Openness in Indian and US For-Profit Education Technology Ecosystems

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We report on a survey of 55 offerings in the Indian education technology (EdTech) space and compare it with the US EdTech space based on a second survey of 72 US EdTech offerings. In light of the recent work in open ICT ecosystems and their societal impact, we found that our observations from the survey were highly reflective of the *openness* of the respective education technology ecosystems and can be best understood when analyzed using this lens. We see how the concept of openness is applied to study these ecosystems and further discuss how it helps to understand the links between the education technology ecosystem, the education ecosystem and its innovation trends.

1. Introduction

In recent years, the education technology (EdTech) space in India has been receiving an unprecedented level of interest from administrators, educators and investors alike. Multiple factors drive this interest, including the emergence of freely available quality content such as Khan Academy and MOOCs (Massive Open Online Courses) internationally, the $35 Aakash tablet and other government programs for education *technologification*, and the opportunities that a huge student population presents. This article describes our efforts to understand the private EdTech space in India, which we hoped would give an insight into the current ecosystem. We surveyed 55 for-profit Indian EdTech offerings and to place our findings in context, we conducted another survey of 72 US EdTech offerings. A host of economic, social, cultural and political factors distinguish the EdTech ecosystems in India and the US and our goal was to see if and how this distinction was echoed in the startup space.

In recent literature, *open ICT ecosystems* have been posited as drivers of efficiency, innovation and development (Open ePolicy Group, 2005; Smith & Elder, 2010) where

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openness represents a synthesis of collaborative creativity, connectivity, access and transparency (Open ePolicy Group, 2005). Smith and Elder (2010) define an *open social arrangement* as one that "consists of social relationships that favor: a) Universal over restricted **access**; b) Universal over restricted **participation;** and c) **Collaborative** over centralized production." On analyzing the results of our survey, we found that they are highly reflective of the level of openness within the respective EdTech education ecosystems and that they can be best understood when seen through the *openness* lens. Thus, we classify the results of our survey based on the three categories defined by Elder et al. and how distinctions between the Indian and US EdTech ecosystems reflect their openness with respect to *access*, *participation* and *collaboration*. As one might expect, the EdTech ecosystem in India is less open than in the US. We further explore how openness in EdTech relates to the respective trends in education and to driving innovation in learning.

Prior work has explored the concept of openness for ICT4D by way of investigating open content creation (Tacchi, 2012) and using it to analyze a pharmacy system in South Africa (Loudon & Rivett, 2011). Spence and Smith (2012) briefly touch upon interconnections between openness, human development and innovation.

In the next section we detail our survey methodology, followed by the results classified under the three categories, and finally discussion and conclusion.

2. Methodology

With an aim to understand the private Indian EdTech sector, we surveyed 55 for-profit Indian EdTech offerings. To place the findings in context and understand how the Indian EdTech startup space differed from the US, we conducted another survey of 72 US EdTech offerings. An offering is a single product or service and there were cases where multiple independent offerings were offered by a single company. Appendix A contains the list of Indian and US offerings. Various online methods were used to populate the company list including web searches, company listings, startup incubator websites and EdTech media blogs. Since our survey looked at monetization and data policies, we filtered out younger startups which had immature beta offerings and uncertain business models. Further, we only considered companies that had at least one currently active product/service offering. We classified all such offerings using multiple attributes – *offering type, delivery mode, education segment, monetization, participation* and *data policy*. Some of these attributes were only selectively applicable depending on

the type of offering.

Offering type refers to the type of product or service and could be anything from online courses, learning management systems (LMSs) and test preparation tools to learning analytics and games. *Delivery mode* indicates if the offering is delivered via web portals, mobile/tablet apps, standalone softwares or even VSAT satellite links or Direct-To-Home (DTH) services. This could further apply differently for different offerings – for instance, all LMSs are web-based but some of them are run in cloud while others in local servers. *Education segment* indicates if the target user segment is one or more of kindergarten, primary, secondary or high school education, college, test preparation and professional course learning. It also marks the distinction between regulated, semi-regulated and unregulated segments. In India, not unlike US, K-12 falls under regulated, college education falls under semi-regulated, and preschools, test preparation and supplemental K-12 tutoring fall under the unregulated segments. *Monetization* refers to the earning model of the company such as payments, ads, or freemium. It also indicates if the company is delivering the offering to the consumers directly (Business-to-Consumer or B2C) or to an organization (Business-to-Business or B2B). For instance, a company could sell its online courses directly to students or to a University which enables access for its students. *Participation* indicates the level of involvement the learners are allowed in the offering, ranging from forum support to active social engagement to user contributed content. *Data policy* refers to the openness of data in the offerings including open content, APIs and analytics.

