THE ROLE OF DISRUPTIVE TECHNOLOGIES IN HIGHER EDUCATION DIGITIZATION

Ioan-Matei Purcărea [78]

Abstract

The COVID-19 pandemic has proved that digitization is an imperative in higher education and the ability to adapt to the next normal will represent a powerful competitive advantage in the industry. This paper analyses the possibilities in establishing new practices in transforming higher education by implementing and using disruptive technologies, taking advantage from the collaborative nature between digitization and disruptive innovation. The pandemic is urging digital transformation of higher education institutions, forcing professionals in identifying opportunities, changing value propositions or developing new operating models for the challenges higher education faces. Growing interest in the academic communities for disruptive technologies adoption highlights the need for higher education institutions to become more agile and plan for the post-pandemic future. With a relevant digital strategy, the University is able to drive efficiency, create superior digital offer, enable curriculum improvements and meet students' digital expectations.

Keywords: Disruptive technologies, Digitization, Higher Education, COVID-19, Next normal

1. Introduction

On the path to the next normal, digital collaborations have been mandated by Covid-19, emphasizing digital collaborative technologies, redefining student engagement by using the collaborative learning concept which has gained even more power through breakout rooms that are providing a fruitful environment full of opportunities for students, allowing even more meaningful digital activities. The role of breakout rooms is to stimulate knowledge and engagement, providing "sense-making" avenues with case studies to summarize, situation analysis, problem-solving assignments, to support deeper learning, taking advantage of the available digital tools. The combination between digital and interpersonal collaborations will most likely continue to advance learning in the next normal.

According to the European Commission's "Digital Education Action Plan (2021-2027)" public consultations' results:

• 95% of the respondents consider that the use of technology in education and training will continue even after the COVID-19 pandemic;

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[78] Drd., Romanian-American University, matei.purcarea@rau.ro

• around 60% had not used online learning before the COVID-19 pandemic;

• respondents agree that online learning content and resources should be more relevant, easy to use and interactive;

• more than 60% of the respondents consider that they had improved their digital capabilities during the Covid-19 pandemic and more than 50% wish to do more.

2. Higher Education in the Next Normal

In this context, IoT is at the core of digitization, powering organizational transformation, creating research-and-innovation hubs. Emerging technologies like 5G and machine learning are enabling huge achievements to efficiency and control, both in the workplace and University.

Gartner's "2020 Magic Quadrant for 5G Network Infrastructure for Communication Service Providers" highlights top 10 market leaders, from Samsung and Cisco to Huawei and Ericson. The Quadrant ranks companies based on "execution and completeness abilities" regarding vision, placing them in four major categories: "Niche Players" (low vision, low execution), "Visionaries" (good vision, low execution), "Challengers" (good execution, low vision) and "Leaders" (outstanding in vision and execution).[79]

At *CES 2021*, 5G benefits for education were highlighted. The multinational telecommunications conglomerate Verizon underlined the impact 5G will have on immersive experiences, including education and the fact that by the end of this year, at least 100 schools will be provided with 5G capabilities, along with Virtual Reality (VR) and Augmented Reality (AR) for low-income schools.[80]

Also, at *CES 2021*, AR and VR advantages were spotlighted by *Healium*, the company that helps manage "U.S. Air Force mental health" using these disruptive technologies to combat mental health concerns and stress. Recently, the U.S. Air Force made the announcement that *Healium* was awarded "SBIR Phase 1 contract" to explore AR and VR, deploying its products to U.S. service members.[81]

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[79] Haranas M., "Gartner's Top 10 Global 5G Network Infrastructure Companies" (March 26, 2021). Retrieved from: <https://www.crn.com/slide-shows/networking/gartner-s-top-10-global-5g-network-infrastructure-companies/2>

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In education, according to "*eLearning Industry*", AR enables professors to highlight virtual examples of various concepts and add digital elements to provide even more support to class materials, this way, enabling students to efficiently engage, learn easier and faster.[82]

Benefits of AR in education include:

- *easy access anywhere and anytime*, AR has the advantage of offering support for traditional physical forms, printed textbooks/brochures;
- *engage students and raise interest*, improving capabilities and increasing collaboration between students, providing opportunities in making learning effortless and interesting;
- *immersive learning*, helping students connecting in real-time with experiences and control the outcomes;
- *effective learning*, helping students improve their knowledge base with the help of immersion and visuals regarding the subject.

