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The quality of higher education through MOOC penetration and the role of academic libraries

The governments of emerging economies have realized the potential of massive open online courses (MOOCs) for enhancing the quality of higher education, but MOOC penetration is still very low in countries like India. This article explores the issues relating to MOOC integration and attempts to identify the key drivers for the adoption of a MOOC-based curriculum. Integration into the curriculum, the MOOC services of the academic library and the Indian Ministry of Human Resource Development's (MHRD) policy and support are identified as the key drivers for increasing MOOC penetration. The article also suggests a direct relationship between the level of MOOC penetration and the quality of higher education in emerging economies. The practical implications for practice and policy are classification of the MOOC services of the academic library and a decision-making model that chooses a hybrid learning strategy for higher educational institutions.

Keywords

MOOC penetration; MOOC integration; quality of higher education; academic library; MOOC; MOOC-based curriculum

Introduction

Higher education from premier institutions remains a dream for the majority of students across the globe, especially for learners from emerging economies. Millions of students, especially from the developing nations, were denied access to it, but now massive open online courses (MOOCs) are providing cost-effective access for a huge number of students across the world. Therefore, MOOCs have attracted the attention of educational researchers in the last decade. Some MOOC courses are free and are provided by some of the best institutions. Many MOOC courses are also available in languages other than English, like Italian, German, Chinese, French, Portuguese and Spanish. These courses not only inspire the learners but are also widely accepted by educational institutes and employers as a mark of educational excellence.[1]

MOOCs can serve underprivileged people through affordable education from the likes of Stanford and the Massachusetts Institute of Technology (MIT) to make them ready for employment. The MOOC courses are no compromise; instead, research and surveys have found these courses to be more interesting and enriching than a standard course. For example, edX's first offered course, an MIT introductory course on circuits, had more than 155,000 students, which was greater than the total number of MIT alumni in its entire 150-year history. MOOCs have much more to offer than any traditional classroom-based system. The advantages of anytime learning, peer discussions on online forums, blended learning, instructor feedback, international exposure to a diverse group of learners and inclusivity make them potentially a significant agent for change for higher education and employment.[2]

The expanding workload and expectations for higher education institutions due to ever-increasing demand and limitation of resources can be addressed through mainstreaming MOOCs. Integration of MOOCs into regular university curricula could increase the enrolment base. It can provide flexible learning schedules and would radically change the learning

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process by shifting the authority from the instructors to the learners and giving equal opportunities to access resources to all participants through various online means.[3]

The potential of MOOCs to improve education quality for very high numbers of learners has attracted several higher education institutions and policymakers towards them. Albelbisi[4] has shown that the characteristics of such a MOOC-based education system must be developed with a lot of consideration. Service quality is one of the major parameters affecting self-directed learning (SRL) using MOOCs. Along with the service quality, another parameter is the MOOC learning environment provided to the learners. Academic libraries have immense potential to offer both service quality and the learning environment to support a MOOC-based curriculum. The current research explores this connection to draw some meaningful implications for practical use.

In India, even after spending more than three per cent of the country's GDP on higher education, the per-student spending is still among the lowest, as compared to other countries. This has been caused by the opening of more universities, subsequently producing higher university enrolment. Though the number of enrolments has increased, this has, unfortunately, further reduced the per-student spending, which has consequently led to a scarcity of faculty and deterioration in the quality of education.[5]

Various government bodies, ministries and other institutes of national importance in India have already started the initiative of using MOOCs via the Study Webs of Active Learning for Young Aspiring Minds (SWAYAM) platform[6] to bridge the digital divide for disadvantaged students. To add to it, the University Grants Commission (UGC)[7] and the All India Council for Technical Education (AICTE)[8] have also issued Regulation 2016 instructing universities to transfer credits for courses studied on SWAYAM, which will ultimately be added to students' academic records.

The above steps were taken by the Indian Ministry of Human Resource Development (MHRD), now known as the Ministry of Education, and it has been clearly shown that, since their inception, MOOCs have gained significance in the country. On the one hand, the government is making continuous efforts to spread quality education in the remotest parts of the country, and, on the other hand, these aids are still confined to a handful of elite institutes. Private universities are still lagging behind in making the best use of resources available online. Their students are not yet familiar with the MOOC platforms as a result.

'MOOCs could be the key to developing a new educational environment'

To put it in a nutshell, India needs to focus on balancing both quality assurance and cost reduction in its higher education system. The possible solution for this issue could be the efficient utilization of technology, specifically MOOCs could be the key to developing a new educational environment in the country.

