

Can MOOCs Reskill and Upskill the Indian Workforce for the Industrial Revolution 4.0?

Durgesh Tripathi¹ and Surbhi Tandon²

Guru Gobind Singh Indraprastha University, India

drdurgeshtripathi@ipu.ac.in

surbhitandon71@gmail.com

Abstract: Industrial Revolution 4.0 is blurring the boundaries between human intellect and technology. It is characterized by technologies like Artificial Intelligence, Machine Learning, Blockchain Technology, Robotics, Internet of Things among others. The much-celebrated Industrial Revolution 4.0 will create massive job losses in developing countries including India due to the automation of jobs and processes. Thus, there is a dire need to reskill a vast majority of the workforce for the Industrial Revolution 4.0 which has already begun to be implemented due to its optimization and efficiency in resource usage. According to an estimate by OECD, the nature of 1/3rd of the jobs will transform due to technological interventions. Whereas World Economic Forum has set an ambitious target of reskilling at least 1 billion people by 2030. It believes that the world is undergoing a reskilling emergency. On the other hand, Massive Open Online Courses (MOOCs) were conceived as an online version of distance learning and are increasingly being seen as a medium for filling the skills gap. Higher Education Institutions (HEIs) are relying on the MOOCs courses along with utilizing the tools of Web 2.0 to cater to the demands of quality, affordable and accessible education to all. MOOCs also caters as a platform for the promotion of lifelong learning. COVID 19 has provided a spurt to the acceptability of MOOCs courses with most Edu Tech start-ups and MOOCs websites registering double-digit growth in the recent past. Coursera's 2020 impact report showcases that India has become the second-largest market for MOOCs with 9.84 million learners after the USA which has 14 million learners. The paper investigates the viability of the MOOCs courses in filling the skill gap as well as the reskilling of the Indian Workforce. It will also delve into whether the MOOCs courses can bridge the digital divide with the country having the world's largest unconnected population. It will critically engage with the question of whether Industrial Revolution 4.0 requires only highly specialized technology-based skills or soft skills or a combination of both for future jobs.

Keywords: Industrial Revolution 4.0, reskill, Indian workforce, MOOCs, youth

1. Introduction

MOOCs (Massive Open Online Courses) added an important and vital dimension to the Open Education movement. It seemed like a logical progression to the Open Education Resources (OERs) that served as an important database and resource tool for the academics and learners across the globe since the initial phase of computing (Liyaganawardena, T., Adams, A. & Williams, S. 2013). The term MOOCs was coined by Stephen Downes and George Siemens in 2008 reflecting upon the idea of a 'connectivist distributed peer learning model' in education (Baturay, 2014). Whereas others attribute the term of MOOCs to Dave Cormier and Bryan Alexander based on their commentary on the course run by George Siemens and Stephens Downes associated with Connectivism and Connective Knowledge (Weller, 2014). MOOCs generated an instant interest due to their potential of offering free online courses that are open to all and provide immense networking opportunities. The idea of MOOCs seemed irresistible when it appeared as the world's leading educational institutions and universities such as MIT, Stanford, Harvard began to offer such courses through various open technologies and learning management systems such as Moodle or self-created systems such as Stephen Downes' gRSShopper. The overwhelming interest of the learners and the media attention garnered by MOOCs led to the declaration of 2012 as the 'Year of the MOOCs' by New York Times (Pappano).

MOOCs have opened a myriad of opportunities for the educational institutions and even the private sector for imparting distance education and lifelong learning opportunities through the creation of digital content and communicating them through various internet-based applications, portals, and learning management systems. MOOCs are also aligned with the Sustainable Development Goals for 2030 set by the United Nations in consultation with the member states especially Goal 4 which envisages quality education as a means for upward socio-economic mobility and an almost assured chance of escaping poverty.

¹ Assistant Professor, University School of Mass Communication, Guru Gobind Singh Indraprastha University, New Delhi, India, drdurgeshtripathi@ipu.ac.in

² Ph.D. Candidate, University School of Mass Communication, Guru Gobind Singh Indraprastha University, New Delhi, India surbhitandon71@gmail.com

However, the low completion rates of the MOOCs courses have been considered as a major drawback, especially in a developing country. Researchers have suggested conducting comparative studies on the adoption, delivery methods, and implementation of the MOOCs courses in developed vis-à-vis developing countries (Bordoloi, Das, and Das, 2020).