Through Immersive Learning, students have the possibility to deeply immerse, eliminate all distractions by entering the virtual world, increase their motivation and emotionally connect in a highly engaging realistic environment, and benefit from the personalized learning approach.

Another relevant and efficient way to improve remote learning is by enhancing it with VR that has the advantages of increasing student engagement and retention, while VR headset prices are quite low and increased quality of the content through the devices is being provided. Often VR headsets used in remote learning include: Samsung Gear VR, Oculus Go and HTC Vive.[83]

The main benefits of experiential learning with VR devices include the following:

- *Student learning acceleration*, learning can significantly improve by visualizing the learning material;
- *Safe learning digital environment*, if students mistake during the digital journey, the effects are minimum as they happen in a controlled virtual world;
- *Removes the theory - practice gap*, students can experience what they learn in a 3D virtual environment, providing them with more relevant learning experiences;
- *Increases engagement,* students have the possibility to virtually collaborate and learn from one another*.*

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[82] Sinha S., "Augmented Reality In Education: A Staggering Insight Into The Future" (January 2, 2021). Retrieved from <https://elearningindustry.com/augmented-reality-in-education-staggering-insight-into-future>

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Despite the fact they are closely related, experiential learning shouldn't be confused with immersive learning[84], the main differences being highlighted in Table no. 1

Table no. 1 "Differences between immersive learning and experiential learning"

Immersive Learning	Experiential Learning
Crucially leverages technology, such as Virtual Reality, Augmented Reality, mobile devices, etc.	Technology is not typically required
100% thinking capacity of learners is required	Usually requires less than 100% thinking capacity of learners
Always implements gamification in learning	Not necessarily game-based
Dynamic mechanics	Static mechanics
Learning happens by enabling a realization	Learning happens by enabling a skill
A single activity can lead to multiple iterations	Multiple activities make up a single iteration

Source: Kumar J., "Everything You Need To Know About Immersive Learning" (January 24, 2020). Retrieved from <https://elearningindustry.com/everything-need-know-about-immersive-learning>

Nowadays, innovative content creation, as well as life experiences creation is easier thanks to more accessible emerging technologies. In this context, strategic digital curriculum alongside with intuitive applications and digital devices dependence will benefit learning and design education for everyone.
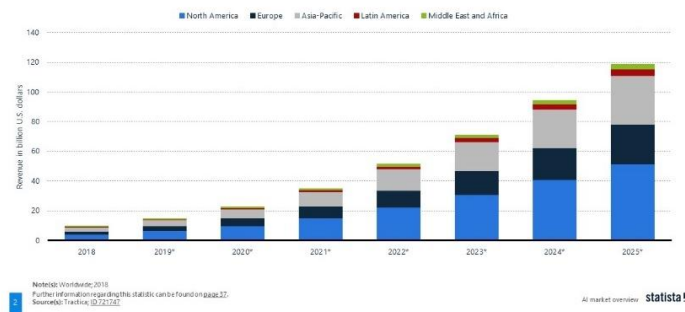

Fig. 1. "Revenues from the artificial intelligence software market worldwide from 2018 to 2025, by region (in billion U.S. dollars)"

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[84] Kumar J., "Everything You Need To Know About Immersive Learning" (January 24, 2020). Retrieved from <https://elearningindustry.com/everything-need-know-about-immersive-learning>

Source: "AI use in marketing", "Statista Dossier"
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>