Literature review
MOOC-based curriculum

Creating MOOCs is an expensive and difficult process. For private sector higher education (HE) institutions in India, financing such an activity is a challenging decision to take due to limited budgets and the rapidly changing educational landscape. The elite institutions in India and across the globe have led the MOOC movement through developing MOOC courses. The other institutions, for whom the budget is a barrier, can still benefit from the MOOC movement by becoming MOOC consumers.[9]

'MOOCs are concentrated mostly within the premier institutions in India'

MOOCs are concentrated mostly within the premier institutions in India. This is contrary to the idea of MOOC, where the focus audience is huge and spread across the world. This unwanted centralization of MOOCs in India is against its basic principle of being distributed and diversified.[10]

In the hybrid MOOC model suggested by Pérez-Sanagustín et al.[11], (Figure 1 and Table 1), they made a systematic analysis of H-MOOC as a combination of two factors:

- x-axis: the institutional support needed (infrastructure, services, human resources)
- y-axis: the alignment of Hybrid MOOC with the curriculum (the similarity between the institution's existing curriculum and the MOOC course selected).

The framework has assumed that the MOOC course to be used in the integration is readily available to the institution. On closely examining the H-MOOC model, it can be stated that for adopting either 'MOOC as a replacement' or 'MOOC as driver', which is a desirable condition in our argument, institutional support plays a vital role. The institute needs to first recognize the benefits of adopting a MOOC-based curriculum and then allocate resources accordingly.

The institutional adoption of MOOC-based curricula in the Indian context faces certain challenges due to the lack of available funds within HE institutions. Private sector HE institutions especially will evaluate the decision about MOOC integration in terms of a business proposition. Marrhich et al.[12] have identified that the institutions do not adopt a MOOC-based curriculum due to no return on investment on such an initiative. Hence, only a few private sector HE institutions can be expected to take such a course.
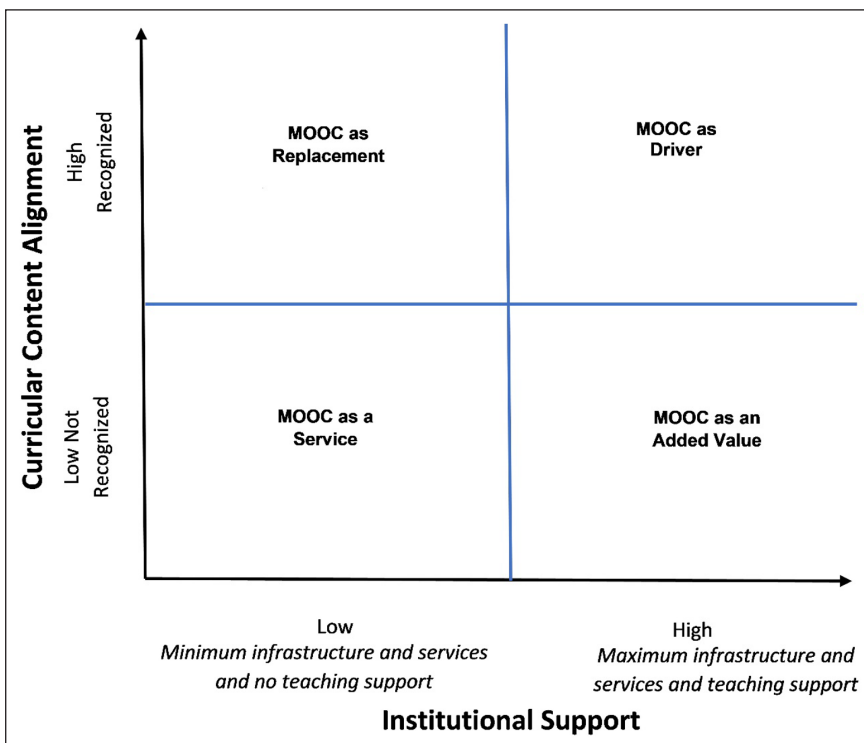

Figure 1. H-MOOC Framework of Pérez-Sanagustín et al.[13]

Contrarily, if a curriculum based on MOOCs were to be made mandatory for all HE institutions in the country by the policy-making bodies such as the MHRD, the institutions would comply with the policy, whether they belong to the public sector or the private sector. Such a policy would not only provide guidelines for MOOC integration but also provide all-round support to enable such an initiative.

X: Low Y: Low	MOOC as a service model	Students study MOOCs voluntarily, with no similarity of its content to the current curriculum and no support from the institution.
X: High Y: Low	MOOC as an added value	Students study MOOCs of their choice, with no similarity to the existing curriculum, but the institution provides support for students to complete their MOOC course.
X: Low Y: High	MOOC as replacement	MOOC replaces existing courses due to the high similarity between its content and the existing curriculum.
X: High Y: High	MOOC as driver	Institution course is designed according to the MOOC.

Table 1. H-MOOC Framework

The MOOC services of the academic library

Deng[14] suggested that the internet and mobile devices have vastly changed the way we acquire information and knowledge. The adoption of MOOCs in universities in Europe, America and China have led their libraries to provide MOOC information services. The complementarity of MOOCs and the role of academic libraries can be clearly seen, and their inter-relation can be established.

On the face of it, MOOC is an online model of education and academic libraries are considered as a support service for teaching and research. But on detailed comparison and analysis, the role of academic libraries in providing support to the MOOC courses can be established:

- both MOOCs and academic libraries have a similar objective of dissemination of knowledge and sharing of information

- the users of both of these models are similar

- both MOOCs and academic libraries specialize in information resources

- both models offer their users the freedom to choose information and knowledge on their own.

