MOOCs AND THE FUTURE OF INDIAN HIGHER EDUCATION
Vision Paper, FICCI Higher Education Committee
August 2014
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Learning through Massive Open Online Courses will enable in all Indians who want to learn, earn, teach or innovate, the capability to realize their true potential and transform our country.
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Foreword

It would scarcely be an exaggeration to state that the recent advances in educational technology and networked pedagogy are poised to redefine and transform what our education system is capable of achieving. The idea that both learning and teaching could be powerfully redefined to openly meet the needs of a massive population of learners, has caught the imagination of people worldwide.

The Massive Open Online Course has made a remarkable mark in just a few years since its inception in 2008. It has been equally vilified as the new fad and glorified as the new order. Every development in its shape or form has received instant worldwide attention. In just the past 3 years, the MOOCs have scaled to over 20 million students, 200 top universities, 40 providers and 20,000 courses.

In India, we have not remained immune to this disruption. Nearly 2 million Indian learners, who constitute the second largest group of MOOC learners worldwide, have given us the mandate to respond quickly and decisively by putting in place systems and policies for MOOC based education.

In the times to come, MOOCs and their variants will permeate every sector of Higher Education and provide meaningful education & training to millions of people in India. We are at an inflection point in technology enabled learning, a point beyond which there exist limitless possibilities to transform our potential.

Mr. Avinash Vashishta
Co-Chair
FICCI Higher Education Committee

Mr. Mohandas Pai
Chair
FICCI Higher Education Committee

Prof. Rajan Saxena
Co-Chair
FICCI Higher Education Committee
Foreword

The phenomenal growth of Massive Open Online Courses over just the past 3 years is enough to show that MOOCs mark a strategic inflection point for the education system. If the phenomenal response to MOOCs by Indian learners is any indication, MOOCs are here to stay as a very visible and powerful medium to teach and to learn.

This report explores the potential impact of MOOCs in Higher Education. It focuses on identifying practical use cases for MOOCs, not just in the formal sector, but also in the non-formal and informal sectors. In the end, it makes several important recommendations for key stakeholders in our education system. It attempts to show how MOOCs may be instrumental in tackling some very important challenges such as faculty shortage, affordability, equity, weak infrastructure, lack of high quality digital content and lack of employability.

It is our hope that the findings of this report and its recommendations serve as a starting point for further deliberations, ignite innovations in education and act as a prophecy of the future.

We would like to thank the FICCI Higher Education Committee for having provided us the opportunity to create this report, and the MOOCs sub-committee members (Girish Gopalakrishnan, Lokesh Mehra, Manish Upadhyay and Mohan Kannegal) for having put in their painstaking effort in writing and reviewing this report.

Prof. B N Jain  
Chair - Sub Committee on MOOCs

Mr. Viplav Baxi  
Convener - Sub Committee on MOOCs
Executive Summary

This paper has been written under the aegis of the Higher Education Committee of the Federation of Indian Chambers of Commerce and Industry (FICCI). It articulates a vision for Massive Open Online Courses (MOOCs) in Indian Higher Education. It is a vision of how MOOCs can help augment, enhance and transform the systems of education in the country.

Learning through Massive Open Online Courses will enable in all Indians who want to learn, earn, teach or innovate, the capability to realize their true potential and transform our country.

Our main considerations while drafting this vision have been those around quality, affordability, scalability, inclusion and employability. With MOOCs, we have a mechanism to deliver high quality education and a globally collaborative learning experience to any section of society. For the first time, technology and digital content have been combined together to serve massive groups of learners across diverse educational, economic, social and ethnic backgrounds.

The paper divides the Higher Education system into three sectors – formal, non-formal and informal – and sets the context for MOOCs to be leveraged in each of these sectors.

The formal sector represents the traditional means of teaching and learning - through universities, colleges and other institutions including those for open & distance learning and for vocational training. The non-formal sector for Higher Education is represented by courses and certifications that are not handled by the formal sector. The Informal sector represents the vast majority of learners who are learning all the time, through communities rather than courses, and not necessarily to get certified.

MOOCs can play a transformative role in each of these sectors. The report describes each sector, outlines how MOOCs can be leveraged to fulfil needs in that sector and summarizes the key challenges that adopters may face. It also provides a practical guide by suggesting some applications of MOOCs in these sectors. These applications are illustrated with examples and vignettes.

In conclusion, the report proposes several next steps for the government, education providers & professional associations and employers to consider in their strategy for adoption of MOOCs. These recommendations span MOOC structure, policy, certification, accreditation, interoperability, infrastructure, R&D, quality and advocacy.
Terms of Reference

The potential of the MOOC format, because of its reliance on the capability of the participants, the nature of the learning itself, the underlying technology and the potential to address key issues such as scale, quality, affordability, inclusiveness and employability, is immense for a country like India.

Scope

The FICCI Higher Education Committee, chaired by Mr. Mohandas Pai, understands the potential of this medium to make longstanding impact on Indian Higher Education. Accordingly, it constituted a sub-committee in December, 2013, to articulate a vision for MOOCs in Higher Education in India and make recommendations towards executing this vision.

Methodology

The sub-committee knew that it would be antithetical to conduct this project in a manner that was small, closed and offline. Accordingly, members have set up a blog site1 and publicized this initiative through both online and offline means, such as Twitter, Google+, Facebook and many online/offline conversations. Committee members have brought in their own experiences, connections and perspectives and placed them in full public view for comments and critique. We have also put together a large repository of resources that are relevant to the domain. There is also the hope that these resources and public conversations will become part of an ongoing community of practice around MOOCs in the times to come.

To keep the report concise and actionable, we have decided to focus on the role of MOOCs in improving scale and quality of formal, non-formal and informal Higher Education in India. We have proposed an overall vision proposition followed by practical use cases and recommendations on how it can be propagated by government, educational providers and employers.

It is our hope that this effort will spawn more concerted thinking and quick and decisive action from various stakeholders concerned with online education in general, and higher education in particular.

1http://indiamoocs.wordpress.com
Massive Open Online Courses
Significance and Evolution
Massive Open Online Courses

Massive Open Online Courses are the new revolution sweeping the Higher Education sector. As the name suggests, these courses are conducted online for hundreds of thousands of students worldwide without restrictions. Top global universities have already joined MOOC platforms or started their own MOOC initiatives. Together they host thousands of courses. Providers have now also started offering additional paid services, for example, assessments and certification.

MOOCs offer high quality education from these top universities, usually for free. Over 10 million students globally have enrolled in thousands of such courses offered by just the top 3-4 providers of MOOCs. Coursera has over 8.5 mn students and offers 700 courses from 110 globally recognized partners. Udemy has over 3 million students and offers more than 16,000 courses. edX has over 1.3 mn students from 195 countries. Udacity has 1.6 mn students in 12 full courses and 26 free courseware. These numbers have been achieved just over the past 3 years (2011-14).

These MOOCs have also garnered tremendous amounts of investments from institutions and venture capitalists. Coursera has received (as of Nov. 25, 2013) USD 85 mn in investment from investors such as GSV Capital and Learn Capital. Udacity has obtained about USD 20 mn funding from Charles River Ventures and Andreessen Horowitz. Udemy has garnered about USD 16 mn in funding as well. edX, a non-profit, has been seeded with USD 30 mn each from MIT and Harvard.

Major Players in the MOOC

1. Coursera
2. Udemy
3. edX

Evolution of MOOCs

MOOCs were created in 2008 by George Siemens, Stephen Downes and David Cormier. Siemens had proposed a new theory of learning for the digital age called Connectivism. This theory posits that learning is the process of making connections and knowledge is the network. The roles of the teacher and learner have changed in this new model. The teacher has to take on the role of an expert learner. The process of teaching is transformed into a process of modelling and demonstration. The learner takes on the key tasks of reflection and practice. Thousands of people have since then worked on exploring this new theory and format, which promises to change the way we look at learning, teaching and systems of education. The MOOCs based on Connectivism are more popularly called cMOOCs.