Industrial Revolution 4.0 has been characterized by an overwhelming overlap between human intelligence and technology and in some cases, it even far exceeds human intelligence. It is characterized by a significant transition from the electronic-based industries to the fusion of new and emerging technologies like Artificial Intelligence, Robotics, Nanotechnology, Internet of Things in each aspect of the smart factories. The rapid change would be ushered by the interconnectivity between devices and automation leading to newer and higher levels of efficiency, better decision making, and enhanced level of responsiveness to the customers. Smart Factories would be embedded with advanced sensors, software, and robotics to facilitate machine-to-machine communication and the Internet of Things. It has been viewed as a paradigm shift in industrial capitalism which would be epitomized by the increased automation, predictive maintenance, and self-optimization of the processes.

According to the World Economic Forum's Global Risks Report, 2021 over 85 million jobs will get automated in the coming five years thus, seeking an urgent need for the re-skilling of the youth and preparing them for the changing nature of work. Global Risks Report 2021 also mentions that 'livelihood crises' have been ranked as the second topmost short-term risk to the world as 'infectious diseases' as per the Global Risks Perception Survey.



Source: World Economic Forum's Global Risks Report 2021

Figure 1: Global Risks Horizon

Whereas a report by McKinsey Global titled 'The Future of Work after COVID 19' estimates that 100 million people will have to find a new job by 2030 across the top eight economies of the world (China, France, Germany, India, Japan, Spain, the United Kingdom, and the United States) that account for around 62 % of the GDP of the world. The solution to the massive problem lies in the reskilling and upskilling for the current workforce and newer individuals joining the workforce. While World Economic Forum's Future of Work Report 2020 shows that employers have braced themselves for the challenge and in the second quarter of 2020 at least 1/5th of the employers have begun to provide opportunities to their employees for online learning and up gradation to meet the challenges of future ushered due to the digital leap. (Monaghesh and Hajizadeh. 2020). Whereas a survey conducted by Udemy for the Indian Workforce showcases that at least 92% of the employees themselves feel that there is a skill gap and they need to update their skills to remain relevant to the job market and competition.

2. Objectives of the paper

From the aforementioned deliberations, it may be assumed that there is a dire need for the reskill and upskill of the workforce in general across the globe along with the Indian Workforce which is facing a crisis due to the skills gap and may face livelihood crises in the near future due to the paradigm shift in the production of goods and services facilitates by the technologies that form the foundation of Industrial Revolution 4.0. Massive Open Online Course is an important digital tool that has been utilized by various government and non-government platforms for imparting new knowledge, skills, and full-time distance education. Thus, the paper aims to understand:

- 1. Viability of the MOOCs courses in filling the skill gap or upskill the Indian Workforce to meet the challenges of the future with the emergence of Industrial Revolution 4.0.
- 2. Can MOOCs play a vital role in imparting both vocational/technical skills and soft skills for future job requirements.

3. Review of literature

MOOCs are essentially free online courses that are open to all interested participants where educators use various technological tools to provide knowledge and content to those enrolled in the programmes.

3.1 Characteristics of MOOCs

According to Baturay (2014), the key features of a MOOC's course are Open, Participatory, and Distributed. Here, Open refers to the ability of any interested individual with internet access to join a course without any difficulty gaining access to course and content shared publicly and even join discussions related to the course. Whereas Participatory refers to the active engagement of the learners with others including instructors, however, such participation remains voluntary. The third aspect is 'Distributed' has its roots in the connectivist approach where the course materials are circulated over a network and such materials act as an initial simulation for discussions, analysis, and further thinking facilitated by technology. Various MOOCs models have also been developed since their inception such as cMOOCs, XMOOCs, LOOCs, SMOCs.

