ABSTRACT
The Vision Paper builds a vision of Massive Open Online Courses for Indian Higher Education.

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Contents

Executive Summary ........................................................................................................................................... 4

Section 1: Terms of Reference ......................................................................................................................... 4

Section 2: Massive Open Online Courses ....................................................................................................... 6

Evolution of MOOCs ........................................................................................................................................ 6

Important Related Trends in Education Technology .................................................................................. 10

Learning Analytics ........................................................................................................................................ 10

Gamification .................................................................................................................................................. 10

Adaptive Learning ....................................................................................................................................... 10

Other Important Trends ............................................................................................................................... 10

Section 3: Vision Statement ............................................................................................................................ 11

Section 4: MOOCs in Indian Higher Education ............................................................................................ 12

Formal Sector ............................................................................................................................................... 12

Background .................................................................................................................................................. 12

MOOCs in the Formal Sector .......................................................................................................................... 13

Non-Formal Sector ....................................................................................................................................... 16

Background .................................................................................................................................................. 16

MOOCs in the Non-Formal Sector .................................................................................................................. 17

Informal Sector .............................................................................................................................................. 19

Background .................................................................................................................................................. 19

MOOCs in the Informal Sector .......................................................................................................................... 19

Section 5: Potential applications ................................................................................................................... 20

Formal Sector ............................................................................................................................................... 20

Application 1: SPOCs in Traditional University Education ......................................................................... 20

Application 2: MOOCs in Traditional Higher Education System .................................................................. 21

Application 3: Vocational Education: Community Colleges, Polytechnics, ITIs and ITCs ......................... 22

Non-formal Sector ....................................................................................................................................... 22

Application 1: Professional Development MOOCs ..................................................................................... 22

Application 2: Government Personnel Training MOOCs ............................................................................ 23

Application 3: Language, Communication and Soft Skills MOOCs ............................................................ 23

Application 4: Vocational Education MOOCs ............................................................................................. 24
Learning through Massive, open and online courses (MOOCs) shall enable, in all Indians who want to learn, earn, teach or innovate, the capability to realize their own true potential and transform our country.
Executive Summary

This paper articulates a vision for MOOCs in Indian Higher Education. It is a vision of how MOOCs can help augment and enhance the systems of education in the country.

The paper divides the Higher Education systems 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. The non-formal sector for Higher Education is represented by formal courses and certifications that are not the domain of the formal sector. The Informal sector represents the vast majority of learners who are learning all the time, but not for getting certified or through the other sectors.

MOOCs can play a transformative role each of the three sectors. The report describes each sector and outlines how MOOCs can be leveraged to fulfil needs in that sector. We then proceed to identify specific ways in which MOOCs can be used within each sector, illustrating them with vignettes or examples of use.

In conclusion, the report proposes a mechanism to execute the vision through the establishment of an initiative that shall educate and empower stakeholders to adopt MOOCs.

Section 1: 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 some very important issues around scale, quality and employability, is immense for a country like India. Since it is a new format, it is necessary to experiment and choose paths that will have the maximum positive impact.

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.

Members of the committee include:

- Prof. B N Jain, Vice-Chancellor, BITS – Pilani (Chair)
- Girish Gopalakrishnan, Wiksate
- Lokesh Mehra, Microsoft
- Mohan Kannegal, Manipal Global Education
- Manish Upadhayay, LIQVID
- Rajesh Pankaj, FICCI
- Viplav Baxi, LearnOS Consulting Services
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 site (at http://indiamoocs.wordpress.com), and publicized this initiative through both online and offline means, such as Twitter, Google+, Facebook and many online/offline conversations. We also have invited several guest contributions. Each committee member has 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 is 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 time 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 education sectors in India, with an eye on quality, inclusiveness and on affordability. We have proposed an overall vision proposition followed by clear proposal on how it can be propagated.

It is our hope that this effort will spawn more concerted thinking and quick, decisive action from the various stakeholders of our higher educational system.
Section 2: 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 restriction. The top global universities have already joined MOOC platforms or started their own MOOC initiatives. Together they host thousands of courses. The response from Indian students and teachers has been fantastic. Globally, Indians form the second largest pool of students attending MOOC courses.

The MOOCs offer high quality education from these top universities, usually for free. Over 10 million students have enrolled globally for thousands of these courses in just the top providers of MOOCs. Providers have started offering additional paid services, for example, assessments and certification.

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 the system and meet the goals of equity, excellence, expansion and employability.

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) MOOC. 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 the notion 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 both have changed in this new model. The teacher has become an expert learner and the process of teaching has become a process of modelling and demonstration. The learner has then to take 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 170,000 people joined).