In 2011, Sebastian Thrun and Peter Norvig at Stanford started an online course in Artificial Intelligence. They also decided to invite anybody who was interested to join up. The response was massive (over 160,000 people joined from more than 190 countries). Astounded by the response, Thrun and Norvig left Stanford in January 2012 and created a company called Udacity. They wanted to further explore this format, which they too christened “MOOCs”, although they were quite different from the cMOOCs in terms of philosophy, theory, pedagogy and technology.

Soon after, in April 2012, Daphne Koller and Andrew Ng, both Stanford colleagues involved in the Stanford MOOCs, started Coursera. In May, Harvard and MIT joined together to create the edX platform.

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The response from Indian students and teachers has been tremendous. They form the second largest pool of students attending MOOC courses (about 10-15% of the total enrolments in edX, Coursera and Udacity). This marks a huge inflection point in online learning in India which has over 4 mn students engaged in formal distance education today.

For India, MOOCs offer an unprecedented mechanism to take high quality education and place it in the hands of every learner. If MOOCs get formally integrated into our education system, they have the potential to help transform it.

Evolution of MOOCs

The Massive Open Online Course (MOOC) phenomenon started in 2008. The first MOOC was conducted by George Siemens, Stephen Downes and David Cormier. It was called Connectivism and Connective Knowledge 2008 (CCK08). David Cormier was responsible for coining the term MOOC. Subsequently, many MOOCs were run across the world.

These MOOCs were based on the principles of the learning theory of Connectivism, coined by George Siemens, and of Connective Knowledge, as proposed by Stephen Downes. Foremost among these principles are learning is the process of making connections and knowledge is the network.

The roles of the teacher and learner have changed in this new model. The teacher has to take on the role of an expert learner. The process of teaching is transformed into a process of modelling and demonstration. The learner takes on the key tasks of reflection and practice. Thousands of people have since then worked on exploring this new theory and format, which promises to change the way we look at learning, teaching and systems of education. The MOOCs based on Connectivism are more popularly called cMOOCs.

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1http://ukeducationonline.edublogs.org/tag/coursera/
This form, style or pedagogy of "MOOC courses", is referred to as **xMOOCs**, where the "x" stands for "extension" of existing online learning approaches - the extension being in the nature of the courses, the methodology, and the new tools for handling large scale of assessments and collaborative online learning.

Since then, many institutions have joined the xMOOCs bandwagon globally (including IIT Bombay and BITS Pilani from India), and many new MOOC initiatives have sprung up rapidly across the world such as Udemy, P2PU, FutureLearn, OpenStudy and Canvas.

BITS Pilani has already offered courses using Coursera to their own students. IIT Bombay (started July 2014) and BITS Pilani (starting August 2014) will offer courses using the edX platform. While IIT Bombay has offered 3 courses to anybody wanting to attend, BITS Pilani will offer them to its own students. IIT Bombay's courses have already attracted 35,000 students worldwide⁶. Institutions in India are also proposing to implement a Blended MOOC model⁷ based on a combination of online access using the open-source edX platform and customization of the edX platform to incorporate multilingual support and potentially face to face instructor support at various physical centres across the country.

Also, inspired by the xMOOC technology and delivery style, the concept of Small Private

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⁷Adopting MOOCs for Quality Engineering Education in India, Dr. Deepak B. Phatak, Department of CSE, IIT Bombay

http://www.iitb.ac.in/nmeict/pdfs/MOOCs.pdf

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Online Courses (SPOCs) have also entered the discussions around MOOCs. As the name suggests, SPOCs are neither massive nor open. In that sense, they are more a way of replacing lectures in traditional courses by rich content delivered online.

Phil Hill visualizes the MOOC evolution in the following diagram and suggests the challenges for both xMOOC and cMOOC models to be:

1. Developing **revenue models** to make the concept self-sustaining;
2. Delivering valuable **signifiers of completion** such as credentials, badges or acceptance into accredited programs;
3. Providing an experience and perceived **value** that enables higher course completion rates (most today have less than 10% of registered students actually completing the course); and
4. **Authenticating** students in a manner to satisfy accrediting institutions or hiring companies that the student identity is actually known.

![MOOC Evolution Diagram](https://example.com/mooc-evolution-diagram.png)


Important recent developments include introduction of university led credentialing and assessment for a fee, acceptance of MOOC credits in formal education systems, community based badging, student authentication systems, proctoring through offline centres & automated systems, gamification, Udacity’s nanodegrees and many such incremental developments. An inventory of MOOCs can be found on sites like Class Central[^ClassCentral] and MOOC-List[^MOOCList].

[^ClassCentral]: https://www.class-central.com
[^MOOCList]: http://www.mooc-list.com
Important Related Trends

Learning Analytics

Closely associated with MOOCs has been the emerging field of Learning Analytics (the seed for which was sown by some of the same people who created the first MOOCs in 2008). Learning Analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs (Open Learning Analytics: an integrated & modularized platform, George Siemens, Society for Learning Analytics Research).

Given an increasingly digital life, learners and teachers are off-putting data about their activities on the Internet through a variety of devices and applications. Some of this data that is relevant to learning and performance can now be aggregated into Big Data stores and actionable insights generated from them.

Gamification

Also closely linked to online learning in general, and MOOCs in particular, is the concept of “Gamification”. Gamification is the use of gaming techniques for non-game situations. Gamification is becoming increasingly relevant for MOOCs because learner motivation to complete MOOC courses is still at a low level.

Adaptive Learning

Adaptive Learning is the other major educational technology development over the past few years that can be gainfully employed in MOOCs. An adaptive learning system will adjust to what the learner’s interactions with the material suggest about his or her mastery of the materials over time and, based on the learner profile it develops, will begin to anticipate things about the learner and serve up content based on knowledge of that profile (Learning To Adapt, Education Growth Advisors, 2013).

Learning Analytics, Gamification and Adaptive Learning are key trends to watch out for in MOOCs
Important Related Trends

Learning Analytics
Gamification
Adaptive Learning

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MOOCs in Indian Higher Education

The potential of MOOCs across formal, non-formal and informal sectors
MOOCs in Indian Higher Education

For this vision paper, we have included within scope, the following three sectors (which may overlap or even co-exist in certain cases):

1. **Formal** (diplomas and degrees, traditional Higher and Vocational Education)
2. **Non-formal** (continuing professional and vocational education, formal certifications)
3. **Informal** (lifelong and adult learning)

Combs with Prosser and Ahmed (1973) distinguish these as follows:

**Formal education**: the hierarchically structured, chronologically graded 'education system', running from primary school through the university and including, in addition to general academic studies, a variety of specialised programmes and institutions for full-time technical and professional training.

**Non-formal education**: any organised educational activity outside the established formal system - whether operating separately or as an important feature of some broader activity - that is intended to serve identifiable learning clienteles and learning objectives.

**Informal education**: the truly lifelong process whereby every individual acquires attitudes, values, skills and knowledge from daily experience and the educative influences and resources in his or her environment - from family and neighbours, from work and play, from the market place, the library and the mass media.

### Formal Sector

**Background**

Those of us who have tracked India’s higher education system, either as teachers, administrators, employers, regulators, or even as parents or students, have seen an explosive growth in the number of colleges and universities that offer degree, diploma or vocational programmes. The sector has grown from 8.4 mn students in the year 2000 to 30 mn in 2012.

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In hindsight, this was to be expected given that (i) young people in India seek to move ahead in their lives through education beyond secondary school, (ii) population of India’s youth is growing fast, (iii) there is significant effort by government to improve the GER to 30% by year 2030. This enrolment is expected to grow to 70 mn by year 2030. The three factors identified above will push the number of students and of colleges further if India’s service and manufacturing sectors grow faster in the years to come.

The above growth in the number of colleges is partly matched by the growing number of disciplines or vocations in which these programmes are offered by colleges (such as journalism, hospitality, tourism, banking, insurance, retail trade and logistics). This is partly due to the tremendous growth in the service industry.

We have also witnessed a huge decline in standards of education to the point that a majority of graduates are unemployable (or in many cases under-employable). And this is not limited to programmes in science, engineering, law or management. It extends to every discipline, and to every vocation, given that there has been an exponential growth in supply of opportunities in response to a rapidly growing demand. While lack of effective governance (or oversight) may be one reason why quality of education remains poor, unavailability of good faculty in large numbers is perhaps the most important reason. Prof. Goverdhan Mehta, Chairman, 6th Pay Committee for IITs, NITs, IIMs, etc., and former Director, IISc, Bangalore, has observed that "establishment of new Institutes of higher learning ... would mean large scale recruitment of teachers at ... the entry level. However, it is going to be quite a challenging task.....", given that talented young men and women rarely take up teaching as a career.

