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## Enhancing the Higher Education Quality with MOOC Penetration: Role of Policy, Library and Curriculum

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# Enhancing the Higher Education Quality with MOOC Penetration: Role of Policy, Library and Curriculum

## Abstract

The governments of emerging economies have realized the potential of MOOCs for enhancing the quality of higher education, but still, the MOOC penetration is very low in countries like India. This study explores the issues relating to MOOC integration and attempts to identify the key drivers for the adoption of MOOC based curriculum. 'Integration into Curriculum', 'MOOC Services of Academic Library', and 'MHRD Policy and Support' are identified as the key drivers for increasing the MOOC Penetration. The higher the level of MOOC penetration the greater would be the improvement in the quality of higher education. The practical implications for practice and policy are classification of MOOC services of academic library and a decision-making model for hybrid learning strategy for higher educational institutions.

*Keywords:* MOOC Penetration; MOOC Integration; Quality of Higher Education; Academic Library; MOOC; MOOC based curriculum

## 1. Introduction

Higher education from premier institutions remains a dream to majority of students across the globe, especially for learners from emerging economies. Millions of international students, especially from the developing nations couldn't have its access, but now Massive Open Online Courses (MOOCs) are providing cost-effective access to a huge number of students across the world. Therefore, MOOCs have attracted the attention of educational researchers in the recent decade. Several MOOC courses are free and are provided by some of the best institutions. Many MOOC courses are also available in other languages like Italian, German, Chinese, French, Portuguese and Spanish. These courses not only inspire the learners but are also accepted by many educational institutes and employers as a mark of educational excellence (Haynie, 2013).

MOOCs can serve the underprivileged section through affordable education from the likes of Stanford and MIT, to make them job-ready. The MOOC courses are no compromise, instead, several research and surveys have found these courses more interesting and enriching than a regular course. For example, edX's first offered course, 'An M.I.T. intro class on circuits' had more than 155,000 students, which was greater than the total number of alumni of M.I.T. in its entire history of 150 years. MOOCs have much more to offer than any traditional classroom-based system. The advantages of any time learning, peer discussions on online forums, blended learning, instructor feedback, international exposure to a diverse group of learners and inclusivity, make them a high potential change agent of higher education and employment (Friedland, 2013).

The increasing load and expectations from the higher education institutions due to ever-increasing demand and limitation of resources can be addresses through mainstreaming of MOOCs. Integration of MOOCs into regular university curricula would increase the enrolment base. It can provide flexible learning schedules and would radically change the learning 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 (Badi & Ali, 2016).

The potential of MOOCs to improve education quality for masses has attracted several higher education institutions and policymakers towards them. Albelbisi (2019) has shown that the characteristics of such a MOOC based education system must be developed with a lot of consideration. The '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 'Learning Environment' to support MOOC based curriculum. This research would explore this connection to draw some meaningful implications for practical use.

In India, even after spending more than 3% of the country's GDP on higher education, the per-student spending is still among the lowest, as compared to any other country. It is important to note that, the reason responsible for this condition is the opening of a larger number of universities, subsequently producing higher university enrolment. Though the enrolment number has increased, unfortunately, this has further declined the per-student spending which has consequently led to the scarcity of faculty and deterioration in the quality of education (Nath et al., 2014).

The IITs, IIMs, UGC, IGNOU, MHRD, AICTE, and other institutes of national importance have already started the initiative of using MOOCs via the SWAYAM platform to bridge the digital divide for the disadvantaged students. To add to it, UGC (SWAYAM, 2016 a) and AICTE (SWAYAM, 2016 b) have also issued Regulation 2016 instructing universities for transferring credits for courses done on SWAYAM which will ultimately be added to students' academic records.

The above steps were taken by the MHRD clearly show that, since their inception, MOOCs have gained quite a significance in the country. On one hand, the Government is making continuous efforts in spreading 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 in making the best use of resources available online. These platforms are not yet well-versed by the students, the factors thereof are aforesaid low level of awareness and incompetency in utilizing the available MOOC platforms.

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 can be, the efficient utilization of technology more specifically, MOOCs can be the key to developing this new educational environment in the country.

## **2. Literature Review**

### **2.1 MOOC based curriculum**

Creating MOOCs is an expensive and difficult process. For Higher Education (H.E.) institutions in India in Private Sector, financing such an activity is a challenging decision due to narrow 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 (Nissenson & Shih, 2015).

MOOCs are concentrated mostly within the renowned institutions of repute in India. This is contrary to the idea of MOOC, where the focus audience is huge and spread across geographies. This unwanted centralisation of MOOCs in India is against its basic principle of being distributed and diversified (Chatterjee & Nath, 2014).

In the Hybrid MOOC model suggested by Pérez-Sanagustín et al., 2017 (Figure 1 and Table 1), they have done 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 (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 very vital role. The institute needs to first recognise the benefits of adopting MOOC based curriculum, and then accordingly allocate resources for the same.

