

Disruptive Technologies transforming lives with reference to COVID 19 Online Education: A Review Paper

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Abstract

The wave of innovation and logical progression continues unabated and on multiple fronts. Almost every breakthrough is lauded as a step forward, and the list of "next great things" continues to increase. Nonetheless, a few innovations have the potential to completely transform the situation, altering how people live and work, reshaping value pools, and creating entirely new products and services. The present Coronavirus pandemic is unexpectedly and drastically changing how individuals work, live, and communicate on an overall scale. The educational system is undergoing rapid transformations. The instructive framework is going through quick changes. These powerful moves can be deciphered according to the point of view of the problematic development hypothesis, which expresses that past associations were taken out from their areas because of their laziness in embracing innovation. Gigantic open internet-based courses (MOOCs), which were as of late presented, are considered as an incredible innovative power changing the instruction climate. The role of "disruptive" novel technology in higher education is examined in this research. These intriguing innovations, according to Disruptive Innovation theory given by Christensen's, are not expressly meant to improve advanced education learning and instruction, but they do have instructive potential. The motivation behind this review is to exhibit how advanced education foundations are going through key adjustments because of the need to digitize education and preparing exercises. The conversation and end unite central issues that can be utilized to the digitalization of education in the near future.

Key words: Disruptive Innovation, Online education, COVID 19, MOOC

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1. Introduction

The term Disruptive Innovation (DI) has been a buzz word for this decade. Disruptive Innovation has been used by many research scholars to identify and explain the phenomenon which have the potential to transform the world in a better constructional way. This paper uses the the concept of Disruptive Innovation as used by Christensen to identify the processes which have the promise to change the existing systems in a positive way (Christensen, Baumann,, & Sadtler, 2006). The theory identifies that the agents of DI first target the segment which have been largely missed by the general market while delivering products and services. They usually offer these products and services at low prices and ensure catering to the overlooked needs of the segment. The agents or precursor of disruptive innovation then move to major segment of the market to capture the masses through the promise of same functionality which had been neglected or missed by the other providers.

The COVID-19 pandemic has had disastrous impact across the globe (Anuj & Nishu, 2021). Many industries like Hospitality, Tourism, Stock Market, Real estate, and education faced the brunt of the pandemic (Bindu, Archana, & Anuj, 2021), (Wang, 2022). It halted the pace of higher education, across the globe. (Arslan, 2022) The education industry was faced with unprecedented challenges and trials. The virus resulted in mental stress, anxiety, and depression in the world (Pujari, 2021). The spread was very fast and widespread (Kumar K. M., 2022). Most of the industries found it difficult to overcome. This trial became more significant as the customers of higher education came from different income, literacy, technical abilities, and geographies. The income divide became more significant when clubbed with digital divide. The learners varied in their ability to grasp the modes and technicalities of online education. Historically, a learner's learning possibilities have been restricted by the resources limited to geography, income, and institute affiliation. The introduction of new technologies has helped to mitigate the issues resulting due to the pandemic (Kumar, 2021). The main ones which have helped the world are like Artificial Intelligence, Big Data analytics etc. (Bhalerao, 2022). These new technologies have helped education industry also to bring education to every learner.

Online learning allows learners to tap resources and expertise anywhere in the world. It opens up the world of knowledge and skills to all residents of the world beyond the country and religion divide. It offers historically disadvantaged students with greater equity of access to superior quality learning materials, expertise, personalized learning, and tools for planning for future education. Massive Open Online Courses (MOOCs) have been the solution to the issues plaguing the world, especially the developing countries with their massive poor population and rural-urban divide. It also offers more learning choices to learners who wish to enhance their employment opportunities and career growth prospects with added learning and certifications. The flexibility in online learning enables students to apply the learnt subjects in congruent to their learning styles (Phillips, Schumacher, & Arif, 2016). It also provides an additional benefit in earning a certificate at the user's own pace while working full time and spending good time with their loved ones (Tomlin, 2018). And the perceived advantages of online are that the courses could fit in the schedule of the learners saving time and that they could accommodate more courses than using traditional methods (O'Malley & McGraw, 1999).