3. Results: Openness of Indian versus US EdTech Space

We compare the two ecosystems by structuring our comparison under the *access*, *participation* and *collaboration* aspects of openness.

3.1. Open vs. Restricted Access

We interpret openness of access in this space as the degree of free vs. paid offerings, the degree of diversity in the offerings for the learner, and the diversity in business models that facilitate or impede open access.

87% of the Indian offerings in the survey rely on direct payments for their primary offering as opposed to 45% for the US. Few Indian companies rely on freemium (where the basic offering is free, but money is charged for advanced versions or features) or ad-

based models; there are multiple instances of online courses and learning videos and animations being free for learners in the US, or free and pro versions of mobile apps and games, but even the freemium model in India is mostly restricted to limited duration trial versions. Interestingly, 36% of the Indian offerings follow the B2B model against 18% in the US where companies partner with schools and colleges to deliver their offerings to the students. This echoes the focus on payments in India since selling content directly to the students is less promising than selling to the institution.

The openness of access is not defined only by the extent by which free content is available, but also by the availability of access to a diverse set of offerings for the learner. A 32% fraction of the Indian offerings is paid learning content in the form of proprietary videos and animations compared to only 5% for the US. A majority of these cater to the supplemental K-12 segment where either the school or the parents are the expected buyers. The central focus on learning content in the Indian market is reflected in its dominance in the offerings as well as in the emphasis on payments for content. US companies seem more aware of the fact that content, even though crucial, is easily duplicable and transferable and is not the only piece in the learning puzzle. This has led them to shore up their offerings by diversifying them around the content. For instance, MOOCs are not just online videos, but coherent step-by-step courses which try to inculcate many aspects of a traditional course; whereas the online course offerings in India are mostly a simple sequence of videos.

As a consequence of the diversity in offerings and inclination towards freemium models in the US, diversity is seen in newer and innovative business models. For instance, Duolingo offers free language learning and offsets the costs by offering translation services to organizations in such a way that users simultaneously translate documents as they progress through their lessons; Voxy sources its free learning exercises from daily updates from media portals that pay it to display their content, and Coursera charges for certifications while the MOOCs are free for all[1].

3.2. Open vs. Restricted Participation

We interpret openness of participation in this space as the degree of learner participation with the offerings, the degree of learner engagement with each other, the degree of

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[1] See http://duolingo.com, http://voxy.com, http://coursera.com

learner engagement with teachers, the degree of teacher engagement with the offerings and the diversity of offerings which include teacher-centric tools.

As described by Fransman (2010), a symbiotic relationship between application providers and end-users is good for innovation. Aside from MOOCs, many content-focused startups in the US offer platforms for users to create and curate content. In fact, such crowdsourcing based platforms which depend on users for content or other learning artifacts are present in every segment – online courses, student notes, exchanging books, study documents, Q&A, and even learning pin-boards and playlists. This approach to enabling open participation of learners via crowdsourced platforms is not present in the Indian startup space as of yet.

Every learning video/animation or digital course offering surveyed in the US has some sort of a user participation feature which ranges from a simple forum support or community engagement to a social network or a crowdsourcing platform. The same is true for only 53.3% of the offerings in India. Learning Management Systems (LMSs) a very popular enterprise in both India and the US depict a lot of variance between them. In the US, LMSs are meant to engage students, teachers and administrators, seeking their participation in form of feedback and co-creation such that learners feel ownership and contribute towards the content. In fact, social learning forms the core of newer LMS solutions such as Edmodo, which are essentially social networks for learning and focus on increasing both student-student and student-teacher interaction and collaboration. In India, LMS solutions are mostly limited to administrators and teachers, with student involvement being limited to passive activities such as accessing course material and grades. This restricted student participation echoes the focus on teacher-student learning in India and shows the value placed on peer-to-peer learning in the US.

Another aspect of open participation is the inclusion of all actors in the learning process. A startup category absent from the Indian space is where teachers are the target beneficiaries of crowdsourcing platforms exclusive to teachers to share, exchange, buy and sell teaching resources.