MHRD’s report on faculty shortage is a telling commentary on the subject. According to it, "the present shortage of 3.8 Lakhs teachers ... in the higher education ... comes to over 50% .... It is likely to grow to 13 Lakhs in the next 8 to 10 years." It is actually worse in some cases. In the same report, while emphasizing the point that there had been no recruitment in most universities for decades, "the Vice Chancellor of Allahabad University once mentioned that the youngest faculty member in his university was 55 years old". Any attempt to rush into recruiting faculty members in large numbers is fraught with danger of further eroding quality of education.
Clearly, the way to address the issue of improving both scale and quality of education is to explore the use of technology. Recent experiments with MOOCs offer an opportunity for us in India to address these requirements simultaneously. This paper is an attempt to help understand the role of MOOCs in improving scale and quality of degree, diploma and vocational programmes in countries such as India that seek exponential growth of the sector, but with an eye on quality, inclusiveness and affordability.

**MOOCs in the Formal Sector**

MOOCs offer an alternative to lecture-mode classroom instruction using digital content that can be downloaded (and re-downloaded) by students anytime, anywhere depending upon their convenience. This latter aspect is responsible for MOOCs being termed “online”. The terms “open” and “massive”, on the other hand, refer to the fact that any individual around the world may take courses of his/her choice (in most cases for free) and to the fact that open registration may result in thousands of students taking the course. In some courses registrations have crossed 150,000.

A semester-long course traditionally taught as (say) 40 hours of classroom instruction will typically be broken into over 200 four to ten minute media-rich modules (consisting of text, graphics, voice, video, and perhaps animation), each of which helps a student understand a concept, a design, a result, an algorithm, and the like. Each module is typically followed up with one or more exercises that a student is expected to complete before he/she moves onto the next module. Of significance is the fact that student responses to exercises are evaluated by MOOC’s back-end servers in real-time, thereby enabling students to attempt exercises multiple times till they complete them correctly.

Analytics on student activity, including downloads and performance on exercises, are available to an instructor to assess student engagement with the courses. Tools for several students to collaborate or “study” together are also available. MOOC courses also provide for computer-based simulations (these emulate lab-like experimentation), a component that is so very essential in programmes such as sciences, engineering and medicine.

While today, the tools, technologies and platforms that enable colleges to offer MOOC-style courses may be termed "version 1.0", it is expected that MOOCs will evolve over time and begin address the concerns one currently has or will have as we experiment with MOOCs.

This report would be incomplete if it were to not discuss the merits or demerits of replacing existing classroom based courses with MOOCs-based online courses. And before we do that it is...
important to understand that the motivation or business model is not so much to replace existing classroom based courses offered by the universities.

First, MOOCs are an exploration in developing and experimenting with alternative models of course delivery. Second, and presumably, this is an outreach programme that will ultimately yield dividends in the form of building global brands.

It is unclear whether students from around the world are willing to pay even a small amount unless the university agrees to issue a completion certificate, an aspect that remains a "work-in-progress". Unless a student has paid a fee upfront, he/she may (or more accurately, is likely to) lose interest and drop out of the course (today, dropout rates are in excess of 90%).

Competence can only be certified if there exists a way to conduct "proctored" exams to test students' knowledge or problem-solving ability. Solutions such as Proctoru are proposing mechanisms whereby proctoring could be done online. Coursera has also attempted to verify online the identity of the student taking the exam and provide a Verified Certificate through its Signature Track program. These aspects, viz. completion and certification, as also revenue models, are likely to evolve over time. But, lack of clarity on these issues should not deter us from exploring MOOCs as a way to complement efforts to improve quality and scale in higher education in India.

Small Private Online Courses (SPOCs)

The one model that is likely to pave the way for MOOCs to flourish globally, but more importantly for Indian higher education providers, is the model adopted by Udacity and Georgia Institute of Technology for the MS programme in Computer Science launched in September, 2013 for fee-paying students enrolled in the programme. The fee is $7,000 for the programme against the usual fee of $40,000 or more. Admission to the programme is available only to "eligible" students (but from anywhere in the world). The course content may be downloaded only by students enrolled in the programme. They will be eligible for the award of the degree from Georgia Institute of Technology provided they successfully complete all evaluation components in the required courses. The key to its potential success will be a "closed group of fee-paying students who expect to earn a degree".

MOOCs offer a way to gain skills not taught in the formal sector, demonstrate them to potential employers and stay abreast of developments at the workplace

http://www.proctoru.com/
https://www.coursera.org/signature/guidebook/certificate
https://www.udacity.com/georgia-tech
Clearly, while staying with technology that supports MOOCs, but with a minor shift in pedagogy, Georgia Tech (for instance) is now offering courses to fee-paying students who are enrolled in its programme. Such courses (or the pedagogy) are referred to as SPOCs, or "Small Private Online Courses".

There are two aspects to SPOCs that should be noted: (i) there are components of a course, such as tests, quizzes or exams that are necessarily (or essentially) "proctored" (in addition to exercises that follow each module in the digital content), and (ii) a part of the course may involve classroom based problem-solving sessions where students are assisted by "teaching assistants" or "TAs". The latter is referred to as the "blended" form of course offering.

Potential gains from MOOCs/SPOCs

Below we consider a few programmes in India that can benefit significantly from using the pedagogy or technology that underlies MOOCs (or more precisely SPOCs). Before we do so, we identify characteristics of programmes (or institutions) that are likely to benefit the most. A traditional degree or diploma programme, with a well-defined curricula, offered by a university, college or a vocational school would benefit the most from using SPOCs provided:

a. The programme caters to a large body of fee-paying students admitted to the degree or diploma programme.

b. The students in the programme are potentially distributed across several locations.

c. A course, when offered in traditional classroom based instruction, requires a number of well-qualified professors to deliver instruction.

d. The students are expected to be tested on their understanding of the subject matter and/or their problem-solving skills before they are awarded a degree or a diploma.

e. There exist ways/means to give exams that are "proctored".

f. (_preferably) an "army" of instructors or TAs (Teaching Assistants) is available to help students with problem-solving in smaller classrooms or tutorials (or with experiments in smaller lab settings).

A programme, of the kind above, can expect to witness significant gains in the quality of instruction using MOOCs. This is illustrated by an example below.

a. No fundamental change is necessary in respect of curricula in respect of "credits", pre-requisites, Lecture|Tutorials|Practicals (or LTP) structure. A 3L-1T-2P course would be delivered as a MOOC course (actually a SPOC course) with 0L-1T-2P as the LTP structure. Here classroom based lectures are completely replaced by digital content that may be downloaded on demand.

b. (And this is a preferred mode of re-structuring) The concept of "blended classes" may be introduced. In that case, a course with a 3L-1T-2P or 3L-0T-2P structure may
be re-structured as 0L-2T-2P with classroom based lectures replaced by digital content and number of tutorials changed from 0 or 1 hour per week to 2 hours per week.

c. The big advantage is that we require expert professors only to create digital content for each course or to generate problem sets to be solved by students in tutorials. The content may be downloaded by students taking the course (only). In the traditional mode, we would require many "expert" professors to lecture in classrooms (one for each "section" or college as the case may be).

d. More importantly, the gains are in respect of quality of content delivery. In the example illustrated below, the average quality of instruction improves from 5.5 to 7.5 in a multi-section or multi-location course with 8 sections. In the figure below, student feedback on a scale of 10 ranges from 2 to 9, resulting in an average of 5.5. It is to be expected that a course delivered in SPOC mode with blended form of tutorials will yield average students satisfaction of at least 7.5 (or so) across the board.

Later in this report, we identify several groups of institutions (or programmes run by them) that are likely to benefit the most from using MOOCs (more specifically SPOCs) so as to improve both scale and quality of education.
Non-Formal Sector

Background

Non-formal education is all about ‘acknowledging the importance of education, learning and training which takes place outside recognized educational institutions’. India has a large population of students and workers who operate outside the formal sector or who need to be additionally skilled to be gainfully employed.