Disruptive nature of MOOCs

'Disruptive technology' as termed by Christensen denotes the new technology which has the capacity of attacking established products of the entering markets at lower cost and notable

performance measured on a traditional scale. Though these technologies have limitations of ignoring the discontinuous change patterns, they are significantly powerful in broadening the markets for new functionality (Utterback & Acee, 2005). Besides, disruptive technologies establish novel market segments that enroute the new products to the early adopters or to attain the leading edge of the niche markets. The pandemic crisis has thrust educational institutions to digitise teaching despite lack of required skills to teach online. MOOC is viewed as a change agent with the disruptive nature that differs from the traditional educational norms (Ossiannilsson, Altinay, & Altinay, 2016). With the availability of many technological tools for online learning; the students, teachers and universities are forced to adapt to the situation amid several disruptive challenges. MOOC can be truly disruptive only if it could complete the existing markets with low-cost business models at high quality and penetrate deep in the markets replacing the established organisations (Langen & Bosch, 2013).

Initially, MOOC was considered a disruptive innovation as it attracted huge academic and public environments. Nonetheless, strategic moves of venture capitalists and elite universities transformed the focus of MOOCs from *disruptive innovation* to *sustaining innovation* (Bozkurt, Akgun-Ozbek, & Zawacki-Richter, 2017). Findings of Al-Imarah & Shields (2018) reveal that MOOCs can be considered as a sustaining innovation for learners outside universities, thus establishing new markets. Besides, it does not match all the disruptive innovation characteristics found in literature. For instance, the *social embeddedness* feature of the institutions is not compatible with MOOCs. Because of the solid rationalised institutional logic, higher education institutions continue undisrupted. And the main issues of MOOC to be considered disruptive in the educational landscape as identified by Hyman (2012) are business models, certifications and student evaluations (Hilmi, 2016). Therefore, MOOCs phenomenon can be partly disruptive and partly a transient bubble (Perelman, 2014). Indeed, the major influential effects offered by MOOCs include flipping the classroom, improvements in adult education, and opening up education to everyone (Langen & Bosch, 2013).

Disruptive potential of MOOCs

Moreover, the MOOC wave has made the access to knowledge and social innovations more open. Also, the new trend has caused the *academic-bureaucratic* complex go bankrupt (Perelman, 2014). So, MOOC is a mere symptom of academia's *obsolescence* and universities risk becoming outdated in their pursuit of retreat the new entrants (Christensen, 2008). MOOC is an effective tool to be employed in the experimental space of institutions to explore the better possible ways to teach students productively. And less overlap is being observed between the University MOOC market and the Start-ups' MOOC market. Besides, the bargaining power of buyers and suppliers is very high with vendors such as Pearson, Google and Blackboard being important for the functioning of the university models (Jacoby, 2014). However, new business models and technology enablers could cause a low-cost market disruption serving to students' need towards enhanced performance (Yuan & Powell, 2013). Furthermore, the major threat is the 'quality assurance' of the courses offered by the private institutions as they are not enshrined by the law of the state and monitored by the Quality Assurance Agency. Indeed, the disruptive potential of MOOC can be assessed through three steps: (i) asking appropriate questions on significance, (ii) draw the trajectory maps to determine the quality and the content, and (iii) decide whether it could penetrate the mainstream market (Hilmi, 2016). Based on the three criteria, MOOCs cannot be a direct competitor for the traditional degree providing college educational business models;

but it would facilitate other developments that disturb the educational landscape (Langen & Bosch, 2013).

Overcoming the challenges of Disruption

Since the pandemic has not allowed students to get back to universities and colleges, several activities were undertaken by the institutions and government to save learning undisrupted. For instance, Chinese government's 'Ensuring learning undisrupted when classes are disrupted' initiative has online educational components, despite the challenges of staff-student isolation and lack of time to get acclimatised the unexpected circumstance (Huang, Tlili, Chang, Zhang, Nascimbeni, & Burgos, 2020). However, these challenges could be overcome by open educational platforms (OEPs) and open educational resources (OERs). For a better learning experience, the educational institutions must be aware of the obstacles to encounter them effectively. Some commonly encountered problems are related to copyrights, choosing high-quality OER, lack of self-organising abilities, communication capabilities for the online scenario, and lack of technical skills. In addition, digital divide and equitable student learning experience are severe challenges for the universities ensuring the less privileged students no longer feel disadvantaged (Garcia-Morales, Garrido-Moreno, & Martin-Rojas, 2021). Moreover, optimal designing of courses is of serious concern to balance individual learning and collaborative learning fostering student engagement.

