows the user to learn in a close-to-reality controlled environment, generated by a machine, which enhances the practical application of knowledge by the individual[42] . In addition, in a moment like this where Covid-19 pandemic has forced distance learning measures, experimental learning offers an alternative solution against the downsides of distance learning experience. Creating a controlled environment not only permits the user to live a different type of learning which intrigues him/her and lightens the acquiring process but also enables to minimize attention distraction and social related issues by facilitating simultaneous provision of class material and group discussion. On the same page, **Artificial Intelligence**, commonly known as AI, is another trend in e-learning. Artificial intelligence (AI) is the ability of a system - hardware and software - to perform certain tasks and activities by simulating reasoning systems used by the human mind[43]. Basically, AI' application in e-learning's field allows new educational methods such as AI tutors or chatbots (serving as intelligent teaching assistants) that are matched with students through ML (machine learning) algorithms. These algorithms improve automatically through experience and by the use of data[44], delivering a higher performance with time. Therefore, by carrying out normal conversations or questionnaires, virtual coaches and chatbots analyze and choose the most appropriate learning path for the underlying individual. These relevant improvements in the sector caused a shift from LMS to a new and innovative platform. In order to deliver such customization paths, experts are putting much effort on **Learning Experience Platforms** (LXP or LEP) so as to enhance staff/content training programs. The *Learning Experience Platform* (LXP) is a consumer-grade learning software designed to create more personalized learning experiences and help users discover new learning opportunities. By combining contents from different sources, recommending and delivering them with the support of

[41] Baz, F. Ç. (n.d.). New trends in e-Learning. http://dx.doi.org/10.5772/intechopen.75623
[42] Current and Upcoming Trends in eLearning. (n.d.). Retrieved from https://emerline.com/blog/elearning-trends-and-predictions-for-2021
[43] Id. 40
[44] Mitchell, Tom (1997). *Machine Learning*. New York: McGraw Hill. ISBN 0-07-042807-7. OCLC 36417892.

Artificial Intelligence, across the digital touch points[45] and many other tasks such as tracking student's progress, create customized learning paths, etc. Moreover, for general improvement of its services, e-learning focuses also on expanding its **Learning analytics** (use of data collected by Digital systems), **data tracking and analysis** which are fundamental for developing and delivering newer technology's enhancements.

1.4 Pros and Cons of E-learning

E-learning and its newest approaches implemented are definitely changing the boundaries that once existed in the whole educational sector. From its first relevant inventions to the upcoming ones, the industry is providing alternative solutions for students, educators, corporate trainers and so on. Both academic education and corporate training have been affected by developments in e-learning and were provided with optimal way out methods against the pandemic which influenced these spheres and made impossible the traditional implementation of lectures, training programs and job opportunities.
The benefits offered by the adoption of e-learning in the educational and professional sector can be summarized in :

-Flexibility:
As previously stated, one of the greatest advantages of e-learning is the flexibility. Having accessibility to online courses, makes everything more comfortable and easier whether they are students, employees or other individuals. Depending on the type of approach offered, people can adapt courses, webinars or whatever it may be to their personal needs and schedules. Companies have the possibility of training hundreds of employees in the same fashion and at the same time. Moreover, with the huge number of platforms and applications with which to access, individuals can directly follow their tasks from everywhere. So it completely eliminates locational restrictions and minimizes time pressure by proving an easy, fast and convenient way to join appointments.

[45] Learning experience Platform (LXP): The Definitive Guide. (n.d.). Retrieved April 23, 2021, from https://www.valamis.com/hub/learning-experience-platform#lxp-vs-lms

- Cost efficiency:

Thanks to e-learning, the cost faced both by students and especially by corporations significantly reduce. For students, lots of sites provide a myriad of online courses and college degree programs with different costs opportunities (e.g from Harvard and MIT with more than 2,500 online courses offered from 140 institutions) [46]. Attending these courses at home leads to a substantial amount of money saved from housing, commuting and educational paper material (since textbooks become obsolete and often replaced by online material). Whereas for companies, e-learning offers an even higher opportunity to save money by avoiding travel and accommodation expenses for trainers and employees, reusable online content, budget cuts on training materials[47]. All of these expenses can simply be avoided by offering an online course.

-Development tool:

Given the efficiency of the technology and methodology used in e-learning, another benefit is the positive impact on self-development plans. Customized training paths encourage students and employees in focusing on the required learning content in order to achieve their short/long-term goal so as to progress. Not only this means offering tools to confront and improve one's weaknesses, but also proving readily available means for achieving individual's goals.

-Improved communication and management:

Even if real-life encounters offer a higher satisfaction and to some an easier way to express their thoughts and opinions, the Learning Management System (LMS) along with Learning Experience Platforms (LXP) offered by e-learning provide customized patterns to engage the users in a closer way and improving the individual's IT skills. The adaptability offered by these systems enables the educator to interact with employees and students, in particular, in personalized manners, contributing in a greater engagement of the audience and therefore in better results. For this reason the use of new, fun and interactive ways of teaching are employed as well as improvements in gamification in e-learning[48]. Moreover, the through

[46] Online learning in the time of covid-19: What are the pros and cons? (2020, August 04). Retrieved April 23, 2021, from https://scholarshipamerica.org/blog/online-learning-in-the-time-of-covid-19-pros-and-cons/

[47] Pappas, C. (2019, September 25). Advantages and possible limitations of online learning. Retrieved April 23, 2021, from https://elearningindustry.com/advantages-and-possible-limitations-of-online-learning

[48] Def: Gamification is the strategic attempt to enhance systems, services, organizations and activities in order to create similar experiences to those experienced when playing games in order to motivate and engage users.

tracking learning processes, management is profoundly facilitated, enabling to improve and fill the gaps that users have.

These are the main pros of adopting e-learning in education, but let's not forget that as time passes more and more improvements in the technologies employed will come. One of the core elements of e-learning is that it resembles future developments. As new or updated versions are being implemented, these will be readily available to the audience with a simple click. However with test and trials of new educational methods come fear, doubt and sometimes failure. No innovation has only positive effects, advantages are often followed by disadvantages or at least perceived ones. Some **cons** about e-learning are reported below.

-Isolation:

All the flexibility that e-learning allows, like the chance of choosing the location and time of connection to online lectures might lead to a sense of isolation and apathy. This is because learning online is a solo act for the most part[49] . Not being able to physically participate in a lecture, meeting, or whatever it may be, reduces the enthusiasm and passion that the individual would have had normally. Especially teens and college students, that need company and connection between each other, are hurt from adopting distance learning and even more the ones who need personal contact with educators or trainers in order to successfully learn. This is why the systems implemented in e-learning try to provide the closest (and better) service to 'normal' education.

-Impersonal:

Unfortunately, no matter the tools provided and adopted, e-learning and even more generally EduTech education doesn't deliver the same service as traditional education. Human environment establishes a specific type of relationship which is hardly imitable by any other virtual or online environment. Many students have not fully participated in virtual lessons because they didn't quite perceive the same satisfaction in participating and intervening as in traditional classrooms. And the same reasoning goes with teachers and educators, who are not able to deliver the passion in learning that they would have in normal circumstances.

[49] What are the benefits and disadvantages of online learning? (n.d.). Retrieved April 23, 2021, from https://www.talentlms.com/ebook/elearning/benefits-and-drawbacks-of-online-learning

-Health related issues:

The increasingly amount of time devoted to the use of computers, tablets, mobiles and other technological devices is becoming more common with time. This does not justify that being stuck in front of a monitor for hours may injure individuals. Many have been affected by eyestrain, bad posture, poor vision and other physical concerns. Since it is not realistic to envision a future without the use of technological devices, the best option, as some e-learning platforms are trying to implement, is to deliver a set of guidelines in order to prevent the majority of these concerns (such as desk height, correct posture and so on)[50].

-Possible lack of control:

There is always the possibility that the information provided and delivered even by the best e-learning courses doesn't get received by the users. As already said, being a 'solo act' for the users, e-learning requires the help and commitment by their target audience. This means that in order to be effective, this type of education, needs self-discipline. If individuals lack this component, e-learning would be useless, as it cannot change nor force users into collaborating. What it can do is to provide the widest range of tracking systems and helping/tutoring programs so as to involve students and workers as much as possible.

Overall, the possibility of having an interactive, customized and well-thought distance learning solution which not only enables to organize on one's preferences and location but also adapts to individuals, types of courses and externalities, definitely outweighs the disadvantages that may offer. E-learning has proven to be a great improvement in the educational field and an innovative tool to fully grasp and exploit new professional development strategies for teachers, educators, students, workers and more. Plus, what needs to be considered and will be in the next chapters, is the fundamental role of e-learning during the Covid-19 pandemic that served as a solution for continuing education and training throughout such circumstance.