3.3. Open vs. Restricted Collaboration

We interpret openness of collaboration in this space as the degree of standardization and openness of the data, the degree of analytics offered on their own data by the companies and the diversity of dedicated offerings that emerge as a result of this platform level thinking.

The openness of an ecosystem is enhanced by greater interoperability and data collaboration. We found that 34.2% of the US offerings either had an open data feature where they allowed access to raw/filtered data via APIs or other standards (paid or otherwise), or had a data analytics feature where they provided information and visualizations on the usage. There is only one offering in India that had standardized data accessibility, while the total fraction of Indian offerings with data analytics features is 11.7%. Popular LMSs in the US allow open access (not necessarily free) to their platform or data for the community to augment it with apps or draw insights from it. More and more US LMSs based upon local server architectures are moving to the cloud in order to have uniform data and app repositories across all institutions.

The lack of this platform level design – building a system and letting it evolve, is reflective of the fractured state of technology usage in education in India and this is preventing the market from expanding into offerings that are dependent on the availability of open, standard data. Several categories of offerings are absent from the Indian space as a consequence – 1) Learning analytics offerings that apply mining and visualization techniques to give insights to students, teachers and administrators based on standardized data, 2) Personalized and adaptive learning offerings which apply machine learning techniques for grade prediction and lesson planning tailored differently for each student, 3) Academic analytics offerings which generate fine-grained statistics on student and institutional performance which is beneficial for funders, administrators and authorities, 4) Search and aggregation tools that offer search engines for digital educational content across many offerings or for real world artifacts such as schools and colleges (sometimes with user-augmented information) and aggregation tools that allow combining of learning resources from multiple sources into one coherent lesson.

4. Discussion: Openness, Emerging Trends and Innovation

The concept of openness in ICT ecosystems enabled us to have a structured look at the private EdTech space and helps us in identifying the larger trends that are emerging within the US and Indian education ecosystems. As defined by Leadbeater and Wong (2010), innovation in education can be either to sustain innovation by improving and supplementing learning or to disrupt innovation by reinventing and transforming learning. We further propose that as the openness of the EdTech ecosystem moves from less to more open, innovation in education moves from sustaining to disruptive, in so far

as the education ecosystem relies on technology. Notably, the reverse is not necessarily true. An education ecosystem can of course be disrupted without significant technological innovation.

Evidently, the EdTech ecosystem in India is less open than in the US, and therefore seems inclined towards improving and supplementing learning while in the US the trends indicate a move towards reinventing learning. Let's examine this in more detail. Indian companies work on the basis of the traditional teacher-student, imparter-impartee dynamic, more so at the K-12 level, which is apparent in multiple ways – firstly, the paid model of learning content where schools or parents are the expected buyers and the focus on content-only offerings evidences efforts at supplementing the formal learning. Contrast this with the US, where all the markers of openness point towards a move to self-driven learning. Free content removes students' dependence on the institution or parents for access, and comprehensive course offerings can potentially take care of most of the students' needs on their own. Further, peer-to-peer learning, which has been identified as an important component of learning (Hannon, Patton, & Temperley, 2011), is supported via community engagement and social learning portals.

Secondly, the model of students as recipients of knowledge is seen in the lack of participation and cocreation tools, be it in LMSs or as crowdsourced platforms. Self-driven learning is motivated by the argument that "the 21st century requires people to be lifelong learners (because technology, politics, economics, and the environment are changing so quickly), and this demands a shift away from engagement in school, to engagement in learning" (Hannon et al., 2012); and therefore the trend in US startups is to try and create learning environments where students can navigate themselves.

Thirdly, while there are no offerings in India that challenge the traditional classroom, open data and analytics in the US are driving personalized learning solutions that try to transform the classroom by catering to each student in the classroom differently. A flipped classroom is where students study lecture material on their own time and pace while interacting with peers and teachers online and using the classroom for collaboration and problem solving. This is made possible as a consequence of personalization and analytics where teachers can keep track and get predictions on individual progress. The disruption of learning via education technology is in fact driving another disruption in the startup business models that have come up with newer ways to keep the wheels turning.

Self-driven, peer-to-peer, personalized and adaptive learning, flipped classrooms

and cocreation are all much talked about concepts in the path to fundamentally changing the learning process and this is where we see the EdTech ecosystem in the US heading towards. As ideas of innovation, they almost seem almost intuitive in light of their resonance with the concept of openness as interpreted by our observations earlier. In essence, openness begets innovation.