As the temporary closure of educational institutions has affected more than 60% of the student population (UNESCO, 2020), it becomes extremely indispensable to analyse the obstacles and combat that with suitable measures. Some guidelines to overcome challenges: teachers facilitating interactive learning by promoting open learning communities, gaining digital literacy, getting trained up to use technological tools, disposable assignments to be replaced by engaging students in creative activities, choosing OERs with enough credibility, self-regulation and collaboration (Huang, Tlili, Chang, Zhang, Nascimbeni, & Burgos, 2020). Besides, proper infrastructure must be implemented to mitigate the technical problems in encountering the disruptive impact. Even in times of disruption, MOOC learning tools such as mooKIT, a cooperative learning pedagogy offered in India can be adopted for enhanced teaching purposes and better learning experiences. Moreover, the open and distance learning (ODL) participants have perceived mooKIT to be enjoyable, interesting, knowledge, flexible, relevant, and useful with supportive instructors (Garcha, Mkwizu, & Sharma, 2020). It is highly recommended for the educational institutions to deploy the opportunity to digitise themselves; rethinking the way of delivering the teaching content and getting students engaged. In this regard, gamification and adequate contingency strategies would be an asset (Rodrigues, Franco, & Silva, 2020).

Impetus for future investigation

MOOCs have compelled the policy makers, administrators, and instructors to draw clarified conclusions in defining the completion and success in addition to the pedagogical approaches, business models and delivery methods. Evidence suggests that more detailed research is required to know the level of disruption MOOCs has created and its extent as well as permanence (Jacoby, 2014). Whether MOOC has been perceived as a disruptive innovation or a threat by the higher educational institutions offers an impetus for future research investigations. Moreover, Rodrigues, Franco, & Silva (2020)'s study calls for the need of an empirical research in truly assessing the socio-economic impact of the pandemic in transforming the lives of people. Hence,

more experimental research and correlational studies are required to explore the influential nature of MOOCs (Bozkurt, Akgun-Ozbek, & Zawacki-Richter, 2017).

2. Methods

Objectives of Research (Research Goals)

- To study the phenomenon of 'disruptive innovation' using Christensen's Disruptive Innovation principle.
- To explore the effect of "disruptive" progressive technology in higher education institutes during COVID-19 disruption
- Finding the above goal through PRISMA framework
- Review of the literature identified through PRISMA flow diagram

To achieve these objectives, the following disruptive innovation topics were discussed: new processes and techniques of coaching and learning in online education, the possibilities and threats of disruptive innovation, and conclusions and recommendations for policymakers and higher education institutes.

The subsequent sections begin with explaining the materials and methods used to conduct the research. Following that the results are reported. Finally, the discussion part presents the conclusions drawn from the analysis and its implications.

Materials and methods

Since the article invokes reviewing literature concerning disruptive innovation in higher education and to learn the impact of disruptive technology in the Covid-19 scenario, the research incorporates most relevant literature obtained through systematic analysis. Hence, the research takes place in two phases. During the first phase, articles are selected using an established selection mechanism known as PRISMA method (Urrutia & Bonfill, 2010). Based on the recommendations of the PRISMA method, the study incorporates the flow diagram as shown in figure 1. In order to locate the most credible literature, articles are searched using the *Scopus* database, which is one of the largest databases having more than 27 million abstracts related to scientific literature (Burnham, 2006). In addition, articles from other sources are also used. Within the database, Boolean search terms are applied using the search terms like “disruptive* innovation,” “disruptive* technology,” “Christensen’s* disruptive* innovation* principle,” “possibilities* and threats* of* disruptive* innovation,” and “new* processes* and techniques,” and “Covid-19* disruption.” Initially, 54 documents were identified from the *Scopus* database, whereas 15 documents were identified from other credible sources. Then, the duplicate records (n = 12) are removed. Also, the records with irrelevant constructs (n = 9) are also removed. After that, exclusion criteria like articles in English language (n = 1) and articles not having direct association with the objectives (n = 3) are removed. Finally, 44 articles are chosen for analysis. In the second phase, a detailed qualitative literature review of the 44 articles is done and the contents relevant to the research objectives are analysed.

