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Massive Open Online Courses: The emerging landscape of digital learning in India

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IIEP Foresight Papers

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Presentation of the Foresight Series

Rapid urbanization, massive population migrations, increased mobility of individuals, unprecedented opportunities for interconnections in a globalized world, renewed interactions between public and private stakeholders, rising intolerance and violence, climate change … Today's societies are changing fast. Educational planning needs to find ways to adapt in a context of vast social, economic, technological, and environmental transformation.

In this context, the objective of IIEP's Foresight Series is to help educational decision-makers and managers look ahead in a changing environment and keep abreast of new developments, exploring possible options to adapt their work accordingly. Using a particular country experience as a basis for reflection, the papers address the role of educational planning in a dynamic context.

Each Foresight paper describes a specific education initiative, taken from either a developed or developing country, that deserves careful attention given its novelty from a planning perspective. Papers will be so written as to foster discussion on each initiative's pros and cons, and to encourage an exchange of ideas on implications for education policy, planning, and management.

Each paper will contain: (i) an introduction reviewing the main challenges addressed by the initiative; (ii) a detailed description of the initiative; (iii) an evaluation of both its impact and limitations; (iv) some thoughts concerning its adaptability to other contexts; (v) a list of critical questions which the initiative raises for educational policy and planning; and (vi) selected references for further reading. Graphs and other illustrations will permit readers to get a quick grasp of the issues.

The papers are concise, to allow decision-makers, managers, and planners to read them quickly and easily, and thus keep informed about new trends occurring in the educational field worldwide.

The authors of the Series are selected based on their intimate knowledge of the documented initiatives, either practitioners directly involved in their design and implementation, or researchers.

The papers will be downloadable from IIEP's website. Shortly after their electronic publication, limited printed copies will be made available.

Muriel Poisson
Editor of the Series

Foreword

The ability to communicate over a distance has never been easier, with the number of internet users jumping from 1.37 billion in 2007 to 3.58 billion in 2017. Even though the digital divide remains huge between regions (half of the world's internet users are located in Asia versus 10% in Africa), countries (75% of all internet users in the world live in the top 20 countries by GDP), and different socio-economic groups, the rapid expansion of information and communication technologies (ICTs) offers unprecedented opportunities for increasing and renewing access to education. This is particularly true at the higher education level, as students are among the most frequent and enthusiastic users of ICTs.

This paper reviews current initiatives taking place in India to promote access to higher education through distance education, online learning platforms, and Massive Open Online Courses (MOOCs). The number of internet users in India has reached 462 million (with a penetration rate of 35% of the total population), and it currently represents the second largest national group enrolled in MOOCs after the USA. In this context, the Government of India is striving hard to leverage the potential of the higher education sector to reach more students and to build a knowledge-based society through a more intensive and optimized use of technology.

The Ministry of Human Resource Development (MHRD) has introduced the National Mission on Education through Information and Communication Technology (NMEICT) which aims to benefit all learners enrolled in higher education institutions. The Mission's objectives are to promote e-content generation, increase connectivity of institutions and learners, and provide open educational resources, such as virtual laboratories and learning platforms, as well as online testing and certification. It aims to increase the online availability of teachers, and to improve training so as to empower teachers to use new learning methods.

This paper examines the digital revolution taking place in the Indian higher education sector, by (i) highlighting the drivers for change in the higher education landscape; (ii) reviewing the major initiatives undertaken by Indian authorities to facilitate lifelong learning for teachers, students, and those in employment that are in pursuit of knowledge free of cost, including the National Programme on Technology Enhanced Learning, the National Repository for Open Educational Resources, and SWAYAM, an indigenous information technology (IT) platform hosting MOOCs; and (iii) analysing the first generation of Indian MOOCs.

This first generation of online learners in India will provide valuable lessons for all countries interested in capitalizing on the development of ICTs to increase access to higher education and to adopt innovative learning methods. Drawing on India's example, specific recommendations for educational planners are outlined at the end of the paper, and will consider reliable access to disruptive technologies, the contextualization of course content, the design of new credit transfer schemes, and the development of active strategies to reach all learners irrespective of their gender, location, and special needs.