According to Rohs and Ganz (2015), massive open online courses (MOOCs) hold great promise for lowering barriers to higher education because they charge low or no fees, can accommodate an endless number of students, and even circumvent the restrictions of space and time. Whereas World Bank (2012) said that such courses can serve as viable alternatives to formal educational systems, particularly in developing nations where access to higher education is constrained by a variety of restrictions and barriers. Though empirical evidence indicates that MOOCs and social mobility have yielded mixed results, with some studies indicating a higher career growth trajectory for individuals from disadvantaged backgrounds in relation to lower financial investments (Zhenghao, Alcorn, Christensen, Erikson, Koller, and Emanuel), and others indicating greater enrollment barriers for students from such backgrounds (Yanez, Nigmonova, & Panichpathom, 2014).

3.2 Limitations of MOOCs courses

Several empirical investigations (Liyanagunawardena, Adams, and Williams (2013) and the University of Pennsylvania in England) have demonstrated that the completion rates of MOOC courses are abysmally low, i.e., less than 10 percent. Numerous academics attribute significant dropout rates to the enormous number of "leisure learners" enrolling in these open and free courses. They believe that the goal of these students is never to complete a course or receive recognition, but rather to acquire the necessary skills and knowledge and then quit the course. As a remedy, several academics propose that the actual number of students enrolled in a course should be determined one week after the course's start date. Those learners who are active after the first week of the course should be considered "real learners" Some researchers have posited that insufficient supervision and a lack of importance placed on students' participation have contributed to the learners' disengagement (Vardi, 2012 Zapata-Ros,2013).

Furthermore, the lack of presence of a teacher/professor and the personal touch of the instructors also leads to disinterest in the course among learners (Kang & Im, 2013). Similarly, MOOCs courses limit the possibilities of doubt resolution in the virtual environment unlike in the classroom teaching where the doubts could be discussed, clarified, or resolved on the spot on a real-time basis (Atiaja, Guerrero, 2013).

Some of the important barriers identified by King, Pegrum, and Forsey (2018) to MOOCs and OERs in the Global South are:

- **Access to Internet:** They asserted that there are huge gaps in the rural area participation in the overall MOOCs participation from Global South due to Access to the Internet and other infrastructure barriers such as power supply, availability of computers among others. They showed a positive correlation between the regional enrolment into MOOCs courses and the strength of broadband bandwidth. There was a clear gender divide in Access to internet facilities.

- **Language Proficiency and Digital Literacy Skills:** Researchers have identified that around 75% of the MOOCs courses are in the English Language which marginalizes the native language speakers in Global South. Language Proficiency acts as a huge barrier to understanding the content and context of the course being taught. Digital Literacy Skills i.e., using keyboards, mouse, desktop computers limit the access to MOOCs courses however, it has been identified that Mobile Phones with simpler functionalities can bridge the barrier to a certain extent.
- **'Foreign' Nature of the Content:** Most MOOCs courses flow from North American or European Universities having limited relevance to the students of the Global South. The theories and examples of the MOOCs courses are not well adapted to the realities of the Global South.

3.3 MOOCs in India

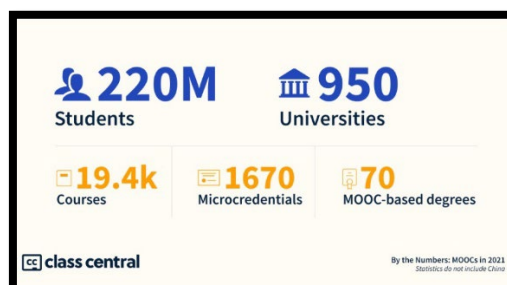
Recognizing the relevance of the MOOCs in the Open Education Movement, the Government of India launched its own MOOCs platform SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) Platform in 2016 under the purview of the Ministry of Human Resource Development (now Ministry of Education) (now Ministry of Education). The government selected nine national coordinator institutions to design, create, and deliver Massive Open Online Courses (MOOCs) courses to learners across India in a variety of fields, including multidisciplinary courses, beginning with the ninth grade.

A study conducted by Singh and Chauhan (2017) related to the application of MOOCs for the pre-service and in-service teacher for professional development showed that awareness amongst the teachers regarding the SWAYAM courses is low.