[50] Id. 47

CHAPTER II: COVID-19 IMPACT IN THE EDUCATIONAL INDUSTRY

2.1 First consequences of the pandemic on education

As we all know, the ongoing worldwide Covid-19 virus has led to a multiple disastrous consequences in the majority of the sectors of the world. The outbreak of Covid-19 has been identified in Wuhan (China) in December 2019 and has been declared a Public Health Emergency of International Concern on 30 January 2020 by the World Health Organization (W.H.O.). Because of the ease and rise in the individuals infected, later on, on 11 March 2020 the virus has been declared as a pandemic, with more than 135 million cases confirmed and 2.92 million deaths only in the following month[51]. All activities have been highly affected by Covid-19 pandemic. Countries have been forced to take extra precautionary measures in order to minimize the damages. Public care strategies included hand-washing, wearing masks, physical distancing and avoidance of gatherings and assemblies[52]. These were followed by total lockdown strategies as to flatten the pandemic curve transmission. The measures imposed by governments determined the closure of restaurants, businesses and educational institutions such as schools, training institutes and higher educational facilities. As a matter of fact, the educational system has seen its greatest disruption since human history due to Covid-19. Data show that at the peak of the crisis, almost 1.6 billion of children and youngsters (91% of students) in 195 countries worldwide could not attend their courses and physically participate in classrooms[53]. The total closure of schools in some countries is impacting over 60% of the student population. Even those countries that have implemented only localized closures, still impacted millions of students[54].

[51] COVID-19 pandemic. (2021, April 20). Retrieved April 23, 2021, from https://en.wikipedia.org/wiki/COVID-19_pandemic

[52] Sumitra Pokhrel, R. (n.d.). A literature review on impact of Covid-19 pandemic on teaching and learning - Sumitra Pokhrel, Roshan Chhetri, 2021. Retrieved April 23, 2021, from https://journals.sagepub.com/doi/full/10.1177/2347631120983481

[53] Education during Covid-19; moving towards e-learning. (n.d.). Retrieved April 23, 2021, from https://www.europeandataportal.eu/it/impact-studies/covid-19/education-during-covid-19-moving-towards-e-learning

[54] Id. 53

Though, also temporary closures and lockdown measures have significant social and economic costs for communities, in particular the ones who already are in difficult and disadvantageous situations. Some organizations, using data, provided global insights as to practically visualize the effects of Covid-19 on education. For instance the ones provided by UNESCO (United Nations Educational, Scientific and Cultural Organization) in *Figure 1* and World Bank in *Figure 2*.

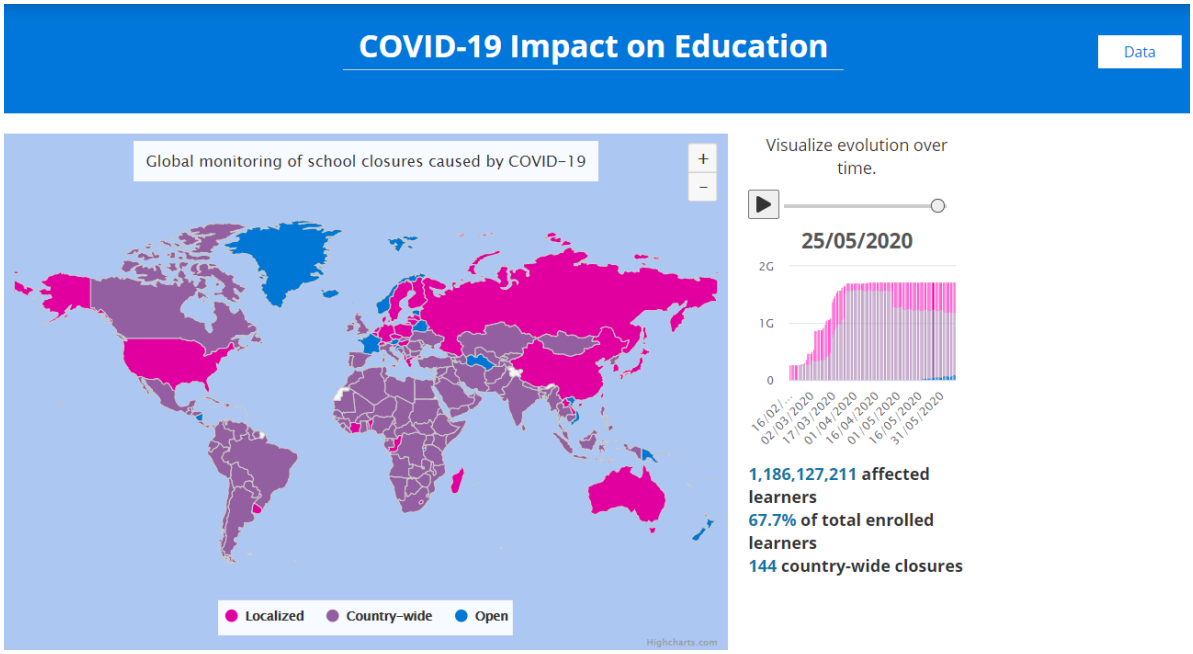

Figure 1, Screenshot of interactive dashboard created by UNESCO.

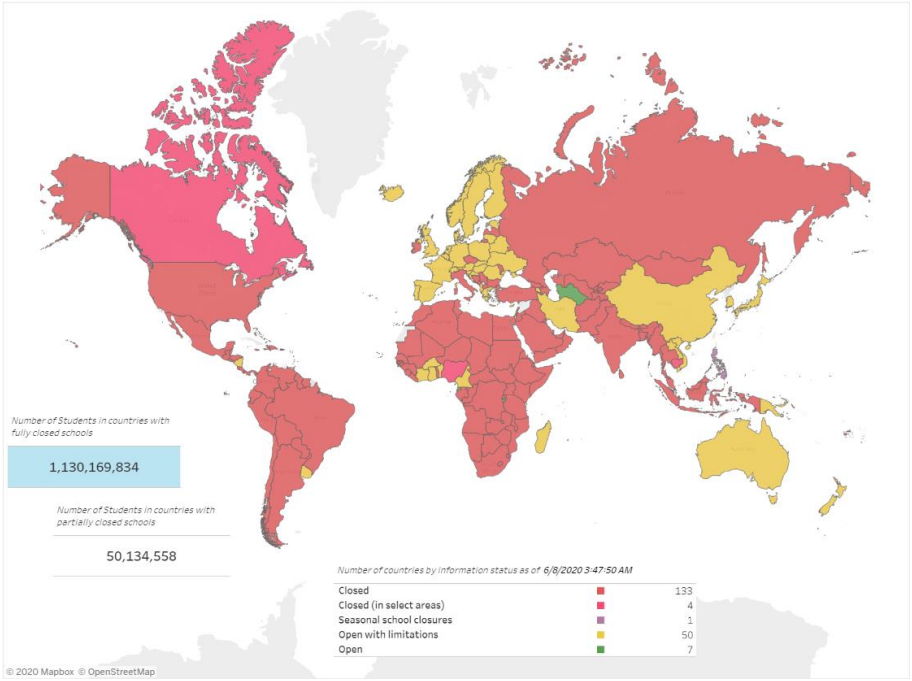

Figure 2, Screenshot of interactive dashboard created by World Bank.

For students, educators, workers and society as a whole, lockdown provisions and unplanned school closures cause relevant issues. Lack of academic interest and performance rises since the absence of a physical environment which grasps the students' attention and satisfaction. The US Centre for Disease Prevention and Control (CDC) also expressed concerns about the implications of school closures. According to the CDC, "longer closures may result in more students congregating outside of schools[55]. In addition, students which require particular attention in the learning process and a closer guidance by teachers are even more affected by school closures. Moreover, students and educators with a lower economic retribution are more pressured and in difficulty to afford digital resources and skills to continue the educational pattern and are deprived of some of the advantages provided by educational institutions (such as nutrition), thus increasing student debt. Parents are also required to increase the attention and supervision devoted to their children, since these are often not interested (or at least less) in following online lectures. In case of an increase in the reduction of attention, participation and interest in learning, the dropout rate and the graduation time are likely to increase more than ever in students. Long-term school closures may also contribute to an increase in the crime rate in youngsters due to an increase in idleness which passively influences the

[55] J. (n.d.). Impact of Coronavirus Pandemic on Education. Retrieved from https://genbase.iiep.unesco.org/workspace/applis/epidoc/fichiers/EPIDOC/38698_52821_56584_1_PB.pdf

individual's behavior. Even other facilities, such as hospitals, have been negatively affected by educational restrictions. The absence of school health centers increases crowding in normal hospital facilities which already have seen an absurd flow of people recovering for the virus.