Contents

1. India's great demographic dividend and the changing landscape of education

India has a democratic governance that places importance on equality of opportunity by encouraging vertical social mobility. Education plays a vital role in encouraging this type of mobility by enabling individuals to attain the knowledge and skills that will help them to progress. As India is also a 'young nation', with a large working-age population compared to its dependent population, education and skill development are even more crucial, as they will help to ensure that India fully exploits this demographic dividend. The Government has launched initiatives such as Education for All, Digital India, Skill Development, and Make in India, which demonstrate its commitment to providing education and skill development to the population.

India is home to world-class higher education institutions (HEIs) in fields such as Management, Medicine, Technology, and Engineering. Thanks to these HEIs, human capital is now one of India's most valuable exports. This is confirmed by both anecdotal evidence of Indian natives working as medical doctors or software engineers around the globe, and by statistical evidence concerning the size and nature of the Indian diaspora. The Indian diaspora is the second largest in the world, with approximately 25-30 million people of Indian origin living outside India. It is also disproportionately skilled, educated, and wealthy, and the proportion of highly skilled Indian migrants has increased considerably over the past decade as the globalization of trade, capital, and labour has progressed.

There are also a substantial number of Indian students going abroad for education and training. According to the US Department of Homeland Security, India is one of the most well-represented countries among foreign students enrolled in US universities, where about 16% of all foreign students are Indian. India is not only a supplier of skilled labour to the world, it also plays a key role in knowledge creation. According to the UNESCO Science Report (2015), emerging economies are responsible for an increasing share of global knowledge generation, and in India all indicators of research and development (R&D) output have increased rapidly in recent years. Tertiary education and R&D activities are a key policy focus in India, and the Government is making sustained efforts to increase the employability of scientists and engineers, and to improve the quality of higher education more generally (UNESCO, 2015).

The Global Innovation Index report (2015) identifies India as the most successful economy in Central and Southern Asia, and as one of the middle-income group countries successfully narrowing the gap in global innovation quality, thanks to improved quality in higher education institutions. The report acknowledges that India has made great strides in areas such as mobile networks, information technology (IT), and broadband. This revolution in communications has accelerated the pace of knowledge creation and dissemination in the economy to an unprecedented level in Indian history. For parts of the Indian population, it has helped to transform innovation-driven entrepreneurship from aspiration to reality.

India is on the brink of a period of profound change in education and training at all levels. The Government is investing substantially in research, science, and technology to generate innovative economic, environmental, and social capacity.

2. The drivers for change in the higher education landscape

The Government of India's National Knowledge Commission (NKC) stressed the need for India to become a knowledge-based economy (NKC, 2007). To do so, India must foster generational change by increasing access to education, creating a digital broadband network capable of connecting research and education institutions, and promoting a vibrant translation industry that makes knowledge available to different linguistic groups. The NKC also made recommendations about how to enhance systems of knowledge creation by fostering a better environment for innovation. These suggestions include establishing a robust intellectual property rights regime, incentivizing research in universities, promoting traditional health systems, and creating a better framework for the delivery of government services to citizens through a citizen-centric e-governance programme.