'The adoption of MOOCs in universities in Europe, America and China have led their libraries to provide MOOC information services'

Luan[15] proposes that the university library is a specialized centre of information, and it must involve itself in the integration and development of MOOCs due to its access to information and its service advantage. Information and communication technology (ICT) is the main driver of MOOCs. It also involves a service paradigm, as MOOCs require resources and support for their successful consumption. When the integration of MOOCs into the academic curriculum is the question, the most suitable university department for the leading role in enabling such integration is the academic library.

MHRD policy and support

Chatterjee and Nath[16] have discussed the challenges of implementing MOOCs in India on a large scale. They suggest a need for a governing body at national level for monitoring and facilitating blended learning in formal higher education. MHRD has already taken several steps to promote MOOC-based curricula under the National Mission on Education through Information Communication Technology (NMEICT) Programme. To provide the best quality learning resources for HE institutions across the nation, the SWAYAM project was started. SWAYAM provides national MOOC courses on an online platform using ICT. It encompasses a range of courses from high school level to higher education and includes skills development programmes. SWAYAM, under the auspices of the MOOCs National Committee (MNC), which consists of technical experts, academicians, administrators etc., would establish other supporting environments for a MOOC-based curriculum such as proctored examination centres, credit transfer guidelines and credit mobility across educational institutions.

'MOOCs require resources and support for their successful consumption'

The UGC has been appointed as national co-ordinator for non-technology postgraduate courses; it has developed 145 MOOCs and has offered 208 courses online on the SWAYAM platform. Since March 2021, according to the latest UGC guidelines on MOOC credit recognition, online courses offered on the SWAYAM platform constitute up to 40 per cent of total credits in each semester.

SWAYAM, under NMEICT, would develop e-content with the National Programme on Technology Enhanced Learning (NPTEL) with a network of seven Indian institutes of technology (IITs) and Indian institutes of science (IIScs). NPTEL has developed e-content for 933 courses in 23 disciplines. The Consortium for Educational Communication (CEC) has also developed MOOCs for 29 undergraduate subjects and is working on a further 58 subjects in four quadrants. The Four Quadrant Approach is explained in Table 2.

Quadrant 1	E-tutorial	Video and audio content, simulations, video demonstrations, animation, virtual laboratory, etc.
Quadrant 2	E-content	E-books, PDFs, text, illustrations, interactive simulations, practical assignments
Quadrant 3	Web resources	Open education resources (OERs), related links, case studies, journals, research papers, anecdotes, historical overview, etc.
Quadrant 4	Self-assessment	Problems and solutions, multiple-choice questions (MCQs), quizzes, frequently asked questions (FAQs), doubt clearance, peer assessment

Table 2. Four Quadrant Approach for SWAYAM
Source: Guidelines for development and implementation of MOOCs, Department of Higher Education, MHRD (F. No. 8-1/ 2015-TEL).

All content on SWAYAM is hosted on the National Integrated Portal (NIP), known as e-Acharya, at a data centre hosted at the Information and Library Network (INFLIBNET) Centre, Gandhinagar. NIP and NMEICT are linked by a cloud known as Baadal, hosted at the National Informatics Centre (NIC). The system is able to support 30 million users, with one million concurrent users. This network makes use of content delivery network (CDN) systems for faster delivery of video content to meet the ever-increasing demand for MOOCs.

Research methodology
Gap identification

Skimming the literature on the issues with MOOC integration into higher education curriculum provides valuable insights on the role of institutions and the role of the central policy-making authority, MHRD, in a developing country like India, as well as the role of the academic library. The issues identified from the review of literature are summarized in Table 1. Taking MOOC penetration as the driver for higher education quality, the following gaps have been exposed by the literature review:

'Academic libraries have many functions and attributes which make them suitable for providing MOOC services'

Gap 1: Integration of MOOCs into the higher education curriculum has several challenges. Many such challenges can be addressed with the involvement of a centralized institution with a professional approach towards information management and dissemination. Academic libraries have many functions and attributes which make them suitable for providing MOOC services at university level. The role of the academic library in a MOOC-based curriculum has not been discussed properly in the available literature.

Gap 2: The literature fails to identify the role of the policy-making body, like the MHRD in the case of India, in driving the MOOC integration programme. Although a few authors have discussed what the governments or policymakers are doing to support MOOCs, the literature shows no evidence of any correlation being established between these two.

The current research aims to integrate the theoretical framework of MOOC penetration in a developing country like India through defining the role of the academic library and the MHRD for enhancing the quality of higher education and to test the model empirically, to understand their relationship and to derive inferences for decision-making and practice.

Research model and hypotheses

In the literature, the research gaps identified for influencing the quality of higher education include the integration of MOOCs into the curriculum, the role of academic libraries and the policy and support of MHRD. These antecedents form the basis of this article's research model, which has five latent variables: integration into the curriculum, the MOOC services of the academic library, MHRD policy and support, MOOC penetration and improved quality of higher education (HE). Their interrelations can be understood clearly from Figure 2.