The institutional adoption of MOOC based curricula in the Indian context faces certain challenges due to the lack of available funds with the H.E. institutions. Especially the private sector H.E. institutions will evaluate the decision of MOOC integration in terms of a business proposition. Marrhich et al., 2020, have identified that the institutions don't adopt MOOC based curriculum due to no return on investment on such an initiative. Hence, only a few private sector H.E. institutions can be expected to take such a course.

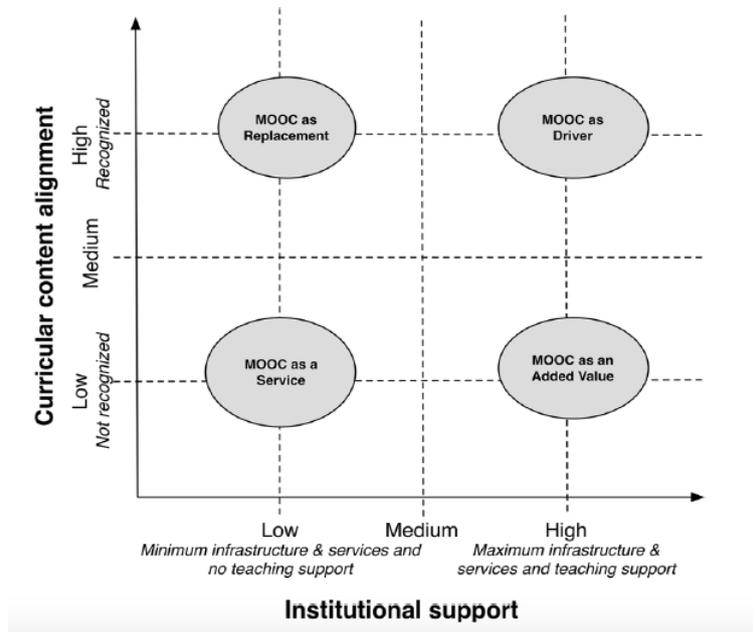


Figure 1: H-MOOC Framework of Pérez-Sanagustín et al. (2017)

Contrarily, if curriculum based on MOOCs is made mandatory for all H.E. institutions in the country by the policy-making bodies such as MHRD (Ministry of Human Resource Development, Government of India), 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-around support to enable such an initiative.

Table 1: *H-MOOC Framework*

X: Low Y: Low	MOOC as a service model	Students study MOOCs voluntarily, with no similarity of its content with 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 with 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

## 2.2 MOOC services of academic library

Deng (2018) suggested that the internet and mobile devices have vastly changed the way we acquire information and knowledge. The adoption of MOOCs in the universities in Europe, America and China have led their libraries to provide MOOC information services. The complementarity of MOOCs and roles of academic libraries can be clearly drawn, and their inter-relation can be established.

On the face of it, MOOC is an online model of education and the 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 specialise in information resources.
- Both models offer their users the freedom to choose information and knowledge on their own.

Luan (2015), proposes that the University library is a specialised 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. ICT (Information and Communication Technology) 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 in the academic curriculum is the question, the university department which can be characterised for the suitability of its leading role in enabling such integration is the Academic Library.

## 2.3 MHRD policy and support

Chatterjee and Nath (2014) have discussed the challenges of implementing MOOCs in India on a large scale. They suggest a need for a national level governing body 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' (NME-ICT) Programme. To provide the best quality learning resources for H.E. institutions across the nation, the project SWAYAM (Study Webs of Active Learning for Young Aspiring Minds) has been started. SWAYAM provides national MOOC courses on an online platform using information and communication technology (ICT). It encompasses a range of courses from High School to Higher Education level and also skills development programs. SWAYAM under the 'MOOCs National Committee' (MNC), which consists of technical experts, academicians, administrators etc., would establish other supporting environments for MOOC based curriculum such as proctored examination centres, credit transfer guidelines, credit mobility across educational institutions etc.

University Grants Commission (UGC) has been appointed as National Coordinator for Non-Technology PG courses, and 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 SWAYAM platform can constitute up to forty percentage of total credits in each semester.

SWAYAM, under NME-ICT, would develop e-content with NPTEL (National Programme on Technology Enhanced Learning) with a network of 7 IITs and IISc. NPTEL has developed e-content for 933 courses in 23 disciplines. CEC (Consortium for Educational Communication) has also developed MOOCs for 29 Under-Graduate subjects, and is working on further 58 subjects in '4 quadrants'. The 'Four Quadrant Approach' is explained in Table 2:

Table 2: *Four Quadrant Approach for SWAYAM*

Quadrant 1	e-Tutorial	Video and Audio content, Simulations, Video Demonstrations, Animation, Virtual Lab etc.
Quadrant 2	e-Content	e-Books, PDFs, Text, Illustrations, Interactive simulations, Practical Assignments
Quadrant 3	Web Resources	OER, Related Links, Case Studies, Journals, Research Papers, Anecdotes, Historical overview etc.
Quadrant 4	Self-Assessment	Problems and Solutions, MCQs, Quizzes, FAQs, Doubt Clearance, Peer Assessment

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 NIP (National Integrated Portal) known as 'e-Acharya' at a data centre hosted at INFLIBNET (Information and Library Network) Centre, Gandhinagar. NIP and NME-ICT are linked by a cloud known as 'Baadal' hosted at NIC (National Informatics Centre). The system is upgraded to support 30 million users, with 01 million concurrent users. This network makes use of CDN (Content Delivery Network) systems for faster delivery of video content, to meet the ever-increasing demand for MOOCs.