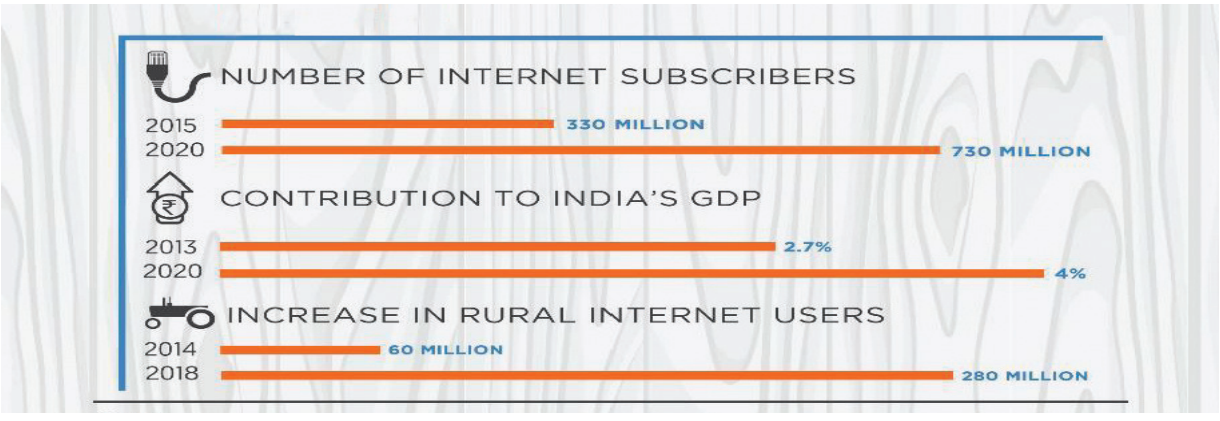
The NKC also discussed distance education, which can provide access to education for a large number of students, including learners with special needs. With the increasing penetration rates of the internet, alongside the widespread use of media platforms like television and radio, the reach of distance learning can be significantly increased in India. The NKC's recommendations on distance education focus on creating a national ICT infrastructure, developing web-based common open resources, establishing a credit bank for course credits acquired by learners, and providing a national testing service for the certification of language competence.

Globalization and the progressively knowledge-based economy have triggered the demand for a skilled workforce, and higher education is one means by which many choose to increase their knowledge and skills. This has resulted in the rapid expansion of higher education institutions in India, as well as an increase in vocational training programmes, which the Government supports through the National Skill Development Corporation (NSDC). The NSDC was established in 2009 to provide funding and support for vocational training programmes, and is charged with providing skills to 500 million people by 2022.

The education sector in India is poised to witness major growth in the years to come. By the end of 2020, India will have the world's largest tertiary-age population and second largest graduate talent pipeline. In order to meet this rising demand, and ensure increased access at a high level, it is important that the education sector leverages the opportunities offered by the IT sector.

The 2014–2015 Internet and Mobile Association of India (IAMAI) Annual Report classifies

Figure 1. India online: A growth story



Source: Analysys Mason's report, 'How to get a billion Indians online by 2020'; 2015 report 'india@Digital.Bharat' by the Boston Consulting Group and IAMAI.

internet users into professional pros, social shoppers, novel networkers, late learners, entertainment enthusiasts (among the heaviest users of the internet), active aspirers (youth users), and data discoverers (early-stage users). The report indicated that the number of rural internet users will increase from 60 million in June 2014 to 280 million in 2018, provided initiatives such as the Government's National Optic Fibre Network (NOFN) bear fruit on target. In 2018, India's internet user base is projected to be 54% above the age of 25, 40-50% rural, 30% female and 70-80% mobile. 'The class of 2018 will be more rural, older, more gender-equal, more mobile and more vernacular than their counterparts of today,' the report predicts (IAMAI, 2015).

Initiatives such as Google's Indian Languages Internet Alliance (ILIA) are targeted at the next 300 million internet users who would prefer content in their local languages.

Figure 2. A history of the internet in India

3. Disruptive technologies for a progressive India

Analysis conducted by McKinsey Global Institute (MGI, 2013) has identified 'empowering' and 'disruptive' technologies with the potential for rapid adoption in India by 2025. In order to classify as 'empowering' and 'disruptive', these technologies must: (1) have wide-reaching benefits and impacts that affect many people, institutions, products, and markets; (2) have significant economic impact; and (3) have the potential to help address India's economic and social challenges. MGI identifies 12 empowering technologies for India, which it categorizes into three types: technologies that 'digitize' life and work, smart physical systems, and technologies for rethinking energy.

As the following table demonstrates, the rate of internet penetration has increased rapidly in India, helping to create an environment in which these types of technologies are likely to be adopted:

Table 1. Internet penetration in India, 2010–2016

Year	Internet Users	Penetration (% of Pop)	Total Population	Non-Users (Internetless)	1Y User Change	1Y User Change	Pop. Change
2016	**462,124,989**	34.8%	1,326,801,576	864,676,587	30.5%	108,010,242	1.2%
2015	**354,114,747**	27%	1,311,050,527	956,935,780	51.9%	120,962,270	1.22%
2014	**233,152,478**	18%	1,295,291,543	1,062,139,065	20.7%	39,948,148	1.23%
2013	**193,204,330**	15.1%	1,279,498,874	1,086,294,544	21.5%	34,243,984	1.26%
2012	**158,960,346**	12.6%	1,263,589,639	1,104,629,293	26.5%	33,342,533	1.29%
2011	**125,617,813**	10.1%	1,247,446,011	1,121,828,198	36.1%	33,293,976	1.34%
2010	**92,323,838**	7.5%	1,230,984,504	1,138,660,666	48.5%	30,157,710	1.38%

Source: Internet Live Stats (www.InternetLiveStats.com)

The internet's increasing popularity not only provides the population with a useful tool, but also contributes directly to India's gross domestic product (GDP) (e.g. through online transactions, advertising, payment for devices, productivity benefits, and socio-economic impacts). The internet contributed US$60 billion in 2013 equivalent to 2.7% of India's GDP – larger than the contribution of healthcare (2.5%) and military (2.5%), but smaller than agriculture (14%). By 2020, the internet is estimated to account for over 4% of India's GDP (IAMAI, 2015).

4. The digital learning environment in India

The Ministry of Human Resource Development is promoting the NMEICT to leverage the potential of ICT in the teaching and learning process within higher education institutions. Aiming to increase access, equity, and quality of education, the scheme supports e-content generation and provides devices and other tools for institutions and learners. Its focus is on developing appropriate pedagogy for e-learning, which it does through providing various platforms to HEIs. These platforms include virtual laboratories, online-testing and certification platforms, calendars detailing the availability of teachers, Education Satellite (EduSAT) platforms, and Direct to Home (DTH) platforms. The NMEICT also provides training to empower teachers to use these new methods effectively.

In 2006, the NMEICT launched SAKSHAT, a 'one-stop education portal', intended to facilitate lifelong learning for students, teachers, and those in pursuit of knowledge free of cost (www.sakshat.ac.in). The portal is expected to be the main delivery platform for the content developed under the NMEICT scheme. The Information and Library Network (INFLIBNET) Centre has also taken up the initiative to create an integrated one-stop e-content portal for easy access to all the content developed under the Mission (MHRD, 2015).

As part of the Digital India campaign, the Government of India has announced several initiatives to increase access to quality education for all, the most significant of which are detailed below.

The National Programme on Technology Enhanced Learning

Funded by the Ministry of Human Resource Development, the National Programme on Technology Enhanced Learning (NPTEL) was conceived in 1999 and launched in 2003 by the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc). Its goal was to use multimedia and web technology to enhance the learning of basic scientific and engineering concepts. Significant infrastructure was set up for the production of video-based teaching materials by the IITs and Technical Teacher Training Institutes (TTTIs). The NPTEL thus improves the quality of teaching in rural colleges by providing an opportunity for teachers and students from rural areas to learn from these high-quality lectures. The NPTEL has developed 219 curriculum-based video courses (110 new courses and 109 existing ones in digital video format) and 129 web-based e-courses.

Ekalavya

Ekalavya was launched by IIT, Bombay in 2004 for the development and dissemination of e-content in various Indian languages. It has developed an Open Source Educational Resources Animation Repository (OSCAR) that provides web-based interactive animations for teaching various concepts and technologies. OSCAR offers a platform for mentors and professors to suggest ideas for animations and for developers and students to create content based on the suggested ideas and guidance. The funding for the Ekalavya and OSCAR projects comes mainly from private industry. Notable industry partners who have provided direct support include EMC, Infosys, Intel, PSPL, Red Hat, TCS, and VIA Technologies. Professional associations, such as CSI and NASSCOM, have also indicated their interest in supporting and participating in these projects. The Ekalavya project consists of several programmes, such as eGURU, eOUTREACH and eCONTENT.

- The *eGURU programme* is based on the traditional Indian concept of Guru-Shishya (the teacher-student relationship), and is designed to provide e-guidance and mentorship to undergraduate and post-graduate students in need of assistance. It focuses on students in science and engineering programmes who are carrying out their final-year projects, and encourages them to think of innovative technical solutions to real-life problems by collaborating with companies.