Summarizing and reporting the global effects of school closures provided for by UNESCO[56] we find:

- Interrupted learning
- Deprivation of school nutrition for students
- Unequal access to digital learning portals
- Increased pressure on educational institutions that remain open
- Social isolation

Even before the arrival of Covid-19, the promise of a solid education as a human right was already a difficult challenge for the world to achieve as more than 250 million children were out of school, around 56% of primary school children worldwide lacked proper reading skills and nearly 800 million adults were illiterate[57]. As expected, the outbreak of a pandemic enhanced the financial gap in order to reach quality education (Sustainable Development Goal 4) as funds diverted into the Health sector and the economy. What it means for education is that a higher number of students, children in particular, couldn't enjoy and participate in an enriching environment full of learning, nutritional and social opportunities which in turn increases the disparities in poor communities. Comes with no surprise that this disparity is further increased by the implementation of e-learning courses so as to continue education since these families usually don't have the possibility to afford the right digital devices needed for online lectures, plus they lack the proper digital and language skills required. On a similar page, there are disadvantages for workers and generally speaking adults who are suffering from substantial pay cuts, decrease in working-hours, loss of jobs, increase difficulty in finding an occupation, increased responsibility in child-care and so on. Moreover, COVID-19 has shown that education institution closures represent an increased risk for women and girls, as they are more vulnerable to multiple types of abuse, such as domestic

[56] Id. 55
[57] United Nations (n.d.). Education during COVID-19 and beyond. Retrieved from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf

violence, transactional sex, and early and forced marriages[58]. All of these consequences will contribute to the greater picture, being a considerable reduction in world's GDP.

2.2 Responses to the crisis

In order to respond to the educational crisis caused by Covid-19 outbreak, an alternative solution proving the same service was needed. With the introduction of e-learning procedures into the educational framework, some of the most important organizations such as UNESCO and Open Education Community (OEC) provided intelligent provisions and recommendations so as to address the increase usage of online courses and other types of e-learning methods for sustaining education. Starting from the recommendations suggested by UNESCO we find[59]:

- Examination of readiness and selection of the most relevant tools: this refers to the analysis of the various e-learning possibilities which vary in applicability and effectiveness depending on local power suppliers, internet connection and students/teachers' digital skills.

- Ensure inclusion of distance learning programs: as previously stated, not all families enjoy the advantages of a good economic situation. Some may lack internet connectivity and the proper electronic devices needed to follow courses/webinars etc.. In addition, some individuals might suffer from disability. The goal is to provide the right means for these communities and ensure a correct implementation of this process.

- Protection of data privacy and security: because of the mobility to online and offline education, either way implying electronic devices, the amount of personal and educational data recorded on these has severely increased. Therefore, in order to protect the integrity of these data, continuous monitoring and improvement shall be ensured.

- Prioritize solutions to psychological and psycho-social challenges for students before teaching: with the implementation of Blended and Virtual learning, students are suffering from a sense of isolation and apathy which damages the individual. What needs to be

[58] Id. 57

[59] Impact of the COVID-19 pandemic on education. (2021, April 23). Retrieved from https://en.wikipedia.org/wiki/Impact_of_the_COVID-19_pandemic_on_education#Responses_to_the_crisis

accomplished is to connect as much as possible students, teachers, TAs, institutions between each other to minimize the potential of this threat.

- Planification of distance learning programs schedule: this is a very important process to be taken in consideration since there are lots of variables to take into account. These include whether the educators should provide new learning material or enhance already seen knowledge, planning schedules depending on lockdown provisions and students/parents/teachers' needs and availability. Moreover, to consider the right methodologies according to each school and its provisions and so on.

- Support provisions to educators and parents on the use of digital tools: the arrival of the pandemic was an unseen and unpredictable factor. The implementation of a solution to the issue has been readily put in place, but surely it is quite understandable that teachers and workers had little time to prepare them-selves with the proper required skills. Thus, training sessions and guidelines for both educators and learners are a must for delivering the best service in order to compensate the lack in digital skills

- Limitation of the number of platforms used and correct mixture of approaches: as new technological improvements imply the availability of new platforms and methodologies, educators shall identify the approaches offered by researchers that best grasp the effectiveness of the goal, being to provide distance learning courses as to proceed with education. This means not only opting for the highest-tech tools, but rather choosing the ones which are most available for all individuals and sometimes even easier to use. Moreover, it may result crucial blending different types of learnings in order to reach a better one.

-Develop rules and monitor students' progress: being a relative new method, e-learning and in particular distance learning requires its own rules. Additionally, platforms should provide loads of tests, questionnaires and exercises to their students so as to receive more feedback on the implementation of their learning experience. Usually people tend to underestimate the power of this procedure, which is entirely devoted to improve the user experience and therefore the efficiency of the service.

- Define the proper duration of distance learning courses according to students' self-regulation capabilities: this refers to the fact that each distance learning course delivered (with particular reference to synchronous learning) should have different time lapses

depending on the underlying individual who is attending it. Logically, children have a very high attention decrease when it comes to and educational environment and thus require a shorter time span for lectures. Whereas for a college student, this period of time is considerably increased. Obviously there are exceptions, since each individual has its own metacognitive capabilities.

- **Creation of communities and connection improvements:** creating communities intensifies and enhances the experience for both educators and learners, decreasing the sense of loneliness given by non-traditional learning classes and increasing the connection between students and educational institutions.

These represent only some of the recommendations made in order to provide a good response to new methods for implementing learning. Since as we've experienced the pandemic showed ups and downs in the number of daily cases of people infected, with peak of almost 740,000 new cases of COVID-19 were reported globally (see 'The rise and fall of COVID-19'), followed 2 weeks later by a record of more than 14,400 deaths in a single day[60], school closures have depended on lockdown provisions and on Governments' decisions. Generally speaking, in times of re-openings of the schools many have also been the advices made by UNESCO and other relevant organizations in order to minimize the potential risk of infection. These mainly refer to social distancing measures, along with ensuring social and health support by the institutions to students. However, because of the pivot in the usage of online platforms as a solution to distance learning, other organizations focused on sustaining the increasingly trend of using e-learning tools to implement learning and education. For instance Open Education Communities (OEC) have shared many Open Educational Resources (OER), providing additional tools and devices to fight against the Covid-19 educational emergency. As the name suggests, OER are digital resources (such as data, digital assets, openly licensed text and more) which are freely available and accessible to the audience. These represent a huge advantage for many individuals who struggle to obtain the necessary educational means. Not only that, but also provide a useful alternative for learning, teaching and research purposes. Some of the OER which have been shared are: 'Keeping the doors of learning open' created by Commonwealth of Learning[61], Community Contributed Open Educational

[60] Mallapaty, S. (2021, March 18). Has COVID Peaked? Maybe, but it's too soon to be sure. Retrieved April 23, 2021, from https://www.nature.com/articles/d41586-021-00705-9

[61] "Keeping the doors of learning open COVID-19 | COL". *www.col.org*. Retrieved 26 May 2020.

Resources for Teaching and Learning in the COVID-19 Era[62], OERs online courses[63], Teaching and Learning online[64] by MERLOT and SkillsCommons and more. All of these resources identify many tools that support and contribute to helping the educational system. Moreover many Massive Open Online Courses (MOOCs) such as MIT OpenCourseWare, Coursera have improved and gained more relevance thanks to their services. On the same page, as time passes, other solutions are being thought both to overcome the virus and to learn from its existence, one of these being the Digital Education Action Plan[65] enlightening the European Commission's point of view for a better and more fitting digital education in Europe.

2.3 Global transition to online education

As already stressed many times, the outbreak of Covid-19 has forced the closure of educational institutions which furnished the regular face-to-face learning approach used from centuries in history. However, due to unconditional restrictions, educational facilities migrated from the traditional approach to the use of e-learning tools in order to provide the right of education. The use of digital and online devices was rather uncommon before Covid-19, however it wasn't unknown. As a matter of fact, 20% of countries had digital learning resources in teaching in some educational facilities and only a mere 10% of countries had more robust digital learning capabilities offering some of the educational materials available outside of school. According to the World Bank, no country has a universal digital curriculum for teaching and learning[66]. Thus, the pivot towards e-learning's usage has been quite fast considering this circumstance and the need to fulfill distance learning. What it means in practical terms is that countries worldwide had to implement severe adjustments and developments in the accessibility to the internet, in the usage of the right technology and in the underlying skills for the correct application of this technology, with particular regard to the underdeveloped countries and communities which lack the proper digital infrastructures, economic availability and right educational environment. For example, according to estimates from the International Telecommunication Union (ITU), 82.2% of households in Africa lack

[62] "COVID-19 Open Education Community Contributed Resources". *Google Docs*. Retrieved 26 May 2020.
[63] "Capacity development – OER response to Covid-19". Retrieved 26 May 2020.
[64] "Teaching and Learning Online". *www.merlot.org*. Retrieved 26 May 2020.
[65] A3, E. (2021, April 21). Digital education action Plan (2021-2027). Retrieved April 23, 2021, from https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
[66] Id. 53

internet access in their homes. Moreover, previous health emergencies, most recently the Ebola outbreak, showed that the impact on education is likely to be most devastating in countries where there are already low learning outcomes and high dropout rates[67]. Despite this challenges, schools and other institutions are providing different types of approaches such as the 'flipped classroom', 'online classroom', 'virtual classroom' and more through electronic devices and online applications to overcome the impossibility of face-to-face courses. Moreover, online platforms are offering free service access and usage. BYJU'S, an educational technology and online tutoring firm based in Bangalore, has seen a 200% increase in the use of its products since their adoption of free live classes[68]. Similarly, Tencent, an e-learning center that offers online courses in China, has seen one of the largest online movements in the whole history with more than 730 000 K-12 students attending online classes. Lark, a Singapore-based company, has increased its relevance by providing unlimited vide-call minutes between participants, co-editing features, 200GB of free Cloud storage and more[69]. Alibaba Group implemented DingTalk, which is an intelligent working platform that aims at supporting multiple enterprises to enhance the remote working experience. These were only some examples of e-learning devices which gained relevance and contributed in the movement from traditional to digital learning. It's important to notice that challenges were not and still aren't fully eliminated out of the picture.