Rambe and Moeti[17] have provided a model for understanding the inclusion of MOOCs in African higher education through three models: micro level, meso level and macro level.

They have discussed the provision of MOOC open source content and integrating them into the curriculum. Such initiatives are being followed at Tanzania's Kinu, Kenya's iHub, South Africa's Jozi Hub and Nigeria's CcHub.[18] Democratizing MOOCs would require both breadth and depth of participation. The institutional involvement in the MOOC movement would address both physical and psychological barriers, such as access barriers due to the availability of broadband and computers, promote the quality of participation of students and provide a meaningful learning experience due to the involvement of the educators.[19] The derived hypothesis can therefore be stated as:

> H1: The extent of the MOOC's integration into the academic curriculum determines the level of MOOC penetration.

MOOCs are a form of disruptive technology which challenges the traditional forms of learning and instruction. The challenges posed by MOOCs have presented great opportunities to academic libraries. These opportunities also pose subsequent challenges to be addressed by the libraries and information professionals.[20] Libraries have always played the role of knowledge disseminator, and they have a key role in enabling MOOC penetration and adoption in curricula by supporting the instructors, students and the institutions.[21] Hence, the derived hypothesis can be stated as:

'MOOCs are a form of disruptive technology which challenges the traditional forms of learning and instruction'

> H2: The academic library services available for MOOCs influence the level of MOOC penetration.

Government policy and support are required in many areas for MOOC adoption, such as trained instructors for MOOC-based pedagogy, online and offline access to MOOC digital platforms, development of MOOCs in regional languages, credit recognition and credit transfer policies, as well as the implementation of MOOCs in a blended format of instructor-facilitated flipped classrooms. Such initiatives would also assist economically and provide official status for MOOC-based education.[22] The MHRD is responsible for the implementation of national policy on education. Therefore, the next hypothesis can be framed as:

> H3: MHRD policy and support for MOOC integration determine the level of MOOC penetration.

Zhang[23] has related the integration of MOOCs into the curricula to a low-cost and high-quality education model. Albelbisi and Yusop[24] have listed several empirical pieces of evidence for the proposition of MOOCs leading to improvement in the quality of higher education. The Malaysian Ministry of Education, in its 2015 report, expressed its plan to leverage the benefits of MOOC to improve the quality of learning and to extend access to education in Malaysia.[25] So, the relationship between MOOC penetration and the quality of higher education may be formed into a hypothesis as:

> H4: The greater the level of MOOC penetration, the greater is the quality of higher education. (Particularly in the case of developing economies like Malaysia[26] and Africa[27]).
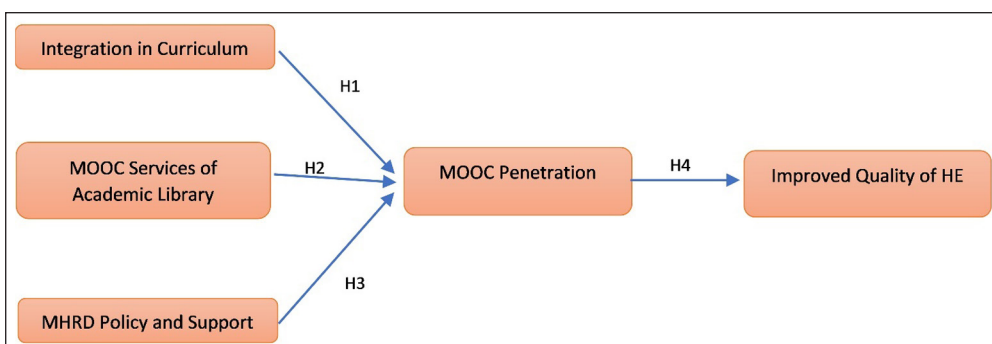

Figure 2. Research model

Empirical study

Survey design

In this empirical research, a questionnaire-based study was used to find the extent of the relationship between the proposed attributes of the research model. A printed survey schedule was prepared with a five-point Likert scale for measuring the respondent's attitude, with a range of 1 to 5, representing 'strongly disagree' to 'strongly agree'. Similar scales have been used in other research articles on attitude measurement. The questionnaire language was English, as it is the medium of instruction and evaluation in the higher education system in Jaipur. The following scales were used in the questionnaire, which have been derived from the extant literature: integration in the curriculum (five items), the MOOC services of the academic library (eight items), MHRD policy and support (five items) and improved quality of higher education (five items). Demographic data on age, gender and education was also collected. The full scales are available in Appendix 1.

The content validity of the scale was determined with the help of three subject area experts. The experts' personal experience and knowledge played a crucial role in establishing the content validity. There are no specific rules for deciding upon the number of experts to use, although validation from many experts might reduce the probability of reaching a decision. Hence, the number of three to five experts is suggested to increase the chance of agreement.[28] This step helps in refining the language of the instrument and also in understanding whether the instrument is able to achieve the desired research objectives.