- The *eOUTREACH programme* is creating a bank of high-quality open source content for the benefit of students, teachers, and professionals. It is developing a large repository of interactive animations for teaching various concepts and technologies, so as to enable independent learning and provide training opportunities for students.
- The *eCONTENT programme* has been designed to create open source digital content in Indian languages through translation and new texts, with different content available at all levels of education.

National Repository of Open Educational Resources

The National Repository of Open Educational Resources (NROER) was launched in 2013 in collaboration with the Department of School Education and Literacy, the Central Institute of Educational Technology, the National Council of Educational Research and Training, and Meta studio, the platform that hosts the repository. NROER intends to 'reach the unreached' and 'include the excluded' in order to extend education to all. It is based on the concept of 'semantic maps', with its digital resources being mapped onto five subject categories: Math, Science, Social Science, Languages, and Art Education. This map becomes a learning resource for teachers, through which they can critically assess the curriculum and construct their own unique learning themes for their classrooms.

e-PG Pathshala

The Government of India's University Grants Commission launched e-PG-Pathshala in 2015. Its aim is to standardize the curriculum followed in various universities and to enhance the overall quality of education, by providing open access e-content. The project is part of the centrally sponsored NMEICT scheme and is expected to gauge the potential of ICT for all learners in higher education. With the motto 'To provide connectivity up to the last mile', the underlying aim of NMEICT is to bridge the digital divide that is often found between urban and rural educators and learners in India.

Study Webs of Active Learning for Young Aspiring Minds (SWAYAM)

SWAYAM is an indigenous IT platform for hosting MOOCs that intends to revolutionize the education system by providing quality education to millions of students, including those living in the remotest parts of the country. It has produced 2,000 online courses, available to students since August 2016.

In areas where SWAYAM does not have the resources to create its own MOOCs, the MHRD is utilising the resources of the following public-funded agencies to assist in content creation:

- The *Consortium for Educational Communication* (CEC), which is coordinating the creation of e-content for 87 non-engineering undergraduate courses, including the production of over 26,000 modules. It is also maintaining 17 Educational Multimedia and Research Centres (EMMRCs) equipped for generating e-content.
- The *University Grants Commission* (UGC), which is coordinating the creation of e-content for 77 non-engineering post-graduate courses, including over 45,000 hours of online teaching.
- The *NPTEL*, which is coordinating the creation of e-content for engineering courses.
- The *National Institute of Open Schooling* (NIOS), which has created e-content for all class 10 non-language courses, and which is currently developing e-content for basic language courses and all class 12 courses.

Although technology is playing an increasing role in education, there are significant challenges in the mass adoption of education-oriented, technology-based products and services, as such digitization is commonplace only in urban areas, primarily metros, mini-metros, and cities. Policy-makers are making strides in the right direction by taking a proactive stance on mass adoption of digital learning.

SWAYAM: The indigenous IT platform for MOOCs

SWAYAM will offer a virtual classroom to students with structured lectures by subject experts. 'An institution can only allow up to 20% of the total courses being offered in a particular programme in a semester through the online learning courses provided through SWAYAM platform,' the UGC regulation (2016) stipulates. Students registered with SWAYAM can complete their entire programme by attending classes online and taking 'proctored' examinations at the end of each semester to move to the next level. For the proctored examinations, centres with adequate facilities will be opened in universities. The credits earned by the students will be transferred to their parent university by the one conducting the programme on the MOOCs platform.

5. The first generation of Indian MOOCs

A new educational landscape that combines online learning with brick-and-mortar classrooms may be able to deliver high-quality education at an affordable cost to a large number of students. Indeed, students from India are signing up for MOOCs in large numbers. Christensen *et al.* (2013) highlight that in virtually every study Indians comprise the second largest national group enrolling in these courses (after participants from the United States). In an analysis of the first year of edX MOOCs at Harvard and MIT, 13.2% of the students were Indian (Ho *et al.*, 2014), and Indians made up 6.9% of the first 1.7 million students to take a MOOC offered by UPenn. An additional 2.5% of MOOC students are Indians living abroad.

This generation is the first generation of online learners, so it is interesting to consider the type of students taking advantage of MOOCs, and the challenges they faced during their adoption of online learning.