In a survey of American college teens in 2020 showed that 43% of students enrolled in traditional face-to-face classroom courses had not taken an online class before, 21% had only taken one online class prior to the pandemic, and 35% had taken two or more classes. Additionally, 87% of students indicated they were somewhat or very satisfied with the course, and afterward, the number declined to 59% [70].

Thus, even if the transition has been readily put in place what needs to be considered is that the efficiency of the service still had and has to be improved.

[67] Id. 53

[68] Written by Cathy Li, H. (n.d.). The COVID-19 pandemic has Changed education FOREVER. This is how. Retrieved April 29, 2021, from https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/

[69] Collaboration and communication software. (n.d.). Retrieved April 29, 2021, from https://www.larksuite.com/

[70] Distance learning Statistics [2021]: Online education trends. (2021, March 15). Retrieved April 29, 2021, from https://educationdata.org/online-education-statistics

Furthermore many countries keep struggling in providing an effective solution to distance learning with the proper computer-based online learning and instead rely on TV and radio broadcasts as learning methods although these result in poor education effectiveness.
On the same page, internet connectivity issues, platforms' bugs and adaptability, better engagement and similar problems still remain to be fully solved.

Generally speaking, the educational platforms, applications and resources provided worldwide are multivarious as each one of them differences from the others in the approach and services offered. However, online platforms proved to be the one of most popular tools to implement distance learning. These platforms, nearly used by all OECD countries, are considered to be such effective because of their versatility in use. Through online platforms, students can access to whatever information available in the platform, whenever they want. Basically, it permits the individual not only to move at his or her own pace but also allows for real-time lessons thanks to virtual-rooms, therefore engaging in a stricter and more direct way the underlying student. For this reason, many schools, universities and other facilities are alternating this type of e-learning with the traditional one with the occasion of schools re-openings. Obviously, this type of approach known as Blended learning is heavily context-related since it's subject to external factors, being in this case the rise in Covid-19 infections leading to educational institutions' closure.

2.4 Major worldwide distance learning solutions offered

Because the increase in usage of e-learning and its recent developments, many have been the platforms and digital tools offered to people as a solution to distance learning. Additionally, the search for a proper distance learning solution for each existing segment has led to a huge development of different platforms. The variety available allows to adopt different kinds of approaches for learning purposes, ranging from platforms that provide IT skills and support to educators to online meetings and virtual classrooms that recreate the natural implementation of traditional lectures without being physically gathered. Nonetheless, many of these tools relate and offer functionalities between each other. Some organizations, such as UNESCO,

have tried to list the majority of educational platforms, applications and resources[71] based on the service they provide. Let's briefly see the main categories:

- **Digital Learning Management Systems:**

- CenturyTech
- Moodle
- Edmodo
- ClassDojo
- Google Classroom
- Schoology
- Skooler

A digital LMS is a software platform that enables you to create, monitor, manage and deliver e-learning courses and training programs ranging from students to employees. The system allows for storage and provision to access to course material. Obviously, learning goals, timelines, achievements (grades/certifications), content updates, tools utilized and more features vary across different types of LMSs and whether the underlying system is for Academic or Corporate purposes. The above examples are some of the most relevant ones in the industry.

- Basic Mobile Phones Systems:

- Cell-Ed
- Eneza Education
- Ubongo
- Funzi
- Ustad Mobile

These types of systems are specifically build for mobile devices with the aim of providing to educators and employers an easy and fast way to reach, train and interact with their workers or students wherever they are. Since the majority of people nowadays own a mobile phone,

[71] Distance learning solutions. (2020, July 07). Retrieved April 29, 2021, from https://en.unesco.org/covid19/educationresponse/solutions

this type of e-learning makes distance learning way easier and effective worldwide. Furthermore, many mobile (and computer) reading applications such as African Storybook, Reads, Global Digital Library are offering open access to digital books and writings in multiple languages to increase reading and writing skills and decrease illiteracy among students.

- Offline Functionality Systems:

- Kolibri
- Rumie
- Ustad Mobile

Many systems aim at offering digital solutions to the ones who are not fortunate as the average individual who enjoys the possibility of affording the proper technologies. Luckly, platforms like the ones reported above, provide off-line learning resources such as open educational library, low-cost technology and other tools to the ones who lack internet connectivity, or simply the possibility of affording expensive devices for sustaining learning during the pandemic.

- Massive Open Online Courses (MOOCs):

- Udemy
- Canvas
- Coursera
- EdX
- TED-Ed Earth School
- Icourses
- Future Learn
- Udacity

As extensively remarked, MOOCs are online courses that provide regular course materials along with other services such as interactive courses between participants, educators, teacher assistants; feedback quizzes and more. They offer an affordable remote learning opportunity for solving the distance learning issue, as a matter of fact with their extensive capability of

gathering more than hundreds of students in online courses, many universities (e.g. Harvard University and Massachusetts Institute of Technology) have adopted this kind of approach to deliver online lectures on multiple subjects. Even if the MOOCs are freely accessible, some of these charge a small fee in order to obtain a 'verified certificate of completion' which proves that the individual has participated and passed the online course successfully (such as the ones provided by EdX) in order to achieve a working promotion or a particular college application.

- Self-directed Learning platforms:

- Abra
- Byju's
- Khan Academy
- Code.org
- British Council
- Facebook Get Digital
- Youtube
- Onecourse

These represent only few of the numerous platforms supporting self-directed learning. As the name suggests, self-directed learning identifies the initiative taken by the individual to learn, deepen or inform on whatever topic the person wants to, without the need of participating into specific courses on the subject in question. This type of learning is not something new, as is has been highly used during time by people that wanted to enhance their personal needs or curiosities. However, with improvements in technology and the outbreak of the virus, more online-based platforms have been put in place for these purposes. Providing educational resources and tutorials to allow an easier self-directed learning process.

- Live-video Communication and Collaboration Platforms (online courses):

- Zoom
- Skype
- WeChat Work
- Teams
- DingTalk

- Lark
- WhatsApp
- Hangouts Meet

These online synchronous e-learning platforms are offering the daily procedures for sustaining online meetings and lectures during Covid-19 among schools and universities. Online courses are usually confused with MOOCs, however they are not quite the same thing even if their offer is fairly similar (as they both are comprised in the e-learning sector). The main differences between the two, regard content and delivery. In online courses content is available and uploaded periodically (usually every week or so), media is restricted by university's credentials and lectures' material is edited by semester. Its delivery is characterized by live classes where students learn at the same pace following a linear learning methodology with a close-ended patter (with due dates). Whereas MOOCs offers open source media always available for anyone, shorter modules' time lapse and content edit based on need. Plus, usually, lectures are pre-recorded and available at the start with no deadlines, permitting a major self-directed learning procedure and customized path. Either way online courses are by far the most used e-learning tool in schools for conducting distance learning.

- Educational Content Creation Platforms:

- Thinglink
- Buncee
- EdPuzzle
- Kaltura
- Trello
- Nearpod

The reported tools allow for the creation of personalized content. Therefore, educators, professors and employers have the possibility to create their own customized coursework material, planning, projects, images, videos and other digital resources. In fact, many professors avail these tools in order to gain more relevance to their courses and implement alternative class organization schedules that engage students in a more interactive way.

- Educational and Technology Support Platforms:

- Common Sense Education
- EdSurge
- Keep Learning Going
- UNHCR
- UNEVOC Resources

Besides the regular digital platforms that provide educational services, others like the ones mentioned above aim at supporting teachers and learners that have encountered difficulties in keeping the correct pace during the pandemic, either because of the lack in IT and digital skills or because of other challenges emerged in the last period. Offering support desks, creation of communities and provision of resources, guides and tools including online courses to overcome the previously mentioned issues.