The Indian government has introduced the National Education Policy, 2020, which makes particular provisions for the incorporation of technology in higher education institutions (HEIs) in India and even promotes the concept of online learning via platforms such as SWAYAM. It seeks to create digital content, a digital repository, virtual labs, and an academic credit bank in order to promote digital education in India. Academic Credit Bank will facilitate the transfer of credits from MOOC courses to university students who are already enrolled. The University Grants Commission has increased the academic credit ceiling for online courses from 20 percent to 40 percent. According to the new government regulation, enrollment and participation in a MOOC course would be regarded equivalent to attending physical lectures in a classroom.

3.4 MOOCs in COVID 19 Pandemic

In an article titled 'Remember the MOOCs? After Near-Death, They're Booming' published in New York Times in May 2020, a 'renaissance' for the MOOCs courses was predicted – nearly a decade after its launch. The article makes an important observation that MOOCs courses have grappled with low completion rates with a 10% or lower rates whereas paid courses or those associated with earning credentials had around 40%-90% completion rates. Other strategies that were adopted by the various MOOCs platforms included having collaborations with the corporates and a visible tilt towards focussing on the development of skills especially those dubbed as future skills such as Data Science, Artificial Science, programming. One such platform is Udacity which made collaborations with brands like Google, Mercedes, Amazon to create courses apart from their courses.

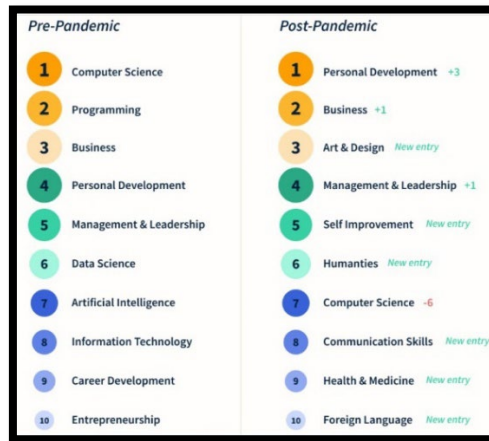


Source: Class Central: A Decade of MOOCs: A Review of MOOC Stats and Trends in 2021

Figure 2: Class Central: A decade of MOOCs

According to A Review of MOOCs Stats and Trends in 2021 given by Class Central, there has been a massive growth of MOOCs enrolments over the decade. As per the review, the MOOCs movement began with the three

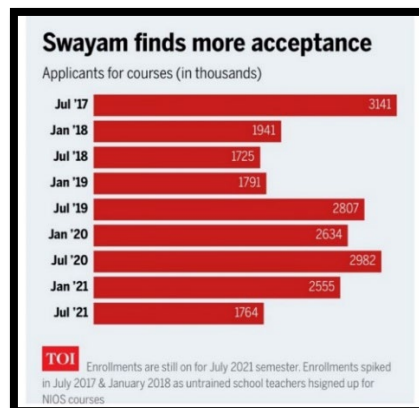
courses offered by Stanford University in 2012 with only 300K learners which have increased to 220K in 2022. In 2021, 3100 MOOCs courses were launched along with 500 Micro-credentials. Whereas the A Review of MOOCs Stats and Trends in 2020 by Class Central dubbed 2020 as the 'Year of MOOCs'. COVID 19 Pandemic gave an impetus to the MOOCs enrolments as learners across the globe both university students and professionals got more time in their hands due to remote work conditions and shutting down of the universities across the globe. Such conditions were necessitated due to the government-imposed lockdowns and work from home advisories in various countries. According to the 2020 Review, the three MOOCs platform Coursera, edX and FutureLearn combined attracted more users in April 2020 than all the users garnered by them in entire 2019. There was also a significant shift in the subjects opted by learners in pre-pandemic and post-pandemic situations. Technology-related subjects dominated the enrolments in the pre-pandemic situation whereas the post-pandemic situation oversaw a significant rise in soft skills and general topics-related courses. Though, 1/5th of the courses was related to COVID 19 pandemic with John Hopkin's Course on COVID 19 Tracing leading the list. On the other hand, Yale University's Science of Well Being saw 2.5 million enrolments in 2020 which were highest across all courses and categories of MOOCs courses.