However, every aspect of openness in EdTech should not necessarily be construed as overtly beneficial in every context; nor should it be inferred from above that the Indian EdTech ecosystem needs to ape the concepts driving the US ecosystem to better itself. Davies and Edwards (2012) warn about the possible widening of socio-economic divides if open data efforts are unmatched with intermediary and local level support. For all the virtues of openness, a myriad of factors affect an ecosystem and some are important to preserve in the Indian context – well-funded US startups can choose to build their user base and focus on earnings later. Conversely, sustainability is a first order concern in low-resource constraints. Indian education is not situated in a 1-to-1 computing context and resource constraints prevent the adoption of a lot of open practices. It is important here to make a distinction between the lowest resource contexts and the relatively high resource contexts within the region. Since most for-profit EdTech startups target contexts where the requisite technology infrastructure is already available, openness will mostly be helpful in maximizing the benefits from technology in such scenarios.

But issues still remain. Standardization vs. specialization is a complex issue due to the large demographic differences of language, culture and administrative constraints of multiple states, education boards and multiple standards. The Indian market conditions in general are less conducive for entrepreneurs than their US counterparts making it further difficult for diverse solutions to emerge. Often, ideas that can be executed independent of such constraints are already executed in the US and capture the local market, leaving it a futile exercise for local entrepreneurs. For instance, MOOCs have seen a large percentage of their user base coming from emerging markets such as India and Brazil[2]. However, in such instances, the International startup should be considered to be a part of the local ecosystem that contributes to its openness.

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[2] See http://blog.coursera.org/post/29062736760/coursera-hits-1-million-students-across-196-countries

Aside from a few far and between, the for-profit startup space has not stepped into the low-resource demographics, which many will argue is for the best. However, with the government pushing multiple subsidized pro-technology initiatives, the market will be opening to newer populations of learners that rely on EdTech and it will be crucial for the startups to carefully consider the parameters of openness they should adhere to.

5. Conclusion

Under our observed parameters, openness has proven to be a useful concept to study, compare and contrast education technology ecosystems. This opens possibilities for the exploration of other ICT ecosystems using similar classifications. Our results show how intuitive the links between the education technology ecosystem, the education ecosystem and its innovation trends are. It strengthens the argument for careful consideration of openness into policy and technology interventions for education as well as other domains which share some of the same trends and constraints. However, our survey only focuses upon one aspect of the entire ecosystem and while it does inform our understanding, more exhaustive studies will reveal newer trends and arguments for open ICT ecosystems.

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Appendix A

Table 1: Indian EdTech Offerings

Offering Name	URL
AskIITians	http://www.askiitians.com/
Aksharit - MadRat Games	http://www.aksharit.com/
AmpleTrails	http://ampletrails.com/eyeris-interactive-whiteboard-system
Attano	http://www.attano.com/store
Avagmah	http://www.avagmah.com/
Digi Library	http://www.thedigilibrary.com
Easygyan	http://www.easygyan.com/e.htm
Educomp - Learning Hour	http://www.learninghour.com/
Educomp - Mathguru	http://www.mathguru.com/
Educomp - Topper Learning	http://www.topperlearning.com/
Educomp Leap	http://www.educomp.com/Products/EducompLeap.aspx
Educomp Smartclass	http://www.smartclassonline.com/SmartClassOnLine/SmartClass.aspx
EduKart	http://www.edukart.com/
Eduora	http://eduora.com/about
Edureka	http://www.edureka.in/
Edurite	http://www.edurite.com/
Eduserve - 2tion	http://www.2tion.net/
Eduserve - Lampsglow	http://www.edservcareer.com/
Everonn - Class on the Web	http://www.classontheweb.com
Everonn Digital iSchool	http://www.everonnischool.com/aboutischool.php
Excelsoft Technologies - m-learning	http://www.excelindia.com/index.php/products/m-learning
Fedena	http://fedena.com/
Funtoot	http://www.edreamssoftware.com/index.html
GOLS	http://www.edureka.in/
Handygo	http://handygo.com/web/behtar_zindagi.asp
HarnessTouch	http://www.harnesstouch.com/
HP Labs	http://www.hpl.hp.com/india/research/educenter.html
HPVideobook	http://www.hpl.hp.com/india/research/videobook.html