India’s demographic dividend is evidenced by the Census 2011 data. India’s working age population (15-64 years) is now 63.4% of the total. The ‘dependency ratio’ - the ratio of children (0-14) and the elderly (65-100) to those in the working age - has reduced to 0.57. Out of a total of 767 mn working age population, near half (333 mn) are below 30, while about 16% (125 mn) are above 50. We have a very young population evenly split in terms of gender. Vocational Education and Training has become the most important segment of the non-formal education. The National Skill Development Corporation (NSDC) is trying to skill 150 mn people by 2022 across a large range of sectors and has recruited a large number of partners to carry out this mission. Sector Skills Councils have been set up with heavy involvement from industry. This is in addition to the ITI/ITC formal vocational educational ecosystem.

There are significant student dropout rates, both from schools and colleges. These contribute to the swelling ranks of people who enter the organized and unorganized job market from Class IX onwards (age 15 years and above).

Not only that, despite strong focus on educational qualifications, of the 5 mn students that graduate and enter the work force each year, a recent survey estimated that a significant proportion, nearly 47%, were found not employable in any sector given their English language and cognitive skills.

The capacity of the formal education system will remain constrained by the lack of infrastructure, faculty shortage and quality. It cannot single-handedly support the needs of such a large, distributed and diverse audience.

It is obvious that these efforts are not going to entirely serve the needs of this large working population and that high quality learning experiences can be provisioned using technology enabled learning for a large segment of the working population that is able to access it.

MOOCs in the Non-Formal Sector

Clearly, one way to provide non-formal education is through MOOCs. MOOCs provide the flexibility to the learner to learn at her pace, from the instructors or organizations of her choice. MOOCs may not always be free. In some variations (like SPOCs), they may be neither massive nor open. They may not always be backed by physical LAB areas for necessary drill and practice skills.

However, they bring the power of online, social network based learning that helps and guides learners in taking greater responsibility for their own learning. Educational design of non-formal programs rely on principles of adult learning and learning theories of Constructivism and Connectivism.

Rogers explains how non-formal education can take different forms including those from:

- The small-scale individual or small group educational activities to large scale national programs
- Highly contextualized to standardized programs
- Adult to children’s education
- Temporary learning programs introductory to formal schooling to a permanent alternative to formal schooling
- Literacy and basic education to post-initial, vocational and advanced continuing professional development
- State programs to those offered by commercial agencies
- Separate educational activities to practical exercises inside schools.

MOOCs and the Future of Indian Higher Education

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India has a large population of students and workers who operate outside the formal sector or who need to be additionally skilled to be gainfully employed

Employability is a huge concern – not just for first time graduates but also on a continuing basis
The MOOCs that have been developed around the world in the past few years have not just been the domain of universities and the programs they run. Rather, there have been a slew of courses offered on Computer Science, Health, Business, Art & Design, Sciences, Social Sciences, Education, Law, Management and a host of other areas.

Traditional training providers such as Lynda.com which has 2600+ courses and over 4 million users, Treehouse and Codecademy have placed increased focus and investment on scaling up their offerings. Many MOOCs in the non-formal sector, especially for Vocational Education and Training, shall require offline, hands-on training and practice areas. Given their online nature, hand holding for learners may also be required.

MOOCs offer a way to gain skills not taught in the formal sector, demonstrate them to potential employers and stay abreast of developments at the workplace

- Small to large scale educational programs
- Niche vs Standardized programs
- Adult to children’s education
- Can range from:
  - soft skill areas such as English, Communications and Teamwork
  - functional skills like Sales, Customer Service and ICT skills
  - skill enhancement courses specific to the sector

Informal Sector

Background

While the formal sector is heavily organized and structured, the non-formal sector represents more learner driven choice-making for skills and certifications. Informal Learning, on the other hand, happens all the time.

“Informal learning is the unofficial, unscheduled, impromptu way most people learn to do their jobs (Jay Cross)”.

Informal learning forms a vast part of any individual’s learning. This typically happens through social or "informal" interactions with peers, colleagues, friends etc. and learning through experiential means (experiential learning).

Informal learning has the following characteristics:

1. It happens outside formal and non-formal structures of education.
2. It is mostly unorganized and originates accidentally depending on context.
3. It is vastly related to direct skill creation, the ability to do something.
4. It creates spontaneous and ad hoc learning pathways that are purely learner aspired and defined.
5. It has the ability to create connections and rapid knowledge networks.

Given the breath of available information and content on the Internet today, students are driven to mine, discover and learn informally. They will look to gain “peripheral learning” over and above what is defined by the course curriculum.

This is an important sector. While the formal and non-formal sectors organize the flow of instruction through programs and courses, this sector focuses more on learning on-the-job, to get better at the job or to get a better one, and the skills required to achieve this. This sector has overlaps with the other two sectors, in the sense that informal learning can be leveraged in the learning process in either of those sectors.


Unorganized, lifelong learning processes for self, community and workplace
Similarly, Gamification (the use of game techniques in non-game situations) may be an important tool for informal learning. Using Gamification tools and techniques such as levels & challenges, leader-boards and augmented game interactions, we can create powerful informal learning environments.

MOOCs in the Informal Sector

The intrinsic nature of informal learning extricates it from being a course based study. Informal learning by its very nature is Massive, Online and Open (MOOC without the 'C'). The MOO(C) platforms may be able to provide a mechanism for citizens to connect and grow interest in variety of “hobbyist” areas such as health, personal finance, sports, amateur photography and areas of broader social interest like disability and alcoholism, where a formal course is generally not available. The interest and purpose of informal learning by the learner, in some instances, may also get institutionalised in formal and/or non-formal courses.

MOO(C) mechanisms provide an opportunity to build a portfolio of these lifelong learning opportunities. One of the important components of these open online environments is Badges. The Badges systems in MOOC design can provide an evidence of informal learning and can later also be recognized in the non-formal or formal systems. Badges may indicate a level of accomplishment, but may also cover non-traditional levels of accomplishment (e.g. popularity badge). The Mozilla Open Badges project provides a standard way to define and manage these badges.

“As Jay Cross states\textsuperscript{23}:

Learning is that which enables you to participate successfully in life, at work, and in the groups that matter to you. Informal learning is the unofficial, unscheduled, impromptu way people learn to do their jobs. Formal learning is like riding a bus: the driver decides where the bus is going; the passengers are along for the ride. Informal learning is like riding a bike: the rider chooses the destination, the speed, and the route.

Critical Success Factors

Having argued that MOOCs (or variants such as SPOCs or blended MOOCs) can indeed improve both quality and scale of tertiary education in India, it is natural to ask as to what are the infrastructural and other requirements to make this happen.

Clearly, creation of digital content (consisting of voice, video, formatted text and even animation) is a big challenge. Other than subject experts to guide the creation, we will need content developers who are well-versed with various tools to create and string together instruction modules and exercises, and to upload them onto a MOOC platform.

The second issue relates to underlying infrastructure consisting of three components. First, the platform from which the digital content is downloaded (or one used to evaluate exercises online or gather and provide analytics) could be one provided by a platform provider. Alternatively, one could develop this from scratch, possibly using the available open community software such as open-edX software, and cloud based storage. Second, the end devices used to download and view the digital content is ideally a desktop, laptop, or a tablet PC. The desktop could be owned individually, or made available in labs or in library for use by students enrolled in the college. The more challenging resource is ready access to high speed Internet with download speeds of (say) 2 to 10 Mbps. A 3G smart phone could well serve the purpose provided the digital content is not bandwidth intensive.

Thirdly, to grow truly national in character, these MOOCs will also need to be translated into multiple languages and adapted to local contexts. It will be also important to map them to different curricular needs. This requires a coordinated (perhaps crowd sourced) effort.

Fourthly, in areas where certification is valuable and desired, these MOOCs will need to devise online mass, assessment techniques and integrate with online or offline proctored test mechanisms where necessary. Investments in platforms will be absolutely necessary to employ peer assessments, robo-grading (automated mass evaluations), learning analytics, gamification and other important tools and techniques.