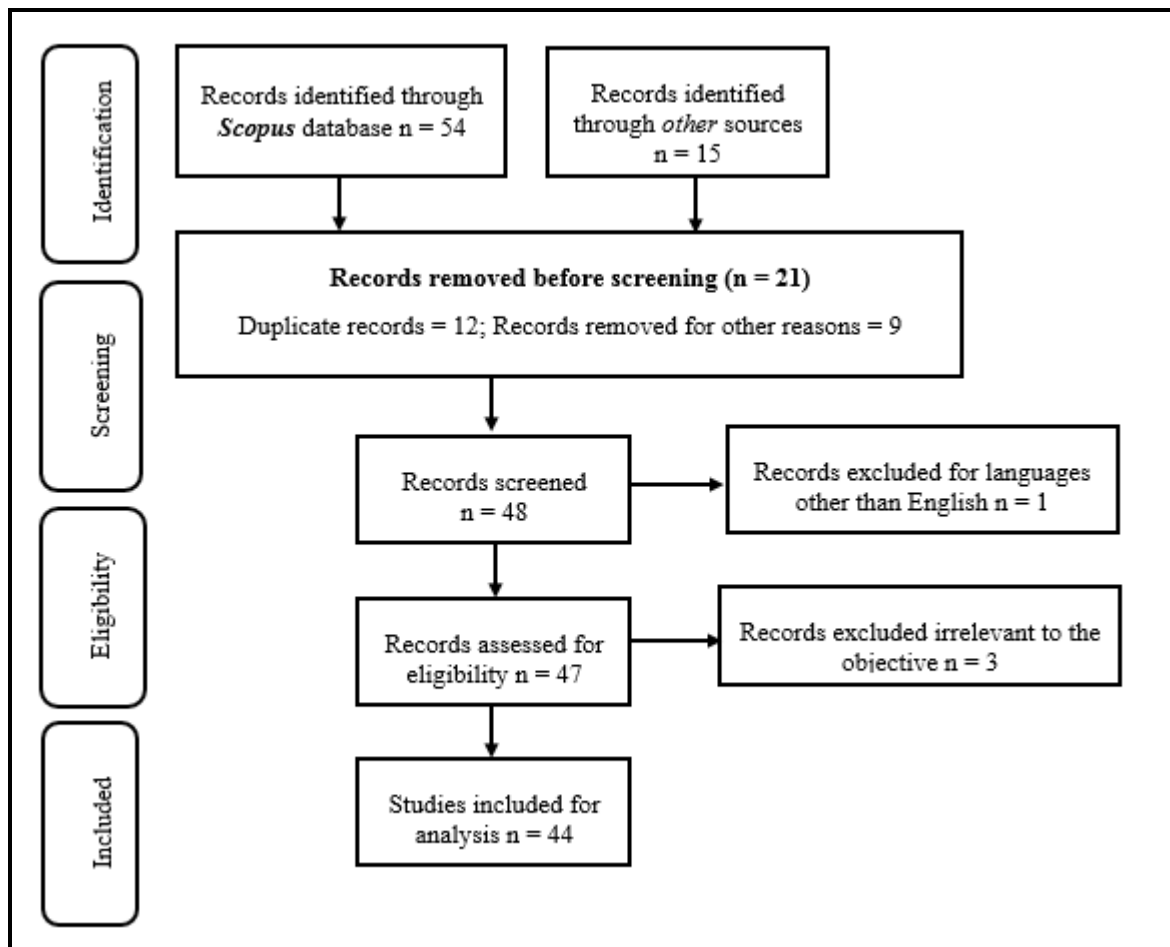


Fig. 1 PRISMA flow diagram employed in the research (constructed by referring Haddaway et al. (2022))

Research Gap

After an extensive literature review through PRISMA flow chart, it has been identified that there are very few papers which have attempted to study MOOCs phenomenon as a disruptive innovation. The role of "disruptive" novel technology in higher education is examined in this research. These intriguing innovations, according to Disruptive Innovation theory given by Christensen's, are not expressly meant to improve advanced education learning and instruction, but they do have instructive potential. Most of the research in this field addresses the MOOCs-content and pedagogy but only a few research address the need to understand whether MOOCs and such technologies can be termed as disruptive innovation.

3. Results

Massive Open Online Courses (MOOCs) have been hailed as a riposte to the trials thrown by the pandemic. It started its journey by catering to those customer segments which were majorly neglected by the education industry. The learners who wanted to learn on their own pace, in the comfort of their personal space in contrast to the one size fits all market model of existing education industry. This was the commencement of disruption which promised personalization of learning. It enabled many learners across the age, income, caste, creed, colour, and geographical divide to enhance their knowledge through MOOCs. The MOOCs have the potential to fulfil the

lacunas of existing education system which was troubled with the limitations of huge costs of infrastructure, mobility, accessibility and other constraints like time and availability.

The pandemic accelerated the pace of this disruption by fuelling the need of learning, which is delivered online, which has almost negligible set-up costs and which can be initiated with minimum logistic requirements. This was the onset of a disruptive innovation which was now available to masses at low costs and satisfied their unfulfilled demands. It challenged the existing business models in the sense that now the learning was available on demand, and it could be fragmented and paced according to the requirements of the customer segments.