2.5 General framework and main video-conference platforms used in Italy during Covid-19

Italy has been the first country in Europe to implement a national lockdown measure. Starting from the closure of educational facilities in the north of Italy at the end of February 2020, to the first lockdown implemented in March 2020 that caused the closure of all educational institutions in the country. In order to minimize the damages caused by Covid-19 restrictions on students' education, the use of e-learning worldwide has been fundamental. Teachers and students had the chance to continue learning thanks to online platforms. The first guidelines regarding the minimum number of hours devoted to learning were set in July, ensuring 10 hours for primary school students, 15 for elementary and secondary school and 20 for high-school youngsters. On 14th September 2020, the majority of institutions re-opened, however, due to the unstable circumstances given by the pandemic, online courses remained the primary option for providing a sustained and systematic tool for continuing learning. The first step towards this solution has been made in the 'CuraItalia' decree which aimed at improving the supply of digital devices and services in order to support distance learning and working at home. Around 85 million euros were used to finance and promote the use of digital

platforms[72]. The Educational Ministry, Miur, devoted 10 million euros to help the provision of the necessary technologies and devices to educational facilities, 80 to support the students more in need and provide individual digital devices for low-income families and the remaining 5 million euros to readily train the educational personnel on the new methodologies and techniques required from the adoption of online courses. Newspapers have shown that on 18th March 2020, 67% of schools had moved their learning activities onto online educational ones, almost reaching 6.7 out of 8.3 million students adopting online learning procedures[73] . However, on the negative side, ISTAT estimated that around 3 million of students ranging from 6 to 17 years old have encountered difficulties in following distance learning courses due to poor internet connectivity and lack of proper digital devices[74]. On the same page, a research conducted by Save The Children identified that 28% of students in Italy (from 14 to 18 years old) affirm to know a colleague who stopped attending school during Covid-19[75] due to connectivity issues. This increases the disparity in education between individuals and for this reason, worldwide organizations are still currently trying to finance and support educational institutes as to solve these issues connected with the use of e-learning.

In Italy, children and youngsters were already familiar with the usage of digital technology as internet became part of our reality in the last decades. However, the approach used up until now has been changed since the arrival of Covid-19. Nowadays people not only exploit digital devices for personal, educational or recreation purposes, but instead see these online tools as a possibility to interact socially with each other. For these reasons, the appropriation of online tools such as computers, tablets, mobile phones and such became even more important within the nuclear family.

As one can imagine, the turnaround towards distance learning has been an unexpected factor for the majority of people, including both for students and educators. Before the actual acknowledgment of long-lasting lockdown provisions, teachers tried to overcome distance learning through socials such as WhatsApp, Messanger, Glide or even HouseParty. However, these proved to be unsuccessful for implementing a proper learning path because of their poor

[72] Maci, L. (2020, October 06). Il Digitale per la SCUOLA: 16 PIATTAFORME per la Didattica A DISTANZA. Retrieved April 29, 2021, from https://www.economyup.it/innovazione/il-digitale-per-la-scuola-15-piattaforme-per-la-didattica-a-distanza/

[73] Unicef Office of Research (2021, February). La didattica a distanza durante l'emergenza COVID-19: L'esperienza italiana. Retrieved from https://www.unicef-irc.org/publications/pdf/la-didattica-a-distanza-durante-l'emergenza-COVID-19-l%27esperienza-italiana.pdf

[74] Id. 73

[75] Id.73

performances in organizing, storing and managing the learning content and documents. Thus, educators and educational facilities searched for a new method for implementing distance learning and encountered great success by using video-conferencing 'apps'. Thanks to the creation of a virtual classroom, students and users, had the opportunity to interact in a closer way with respect to other e-learning processes such as Television's educational programs or educational Radio programs. Moreover, by establishing a synchronous environment, these online platforms were highly preferred with respect to e-mails, messages, phone calls and other digital/non-digital tools.

Due to the increase in relevance and usage, online platforms and virtual-room apps started to become more and more used by educational facilities. Obviously, the number of apps or platforms that provide these kinds of services is multivarious. However, some became more popular than others, probably thanks to specific features which led to a competitive advantage with respect to the others. Let us see the major online platforms used in Italy:

- Zoom

Zoom was funded back in 2011 by the Chinese engeneer Eric Yuan in San Jose, California. Yuan was actually part of the staff directing the WebEx project launched by Cisco, however he decided to leave because of the poor performances given by the project. Zoom Video Communication is a firm specializing in videoconferencing and soon became more and more relevant. Its importance increased exponentially during Covid-19 pandemic, where the app registered and increase of 367% annual-basis profits[76]. Moreover, data have shown that at the end of December 2019 the number of daily participants was 10 million, which increased to 200 million in March 2020 and again to 300 million in April[77]. The reasons for which it has gained such relevance are its ease in use, intuitive interface and overall the friendly user experience. Users can easily participate in video-calls, meetings and webinars simply by freely downloading the app from internet, or alternatively by accessing directly through the browser without any download using the Zoom web client. With the free version, Zoom

[76] ANSA, R. (2020, December 01). Covid: App ZOOM quadruplica LE Entrate, rialza l'outlook - Software E APP. Retrieved April 29, 2021, from https://www.ansa.it/sito/notizie/tecnologia/software_app/2020/12/01/covid-app-zoom-quadruplica-le-entrate-rialza-loutlook_445b7d3b-a75a-4add-bc74-4f268d325674.html

[77] Detto:, L., & Detto:, U. (2020, May 01). Zoom: I segreti del successo e gli utenti italiani. Retrieved April 29, 2021, from https://vincos.it/2020/04/24/zoom-i-segreti-del-successo-e-gli-utenti-italiani/

allows a limited time videoconference (usually 40 minutes) and up to 100 participants. However, it also offers various monthly subscriptions (Pro, Business,Enterprise Plus) which offer unrestricted time limits, greater virtual-rooms (up to 1000 participants) and other features (such as greater storage space). Participating into online meetings is fairly easy since it requires to join by clicking on a sharable link. During the lectures, educators and learners can share their screens, course material, links, access to the chat and record the lesson. Plus, hosts are allowed specific functions such as the possibility to mute someone's microphone or video, eject participants and other useful tools such as creating waiting rooms and so on. Another reason for which Zoom has been so much adopted during the pandemic, is because Yuan allowed schools in the most Covid-19 affected countries (Italy being one of these) the use of its services for free.

However Zoom, received some negative feedback lately due to its poor privacy and security system. The phenomenon of 'Zoombombing', which is identified by the intrusion of non-invited participants who interrupted online lectures by sharing improper contents, has led the organization to readily improve these issues by solving and releasing Zoom 5.0 version.

- Cisco Webex

Cisco Webex was born as WebEx, an American company that sells online and videoconferencing applications back in 1995. Later on in 2007 it has been taken over by Cisco Systems, with its headquarters in California. As other platforms, its aim is to provide a flexible videoconferencing solution to many businesses, which is why it offers multiple services such as Webex Teams, Webex Meetings, Training Center, Support Center, Event Center and many others. During Covid-19 pandemic, Cisco Webex saw an absurd amount of increases in downloads, usages and profits. Statistics registered a record of 324 million attendees in March, moreover the senior vice president and general manager Sri Srinivasan stated that "Webex grew 2.5 times in Americas, four times in Europe and 3.5 times in Asia Pacific. Our growth is sourced from enterprise expansion, education and telehealth."[78]. While Webex Teams focuses more on collaboration functionality, Webex Meetings specializes on videoconferencing and online events. Similarly to Zoom, people can either download the software or access via Web, however the latter option doesn't give the same encryption and Voice-Over-IP that would be available through the desktop version (the one downloaded).

[78] Mukherjee, S. (2020, April 03). Cisco's Webex draws RECORD 324 million users in March. Retrieved April 29, 2021, from https://www.reuters.com/article/us-cisco-systems-webex-idUSKBN21L2SY

The interface is pretty intuitive and the dashboard allows for a clear understanding of the available possibilities, namely: Start Meeting, Join Meeting or Plan Meeting. The dashboard also provides to see the scheduled meetings and to arrange the proper settings according to one's needs. For teachers and students, participating in lectures is fairly easy since it can be done through e-mail (Microsoft Outlook) or by sharing the virtual rooms' link. As the other platforms on the market, Cisco Webex offers the users to interact through web-cams, microphones and to share one's screen and/or documents with a simple click. Additionally educators have the possibility to record the lecture and then send the underlying link in the chat, along with other customization tools such as muting, ejecting, allowing others students in the virtual room. Furthermore, it has different versions, starting from the free one which allows for a maximum of 100 participants and 50 minute's time lapse, to more expensive ones such as Plus or Business, which permit to expand benefits such as meeting time duration, participants and more. Besides these standard features, Cisco Webex's success comes from a high employment of HD video conferencing up to six participants at a time, good active Speaker technology, useful platform compatibility with operating systems, unparallel data protection and relatively high bandwidth transmission[79].

However, only few Italian educational facilities such as Luiss Guido Carli, Politecnico di Torino and Università di Camerino are using Cisco Webex as a way to conduct distance learning. Many others have preferred to operate with other platforms (e.g Zoom).