Source: Class Central: The Second Year of The MOOC: A Review of MOOC Stats and Trends in 2020

Figure 3: Class Central: The second year of the MOOCs

Another important aspect highlighted by the Report of 2021 was the rise of non-university courses on the various MOOCs portal. The most renowned technology brands such as Amazon, Google, Microsoft, Facebook are creating MOOCs courses. Coursera had 31% non-university-created courses in 2020 which rose to 39% in 2021. edX saw a rise of 10% in such courses as it had 16% such courses in 2020 which rose to 26%. FutureLearn had 38% such courses in 2020 whereas in 2021 it had 51% courses from various companies. In the Indian context, there has been a rise in the acceptance of MOOCs courses, especially from the SWAYAM Portal as reported by Times of India in an article titled 'What makes Swayam attract IITs, IIMs, and crores of students? in August 2021. The news article reported that the platform oversaw 1.1 crore enrolments between July 2019 to January 2021. Thus, it attracted almost 27.44 lakhs learners every semester from 2019.



Source: Times of India -What makes Swayam attract IITs, IIMs, and crores of students? published

Figure 4: Times of India

According to the report, some of the popular courses on the platform are Python for Data Science, Machine Learning, Data Structures, and Algorithms using python and programming. Until 2021, at least 149 universities accepted the credit transfer from SWAYAM MOOCs courses earned by the learners. The learners completing the course and taking the end-term proctored examination on SWAYAM Platform have also risen with around 70,000 learners attempting the examination in 2018 to nearly 2 lakh learners taking the examination in 2019 and 2020.

4. Data collection

A descriptive and exploratory research methodology has been utilized for the study. The sources for the descriptive research were derived from an extensive search of two online databases Google Scholar and JStor for the particular study based on their relevance to the research objectives. The search words were MOOCs+India, MOOCs+Upskill, MOOCs+Reskill, MOOCs+Technical Skills, MOOCs+Vocational Skills, MOOCs+Soft Skills, and MOOCs+Higher Education. However, enough data sets were not available for meta-data analysis.

5. Results

According to a study titled *Lifelong Learning opportunities through MOOCs in India (2020)*, the most prominent issue with the government-sponsored MOOCs offered was the high dropout rate with almost more than 97% cumulatively. The study analyzed the data from the three National MOOCs coordinators namely Consortium of Educational Communication (CEC), University Grants Commission (UGC), and Indira Gandhi National Open University (IGNOU) that offers courses through the SWAYAM platform. The learners who had finished the course and applied for the final examination were less than 3% for UGC, under 2% for CEC, and less than 1.01% for IGNOU. The other barriers and challenges that they identified regarding the Indian MOOCs courses were lack of a common framework and ecosystem for MOOCs throughout the country, lack of teacher's acquaintance with the ICT technologies for educational purposes, unavailability of proper infrastructure to offer technology-based learning for the learners and digital divide. The hassle borne by the learners was credit transfer through MOOCs courses also becomes a barrier for the students whereas in some cases, universities do not offer such options for credit transfer.

Another study titled *'Bridging Students' Soft Skills Gaps with MOOCs'* about eLene4Work Project under Erasmus+ Programme was carried out in 9 European Countries between 2014-2017. The study was aimed to gauge the viability of MOOCs courses in imparting soft skills including digital soft skills. Imparting soft skills has an inherent challenge of bringing behavior change component. The researchers were trying to understand the feasibility of MOOCs courses for soft skills for the vacancies in labour market. The countries included in the study were Belgium, France, Germany, Greece, Finland, Italy, Poland, Spain, and United Kingdom. The study revealed that it was difficult to accommodate the learners with no knowledge in the subject with the students with a Ph.D. in the subject in a single course. It also identified that rich sources have to be developed to bring diversity which aids the learning and understanding of the participants. It recognized that engagement with the learners regarding their understanding and class materials is essential. It also emphasized the discussions taking place in participant-created digital spaces and vouched for creating social media groups to continue the discourse beyond the course as well. It identified tools and project-based MOOCs as more viable for imparting soft skills than traditional MOOCs with recorded lectures and assignments. It recognized the language as a barrier to the participants and success of the MOOCs courses.