Fifthly, mechanisms for recognizing MOOC outcomes across sectors (such as by credit transfer and accreditation) are going to be important to establish.

Last, but not least, we shall need strong advocacy mechanisms that make stakeholders aware and capable of adopting and adapting MOOCs in their systems of teaching and learning.

Strong advocacy mechanisms are needed to make stakeholders aware and capable of adopting and adapting MOOCs
Potential Applications

Applications and scenarios for formal, non-formal and informal sectors
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Potential Applications

Formal Sector

Let us look at how MOOC or SPOC models can be used in the formal sector.

Application 1: SPOCs in Traditional University Education

The broad contours of a university (for example, like the Uttar Pradesh Technical University [UPTU]) are as follows:

<table>
<thead>
<tr>
<th>No. of colleges affiliated to UPTU</th>
<th>500+ (300 offer Engg. in various disciplines, 400+ offer MBA, &amp; more)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of distinct programmes offered at UG level in UPTU</td>
<td>12 distinct degrees, possibly offering over 50 specializations</td>
</tr>
<tr>
<td>Curriculum created by UPTU</td>
<td>Uniform for nearly all colleges</td>
</tr>
<tr>
<td>Examination, certification</td>
<td>Conducted centrally by UPTU</td>
</tr>
<tr>
<td>Role of colleges</td>
<td>Train students (conduct lectures, tutorials, lab sessions)</td>
</tr>
<tr>
<td>Process of admissions (eligibility, merit list)</td>
<td>Centrally spelt out eligibility</td>
</tr>
<tr>
<td>Total no. of students in all colleges affiliated to UPTU</td>
<td>210,000+</td>
</tr>
<tr>
<td>No. of students graduated summer 2013</td>
<td>54,000+</td>
</tr>
<tr>
<td>No. of students admitted each year in all colleges affiliated to UPTU</td>
<td>120,000+</td>
</tr>
<tr>
<td>No. of distinct semester-long courses offered in UPTU</td>
<td>Hundreds (possibly over 500)</td>
</tr>
<tr>
<td>No. of students in typical semester-long course in UPTU</td>
<td>1,000 to 5,000 (in some cases as many as 10,000)</td>
</tr>
</tbody>
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  - No. of distinct semester-long courses Hundreds (possibly over 500) offered in UPTU
  - No. of students in typical semester-1,000 to 5,000 (in some cases as many as long course in UPTU 10,000)


It merits analysis whether SPOCs can indeed help UPTU-like technical universities and its affiliated colleges (and there are more than 10 state-wide universities in India), to improve quality of instruction. The answer is a resounding "yes, the potential is exceptionally high" (and one must explore this even if it is only to experiment). Some additional comments are presented below.

a. It is conceded that SPOCs will only replace the classroom instruction with delivery of digital content, and not bring about any significant change in pedagogy.

b. One must consider instructor-led classroom-based tutorials with small number of students (say 20 to 35) to help improve problem-solving capability in students. Needless to say, lab work must continue to be emphasized. Both of these are possible, given that required infrastructure already exists in all colleges.

c. One may not entirely replace the existing classroom model into one based on SPOCs. Instead, and to begin with, one must consider those courses/programmes where the number of students is very large across the university. In UPTU-like universities there would be many courses where the registration would exceed few thousands. This is where the payoffs are greater. Once the experience is positive, one will wish to ramp it up quickly, covering courses where the number of students enrolled is smaller, but still in thousands, if not hundreds.

d. On the faculty front, one would need faculty who are subject experts at creating digital content and problem sets for use in tutorials. This exercise is done once for the university, but used and re-used (with some updates each year) by colleges that follow the curriculum. One would, however, need an army of instructors to hand-hold students through the problem-solving tutorials. These instructors are not necessarily experts. In US, universities tutorials are typically handled by post-graduate students, who double as Teaching Assistants.

There are several other universities that are similarly organized to offer technical education in their respective states. For instance, Visvesvaraya Technological University (or VTU) has 201 engineering colleges in Karnataka affiliated to it. Every year over 50,000 students graduate from VTU. In Tamil Nadu, over 550 colleges admitted over 175,000 students in the last academic year to its various programmes in engineering.

**Application 2: SPOCs in Other Universities**

The broad contours of a university like Delhi University are similar, though not identical, to those of UPTU mentioned above. Surely, the disciplines in which DU offers programmes, their

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9http://vtu.ac.in/
curricula, etc., are different from those offered by UPTU. But, this is where the dissimilarities end. As with UPTU, (a) the group of students from various colleges enrolled in a given programme is well-identified, (b) given that all students pay tuition fee, they are committed to completing various courses and earn a degree, (c) students enrolled in the same programme follow the same curriculum and take the same tests, and finally (d) the exams are proctored, conducted and evaluated centrally by university professors.

As for numbers, at least 20 colleges offer BSc (Hons) Physics programme to over 1,100 students. BSc (General) is offered by over 50 colleges, with a total enrolment of over 2,000 students. The number of students thus registered in a semester- or year-long course is 1,000 to 2,000. It is, therefore, argued that using the SPOCs method will allow a university such as Delhi University to leverage the SPOCs model of delivery of instruction, while introducing problem solving sessions - or tutorials in small batches of students - and laboratory sessions taught by faculty in various colleges.

Our assessment is that barring a few good colleges, it is a challenge to find subject experts to deliver lectures in large classroom settings, while such colleges will have the faculty resources to help students solve problem sets in tutorials or conduct lab experiments. If a university like DU were to adopt the blended mode of instruction (and with lectures replaced by delivery of digital content) it would be able to significantly improve the scale and quality of its programmes.

Needless to point out that there are several other universities in India - some even larger, other smaller - that are similarly organized. University of Pune has 500,000 students studying in over 130 colleges across several districts in Maharashtra. The universities in Mumbai, Kolkata or Chennai cannot be very different either. They can adopt, and adapt, the SPOCs model with a view to improve quality of instruction and begin to address the issue of faculty shortages in their colleges.

Application 3: SPOCs in Technical Polytechnics

Across India there are over 3,400 polytechnics with over 1.1 mn students enrolled in engineering/technology programmes each year. In Tamil Nadu alone, there are 501 polytechnics offering admissions each year to over 0.2 mn students in over 60 distinct Diploma programmes.

SPOCs may be used in traditional educational institutions to combat faculty shortage and to improve scalability and quality.

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There are (presumably) 1,000 to 10,000 students in various programmes offered by the polytechnics (or an average of 3,300 students in each programme)\(^\text{27}\).

Clearly, polytechnics can take advantage of SPOCs to improve the quality of instruction they deliver to their students. This new approach of using SPOCs, together with blended classes and hands-on lab work can be a game changer, more so since finding the right faculty in polytechnics is an even greater challenge compared to engineering colleges.

**Application 4: MOOCs in Traditional Higher Education System**

MOOCs could be leveraged in the traditional university system in many ways.

1. Indian teachers and institutions could use MOOC platforms to create and conduct MOOCs for students all over the world, just like universities have done worldwide. This has attendant benefits for branding, publicity, recruitment of foreign students and extension of the Indian Higher Education system across global boundaries.

2. Institutions could empanel expert and reputed teachers to create and/or conduct MOOCs on their behalf, or use content created by top notch teachers and universities elsewhere in the world.

3. MOOCs could be used by teachers as essential components of internal assessment. Teachers could substitute traditional activities with MOOC based activities and assess students based on their performance and participation in the MOOCs.

4. MOOCs accomplishments could be counted as actual degree or diploma credits. Certain highly trusted and reputable MOOCs could find their way into the curriculum itself.

5. MOOCs could also be used (like in the case of the Open Education Resource University, OERu) to recognize prior learning (RPL - Recognition of Prior Learning).

6. There will be many curricula that required physical participation or interaction in laboratories. These can be blended with MOOCs, like the IITs are intending to do.