Figure no. 1 highlights "Revenues from the artificial intelligence software market worldwide from 2018 to 2025, by region (in billion U.S. dollars)" ***Tractica*** forecast, North America is the regional market leader with major increase in expected revenues, followed by Europe and Asia-Pacific, other major regional performers regarding AI software, expected as well to have a major market growth.[85]
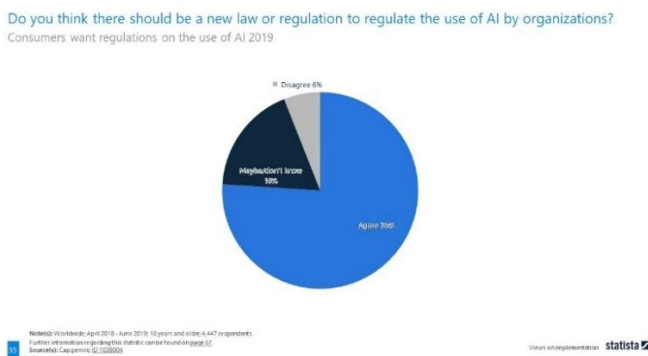

Fig. 2. "Do you think there should be a new law or regulation to regulate the use of AI by organizations?"
Source: "AI use in marketing", "Statista Dossier"
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>

A ***Capgemini*** survey conducted worldwide between April 2018 to June 2019 (Fig. no. 2) on 4,447 respondents, 18 years or older, highlighted consumers' needs (76% of the respondents) regarding the existence of a "law or regulation to regulate the use of AI by organizations".[86]
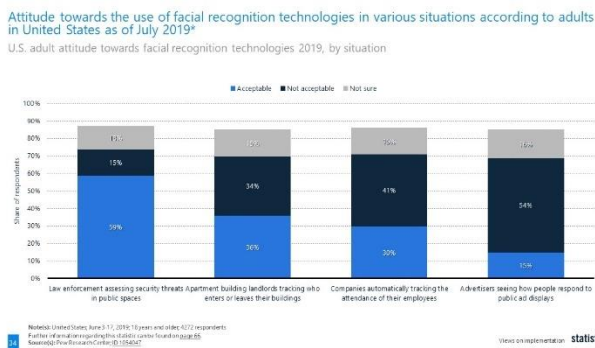
[85] "Statista Dossier", "AI use in marketing". Retrieved from
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>
[86] "Statista Dossier", "AI use in marketing". Retrieved from
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>

Fig. 3. "Attitude towards the use of facial recognition technologies in various situations according to adults in United States as of July 2019"
Source: "AI use in marketing", "Statista Dossier"
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>

A **Pew Research Center** survey conducted in June 2019 (Fig. no. 3) on 4,272 respondents from the United States, highlighted the fact that 59% of the respondents accept the "use of facial recognition technologies by law enforcement" when there are concerns regarding security threats in public, while the level of acceptance regarding "advertisers' use of this technology" is quite low, only 15% of the respondents.[87]

The post-COVID-19 pandemic world means better use of new analytics technologies to make better decisions for the future, improving agility and resilience, while considering the evolving digital behavior, as well as aligning the digital strategy with the evolving consumer expectations.[88]
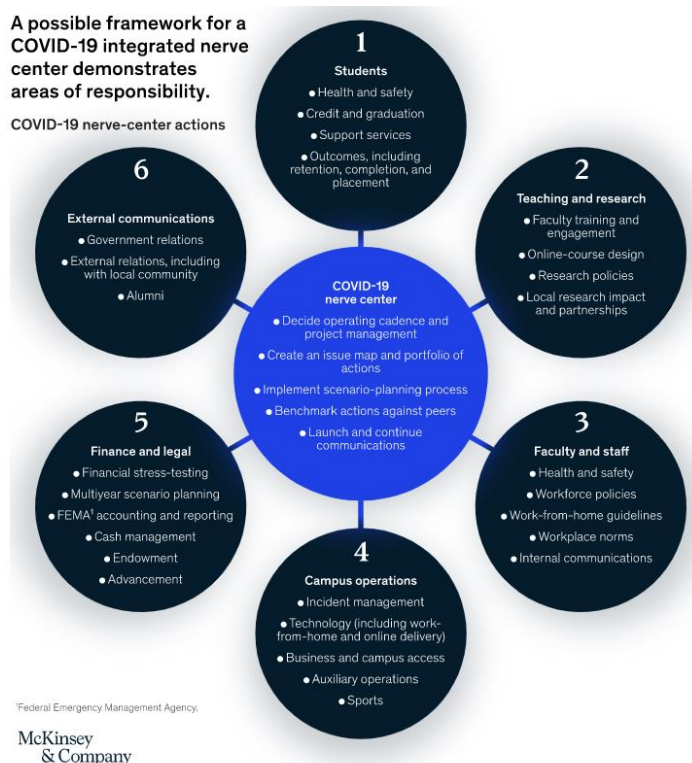