Sampling and procedure

The survey engaged faculty and library professionals who have had prior experience with at least one MOOC course. Data was collected from a sample of ten private universities from the capital territory of Rajasthan state in India. A survey method was used for this research because of its potential for generalizing the findings for a larger population with similar characteristics. The survey used a printed form and a tailored design method as proposed by Dillman.[29] The purpose and usefulness of the study were explained to the respondents before they took part, and they were reassured that their responses would be kept confidential. The respondents were guided through the questionnaire followed by a short thank you message. Data has been collected from 300 participants; 236 complete responses were received, which were then considered for inclusion in the final analysis, meaning that the survey had a 78.67 per cent response rate. The average age of participants in this survey was 34.4 years. There were more female (154) than male (82) participants in the survey out of the 236 selected responses.

Analysis of data

Confirmatory factor analysis has been used to determine the psychometric properties of the measured attributes. As previously stated, all items have been measured using a five-point Likert scale. The instrument's reliability and discriminant validity were determined using the Fornell-Larcker ratio (FLR), average variance extracted and the composite reliability. The observed values for these measures are recorded in Table 3.

Construct	FLR	AVE	CR
Integration in Curriculum	0.93	0.69	0.83
Academic Library Services for MOOCs	1.17	0.66	0.74
MHRD Policy and Support	0.95	0.64	0.71
MOOC Penetration	0.97	0.55	0.87
Improved Quality of HE	0.91	0.63	0.81

Table 3. Scale properties

According to Bagozzi and Yi,[30] the construct's ability to measure the desired characteristics is called the construct validity. Construct validity is determined using convergent and discriminant validity. The FLR is used to estimate the convergent validity of the measure.[31] The discriminant validity is determined by plotting the square root of average variance

extracted (AVE) values along with their correlation with other items in the construct, according to Fornell and Larcker.[32] On doing the plotting for this construct, the values of the square root of AVEs were higher than their correlation values when all other items in the construct were included. As a result, it was concluded that the research model achieved satisfactory values for discriminant validity. Chin[33] suggested an AVE greater than 0.50 as the indicator of acceptable measurement error. The observed values of AVEs for this research have passed the recommendation. The convergent validity is determined using the composite reliability (CR) values. Chin[34] suggested a CR greater than 0.60 as the indicator of achieving convergent validity. All observed values had CR values more than 0.60, meaning that the construct achieved convergent validity also.

Exploratory factor analysis using principal component analysis and varimax rotation was carried out to understand the factor structure of the research instrument. All factors with a loading of more than 0.60 were selected for the study. This step is important as it helps us to remove the items with non-significant effects. All items falling below 0.60 factor loading had to be removed from the instrument.

The confirmatory factor analysis was conducted to determine the fit indices of the research model. Chi-square values were non-significant for this construct. The fit indices included in this study are goodness of fit index (GFI), adjusted goodness of fit index (AGFI), Tucker Lewis index (TLI), normed fit index (NFI), comparative fit index (CFI), incremental fit index (IFI) and root mean square error of approximation (RMSEA). All fit indices produced satisfactory values. The usually acceptable value for all these indices is more than or equal to 0.90, and the RMSEA values are acceptable under 0.08. All the tested values are shown in Table 4 below.

goodness of fit index	0.953	comparative fit index	0.948
adjusted goodness of fit index	0.896	incremental fit index	0.955
Tucker Lewis index	0.925	root mean square error of approximation	0.073
normed fit index	0.908	chi-square value	171.546
degrees of freedom	152	significance value	0.110
chi-square/ degrees of freedom	1.128		

Table 4. Fit indices for the research model

Main effects

The gamma values (γ) represent the regression coefficients of the endogenous variables (dependent variable) on the exogenous variables (independent variables). The results of the confirmatory factor analysis are shown in Figure 3 below with the symbol ***.
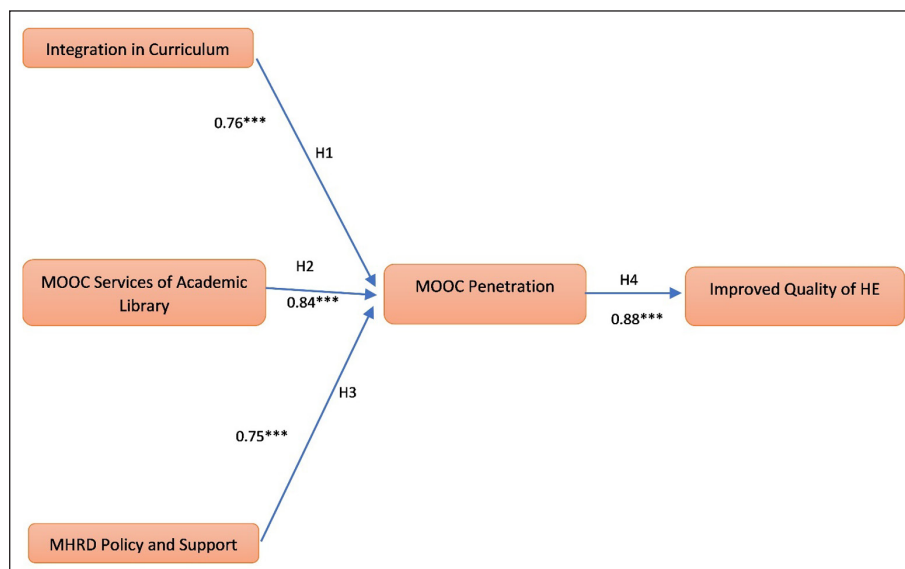

Figure 3. Improved quality of HE structural equation model

Discussion
Academic library services for MOOCs

The research model tested for this study shows a positive relationship between the academic library services provided for MOOCs and MOOC penetration. The literature review of this current research showed that the academic library's roles in facilitating integration and management of a MOOC-based curriculum can be classified into two broad categories:

i.   extension of existing library services, and

ii. new library services.