**MOOCs may allow institutions to reach a global audience of students, teachers to become increasingly mobile and learning experiences to become more collaborative**

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\(^{27}\)http://www.aicte-india.org/downloads/Growth_Technical_Institutions_310514.pdf#toolbar=0
**Application 5: MOOCs in Open and Distance Learning**

There are around 200 Open and Distance Learning (ODL) institutions in India with over 4 mn students. Their entire curricula and delivery could also be transacted through MOOCs. For ODLs that are not yet providing online methods (i.e. that rely on printed books and CDs), this is a great opportunity to leverage the MOOC medium along with the wealth of open education resources that are available.

Recognizing this potential, Open Universities in the UK (FutureLearn) and Australia (Open2Study) have set up their own MOOC initiatives. The entire Open and Distance Learning education model could benefit immensely from adoption of MOOCs.

**Application 6: MOOCs in Vocational Education: Community Colleges, Polytechnics, ITIs and ITCs**

For Vocational Education and Training (VET), a lot of focus is placed on hands-on activities. As mentioned, there may be developments in technology that may enable some efficiencies in setting up these LABs (using haptics, we can potentially create lower cost simulations of equipment interaction scenarios). VET will benefit from a blended approach to MOOCs.

The extent of open and online learning in these MOOCs, will depend upon the degree of hands-on requirements. A lot of domains, predominantly sales and customer service, which do not require hands-on-equipment training, would benefit from MOOCs that leverage simulations and serious games.

For example, a customer service manager in an automobile company is entrusted with handling customers, their jobs and complaints, but not actually fix the problem, which is something that requires hands-on-equipment. Similarly, sales people need an appreciation of the engineering behind the automobile, but only enough for them to communicate the benefits of the automobile to the prospective customer.

**MOOCs may help Vocational Education and Training institutions to improve quality and scale; also can be blended with online LABs**
In fact, more than half the jobs in sectors such as Banking, Auto, IT/ITes, Retail, Healthcare and Hospitality belong to such roles. This could be a major area of MOOC based interventions, backed by videos, mobile learning, simulated role-plays, serious games and decision making simulations.

For learning that does require hands-on experience, the possibilities are to either setup new LABs or leverage existing capacity (for example, use of school labs in the afternoon for the community to use) or to explore computer “haptics” based approaches. The LAB experience can then be blended with online learning and assessments can happen both in LABs and online.

Non-formal Sector

Application 1: Professional Development MOOCs

Many professions require continuous learning and re-learning to stay current, adapt to rapid changes and stay competitive. Often, associations of professionals from a related field, become hubs where these opportunities for learning are made available, in addition to chances to network with other professionals and experts. There is already a rich culture of sharing and an appreciation of collaborative learning in these associations. Many such organizations already exist where the requirement to earn education credits is tied to the license to operate in the profession.

For professional organizations, adopting the MOOC models will lead to an exponential increase in knowledge sharing and exposure to a massive worldwide audience. This will increase value for members and improve competitiveness and quality of the profession as a whole.

MOOCs for Professional Development may be operated by associations of professionals to serve continuing education needs for maintaining professional licenses

\(^{28}\)The work done under the Sakshat Amrita Vocational Education project, accessible at http://www2.amrita.edu/centers/ammachi/projects/save
Vignette

I am Mr. Madhur Pande. I am a Sales and Marketing Manager in an FMCG company. I am required to achieve set targets to get performance bonuses and promotions. My prime responsibility is to understand potential consumers and their needs and requirements and understand if the product/s manufactured by the company fulfils the needs and desires of the consumers. I also need to understand the market trend and changes and suggest improvements accordingly. I need to analyse the methods and procedures followed by other FMCG companies manufacturing similar products. I have to understand the competition in the market and suggest competitive prices for the products. I am required to develop marketing strategies and devise plans. I need to focus on the process of selling the products and various ways and means to promote and advertise them for which I require training and knowledge of social media and related analytics.

Application 2: Government Personnel Training MOOCs

Governments can also leverage MOOCs for personnel training. Given the large captive audience for general courses (such as procurement planning, fiscal adherence and other areas of importance) across the public sector, including some very large public sector organizations themselves, the Government can and may officially adopt MOOCs.

In the process, there will be also be major cost and time savings, apart from the potential to improve quality of service and a greater level of connectedness between government officials.

Vignette

I am Mrs. Sapna Gopalan. I work as an Inspector in Central Excise and Customs. My key responsibilities include generating reports on duty collection, number of show cause notices issued, top 100 service providers, top 10 exports and imports. I have observed that there is a tremendous shortage of manpower in the department and there is improper distribution of work. I am required to put up several reports online and send them to higher officials. I am required to trace non income tax filers and penalize them. But there is no training provided to us on software that help us trace these persons. I see MOOCs as an efficient means to take courses and specialise in the Customs department systems and processes and be more effective in my job.
Vignette

I am Pravin Kumar. I am a B.Sc. Physics and Photography graduate from the University of Pune and have been unemployed for over a year. I am looking for a job as a designer in software companies. In spite of my good grades in the graduation, I am unable to strike a job in a software company. I am weak in my communication and language skills and I find it difficult to communicate with people. I would like to hone my soft skills and become more employable.

Application 4: Vocational Education MOOCs

Vocational Education can immensely benefit from MOOCs. Some areas of vocational training will certainly require hands-on, face-to-face interaction, but many others can be performed totally online. Even for the hands-on experience, there have been technology advances in haptics technology that hold great promise for simulating work on equipment. In a lot of cases, where hands-on is particularly hazardous or difficult to recreate in real life, training can be effectively supplemented using life-like simulations. Traditional ITI/ITCs can benefit immensely from integrating MOOCs not just for students but also trainers and experts involved in VET.

MOOC certifications for Vocational Education and Training can help expand the availability of skilled labour
Vignette

I am Prakash Singh. I had to start working at an early age. I wanted to become an automobile engineer. I completed my Diploma from an ITI. Now after working for the past 4-5 years, I want to upgrade my skills and learn new things that will help me grow in my career.

Application 5: Teacher Education

The Education sector must leverage MOOCs for its own consumption as well, as not to do so would be incongruous. It is important to acknowledge that if we were to teach teachers in the same way as we taught our students, then we would merely be continuously reinventing the wheel. The need of the hour is to embrace new paradigms of teaching and learning, rather than incrementally innovating the existing ones. Teacher Education MOOCs can span both pre- and in-service programs supplemented as necessary by school internships and physical LABs.

Vignette

I am George Fernandez, a retired colonel from the Indian Army now heading operations in ATOZ Foundation. Our foundation’s mission is to create quality teachers to improve the quality of education. The foundation is funded by a high net worth individual who has invested in a University campus in South India purely dedicated for teacher training. We get people from all walks of life who wish to make a difference to the society by contributing as teachers. We churn out 15,000 such teachers every year through our University. Unfortunately, we fail to provide appropriate skill development opportunities and engage with our teachers after they leave our campus. We are not able to implement continued education to a growing number of these teachers passing out of our campus- around 125,000 currently.
Informal Sector

We propose possible ways to contextualize how MOOCs can be provisioned for informal learning needs.

1. MOOCs providers can provide a technology platform where citizens can come together to form communities of interest.

2. Providers can identify and present structured content to citizens in areas where they have interests. They can also allow citizens to create their own content.

The MOOC platform can oversee and bridge the gap between informal and formal/non-formal learning through rich analytics, gamification, badges and adaptive learning mechanisms.

Application 1: Life Skills (such as Finance, Health, Technology and Personality development)

Citizens access a wealth of information on the web and through their social networks to build know-how on personal finances (where to invest, understand the risks etc.), general health and medication (what is wrong with my health? What does the prescribed medicine do?), technology and do it yourself culture (how do I use this gadget? How do I repair this piece of furniture?).

While a majority of such interests are on a "needs-to" basis, in some instances there will be continuing interest to build and grow the know-how into higher level knowledge and skills. MOOC platforms can track and help citizens to take a step towards courses and certifications.

Vignette

I am Babulal Joshi. I always had issues managing my personal finances. By the time I was 35, I was badly indebted. I was under constant apprehension of going bankrupt if I lost my job. All this was due to poor financial planning and my lack of foresight in preparing for the future. I would have really benefitted if I could have learnt these essential skills early on in my life.
Application 2: Citizenship (areas of National/NGO significance)

Social media has elevated a number of social issues to national significance. Carbon Footprint Credits, Disability, Alcoholism, Gambling, Counselling services, Civic Sense building are a few of them. A number of NGOs across the country address these social and environmental challenges the country faces. MOOCs can be an enabling channel for community sharing and providing focussed courses to cater this category of informal learning.