'Paving the Way for the Future of Work' – a Canadian study recommended the alterations in the public policy to meet the demands of the future of work especially in the gig economy conditions where skills become redundant with the emergence of newer technologies every few years. It emphasized that academic institutions should prepare themselves for the on-demand upskilling courses as many sectors across the economy need a workforce equipped with newer technologies such as IoT, Augmented Reality, Machine Learning, 3D Printing. It recommended MOOCs and Boot Camps for courses like Coding for the regular updating of skills in the gig economy. It also gave the solution that tuition fees for such courses may be viewed by learners as part of the future salaries.

Another study titled *'MOOCs and Upskilling in Australia: A Qualitative Study'* showcased that MOOCs offered great flexibility to those employed in the various industries. The flexibility and the low cost of the courses were an advantage for the employed learners as they could manage their family and job commitments along with the acquisition of new and updated skills. The study pointed out that even professional associations recognized the contribution of MOOCs courses for gaining new credentials for the working professionals. It asserted that

MOOCs courses are ideal for the 21st-century work place which needs rapid technological adaptations. It believes that MOOCs offer an opportunity to the professionals to upskill themselves beyond the traditional university set up and diversify their portfolio through earning credentials. The study also recognized the need for more research in terms of the 'quality' of MOOCs courses as well as their 'success' rates in Australia. It also pointed out the low support from the employers for undertaking such courses as well as the lack of accreditation from the educational councils in the country.

6. Conclusion

MOOCs offer great potential for upskill and reskill the Indian Workforce especially with regards to the skills required for coping with Industrial Revolution 4.0. However, Upskilling and Reskilling remain a 'bottoms up' movement with learners being more pro-active in the voluntary updation of the skills. MOOCs should be considered as a viable open for reskilling and upskilling by both the government institutions and companies. However, there is an increased need for more research on the design, development, and delivery of the MOOCs courses for developing 21st-century skills in the learners considering the high attrition rates of the courses.

References

- Atiaja, L. and Guerrero, R. (2016) "MOOCs: Origin, characterization, principal problems and challenges in Higher Education," *Journal of e-Learning and Knowledge Society*, 12(1), pp. 65–76
- Anani, N. (2018) "Paving the way for the future of work," *Canadian public policy. Analyse de politiques*, pp. 1–10. doi: 10.3138/cpp.2018-012.
- Bordoloi, R., Das, P. and Das, K. (2020) "Lifelong learning opportunities through MOOCs in India," *Asian Association of Open Universities Journal*, 15(1), pp. 83–95. doi: 10.1108/aaouj-09-2019-0042.
- Baturay, M. H. (2015) "An overview of the world of MOOCs," *Procedia, social and behavioral sciences*, 174, pp. 427–433. doi: 10.1016/j.sbspro.2015.01.685.
- Bandalaria, M. D. P. (2018) "Open and distance eLearning in Asia: country initiatives and institutional cooperation for the transformation of higher education in the region," *Journal of Learning for Development*, 5(2).
- Corti, P. et al. (2014) "Bridging Students' Soft Skills Gaps with MOOCs," *International Journal for e-Learning Security*, 4(2), pp. 382–384.
- ETHRWorld (2022) *How the pandemic has created a fresh challenge for upskilling the workforce*, ETHRWorld Contributor. Available at: <https://hr.economictimes.indiatimes.com/news/workplace-4-0/learning-and-development/how-the-pandemic-has-created-a-fresh-challenge-for-upskilling-the-workforce/88629129> (Accessed: January 1, 2022).
- Education Desk (2020) "UGC doubles credits allotted to MOOCs, asks colleges to develop online courses," *The Indian Express*, 3 August. Available at: <https://indianexpress.com/article/education/ugc-doubles-credits-allotted-to-moocs-asks-colleges-to-develop-online-courses-6537513> (Accessed: June 16, 2022).
- Eugenia, C. et al. (no date) *DeMOOCratization of Education?: Massive Open Online Courses (MOOCs) and the opportunities and challenges for developing countries*, Graduateinstitute.ch. Available at: https://repository.graduateinstitute.ch/record/286962/files/MOOCs_Full_Final.pdf (Accessed: June 16, 2022).
- Hew, K. F. and Cheung, W. S. (2014) "Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges," *Educational research review*, 12, pp. 45–58. doi: 10.1016/j.edurev.2014.05.001.
- Kang, M. and Im, T. (2013) "Factors of learner-instructor interaction perceived learning outcomes in Online learning environment," *Journal of Computer Assisted Learning*, 29(3), pp. 292–301.
- King, M., Pegrum, M. and Forsey, M. (2018) "MOOCs and OER in the global South: Problems and potential," *The International Review of Research in Open and Distributed Learning*, 19(5). doi: 10.19173/irrodl.v19i5.3742.
- Liyaganawardena, T. R., Adams, A. A. and Williams, S. A. (2013) "MOOCs: A systematic study of the published literature 2008-2012," *The International Review of Research in Open and Distributed Learning*, 14(3), p. 202. doi: 10.19173/irrodl.v14i3.1455.
- Littlejohn, A. (2013) *Understanding Massive Open Online Courses*, CEMCA. New Delhi.
- Lund, S. et al. (2021) *The future of work after COVID-19*, McKinsey.com. McKinsey & Company. Available at: <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19> (Accessed: June 16, 2022).
- HR News (2021) *ETHRWorld.com*. Available at: <https://hr.economictimes.indiatimes.com/news/workplace-4-0/learning-and-development/21st-century-needs-india-to-upskill/8265644436> (Accessed: January 2, 2022).
- Nisha, F. and Senthil, V. (2015) "MOOCs: Changing trend towards open distance learning with special reference to India," *DESIDOC Journal of library and information technology*, 35(2), pp. 82–89. doi: 10.14429/djlit.35.2.8191.
- Pappano, L. (2012) "The year of the MOOC," *The New York Times*, 2 November. Available at: <https://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html> (Accessed: January 3, 2022).
- Rohs, M. and Ganz, M. (2015) *MOOCs and the claim of education for all: A disillusion by empirical data*. *The International Review of Research in Open and Distributed Learning*.
- Swayam central (no date) *Gov.in*. Available at: <http://www.swayam.gov.in> (Accessed: June 16, 2022).