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 also
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.

Since then many universities have joined the xMOOCs bandwagon globally (including the IITs from India), and many new MOOC initiatives have sprung up rapidly across the world such as Udemy, P2PU, FutureLearn, OpenStudy and Canvas. IIT Delhi and BITS Pilani are offering courses (using Coursera) to their own students.


In India, the IITs are proposing to implement a Blended MOOC model based on a combination of online access using the open-source EdX platform and customization of the EdX platform to incorporate 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 Online Courses (SPOCs) have also entered the discussions around MOOCs. As the name suggests, they are neither massive nor open. In that sense, they are more a way for traditional courses to be taken online than really following any of the MOOC philosophies.

These MOOCs have also garnered tremendous amounts of investments from institutions and venture capitalists. Coursera has by now received (as of Nov. 25, 2013) USD 85 million dollars in investment from investors such as GSV Capital and Learn Capital and has 5.5 million users across 190 countries, 512 courses and over 22.2 million enrolments (as of Jan 2014). Udacity, with over 1.6 million students has obtained about USD 20 million in funding from Charles River Ventures and Andreesen Horowitz. Udemy has garnered about US1D 16 million in
funding as well. EdX, a non-profit, has been seeded with USD 60 million from MIT and Harvard (USD 30 mn each).


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 identify is actually known.
Important recent developments include introduction of university led credentialing and assessment for a fee, acceptance of MOOC credits, community based badging, student authentication systems, proctoring through offline centres & automated systems, gamification and many such incremental developments. An inventory of MOOCs can be found
on sites like Class Central (https://www.class-central.com/) and MOOC-List (http://www.mooc-list.com).

Important Related Trends in Education Technology

Learning Analytics
Closely associated with MOOCs has been the emerging field of Learning Analytics (the seed for which was sown 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” (George Siemens, SoLAR, Open Learning Analytics: an integrated & modularized platform).

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 relevant to learning and performance can now be aggregated into Big Data stores and useful & actionable insights generated.

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. This was true of traditional online courses as well.

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).

Other Important Trends
Other trends that are impacting learning and teaching include:

a. Simulations and Serious Games, Augmented Reality – These can enable rich, collaborative learning experiences and come close to replicating real life conditions.

b. Auto-graders – Also called robo-graders, these are software that can perform large scale automated assessments, such as grading essays or grading computer science code projects. These are immensely useful for self as well as formal assessments at the scale at which MOOCs operate.

c. Wearable Computing, Internet of Things – Very soon, devices like smart “sensory” or “visual” devices shall start making a significant inroad into our learning experiences. The use of these devices not only enable us to get additional information from our environment but also to proactively interact with it.
d. 3D Printing – “…refers to technologies that construct physical objects from three dimensional (3D) digital content such as 3D modeling software, computer-aided design (CAD) tools, computer-aided tomography (CAT), and X-ray crystallography. (NMC Horizon Report, 2014). Though largely unexplored for their use in education, 3D printing does offer rich opportunities in the area. For example, history students can now create replicas of fragile artefacts and engage in learning by physically engaging with the replicas.

Section 3: Vision Statement

For India, the main considerations that have shaped our vision on MOOCs in Higher Education are those around the following aspects:

1. Quality
2. Affordability
3. Scalability
4. Inclusion
5. Employability

It is clear that these aspects will impact, to varying degrees, any attempt at building an overarching vision. It is also obvious that there are hidden tensions between them as well. For example, building quality at scale has always been difficult to reconcile given the creative endeavours of the education system.

With MOOCs, we have a mechanism to reach 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 students across diverse educational, economic, social and ethnic backgrounds. MOOCs have raised the bar on what learners and educators can do to gain and impart education. MOOCs have also provided ways for anyone to learn using open resources and networks, and to earn and innovate.

Our vision, therefore, encompasses the five aspects mentioned above and the transformative potential of the MOOCs, and describes how MOOCs can bring about transformative change for Indian Higher education.

Learning through Massive, open and online courses (MOOCs) shall enable, in all Indians who want to learn, earn, teach or innovate, the capability to realize their own true potential and transform our country.

We believe that MOOCs shall create an additional, ubiquitous channel that any individual can leverage, whether it is to learn, teach, become employable or innovate. Only this kind of an
approach can help any individual, irrespective of background, to realize own true potential. And if individuals can connect together for this, we as a nation will be transformed.

Section 4: 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 & 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. To be sure, the sector has grown from 8.4 MM students in the year 2000 to 28 MM in 2012.