Vignette

I am Prerna Murthy and work as a Director for Earth Matters, an India based NGO that has been in existence for about 20 years and works to raise awareness on social and environmental issues. As a local NGO, we face significant shortcomings in areas such as Governance, Strategic Planning, networking, capacity management and building relationships with NGOs. A number of volunteers employed by us graduate from a variety of areas without specialised knowledge in some of areas highlighted above. There is lot of informal learning through web resources that is ad hoc and distributed. We also look to tap into the know-how of other NGOs facing similar challenges and constraints, so we can build specialised know-how, create and share best practices.
Application 2: Citizenship (areas of National/NGO significance)

Social media has elevated a number of social issues to national significance. Carbon Footprint Credits, Disability, Alcoholism, Gambling, Counselling services, Civic Sense building are a few of them. A number of NGOs across the country address these social and environmental challenges the country faces. MOOCs can be an enabling channel for community sharing and providing focussed courses to cater this category of informal learning.

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Issues of national significance and impact can be handled by MOOCs very effectively.

Next Steps
Next Steps

To execute this vision, we have proposed possible next steps for consideration by the government, institutions & education providers, and employers & professional associations.

Government

Government may encourage, recognize and accept, facilitate and possibly incentivize the use of MOOCs, and its variants (SPOCs, xMOOCs, cMOOCs, etc.), for online delivery of courses in all sectors, viz. formal, non-formal and informal education. One possibility for the central or state governments is to do so through its arms such as MHRD, UGC, AICTE, state-level Directorates of Technical Education, etc. However, it may be left to non-governmental bodies to take the lead. Non-governmental bodies include industry associations, professional societies, groups of universities/institutions or even public or private (both for profit and not-for-profit) education providers. Areas worth exploring include:

a. Develop systems to recognize or certify competence of individuals who have taken MOOC-based courses.

b. Promote and fund R&D of MOOCs and its variants to address areas that are still "works-in-progress" as also areas that will enable use of MOOCs and its variants to address needs that remain unaddressed. Examples include giving "proctored" exams in multiple remote locations, or computer-based evaluation of students' responses to exercises.

c. Promote and fund the development of MOOC courses, tools and platforms for use by a large number of organizations to serve millions in formal, non-formal and informal education sectors.

d. Promote and fund an assessment of the quality of education delivered in courses that are delivered online using MOOCs pedagogy as compared with other modes of faculty-led instruction in large classroom formats.

e. Sensitize organizations, viz. institutions and corporate entities, faculty, students and parents of the merits and de-merits of MOOCs and their applications to formal, non-formal and informal education.

f. Like American Council of Education\(^3\) and the National College Credit Recommendation Service (NCCRS)\(^4\), NBA and NAAC can accredit MOOC programs and courses for use in credit transfer\(^5\) between MOOC Providers and formal & non-formal educational institutions.

\(^3\)http://www.acenet.edu/Pages/default.aspx
\(^4\)http://www.nationalcrs.org/default.aspx
\(^5\)http://chronicle.com/article/American-Council-on-Education/137155/
Institutions and Education Providers

Institutions and Education Providers may adopt and adapt MOOCs and its variants and offer courses as part of formal, non-formal and informal education. In doing so institutions and education providers could develop, or help develop, digital content for various courses. Necessarily, education providers and institutions may have to review and revise their curriculum to recognize the significant contribution that MOOCs may play in improving scale and quality of education. Additionally:

a. Institutions and education providers may train its faculty in developing high quality digital content for courses they offer, as also in giving courses using MOOCs pedagogy (with or without blending them with faculty-led problem-solving sessions).

b. Re-assess and revise existing curricula from the viewpoint using MOOCs as a way of delivery instruction to students in formal, non-formal and informal higher education.

c. They may develop frameworks for instruction of quality assessment and assurance, towards which they may develop quality standards against which quality is to be assessed.

d. Institutions and education providers may undertake R&D of MOOCs and its variants to address areas that are still “works-in-progress” or address needs that remain unaddressed. They may also collaborate with others to undertake development of MOOCs tools and platforms.

e. By collaborating to create a common vocabulary linking credits to learning outcomes across all programs and courses (similar to the European Credit Transfer System [ECTS] or through some other mechanism), a robust framework for credit transfer may be created. This shall allow MOOCs to play a significant role so long as they comply with the framework.

f. Open and Distance Learning Providers may quickly adopt MOOCs technology and pedagogy to provide new learning experiences to their students. India could also have its own Open University MOOC initiative like in countries such as UK and Australia.

g. Teacher Education Institutions may quickly build capability in MOOCs and adopt them formally in their curriculum. It is also very important for them to invest in leading this change across other institutions.

Train faculty in developing high quality digital content for courses they offer, as also in delivering courses using MOOCs pedagogy

http://ec.europa.eu/education/tools/ects_en.htm
Employers & Professional Associations

Employers seeking to employ fresh graduates or experienced professionals, and professional "guilds" or associations, may recognize the value delivered by MOOCs. They may accept recognition or certificates awarded by competent authorities based on standards for assessing one's competence acquired using MOOCs-based courses. Additionally:

a. They may encourage their own HR departments to arrange for continued education of their employees in emerging areas of technology or management.

b. Employers may work with industry associations like FICCI and others to facilitate development of standards for quality assessment and assurance.

c. Agree on a common Badges system, perhaps based on the Mozilla Open Badges framework.

d. Help MOOCs pathways emerge and the MOOC system become fully interoperable - recognizing and sharing MOOC credits, credentials, prior learning and portfolios. Facilitator organizations like MOOCs University and OERu could also become useful entities in the ecosystem.

e. Help consolidate learning records through providers such as Degreed. Degreed is a free service that tracks and scores all of a person's education-from books and online courses to formal college degrees.

f. Help build/recognize "nanodegrees" or similar employment pathways as popularized by Udacity, XSeries from MIT-edX or Signature Track from Coursera.

Teacher Education Institutions may quickly build capability in MOOCs and adopt them formally in their curriculum.

Facilitator organizations like MOOCs University and OERu could also become useful entities in the ecosystem.

Employers may encourage their learning departments to leverage MOOCs, Badges and Portfolios

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*http://www.moocsuniversity.org
*https://degreed.com/
*https://www.udacity.com/nanodegrees
*https://www.edx.org/xseries
Conclusion
Conclusion

It is abundantly clear that in India there is a need to significantly expand opportunities for post-secondary education in a big way. This comes at a time when there has already been a very significant expansion in the last decade. The anticipated expansion should happen while we simultaneously and significantly improve the quality of instruction. Given that faculty is in short supply (itself an understatement), we must resort to technology enabled learning to help fill existing gaps in access and quality as also grow opportunities for post-secondary education.

Reluctance to adopt this changed pedagogy is likely to be a greater roadblock in introducing MOOCs (or SPOCs). In India, this is likely to be the case because of resistance to change on the part of both teachers and administrators rather than from a conviction that face-to-face classroom based instruction is irreplaceable. One way out is to indeed put in place a well thought-through plan for assessing students’ learning experience by running courses simultaneously in two formats, viz. (a) MOOCs based instruction together with flipped classes, and (b) traditional classroom-based lectures with tutorials. Any decision to accelerate adoption or to wind down adoption of MOOCs must be based on outcomes of these experiments.

MOOCs have been adopted by some of the best universities abroad and in India by IIT Bombay and BITS Pilani. It is also clear that MOOCs are here to stay, but will evolve over time to address varying needs in the world. Given the enormity of the task of increasing GER in India to 30% by 2030, Indian institutions and academic regulators cannot remain mute spectators.

This paper has set an ambitious vision for MOOCs in Higher Education in India. There are many other important challenges to this vision such as building capability in stakeholders to adopt this innovation and being able to scale these innovations equitably. This may also require significant policy measures to make them mainstream, especially in the formal sector where credits are the currency.