Table 5 contains the classification of the academic library services for MOOCs based on (i) extension of existing library services and (ii) new library services.

'this study shows a positive relationship between the academic library services provided for MOOCs and MOOC penetration'

MOOCs as an extension of Existing Library Services	Citations	Scope of New Library MOOC Services	Citations
Teaching reference services for MOOCs	35	Support services for development of new MOOCs	36
Copyright services for MOOC resources	37	Digital platform for peer discussion on MOOCs	38
Provide physical space for MOOC learning	39	Development and management of a university-wide digital MOOC platform for access, instruction, evaluation, feedback and support, based on artificial intelligence	40
Reliable broadband access	41	MOOC technical support	42
Library network for sharing of digital resources	43	Centralized MOOC administration	44
Training students and instructors on latest technology to use MOOCs	45	MOOC pedagogy training for instructors	46
Index, ranking, organizing and cataloguing MOOCs	47	Student counselling for MOOCs	48
Technical infrastructure for MOOCs	49	MOOCs with embedded links for resources	50
Promoting MOOCs	51	MOOC knowledge services for students	52
Training students in English language to understand MOOCs	53	Development of FAQs for student self-service	54
Preserving and archiving MOOCs	55	Mobile access of MOOCs, resources and services	56
Learning resources for MOOCs	57	Information retrieval training for MOOCs	58
Continual improvement of digital learning resources for MOOCs	59	Technical team for MOOC support	60
Digitization of traditional resources	61	Co-ordinate in MOOC instruction, design, development and management	62
Developing open educational resources for MOOCs	63	Evaluation of prospective MOOCs for inclusion	64
Cybrarian services	65		
Programmes for information literacy of MOOC students	66		
Inter-departmental co-ordination for MOOC-based education	67		

Table 5. Classification of the MOOC services of the academic library

The relationship between MOOC penetration and the quality of higher education

The quality of higher education has a direct relationship with the degree of MOOC penetration, according to this study. Figure 4 illustrates the relationship between the level of MOOC penetration in higher education institutions in India and its relationship with the educational quality parameters of these institutions. Based on this figure, three cases can arise, which are discussed in Table 6.

Case 1	MOOC adoption by individual users	Low MOOC penetration	High dropout rate. Not affordable for everybody. Language constraints, lack of resource availability, guidance and motivation
Case 2	Institutional adoption (voluntary)	Medium MOOC penetration	Based on sparingly dispersed cases. The adoption rate and effect if localized and not translated to the masses
Case 3	Institutional adoption (policy based)	High MOOC penetration	Pan India institutional adoption under central policy. MHRD will provide guidelines, policy framework, resources and training under NME-ICT programme

Table 6. Relationship between the level of MOOC penetration and the quality of higher education

Case 1: MOOC adoption by individual users

MOOCs are playing an important role for students and young professionals for skill and career development.[68] The recent advancement in technology, mobile device adoption and internet penetration in India has supported the growth of the MOOC movement. According to the Coursera impact report of 2020, there were around ten million registered MOOC users in India for Coursera. As per the statistics, India has the second highest number of registered MOOC users, after the United States. Although the statistics look very attractive, the reality is that there is a high dropout rate, with only five to ten per cent of people completing an entire course.[69] The major challenges for MOOCs in India are the digital divide, language barrier, lack of proctored evaluation, low motivation, lack of support and guidance and the high dropout rate. These issues make this case the least desirable to increase MOOC penetration and adoption in a developing nation like India.

Case 2: Institutional adoption (voluntary)

The institutional adoption of a MOOC-based curriculum is ideal, but very few institutions in India are known to have adopted MOOCs. The proportion of private institutions is even lower. The reason for this is the high cost of infrastructure and human resources required to manage and maintain a MOOC-based curriculum and lack of senior management control in administering MOOC-based courses. Another reason is that there is no return on investment for the institution on adopting a MOOC-based curriculum.[70] For this scenario, the higher education institution would need to decide upon the right strategy for adopting a MOOC-based curriculum. The decision would depend upon several parameters, such as the level of resources available within the institution, the quality of the teaching staff, the type of courses they offer and the level of student performance.