- Microsoft Teams

Microsoft Teams is another leader in the digital communication environment. Developed by Microsoft as part of the Microsoft 365 package and launched in March 2017, this platforms offers a huge variety of services ranging from videoconferencing to broader management capabilities. Skype was already well known in the past, however in order to capitalize on the integration of Windows phones and mobile apps, Microsoft moved Skype from P2P networks, to cloud-powered services which resulted in a failure for the business[80]. Therefore, Microsoft decided to shift its attention from Skype to Teams and later on in September 2019 Skype for Business was officially phased out in favor of the newest platform[81]. As other online platforms, Teams saw an increase in usage during Covid-19 pandemic, reaching over 75

[79] Axxys Technologies, & Axxys Technologies. (2020, November 16). 5 useful features of Cisco Webex - blog. Retrieved April 29, 2021, from https://www.axxys.com/blog/5-useful-features-cisco-webex/

[80] What happened TO Skype: How Zoom Surpassed Skype? (2021, April 07). Retrieved April 29, 2021, from https://techresearchonline.com/blog/how-did-zoom-surpassed-skype/

[81] Foley, Mary Jo. "Microsoft will drop Skype for Business Online on July 31, 2021". *ZDNet.* Retrieved February 9, 2020.

million daily users in April 2020 and 200 million meeting participants in a single day in April, 2020[82]. Microsoft Teams proved to be a great substitute for other leaders like Zoom and others, especially if the individual is familiar with the Microsoft environment. The platform's interface may result a bit confusing at first, however this is because of the multiple functions that it allows. Users can participate in videoconferences through either downloading the app or by a link in their browser. Meetings can reach over 100 participants at a time (around 250) and can be scheduled on one's personal calendar or can be directly created by the user. Moreover, through the Microsoft Stream integration, meeting broadcasts can reach 10 000 viewers per session. Besides all the related possibilities available, such as video and audio settings, one-to-one or group chats (including modern chat features), customization features during a meeting and more, one of Teams' strength relies on a great channel offer which can be either standard/public (accessible to anybody) or private (requiring the owner's permission to enter). Thanks to close relation with the Microsoft 365 package, the platform offers many useful interactions with the underlying apps (Outlook, Word, Exel, PowerPoint…). For instance scheduled appointments in the calendar directly connect into one's Outlook account, moreover users can manage Word (or others) files within their channels, educators can create and share quizzes through Office Forms and many other benefits. In addition, Microsoft Teams offers a solid cloud storage and data security, which is fundamental for implementing a proper reliable service for both schools and businesses. As the others, also Teams offers multiple advantages with different monthly subscriptions to Microsoft 365 (Essential, Premium, Business).

- Google Meet

Last but not least in our list we have Google Meet, which is a video-communication platform developed, as one can imagine, by Google[83]. Its launch is dated back in 2017 and along with Google Chat (another service provided by Google) it was supposed to replace the former Google app 'Hangouts', as it in fact did. Similarly to Teams, Google Meet and Google Chat are part of a broader set of services being G-Suit (Google office suite) that allows great interactions possibilities among the applications of the notorious company. Its popularity increased during the Covid-19 pandemic, growing by a factor of 30 between January and

[82] Microsoft teams success STORY: Past, present and future. (2021, March 09). Retrieved April 29, 2021, from https://www.pythagoras.co.uk/2020/07/microsoft-teams-success-story-past-present-and-future/

[83] Johnston, Scott (March 9, 2017). "Meet the new Hangouts". *Google*. Archived from the original on March 14, 2017. Retrieved March 15, 2017.

April 2020 with around 100 million daily active users[84]. This numbers were also achieved by the fact that Google started making available this video-conference tool for free due to the global pandemic crisis. This implies that it imposed some restrictions to the advantages offered by the platforms (such as reducing to a maximum of 60 minutes the video-call time lapse and a maximum of 100 participants a t a time for the free version). However, it still provides great use for companies and teachers. The access to the meetings is done either by web or by downloading the related apps available for both Android and iOS systems. The interface is rather simple and self-intuitive, allowing to start, join, plan meetings and to customize the general/video/audio settings. Moreover, the features offered by the platform during the video-call are the ones which you can expect, such as: muting/video/deny/enter options, chat box, sharing documents/screen, call encryption between users, video recording and storage into one's personal account drive, customization of layout and more. Probably the major strength of Google Meet is that is part of the G-Suit, therefore it allows easy and useful connections with other services provided by Google (e.g Google Calendar, Google Workspace). As previously said, everything needed in order to cope with this platform is an account Google which gives the implementation of video-lectures far easier for people around the globe. Other advantages or extended capabilities may be obtained by paying G-Suit subscriptions (Basic, Business, Enterprise).

To summarize, the number of e-learning platforms offered to the audience is multivarious. As we have seen the ones reported above show similar features between each other since their goal is the same. However, slight differences in the services offered in the free versions of each, the ease in usage, the security of the data, the interfaces, the availability, the recording system and more, determine the customer preference in using one or the other. Teachers and students (or any other user) who prefer a simpler way to conduct learning and move around may show a preference towards Zoom. On the contrary, individuals who look for a better security system might opt for Cisco Webex. Similarly, people who prefer a broader management utility function will most likely prefer Microsoft Teams or Google Meet for their relations with other services (Microsoft 365, G-Suit). The reasoning goes on, depending on each circumstance.

[84] Google meet. (2021, April 26). Retrieved April 29, 2021, from https://en.wikipedia.org/wiki/Google_Meet

CHAPTER III: SURVEY ON E-LEARNING AND ITS TOOLS DURING COVID-19

3.1 Introduction

After having considered all the previous data and information offered by this paper, we have come to the conclusion that many e-learning methodologies have sprung, especially during the pandemic, with the pure purpose of improving the educational sector which has been drastically affected by the Covid-19 crisis. Nonetheless, many tools were unfortunately non-usable or unachievable for less than average income families. On the other hand, many students and adults tried to cope with different online platforms in different manners. Some exploited Massive Open Online Courses to continue their education, others have followed the ones proposed by their public/private educational institutions. Either way, the use of e-learning's means has generally increased, but one could ask whether this was the correct approach. Broadly speaking, the implementation of these methods was the only real and concrete way around to virus' restrictions and government measures, therefore e-learning definitely proved to be necessary for allowing to continue education. However, the practical efficiency of the online course/platform offered and the users' perspective on its implementation is a very important aspect to be considered. For this reason, there has been a decision to conduct a questionnaire on these topics in order to get a closer look on people's usage of e-learning tools (the main devices used here in Italy) during the pandemic and their perspective on these (users' satisfaction and service's effectiveness) . This research has the pure intention to report data collected during Covid-19 and provide useful and beneficial information for future researches and improvements in the educational industry. Regardless of the results ,with all the aforementioned information, the one found on the internet and personal rumors and points of view, one would expect that even though people are largely consuming e-learning tools they still are remaining unsatisfied with their implementation. This is probably because technology implemented services can't quite reach the same experience (physical) as the one offered by life it-self or at least it still has to improve in order to provide a similar sensation. However, the results are discussed down below.

3.2 Method

This research was created on 24 April, 2021 and later sent on 25 April, 2021 to gather data in order to better understand the trend, implementation, users' satisfaction and future utilization of e-learning tools also after the Covid-19 pandemic. The online questionnaire comprises 10 questions regarding the usage and perception of distance learning among the Italian population, specifically in the center of the country. Once ready to be published, the questionnaire, created directly online through one of Google's extensions, has been sent to multiple groups and individuals through a sharable link on social medias such as Whatsapp and Facebook (which now govern the online communication system) and later collected and gathered in graphs showing the total results of the analysis. The questions have been thought in such a way as to be answered by different ranges of individuals (ranging from 13 to 40+), however these have particular attention to the younger generation, mainly to middle/high-school and universities students. Moreover, questions are focused on the individuals' perspective about the e-learning tools used by him/her-self , on the viability of them and generally speaking on the whole distance learning framework. The following questions were asked:

- Gender
- Age
- Job/Profession
- Which e-learning tools have been mostly implemented to sustain your educational path?
- Are you satisfied about the services provided by these?
- Which online video-conference platform have you used for distance learning?
- Which, instead, you are more familiar with for personal use?
- Why do you think it is the best?
- Do you prefer distance learning or traditional learning (normal classrooms)?
- Will you continue to use e-learning platforms also in the future (after Covid-19)?

Multiple choice answers were given and specifically selected, following the most popular trends emerged in Italy, however a further option named 'Other' allowed for the respondent to type its own personal answer. In addition, the research tries also to provide an overview of the most utilized online platforms here in the Italian territory, in order to enhance their

importance and provide multiple standpoints on their efficiency as to induce future improvements and developments.

3.3 Results

A week after the questionnaire has been shared, a total sample of 154 participants emerged. The following tables are shown in a chronological order relating to the aforementioned questions used in the research. The first table (*Table 1*) relates to the gender of the respondents. Following, the next ones show the age of the participants (*Table 2*) and their profession (*Table 3*).