- Indian students enrolling in MOOCs are on average very highly educated: 84.3% have postsecondary degrees and nearly 40% have graduate degrees.
- MOOCs are supplementing rather than substituting traditional higher education for many students in India. Nearly 40% of Indian MOOC students are also enrolled in a traditional undergraduate or graduate degree – a larger number than among the non-Indian MOOC student population. Of these students, approximately half are enrolled in an undergraduate programme, and half are enrolled in a graduate programme. These students may be supplementing poor-quality traditional educational options, enrolling in online courses that are not being offered by their brick-and-mortar institutions, or even preparing for entrance exams for the most competitive traditional institutions (Christensen *et al.*, 2013).
- With a median age of 26, Indian MOOC students are also significantly younger than other MOOC participants.
- The majority of Indian MOOC students are employed full-time and use the courses to develop skills that will help them in their current job or will help them find a new one. MOOCs are increasingly being used to fill in the gaps of a traditional higher education system, and they are largely seen as a learning model for professional training.
- Indian MOOC students who are employed or currently looking for work are predominantly drawn from industries with relatively well-defined skill sets and promising job prospects. Specifically, 70% of employed Indian MOOC students work in STEM fields (engineering, computers, or

mathematics) or business (Christensen *et al.*, 2013).

The Indian Institutes of Technology are excellent centres of learning, but the reality is that the 16 IITs enrol less than 0.5% of all students in higher education in India (Alcorn, Christensen, and Kapur, 2015). MOOCs therefore allow students to bolster their education with courses from top-quality institutions.

6. Future prospects and emerging challenges

A revolution is taking place at all levels of the education system. People have started to take their learning into their own hands and to view education as a lifelong practice. As a result, a new phase of education has emerged which places importance on digital learning. Self-learning environments such as MOOCs and other digital tools have transformed the domain of education, connecting students to global learning platforms, and making learning more dynamic. Increasing internet penetration, time constraints faced by students, geographical challenges in attending physical classes, and the low expense involved in online training are the primary drivers of the digital learning sector.

It is likely that the success of MOOCs will persist in India, as there is a high demand among students. The Government of India has recognized the power of MOOCs for enhancing entrepreneurship, education, and training, and has made a budget provision for the development of further MOOCs. The expansion of online learning will be crucial to the success of the Government's recent initiatives to provide quality education for all at all levels. India is one of the most flourishing smartphone markets in the Asia-Pacific region, with penetration at 21.3%. In 2016, JIO-Reliance was launched, which provides 4G internet at affordable prices. With high and increasing smartphone penetration, affordable smartphone internet, and many MOOCs easily accessible on smartphones, MOOCs are one of the most viable platforms for transforming the state of education in India.

7. Implications for educational planners

With the fast-paced digitization of learning platforms, along with the aspirations of digital learners, it is of the utmost importance to reflect on current practices, and to identify and rectify the barriers restricting access to MOOCs and other open educational resources. The success of digital learning platforms relies on the availability of internet-enabled devices, the speed of the internet, the readiness of learners, and the proactive educational policies of the government.

For educational planners considering MOOCs in the Indian context, our recommendations are as follows:

- Provide reliable access to technology, such as broadband internet, computers, tablets, and mobile phones, to retrieve course content;
- Facilitate access to technology and internet for rural communities in India (the majority of MOOC students currently hail from large urban areas);

- Ensure quality schooling that prepares students to understand university-level academic content;
- Prioritize digital literacy and English language proficiency;
- Contextualize the course content of MOOCs, especially in the humanities and social sciences, so that they are suitable for different cultural settings;
- Encourage students to opt for MOOCs by introducing mechanisms that allow credit transfer between traditional institutions and MOOCs;
- Address gender disparity among MOOC participants (Indian women make up just 20% of Indian MOOC students, while the Gender Parity Index (GPI) has climbed to 0.86, which indicates a less unequal participation among men and women in India's traditional higher education institutions);
- Provide support for people with disabilities to access digital learning, so as to facilitate the learning process for India's significant differently abled population;
- Conduct further research into how to reduce dropout rates for MOOCs, thus supporting learners to complete the programmes and secure their desired career and educational benefits.

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