Case 3: Institutional adoption (policy based)

The policy-based integration of MOOC courses in the traditional higher education framework would lead to the highest level of MOOC penetration in the Indian higher education system. This would also streamline the usual institutional challenges faced in adopting H-MOOCs. From the student perspective, the completion rates of MOOCs would increase[71] due to the availability of facilitator instruction for students for the MOOC-based curriculum[72] and the availability of guidance to the students, which plays a crucial role in the timely completion of MOOCs.[73] The students would also benefit from academic library services for MOOCs such as information retrieval, technology training, reading, writing and language skills before undertaking MOOC courses.[74]

The legitimacy and acceptance of the MOOCs would enhance due to credit transfer and credit recognition of MOOCs.[75] The confidence of employers and institutions in MOOCs can be addressed by arranging proctored assessment of MOOC coursework.[76] Due to centralized administration of a MOOC-based curriculum, there would be efforts to include every department[77] and the workload on faculty and staff would be distributed and managed accordingly.[78]

This would be instrumental in overcoming the obstacle of the tradition barrier for MOOCs by providing instruction, discussion, support and resources for students and instructors.[79]
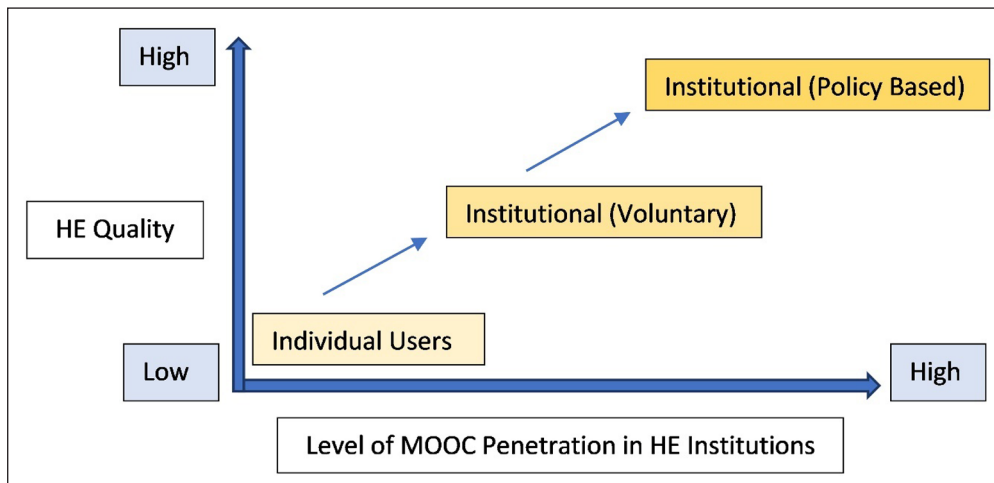
Figure 4. Relationship between the level of MOOC penetration and the quality of higher education

Decision model for MOOC integration into the university curriculum

Based on the levels of instructor autonomy on the course and the corresponding levels of student autonomy, there could be four types of MOOC integration model. This can be illustrated using a quadrant model based on a continuum of two factors:

i. instructor autonomy on the x-axis, and

ii. student autonomy on the y-axis.

Instructor autonomy can be defined as the level of control available to the course instructor to manage the content and the pedagogy. In other words, the instructor is in a position of authority.[80] A low instructor autonomy means that the instructor has less control to manage the course. A high instructor autonomy means that the instructor can control the pedagogy, content and delivery of the course, as is the case with traditional classroom-based teaching.

Student autonomy can be defined as a high level of self-directed and personalized learning.[81] Student autonomy refers to the flexibility of the learners to self-regulate their learning. A low level of student autonomy means that the student is under the control of the instructor or the institutional policies to gain course credits. However, a high level of student autonomy means that the students have the flexibility to choose their course, the course platform and the learning process.

This model provides four strategies of MOOC integration based on the combination of the level of autonomy the institution's policymakers need to provide the instructors and the students. The choice of the MOOC integration model depends on the design and development of the course. The course design has three important curriculum components: (1) learning outcomes, (2) learning activities, and (3) learning assessments. The right choice is the one where these three curriculum components align and reinforce one another.[82]

Zhang[83] has discussed the integration of MOOCs into curricula based on the principle of alignment. The four models proposed were:

i.   use of MOOC for content

ii. flipped classroom

iii. bridge course for equivalence

iv. direct credit transfer from MOOCs.

These four MOOC integration models can be categorized in the proposed MOOC integration model based on the continuum of autonomy for instructors and students, as shown in Table 7.