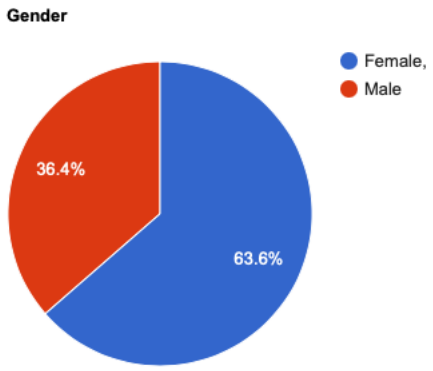

Table 1 Percentages of the gender of the people who responded to the questionnaire

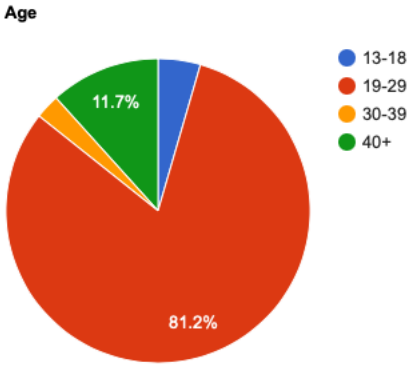

Table 2 Percentages of the age of the respondents

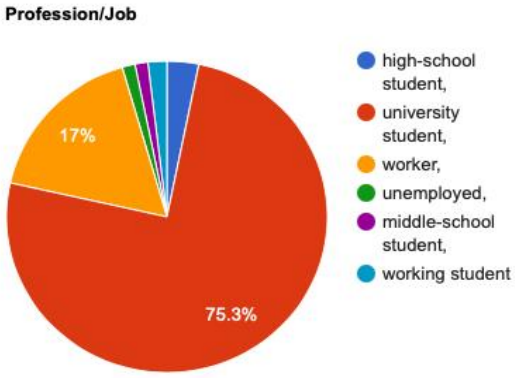

Table 3 Percentages of the profession of the respondents

From this point onwards, the questions asked related to the real purpose of the research, going more in-depth with e-learning tools and its implementation.

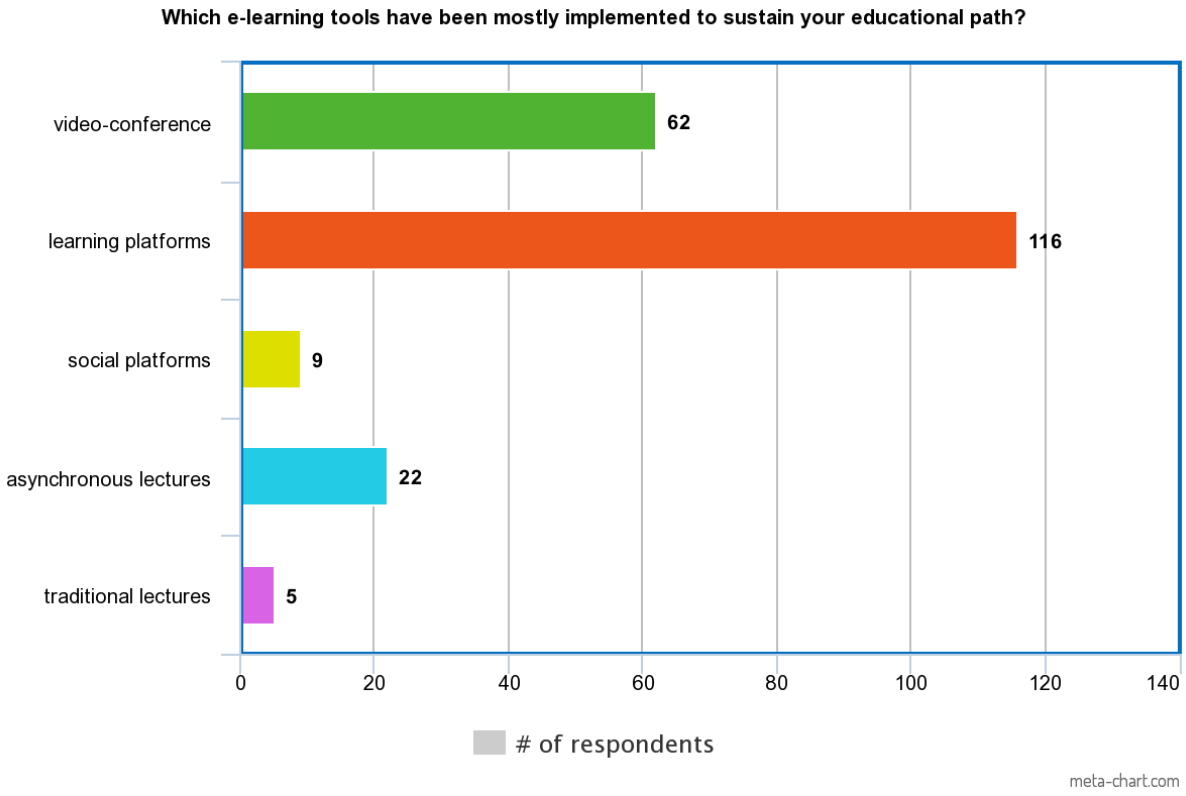

Table 4 Percentages of the mainly used e-learning tools of the respondents

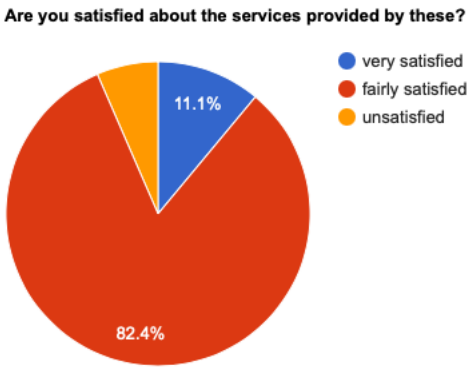

Table 5 Percentages of the respondents' satisfaction grade

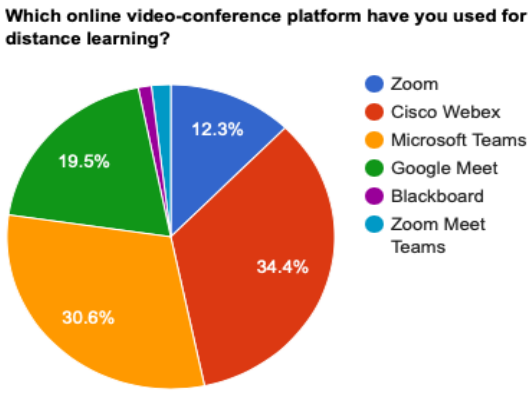

Table 6 Percentages of online video-conference platforms used by the respondents for distance learning

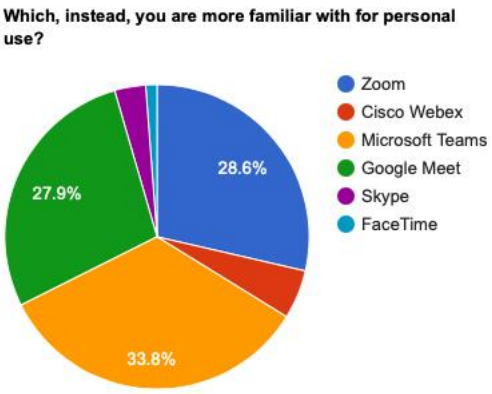

Table 7 Percentages of online video-conference platforms more frequently used for personal purposes by the respondents

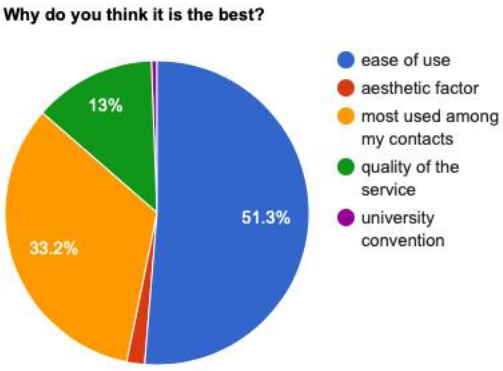

Table 8 Percentages of the reason for which the underlying platforms used by the respondents is better than the others

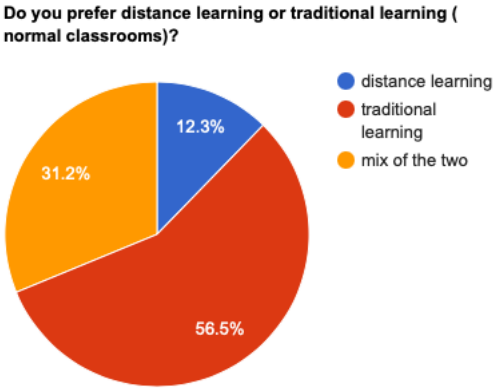

Table 9 Percentages of respondents' preference regarding distance and traditional learning