However, the potential that can be unleashed through implementing this vision is enormous. It requires concerted effort over the next few years to establish MOOCs as a channel that can deliver high quality learning to a wide cross section of adult learners. We must collectively move forward in adopting and adapting this transformative development in education.
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**Glossary**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AICTE</td>
<td>All India Council for Technical Education</td>
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<tr>
<td>B. Sc.</td>
<td>Bachelor of Science</td>
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<tr>
<td>BFSI</td>
<td>Banking, Financial Services and Insurance</td>
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<tr>
<td>BITS</td>
<td>Birla Institute of Technology and Science</td>
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<tr>
<td>CEC</td>
<td>Consortium for Educational Communications</td>
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<tr>
<td>CSE</td>
<td>Computer Science Engineering</td>
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<td>DU</td>
<td>Delhi University</td>
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<td>Engg</td>
<td>Engineering</td>
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<tr>
<td>FICCI</td>
<td>Federation of Indian Chambers of Commerce and Industry</td>
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<td>FMCG</td>
<td>Fast Moving Consumer Goods</td>
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<tr>
<td>GER</td>
<td>Gross Enrolment Ratio</td>
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<td>HE</td>
<td>Higher Education</td>
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<td>HEI</td>
<td>Higher Education Institution</td>
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<td>HR</td>
<td>Human Resources</td>
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<td>ICT</td>
<td>Information and Communication Technology</td>
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<td>IIM</td>
<td>Indian Institute of Management</td>
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<td>IISc</td>
<td>Indian Institute of Science</td>
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<td>IIT</td>
<td>Indian Institute of Technology</td>
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<td>INR</td>
<td>Indian National Rupee</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>ITC</td>
<td>Industrial Training Centre</td>
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<tr>
<td>ITeS</td>
<td>Information Technology Enabled Services</td>
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<tr>
<td>ITI</td>
<td>Industrial Training Institute</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>L&amp;D</td>
<td>Learning and Development</td>
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<tr>
<td>LAB</td>
<td>Laboratory</td>
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<tr>
<td>MBA</td>
<td>Master of Business Administration</td>
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<td>MHRD</td>
<td>Ministry of Human Resource Development</td>
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<td>MOOC</td>
<td>Massive Open Online Course</td>
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<td>NAAC</td>
<td>National Assessment and Accreditation Council</td>
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<tr>
<td>NBA</td>
<td>National Board of Accreditation</td>
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<tr>
<td>NGO</td>
<td>Non-governmental Organization</td>
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<td>NIT</td>
<td>National Institute of Technology</td>
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<td>NMEICT</td>
<td>National Mission on Education through Information and Communication Technology</td>
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<tr>
<td>ODL</td>
<td>Open and Distance Learning</td>
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<td>OER</td>
<td>Open Educational Resources</td>
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<td>OERu</td>
<td>Open Educational Resource University</td>
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<td>PG</td>
<td>Post Graduate</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>RPL</td>
<td>Recognition of Prior Learning</td>
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<td>SPOC</td>
<td>Small Private Online Course</td>
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<tr>
<td>TA</td>
<td>Teaching Assistant</td>
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<tr>
<td>UG</td>
<td>Under Graduate</td>
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<td>UGC</td>
<td>University Grants Commission</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UPTU</td>
<td>Uttar Pradesh Technical University</td>
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<tr>
<td>US</td>
<td>United States of America (also USA)</td>
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<tr>
<td>VET</td>
<td>Vocational Education and Training</td>
</tr>
<tr>
<td>VLAB</td>
<td>Virtual Laboratories</td>
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</table>
Member Profiles

**Professor Bijendra Nath Jain**  
Vice Chancellor, BITS Pilani  
(Chair)

Since 2010 Professor Bijendra Nath Jain is Vice Chancellor of BITS Pilani, a university that offers UG, PG and PhD programmes from its campuses at Pilani, Goa, Hyderabad, and Dubai. Earlier, he obtained B. Tech. from IIT Kanpur and Ph. D. from SUNY, Stony Brook (NY). Since 1975, he was with IIT Delhi, where he was at different times Professor of Computer Science, Microsoft Chair Professor, Head of the Department, and Deputy Director. He has held visiting assignments with Universities of Texas and Maryland, Bell Labs, and Cisco Systems. Most recently, he was a Gledden Senior Visiting Fellow at University of Western Australia, Perth.

His interests are in Computer Networks and Systems. He has co-authored number of research papers in international journals or conferences, and the book "OSI: Its Architecture and Protocols" published in 1993 by McGraw Hill, New York. He is a co-inventor, with researchers from Cisco Systems, in seven US patents. In 1983, Prof. Jain was the first to propose a nation-wide data network for India. With funding from GoI and UNDP, and together with developers from other institutions in India, he built and launched in 1989 India’s first data network, ERNet.

**Viplav Baxi**  
Founder, LearnOS Consulting Services  
(Convenor)

Viplav is an education consultant and researcher with over 20 years of experience in elearning and technology. He was one of the first participants of the first cMOOC - CCK08, and has worked intensively with the MOOC community since 2008. He organized the EDGEx conference(http://www.edgex.in) in March, 2012 at New Delhi that featured the MOOC founders George Siemens, Stephen Downes and Dave Cormier. Viplav’s active research appears on his blog (http://learnos.wordpress.com).

He is the founder of LearnOS, a consulting entity focused on the education sector. He has rich and diverse senior management experience having been the CEO of Atelier (Simulations based training), President at Servitium (an eLearning company), Chief Technology Officer (at eGurucool.com, India's largest K12 eLearning initiative and at LIQVID, a digital learning company) and was among the earliest demonstrators of eLearning technology in India at IGNOU as far back as in 1997.
**Girish Gopalakrishnan**  
CEO, Wiksate Solutions  
Formerly Director-ICT Projects, Victorian Higher and Vocational Education (Australia)

Formerly Director-ICT Projects for Victorian Higher and Vocational Education (Australia)-responsible for the strategy and delivery of eLearning to about 500,000 Victorian students. Presently CEO of Wiksate Solutions - building solutions to make social learning intelligent.

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**Lokesh Mehra**  
Director - Education Advocacy, Microsoft

He is the Director- Education Advocacy at Microsoft Corporation India and is responsible for managing strategic relationships with MHRD and Institutional Bodies, Policy led engagements and Skill development initiatives. Prior to Microsoft, Lokesh has had stints with Cisco, Intel and NIIT. He has over 23 years of experience in Education, Marketing, Product Management, Sales and Channel Development in the IT industry.

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**Manish Upadhyay**  
Co-founder and Chief Evangelist, LIQVID

Manish has co-founded LIQVID - a learning company that uses technology. LIQVID has trained close to 350,000 learners in English language through its technology based – blended learning English product. He has been educated at IIT, Delhi & BIT, Mesra and has over 19 years of experience in the elearning industry. He has earlier worked with NIIT and Lionbridge Technologies.

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**Mohan Kannegal**  
Senior General Manager – Learning Solutions, Manipal Global Education

Senior General Manager – Learning Solutions, Manipal Global Education, his job is to ensure Manipal stays at the forefront of technology based education. Before joining, Manipal Global Education, Mohan cofounded Merit Trac Services. MeritTrac is India’s largest assessment company developing and delivering over 2 million online and paper assessments each year.
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About FICCI

Established in 1927, FICCI is one of the largest and oldest apex business organizations in India. FICCI’s history is closely interwoven with India’s struggle for independence, industrialization and emergence as one of the most rapidly growing global economies. FICCI has contributed to this historical process by encouraging debate, articulating the private sector’s views and influencing policy.

A not-for-profit organization, FICCI is the voice of India’s business and industry.

FICCI draws its membership from the corporate sector, both private and public, including MNCs; FICCI enjoys an indirect membership of over 2,50,000 companies from various regional chambers of commerce.

FICCI provides a platform for sector specific consensus building and networking and is the first port of call for Indian industry and the international business community.

Our Vision

To be the thought leader for industry, its voice for policy change and its guardian for effective implementation.

Our Mission

To carry forward our initiatives in support of rapid, inclusive and sustainable growth that encompasses health, education, livelihood, governance and skill development.

To enhance the efficiency and global competitiveness of the Indian industry and to expand business opportunities both in domestic and foreign markets through a range of specialized services and global linkages.