Durgesh Tripathi and Surbhi Tandon

- Santandreu Calonge, D. *et al.* (2019) "MOOCs and upskilling in Australia: A qualitative literature study," *Cogent education*, 6(1), p. 1687392. doi: 10.1080/2331186x.2019.1687392.
- Singh, G. and Chauhan, R. (2017) "Awareness towards massive open online courses (MOOCs) and their usage for teacher education in India," *Asian Journal of Distance Education*, 12(2), pp. 81–88.
- Shah, D. (2021) *A decade of MOOCs: A review of MOOC stats and trends in 2021 — class central, The Report by Class Central*. Available at: <https://www.classcentral.com/report/moocs-stats-and-trends-2021/> (Accessed: January 7, 2022).
- Shah, D. (2020) *The second year of the MOOC: A review of MOOC stats and trends in 2020 — class central, The Report by Class Central*. Available at: <https://www.classcentral.com/report/the-second-year-of-the-mooc/> (Accessed: January 9, 2022).
- Unstats.un.org*. (No date b) Available at: <https://unstats.un.org/sdgs/report/2016/the%20sustainable%20development%20goals%20report%202016.pdf> (Accessed: June 16, 2022).
- Vardi, M. Y. (2012) "Will MOOCs destroy academia?," *Communications of the ACM*, 55(11), pp. 5–5. doi: 10.1145/2366316.2366317.
- Weforum.org*. (No date) Available at: https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf (Accessed: January 10, 2022).
- Weller, M. (2014) *The Battle For Open How openness won and why it doesn't feel like victory*. Ubiquity Press.
- World Bank (2014) *World development indicators 2012*. Washington, D.C., DC: World Bank Publications. doi: 10.1596/978-0-8213-8985-0.
- Zapata-Ros, M. (2013) *MOOCs, a critical view and a complimentary alternative: The individualization of learning and pedagogical help*.
- Zhenghao, C. *et al.* (2015) *Who's benefiting from MOOCs, and why*. *Harvard Business Review Who's Benefiting from MOOCs, and Why* (hbr.org).
- Zapata-Ros, M. (2013) *Assessment in the New Paradigm of Education in Post-industrial Knowledge Society*. *e-prints in library and information science*.