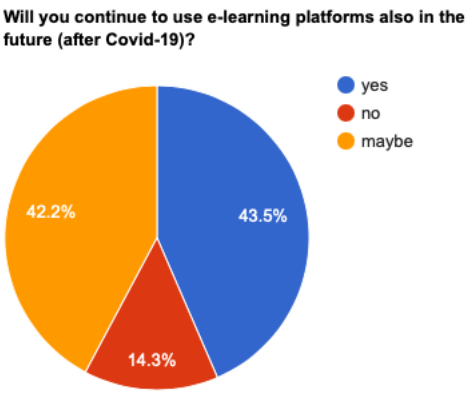

Table 10 Percentages of respondents' willingness to continue using e-learning tools also in the future (after Covid-19)

3.4 Discussion

The research showed that out of 154 respondents, 98 were females and the remaining 56 were males and the majority of these (125 people) were generally young individuals ranging from 19 to 29 years old. The questions have been mainly answered by university students (116 individuals), followed by workers (26 individuals), high-school students (5 individuals), working students (3 individuals) and lastly middle-school and unemployed (total of 4 people). As expected, the utilization of e-learning methods and tools has undoubtedly risen with the Covid-19 outbreak. As previously stated in Chapter II, due to Government restrictions and anti-infection measures taken as to counter the drastic consequences of the virus, the majority of individuals have used e-learning tools for continuing their personal educational path (in case we are talking about students), for allowing employers/employees to sustain the bare minimum working procedures and much more. Out of all the possible means offered and created for these purposes, our sample availed different combinations of distance learning solutions, *Table 4* shows that the main tools used by the respondents are digital learning platforms which have been used by 75.3% of the total sample taken in consideration, followed by online video-conferences, employed by 40.3% of the participants. Not surprisingly, social platforms (5.8%), asynchronous lectures (14.3%) and lectures in presence (3.1%) have proved to be less popular solutions in our scenario. This is probably because the impact given by these approaches, not including traditional lectures which require a different discussion,

results being weaker and less efficient than online synchronous lectures and digital learning systems. Social platforms, even though being one of the most profitable and successful business nowadays simply do not offer the appropriate means for sustaining training programs and educational material and for this reason cannot offer a good solution for distance learning. Differently, asynchronous lectures (both online and offline) can provide useful means for implementing distance learning. However, many individuals cannot cope with the implementation of the service it-self, which is providing different kinds of materials without interaction, as they need a prompt support by a mentor. On the contrary, online platforms provided by educational facilities or LMS better grasp the organizational structure needed in order to make learning easier for students. Similarly, many find online video-conferences adequate because of the possibility of interaction between students and professors. Either way, the tools provided during the pandemic proved to partially satisfy the average individual. As shown in *Table 5* 82.5% of the respondents (127) affirmed to be 'fairly satisfied' and only the 11.1% stated its happiness in the services used, against the remaining 6.4% who said to be unsatisfied. Broadly speaking, these percentages show how the e-learning tools and its structures provided lack some of the features which might help distance learning become more efficient. On the other hand, as shown in *Table 9* and *Table 10*, people prefer traditional learning, or at least a mix of the two, with respect to pure distance learning. Therefore, individuals' satisfaction towards e-learning's tools is certainly affected also by this perspective, being the preference of real life experience over virtual one. Regarding the use of online video-conference, Table 6. identified a lead of 53 individuals (34.4% out of all the people who responded the questionnaire) who have used Cisco Webex as their main online video-conference platform, followed by 47 with Microsoft Teams (30.6%), 30 with Google Meet (19.5%), 19 with Zoom (12.3%), two with BlackBoard (1.3%) and the remaining 3 individuals (1.9%) with a combination of the first three platforms mentioned. On the contrary *Table 7* identifies the mainly used platforms, out of the ones just taken in consideration, by the respondents for personal use and the results proved to be quite different with respect to Table 6. Here there the results underline that 33.8% of the individuals are more familiar with Microsoft Teams, followed by Zoom (28.6% of respondents), Google Meet (27.9% of respondents), Cisco Webex (5.2% of respondents), Skype (3.3% of the respondents) and lastly FaceTime with only 1.2% of the respondents. The discrepancy between the two Tables is probably given by the different implementation of educational programs and conventions by the various institutions which decided their respective platforms. The next table (*Table 8*) describes the reasons for which single individuals decide to use the platform they truly use for

personal instances. Results have shown that more than half of the respondents (51.3%) use the platform they prefer for 'ease of use'. Other relevant factors for users' platform selection are 'quality of service' (13% voted for this motive) and even more relevant is the use of the underlying platform by people close to the individual in question (33.2% chose this motive) such as his/her family and friends. This results are very important since they prove that one of the most important engaging factors for platforms' use is its simplicity. Many developers try to accomplish difficult tasks to create a high technology and effective platforms that allow to do an infinite amount of functions while missing the most important part for its audience, being the ease of use, and therefore failing in gaining market relevance. Moreover, the more people use one's app or device, the more people tend to follow the same path. For this reason, many individuals found them-selves using platforms such as Zoom for communicating online with their friends only because their friend was already familiar with Zoom. The same reasoning can be applied to other platforms. However as already stated, some platforms are definitely more appropriate than others for conducting and providing educational materials. The last two tables provided respondents' preference regarding traditional 'in presence' learning with respect to online learning. As a matter of fact (*Table 9*), 87 participants, corresponding to 56.5% of our sample, stated their preference for traditional learning. Whereas, 48 individuals (31.2% of our sample) would be willing to the implementation of a mixture between distance and traditional learning and only 19 (12.3% of our sample) preferred distance learning. As expected, the implementation of e-learning methodologies does not quite reach the same level of satisfaction given by real life experience. People feel more engaged if surrounded by other colleagues and if allowed to directly interact with each other. Data showed (*Table 10*) that only 14.3% of the respondents will not continue to use e-learning platforms also in the future, whereas 43.5 % of the respondents will and 42.2% are uncertain about whether to continue to use them or not. Nonetheless, as shown in *Table 10*, individuals still recognize the importance of e-learning as a useful tool. However, it all comes down on how the service is implemented and on the actual need of distance learning solutions in our daily routine.

3.5 Conclusion

In conclusion, the survey conducted and reported above led to a deeper and closer analysis regarding some of the main and core arguments relating to the implementation of e-learning in our society, specifically during a pandemic. Summarizing, the questionnaire showed a particular uncertainty with the use of these kinds of approaches in the learning framework, especially for youngsters. These underlying issues and uncertainties should be further analyzed through a separate questionnaire which aims exclusively at understanding the practical reasons for which students, and others, are not convinced about e-learning. Nonetheless, as already mentioned in the previous chapters, e-learning presents some technical and non-technical problematics which definitely require to be improved on. Moreover, the research helped assessing some of the reasons for which notorious e-learning platforms have gained their relevance, such as the simplicity and ease of use offered by Microsoft Teams and Zoom, in the individuals' routine, whereas others like Cisco Webex have shown to be more used for educational purposes rather than recreational purposes. In addition, the survey underlined even more people's preference towards traditional learning over distance one, which if seen through the lens of the average contemporary individual might seem quite understandable under a situation in which people have been restricted from the creation of physical relationships and bonds for over than a year, that certainly engage the individual more than the ones created and implemented virtually. Either way, half of the respondents affirmed that they will continue using e-learning tools also after Covid-19 therefore acknowledging the its relevance and its important role in the future as it forms a unique and fundamental device for confronting difficult scenarios, including external factors as Covid-19 is and has been in our world.

Conclusion

In conclusion, after having analyzed in depth some of the areas which have become the day-to-day reality we live in, e-learning has come as an effective solution to prevent a total and global catastrophe caused by the advent of the virus. On the same page, the proposed tools not only provided means in the educational sector but also within the worldwide working environment which, in turn, reflects the World Economy. As previously affirmed, the consequences of the pandemic have negatively affected the economy along with its futures' prospects, but one can firmly state that thanks to e-learning a substantial minimization of the damages, that would otherwise have occurred, has been implemented and most importantly has been crucial for carrying on during such a period. However, data also showed that the efficiency of the methodology in question is, non the less, much improvable. As expected, the use of new technology and other systems for supporting education has encountered many issues, starting from the physical and financial lack of the proper devices in some of the families, from the actual implementation of the service which didn't really proved to capture the demanded value. Moreover, even if not disgusted by the idea, the majority of individuals (referring to the ones who participated in the questionnaire provided but also generally speaking) still expressed more excitement towards the traditional implementation of education, therefore stating a higher level of satisfaction and engagement for 'normal classrooms'. At the same time, this last topic, seems quite reasonable in a scenario in which many people have suffered and lacked social contact between each other and between their respective families for over a year. Either way, as time passes new improvements and further developments in the industry will be made since the relevance that e-learning has gained during these latest years. Lastly, even after Covid-19, e-learning will no doubt cover a bigger role than before in our world, especially with improvements and upcoming trends on the way.

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