Fig. 4. "COVID-19 NERVE CENTER"

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[87] "Statista Dossier", "AI use in marketing". Retrieved from
<https://www.statista.com/study/57404/artificial-intelligence-use-in-marketing/>
[88] PURCAREA, I.M., 2021. "The Disrupted Retail and the Innovative Technology: Connecting Data..," Romanian Distribution Committee Magazine, vol. 11(4), pages 32-42, January.

Source: "Coronavirus and the campus: How can US higher education organize to respond?" <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/coronavirus-and-the-campus-how-can-us-higher-education-organize-to-respond#>

Figure no. 4 shows **McKinsey & Company's** proposition for an "integrated nerve center" at the beginning of the Covid-19 pandemic, a flexible, simple and multidisciplinary construct designed to easily adapt and rapidly respond to changing conditions.[89]

The above figure shows a framework highlighting areas of responsibilities for the "Covid-19 nerve center", organized around the core of it, and consists of the "Covid-19 nerve center"; Students; Teaching and research; Faculty and staff; Campus operations; Finance and legal; External communications.

Four types of actions are being considered in the "Covid-19 nerve center", organized around teams with specific areas regarding responsibilities:

1. **Discover** from a relevant perspective on the situation and make use of the economical and epidemiological available information, also seeking data from leaders, faculty, students, alumni and other stakeholders;
2. **Decide** what actions are needed right away, while securing agreement with the university and community values;
3. **Design** a pragmatic portfolio with immediate strategic directions;
4. **Deliver** efficient solutions, while ensuring flexibility.

Massive changes have occurred as a result of the unprecedented disruption produced by the Covid-19 pandemic, experiencing radical transformation of higher education with accelerated change in record time. Relevant infrastructure and technological platforms with solid servers hosting them are required for the digital education process in order to efficiently assist the virtual workload. Results of a recent research paper reveals the use of a plethora of technological platforms and tools such as video-conferencing, streaming conferences, educational applications, instant messaging and Massive Open Online Courses (MOOCs), to provide support for new methodologies in enabling learning processes, new alternatives for traditional learning.[90]

[89] Illanes P., Law J., Mendy A., Sanghvi S., Sarakatsannis J., "Coronavirus and the campus: How can US higher education organize to respond?" (March 30, 2020). Retrieved from <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/coronavirus-and-the-campus-how-can-us-higher-education-organize-to-respond#>

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3. Conclusions

1. With a relevant post-pandemic digital strategy, the University has the opportunity to redefine student engagement by using collaborative learning, to drive efficiency, create superior digital offer for students, build a digital campus, as well as a long-term digital learning environment, enable curriculum improvements and meet students' digital expectations, to advance learning in the next normal.

2. Following the unprecedented disruption as a result of the Covid-19 pandemic, the disruptive innovation has proven to be a powerful way in obtaining innovation-driven growth. While adapting to the next normal, evolving higher education digital behavior ensures better planning of the curriculum and better decisions for the future.

3. Growing interest in the academic communities for disruptive technologies adoption highlights the need for higher education institutions to become more agile and plan for the post-pandemic future, while providing relevant support for new methodologies in enabling new learning processes.

4. In the post-COVID-19 pandemic world, Higher Education has to deliver the latest organizational digital capabilities for effective digital planning and relevant digital learning content with advanced digital skills.

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