Christensen has defined DI as a process whereby a company with fewer resources is able to successfully challenge established incumbent businesses (Christensen, Raynor, & McDonald, 2015). The MOOCs needed lesser resources and it challenged the existing business models of the education industry with its low-cost, higher accessibility and improved functionality of better, convenient delivery of learning catering to the increasing needs of the customers. MOOCs are a perfect fit to the definition of DI as they have a possibility to cater to demands of masses who with the onset of virus are apprehensive of going to a public place with large number of people in a closed space with proximity to continue their education.

The basic characteristics of DI which is that they bring about systemic social change through scaling and replication (Christensen, Baumann, & Sadtler, Disruptive innovation for social change, 2006) have been promised by the MOOCs. They have been a solution to the need of the crippled orthodox education system especially of the developing countries which could not cater to the current trends and demands of the dynamic higher education. MOOCs have offered a platform to the customers of such markets to augment their learning and skills through their offerings.

4. Conclusion

Processes and techniques of coaching and learning in online education

Processes and techniques of coaching and learning in online education have been improving since the beginning. The literature review identifies the parameters which have been considered crucial in improving the learning potential of online education. The significance of learner engagement and motivation has been identified by many researchers. Similarly, lots of consideration has been given to the designing of the course. A well-articulated design of an online course improves student engagement through detailed explanation on how to solve problems (Fink, 2007). The learning and knowledge enhancement depend on the clarity of subject communicated, fostering learners' interest towards the course content, perceived instructional outcome, and preparing and organizing the course material (Theall, Wager, & Svinicki, 2021). The existing literature has also given due importance to the clarity of objectives and specification of learning outcomes and well-defined evaluation criteria, and relevant logistical information (Foster, 2020). The research also underlines that the technical requirements of an online course must be operable, perceivable, robust, and understandable (Truckle, 2019). These MOOCs have immense impact on the instructor learner interaction enhancing the quality of learning experience. The MOOCs have transformed the historical role of the teacher or instructors in the education system. The significance of coaching and mentoring has been given more leverage than teaching and lecturing. In an online learning environment, the role of the instructor gradually evolves from being authoritative to becoming supportive (Peltier, Drago, & Schibrowsky, 2003). The process of peer-to-peer interaction is also considered very important. Electronic access to communication

through online discussion forums are the contemporary methods of imparting details in web-based learning.

The COVID-19 pandemic has been a game changer across the globe (Rejula, 2021). It forced education providers all over the globe to search for alternatives to face-to-face instruction. This gave way to online teaching and learning, which have been used by instructors and learners on an unprecedented scale. A disruptive innovation is a market intervention which creates a new product/service and value network and ends in disruption of an existing market and incumbents, displacing established market leaders and alliances. Online teaching especially MOOCs have the potential to be a disruptive innovation as per the Christensen definition as it displaces the historic value network of face-to-face instruction. It harbingers the era of low-cost, high quality, personalized and highly accessible education which provides the value of flexibility to the learners. Like any DI, it has disrupted the market with improved value innovation model of convenient and personalized learning.

Most educational institutions in the disciplines of choice have transitioned to online education. Tele or video conferencing, E-portals, webinars, websites, video recordings, simulations, and online tests were regularly cited as the main ways of running classes and gauging student performance. Disruptive technology adoption has a positive influence on an institution's resource efficiency, processes, earnings, and even strategic advantage during the COVID-19 pandemic. E-learning adopters who continued to learn online, in contrast to this, higher education institutions that had a lot of trouble deploying e-learning as a disruptive technology stayed closed to students. The institution had to cancel physical education lessons because of COVID-19 avoidance. This needed the quick uptake of e-learning platforms as well as the introduction of disruptive technology. People look for ways to accept technology innovation before making additional commitments to adopt it.

According to the research study, many both educators and learners are not familiar with the idea of online learning. However, you may successfully grasp the online education process if you have the correct information. The spike in COVID-19 infections during the lockdown has made people feel more anxious. Mental stress prevents students from focusing on their studies. It is incredibly challenging to get ready to continue your studies when there are educational institutions closings, postponed exams, and uncertainty about the future. All activities are contingent on communication, and since lockdown, technology-enabled communication has taken the place of face-to-face interactions has restrictions of its own (Debbarma I, Durai T., 2021).

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