In hindsight, this was to be expected given that (i) young people in India seek to move ahead in their lives though education beyond high 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 50 MM by year 2030. The three factors identified above will push the number of students and colleges further if India’s service and manufacturing sectors were to grow faster in the years to come.
The above growth in number of colleges is partly matched by the growing number of disciplines or vocations in which these programmes are offered by colleges (read Bio-informatics, journalism, hospitality, tourism, banking, insurance, retail trade, etc.). 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, it is unavailability of good faculty in large numbers that perhaps is the most important reason. Prof. G. Mehta, Chairman 6th Pay Committee for IITs, NITs, IIMs, etc., 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 do not wish to take up teaching as a career.

UGC’s report on faculty shortages is a telling commentary on the subject. According to it, “the present shortage of 3.8 Lakh teachers ... in the higher education ... comes to over 50% ... It is likely to grow to 13 Lakh in the next 8 to 10 years.” It is actually worse in some cases. While emphasizing the point that there had been no recruitment in most universities for decades, “the Vice Chancellor of Allahabad University 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 forward is to address the issue of improving both scale and quality of education is to explore the use of technology. Recent experiments with MOOCs (or Massive Open Online Courses) offer an opportunity for us in India to address these requirements simultaneously.

**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 gone beyond 150,000).

A course traditionally taught as (say) 40 hours of classroom instruction will typically be broken into over two hundred 3 to 8 min media-rich (composition of text, graphics, voice and video) modules, each of which helps a student understand a concept, a design, a result, an algorithm or 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 (generally) evaluated by MOOC’s back-end servers or platform in real-time using “robo-grading” software, thereby enabling students to attempt completing the exercises till they get it right.

Analytics on student activity, including downloads and performance on exercises, are available to an instructor to assess student engagement and performance with the courses. Tools for multiple students to collaborate and “study” together are also available. MOOC courses also allow for computer-based simulations (these emulate lab-like experimentation), components so very essential to take course in sciences, engineering and medicine (and the like).

This paper would be incomplete if it were to not discuss the merits or demerits of replacing existing classroom based courses by MOOCs-based courses available online. But, at the outset, 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, this is 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, both of which remain “works-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 give “proctored” exams to test students’ knowledge or problem-solving ability. These aspects, viz. completion and certification, as also revenue model, 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.

One model that is likely to pave the way for MOOCs to flourish globally, but more importantly for Indian higher education providers to adopt and adapt, is the model around the MS programme in Computer Science that Udacity and Georgia Institute of Technology have jointly announced starting last year for fee-paying students admitted into the programme. The fee is around $7,000 for the programme against the usual $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 by only such students. Provided they successfully complete all evaluation components in the required courses, they will be eligible for the award of the degree from Georgia Institute of Technology. The key to its potential success will be “fee-paying closed group of students who expect to earn a degree”.

Clearly, while staying with the technology, and a minor shift in pedagogy, Georgia Tech (for instance) is no longer offering courses free of cost to the masses. These courses (or the pedagogy) are today referred to as SPOCs, or “Small Private Online Courses”. There are two
aspects to SPOCs that need attention: (i) there are components of a course, such as tests, quizzes or exams that are necessarily “proctored” (in addition to exercises that follow each module in the digital content), and (ii) a part of the course may involve classroom based exercises or assignments where students are assisted by TAs. The latter is referred to as the blended form of course offering.

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

a. It caters to a large body of fee-paying, students that have been 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, will require a number of well-qualified professors to deliver the 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 (as illustrated by the 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 indeed be delivered as 0L-1T-2P with classroom based lectures 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 the 3L-1T-2P or 3L-0T-2P course may (repeat, may) be re-structured as 0L-2T-2P with classroom based lectures replaced by digital content and number of tutorials doubled from 0 or 1 hr per week to 2/week.
c. The big advantage is that we require expert professors only to create digital content for each course or to generate problems to be solved by students in tutorials. The content may be downloaded by all students taking the course across any number of locations (or colleges). 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.

![Quality of teaching. Note avg. quality is 5.5, target is > 7.5](image)

e. The table below is an attempt to estimate requirements of expert faculty (who deliver lectures or create problem sets), and instructors/TAs for a typical course consisting of 2400 students, divided into 10 lecture sections, and into 80 tutorial groups of size 30. The course considered is **3L-1T-OP class** with 4 credits → **0L-2T-OP class**.