Iken Library - Mexus Education	http://www.mexuseducation.com/index.php/products/iken-library/
Iken School Ecosystem - Mexus Education	http://www.mexuseducation.com/?page_id=42
Iken Zing - Mexus Education	http://www.mexuseducation.com/index.php/products/iken-zing/
Jed-i	http://jed-i.in
Learnext	http://www.learnnext.com/
Mindspark	http://mindspark.in
Mobisir	http://www.mobisir.net/mxams/home
mPustak	http://www.hazelmedia.in/vernacular.php
Naukri.com MeritNation	http://www.meritnation.com/
NComputing	http://www.ncomputing.com/solutions/education
Oliveboard	http://oliveboard.in
Oztern	http://oztern.com
Pearson Tutorvista	http://www.tutorvista.com/
Pengala	http://www.pengala.com/platform.html
Quillpad	http://quillpad.in
RedBytes	http://www.redbytes.in/application/
Sharp Edge	http://sharpedgelearning.com/
Tabtor	http://tabtor.com/
Tata ClassEdge	http://tataclassedge.com/html/home.html
Tata Sky Education	http://www.tatasky.com/education/actve-wizkids-sample-games.html
TopChalks	http://www.topchalks.com.htm
Ubqool	http://eduora.com/about
VidyaCenter	http://www.vidyacenter.com/
VoiceTap	http://www.voicetap.in
Vriti	http://www.vriti.com/courses/engineering-entrance.htm
WizIQ	http://www.wiziq.com/features/
Your Next Leap	http://yournextleap.com/

Table 2: US EdTech Offerings

Offering Name	URL
2tor.com	http://2tor.com
Academia.edu	http://academia.edu
Altiused	http://altiused.com
Answer Underground	http://answerunderground.com/
Apple iTunesU	http://www.apple.com/education/itunes-u/
arnetminer	http://arnetminer.org/
Benchprep	https://benchprep.com/
BlackBoard	http://blackboard.com
Bloomboard	http://www.bloomboard.com/
BlueTeach	blueteach.com
BookRenter	http://bookrenter.com
Chegg	http://www.chegg.com/
Claco	http://claco.com
Class2Go	http://class2go.stanford.edu/
ClassDojo	http://www.classdojo.com/about
Codeacademey	http://codeacademy.com
CourseHero	http://www.coursehero.com/
Coursera	http://coursera.com
Curriki	http://curriki.com
Desmos	https://www.desmos.com/
Echo360	http://echo360.com
Edmodo	https://www.edmodo.com
Edshelf	http://edshelf.com
Educreations	https://educreations.com
Eduvant	http://eduvant.com/
Enrolled	http://enrolled.in
Ensemble Video	http://ensemblevideo.com
Funbrain	http://www.funbrain.com

Goingon	http://going.com
Google Apps for Education	http://www.google.com/apps/intl/en/edu/
Google Course Builder	https://code.google.com/p/course-builder/
Grockit	https://grockit.com/
GuideK12	http://guidek12.com/
Hapara	http://hapara.com/
Inigral	http://inigral.com
Inkling	http://inkling.com
InstaGrok	http://www.instagrok.com/
iVersity	http://www.academia.edu/
Kaltura	http://kaltura.com
Kenexa	http://www.outstart.com/trainingedge-lms.htm
Knewton	http://www.knewton.com/
Learnist	http://learni.st/
LearnSprout	http://www.learnsprout.com/
Lingualift	http://lingualift.com/
Many Labs	https://www.manylabs.com/
Mediacore	http://mediacore.com
MentorMob	http://mentormob.com
MindSnacks	http://mindsnacks.com
Minerva Project	http://www.minervaproject.com
Moodle	http://moodle.org/
Moodlerooms	http://moodlerooms.com
Nearpod	http://www.nearpod.com/
Nettrekker	http://nettrekker.com
Noodle	http://www.noodle.org/
Obami	http://obami.com
OpenStudy	http://openstudy.com/
Panopto	http://panopto.com
Piazza	https://piazza.com/

Schoology	http://schoology.com
Sclipo	http://sclipo.com
ShareStream	http://sharestream.com
ShowMe	http://www.showme.com/
Skillshare	http://skillshare.com
Slader	http://www.slader.com/
StudyHall	http://www.studyhall.com/
TeacherPayTeachers	http://www.teacherspayteachers.com/
Tipitap	http://www.tipitap.com/
Tutorspree	http://www.tutorspree.com/
Udacity	http://udacity.com
Udemy	http://udemy.com
Voxy	http://voxy.com
Wiz World Online by 8d World	http://www.8dworld.com/en/product.html