X: High Y: High	Quadrant 1	Flipped classroom	This model uses the best of both worlds. The traditional lecture and homework are reversed. The students learn from MOOCs as homework and then discuss the learning with their peers and the instructor in the classroom for problem solving and activities. The instructor may offer only relevant sections of MOOCs as homework, as per their curriculum design. This model engages students in higher-order learning through proper discussions and active engagement. In this case, the content from more than one MOOC can be used.
X: Low Y: High	Quadrant 2	MOOC credit transfer	According to the latest UGC guidelines on MOOC credit recognition, online courses offered on SWAYAM platform can constitute up to 40 per cent of the total credits in each semester. Major MOOC providers like Coursera and EdX have started to associate credits based on online proctored exams with their monetized MOOCs. If the MOOCs are approved by an institution due to their fit to the curriculum, credit transfer becomes possible. This model provides maximum autonomy to the students, as they are free to choose their course and can self-regulate their learning process. Instructor autonomy is the least in this case, as there is no role for the instructor in such a MOOC integration model.
X: Low Y: Low	Quadrant 3	Bridge course/exam	When the learning outcomes of the traditional course and the MOOC are similar, the courses are considered equivalent. The institute can save on the delivery cost of the course by adopting MOOCs in such a case. But the credit transfer cannot be done due to problems of potential plagiarism and cheating in the online assessment. In such a case, the institute may add a few tutorials, laboratory sessions and assessments to compensate for the quality issues with the MOOCs. In this model, the level of autonomy is low for both the students and the instructor. The students need to adhere to the institutional requirements to get the course credits, and the instructor will not get to design and manage the curriculum as the majority of learning takes place on the MOOCs.
X: High Y: Low	Quadrant 4	MOOC as content	MOOC components are used in regular teaching as learning objects, e.g. videos, reading resources, quizzes, activities, etc. Content from more than one MOOC can be used. In this case, the instructor has maximum autonomy on the curriculum.

Table 7. Decision Model for MOOC integration into the curriculum

This decision model for MOOC integration into the academic curriculum can be understood in the form of a quadrant diagram (Figure 5).
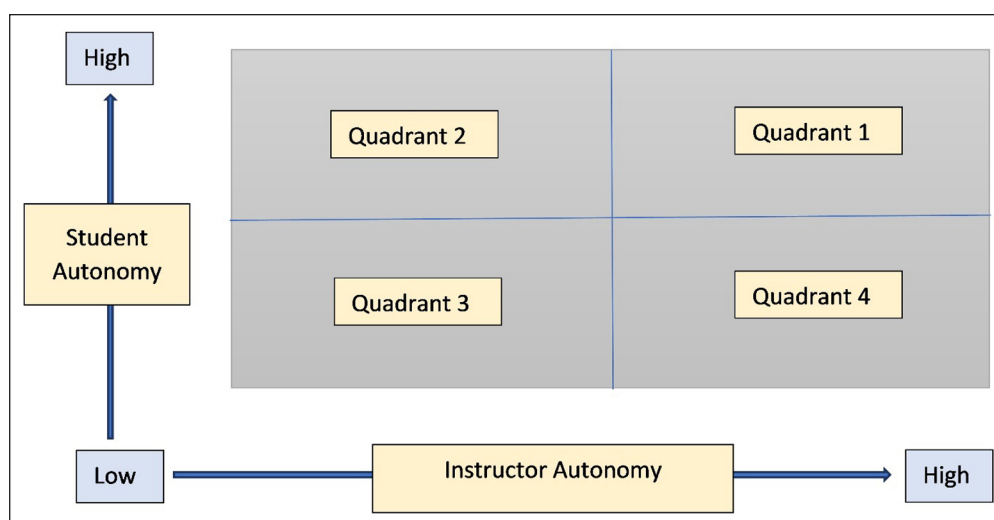
Figure 5. Decision model for MOOC integration into the curriculum

Conclusion

The idea of MOOCs has been at the centre stage of academia and learners since 2012, when the pioneers of educational excellence, like Harvard and MIT, started developing and delivering the first courses. This disruptive innovation has opened tremendous opportunities for learners across the globe to get access to high-quality education and peer learning affordably or for free. The elite institutions get involved in developing new MOOCs because of the availability of resources and prowess to gain revenue and reputation; at the same time, the other higher education institutions from emerging economies may benefit from the MOOCs by integrating them into their curricula through hybrid courses. This not only increases their educational quality but also reduces their delivery costs.[84]

Higher education in India, especially in private institutions, suffers from poor and declining quality of education due to lack of funds and high enrolments. This has affected the student's employability.

'This disruptive innovation has opened tremendous opportunities for learners across the globe to get access to high-quality education and peer learning affordably'

There are several issues about the inclusion of MOOCs in the regular university curricula. This article has evaluated the available research literature to explore these issues. Based on these findings, the research model for improving the quality of higher education through the integration of MOOCs into the curriculum with the help of academic libraries and a central policy-making authority, like the MHRD (Ministry of Education) in the case of India, was developed. The research model has been tested empirically to understand the relationships between the proposed variables.

Integration of MOOCs into the university curricula, the MOOC services of the academic library and MHRD policy and support together lead to MOOC penetration into the higher education system. The higher the MOOC penetration, the greater would be the improvement in the quality of higher education. This assertion has its merit, particularly in the case of developing economies like Malaysia[85] and Africa.[86]

Although the governments of several nations have started initiatives for facilitating MOOC-based learning, these efforts would require synchronized contributions from all the major stakeholders, as discussed in this research, to increase the MOOC penetration, quality and reach of higher education.

Abbreviations and Acronyms
A list of the abbreviations and acronyms used in this and other *Insight*s articles can be accessed here – click on the URL below and then select the 'full list of industry A&As' link: **http://www.uksg.org/publications#aa**.

Competing interests
The authors have declared no competing interests.

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