<table>
<thead>
<tr>
<th>PER WEEK Calculations</th>
<th>Traditional method</th>
<th>MOOC/SPOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of faculty involved in developing content</td>
<td>0 (assumed content is available)</td>
<td>0</td>
</tr>
<tr>
<td>Faculty man hours of developing content</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No. of faculty involved in lecturing</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Faculty man hours in lectures</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Faculty man hours of preparation for lectures</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>No. of instructors/TAs involved in Tutorials</td>
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<td>40</td>
</tr>
<tr>
<td>Instructors/TAs man hours of tutorials</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>No. of faculty involved in preparing problem sets</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Faculty man hours in preparing problem sets</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Instructors/TAs man hours in preparing for tutorials</td>
<td>40</td>
<td>80</td>
</tr>
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</table>

**Summary**

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<tr>
<th></th>
<th>Traditional method</th>
<th>MOOC/SPOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of faculty members who are experts</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>No. of instructors/TAs</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Total time of expert faculty (man hours)</td>
<td>94</td>
<td>8</td>
</tr>
<tr>
<td>Total time of all instructors/TAs</td>
<td>214</td>
<td>248</td>
</tr>
<tr>
<td>Time spent by faculty/instructors/TAs in class per student per week</td>
<td>2.75 min</td>
<td>4 min</td>
</tr>
<tr>
<td>Effort in evaluating class-work/home-work</td>
<td>X (part of it can be automated)</td>
<td>2X</td>
</tr>
</tbody>
</table>

Non-Formal Sector

**Background**

Non-formal education is about ‘acknowledging the importance of education, learning and training which takes place outside recognized educational institutions’ [Smith, M. K. (2001)]. 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 [http://www.censusindia.gov.in/2011census/population Enumeration.aspx].

Vocational Education and Training has become the most important segment of the non-formal education. The National Skills Development Corporation (NSDC) are trying to skill 150 mn people by 2022 across a large range of sectors and have recruited a large number of partners to carry out this mission with heavy involvement from industry [http://www.nsdcindia.org/about-us/organization-profile.aspx].

Then there are significant student dropout rates, both from schools and colleges. These contribute to the swelling ranks of people who are entering the formal or informal job market from Class IX onwards (age 15 years and above).

Not only that, despite strong focus on educational qualifications from the formal sector or vocational education providers, 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. (http://www.aspiringminds.in/researchcell/articles/highlights_of_aspiring_minds_employability_report_on_indian_graduates_2013.html).

The capacity of the formal education system will remain constrained by the lack of infrastructure, faculty shortage and quality. It cannot singlehandedly 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 a working population and that high quality learning experiences can be provisioned using technology enabled learning for a large segment of the working population that can 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 (Knowles), and learning theories of Constructivism and Connectivism.

Rogers (2005) 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.


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.

Sites that keep an updated list of MOOCs available worldwide include MOOC-List (http://www.mooc-list.com/) and Class Central (http://class-central.com/). Individual providers include Coursera, Udacity, Udemy, Futurelearn, NovoEd, EdX, OpenLearning, Canvas, Class2Go, OpenStudy and others. 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.

In India, the Ministry for Human Resource Development, through an innovative project called the National Mission on Education using ICT (NMEICT), has created thousands of hours of high quality video lectures, animations & simulations, e-books, questions and many other elearning elements. These courses span Engineering, Arts and Humanities, Sciences, Management, Social Sciences and many other areas. The course list is being added to aggressively, perhaps making it one of the largest Open Education Resources repository worldwide. These OERs are now intended to be augmented by OERs for Non Formal education as well. The OER policy allows commercial use under the CC-by-SA license for these resources.

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, handholding for learners may also be required. To grow truly national in character, these MOOCs will also need to be translated into multiple languages and adapted to local contexts. In areas where certification is valuable and desired, these MOOCs will need to devise online mass assessment techniques (such as by using robo-graders) and integrate with offline proctored test mechanisms where necessary. Investments in platforms will be absolutely necessary to employ learning analytics, Gamification and other important tools.
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.


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 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.

As Jay Cross states:

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.


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 on 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.

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.

Section 5: Potential applications

Formal Sector
We 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 UPTU) are as follows:

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


It merits analysis whether SPOCs can indeed help UPTU-like technical universities, and its affiliated colleges, 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 to experiment only). Here are some additional comments:

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

c. One may not replace wholesale 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 thousand. This is where the payoffs are greater. Once the experience is positive, one may wish to ramp it up quickly, covering courses where numbers are smaller.

d. On the faculty front, one would need faculty who are experts in the subjects (together with those who are experts at presenting instruction in the form of string of rich-media modules). As also problem sets to be used in tutorials. But, this is an exercise done once for the university, used and re-used 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 “TAs”.)

The broad contours of many universities are similar. Surely, the number of programmes, curricula, etc. may be different. But, the fact remains that here again the university colleges follow the same curricula, the group of students attending different programmes is well-identified and are presumable committed to completing various courses and earn a degree, the exams are proctored and conducted centrally, etc. It is contented that SPOC model will allow universities to significantly improve the scale and quality of its programmes.

Application 2: 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.

7. Where otherwise possible, entire curricula could be transacted through MOOCs. Essentially, the entire Open and Distance Learning education model could benefit from adoption of the MOOCs paradigm.

Application 3: Vocational Education: Community Colleges, Polytechnics, ITIs and ITCs

For vocational education, a lot of focus is 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). However, VET will benefit from a blended approach to MOOCs.

The extent of open & online learning in these MOOCs, will depend upon the degree of hands-on requirements. A lot of domains, predominantly sales and customer service, 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. 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. In fact, more than half the jobs in sectors such as Banking, Auto, IT/ITes, Retail, Healthcare and Hospitality belong to such roles. This should be a major area of MOOC based interventions, backed by videos, mobile learning, simulated role-plays, serious games and decision making simulations.

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, professional organizations need to 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.
I am Mr Madhur Dixit. 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 fulfills 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 should 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. Usha Ravishankar. 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.

Application 3: Language, Communication and Soft Skills MOOCs

Given that a large component of the “un-employability” of our graduates as well as low performance at the workplace is due to ineffective language, communication and soft skills, MOOCs can help bridge the gap if implemented effectively. MOOCs in this case may need to be blended (especially for soft skills) with offline interaction with instructors/experts. MOOCs may also benefit from better learning technology in the form of simulations, serious games, mobile learning and other experiential forms.

Vignette

I am Pravin Sonawane. 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 lifelike simulations. Our traditional ITI/ITCs can benefit immensely from integrating MOOCs not just for students but also trainers and experts involved in VET.

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.

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 engage with our teachers after they leave our campus and 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
This document does not intend to identify specific areas where informal learning can be of significance but provides a framework and illustrates a few application categories where MOOCs could play a key role.
Possible Framework
The following framework can help us 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 courses to citizens in areas where they have interests. They can also allow citizens to create their own courses.

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 (Finance, Health, Technology, Personality development etc)
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 fix 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.

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 Sudha Murthy and work as a Director for EarthMatters.org, 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 INGOs. A number of volunteers employed by us graduates 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.

Section 6: Executing the Vision
To execute the vision, it is necessary that technologists, educators and administrators who are passionate and expert in the field of online learning in general, and MOOCs in particular, should come together to achieve the following goals.
1. **Educate**: Generate awareness about MOOC models and supporting practices/technologies
2. **Engage**: Engage with stakeholders to design, develop and implement MOOC environments and content
3. **Adapt**: Customize solutions for stakeholders
4. **Implement**: Execute and monitor return on investment and impact on desired outcomes
5. **Extend**: Use R&D to continuously improve solutions

We propose that this organization/centre be called the National Centre for Open and Online Learning (NCOOL).

NCOOL shall be led by a Chief Learning Officer (CLO) who will be responsible for driving the vision forward. The CLO will be supported by other necessary people in areas of Learning Technology, Academics and Research besides operational functions.

It shall be funded by stakeholders through a subscription model and through grants from government, industry and other agencies. An initial grant/endowment shall be sought to establish the value proposition of NCOOL to stakeholders for a period of 3-5 years. Ultimately, it is envisaged that NCOOL will become self-sustaining by offering both information and services.

NCOOL shall be responsible for the following:
1. **Implementation** - Implementing the vision set out in this document and evolved through further consultation

2. **Knowledgebase** - Establishing a knowledge base of vendors, products, resources and tools and a mechanism to regularly update stakeholders about MOOCs and supporting Education technologies

3. **Partnerships** - Creating partnerships with the relevant local (such as National Knowledge Network, National Mission on Education using ICT and National Repository of Open Education Resources) and global initiatives (such as SoLAR, edX, FutureLearn and OpenStudy)

4. **Advocacy** - Working with stakeholders across India to advocate and help implement MOOC based teaching and learning models. COOL will engage with stakeholders in the following ways:
   a. Enabling administrators, teachers and students to become aware of and engage in learning through MOOCs
   b. Establish a knowledge repository on MOOCs and on supporting technologies for education
   c. Run regular MOOCs for advocacy and training on various aspects of MOOCs
   d. Generate awareness for all participants: workshops, leadership training, conferences, events, website, newsletters and other means of communication
   e. Conduct R&D through special projects and global alliances

5. **Learning Analytics** - Creating and managing centralized learning analytics and certification record stores for all MOOCs in India

6. **Platform & Tools** – The development or adaptation of open source platforms and tools for MOOCs

**Summary**

This paper has set an ambitious vision for MOOCs in Higher Education in India. There are many 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.