## 3. Research Methodology

### 3.1 Gap Identification

Skimming of literature on the issues with MOOC integration into higher education curriculum provides valuable insights on the role of institution, and the role of the central policy-making authority (MHRD, Govt. of India) in a developing country like India and the role of academic library. These issues identified from the review of literature can be summarised in the Table. 1. Taking 'MOOC Penetration' as the driver for 'Higher Education Quality', the following gaps have been deduced in the light of the literature review:

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

Gap 2: The literature lacks in identifying the role of the policy-making body like MHRD in the case of India in driving the MOOC integration program. Although 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 'Academic Library' and 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.

### 3.2 Research Model and Hypotheses

In the literature, the research gaps identified for influencing the 'Quality of higher education.' includes 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', 'MOOC services of academic library', 'MHRD policy and support', 'MOOC penetration', and 'Improved quality of Higher Education (H.E.)'. Their inter-relations can be understood clearly from Figure 2.

Rambe & Moeti 2017, 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 in Africa (Macharia, 2014). 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 availability of broadband and computers, promote the quality of participation of students, and provide meaningful learning experience due to the involvement of the educators (Rambe & Moeti 2017). Hence, the derived hypothesis can be stated as:

H1: Degree 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 (Kaushik & Kumar, 2016). Libraries have always played the role of knowledge disseminator, and hence, they have a key role in enable MOOC penetration and adoption in curricula by supporting the instructors, students and the institutions (Pujar et al., 2014). Hence, the derived hypothesis can be stated as:

H2: The academic library services for MOOCs influences the level of MOOC penetration.

The government policy and support are required in many areas for MOOC adoption such as trained instructors for MOOC based pedagogy, online and offline access of MOOC digital platforms, development of MOOCs in regional languages, credit recognition and credit transfer policies. Implementation of MOOCs in a blended format of instructor-facilitated flipped classrooms. Such initiatives would also assist in economic aspects and for providing official status to MOOC based education (Trehan et al., 2017). MHRD, (Ministry of Human Resource Development) Government of India, now known as the Ministry of Education 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 determines the level of MOOC penetration.

Zhang (2013) has related the integration of MOOCs into the curricula with the low cost and high-quality education model. Albelbisi & Yusop (2020) have listed several empirical pieces of evidence for the proposition of MOOCs leading to improvement in the quality of higher education. Ministry of Education, Malaysia in their 2015 report have expressed their plan to leverage the benefits of MOOC to improve the quality of learning and to extend access to education in Malaysia (Albelbisi & Yusop, 2020). So, the relationship between MOOC penetration and the quality of higher education may be formed into a hypothesis as::

H4: Greater the level of MOOC penetration, the greater is the quality of Higher Education.

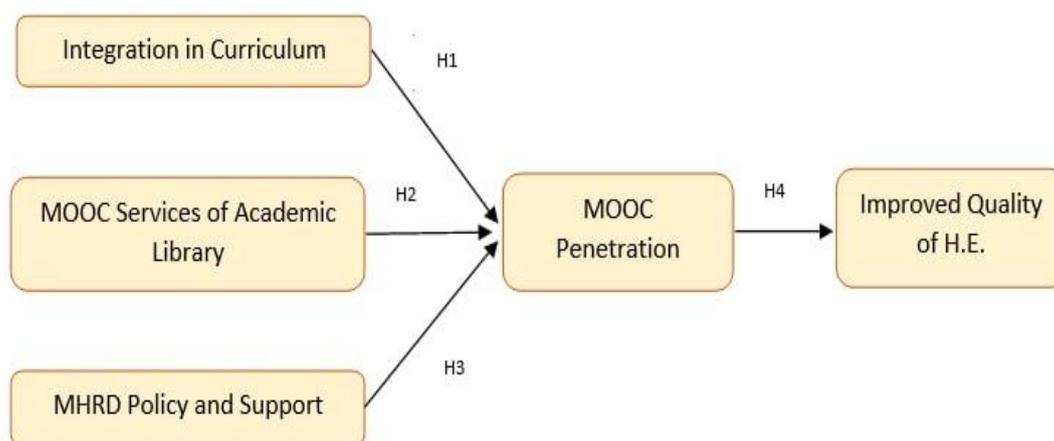


Figure 2: Research Model

### 3.3 Empirical Study

#### 3.3.1 Survey Design

In this empirical research, a questionnaire-based study was used to find the extent of relationship between the proposed attributes of the research model. A printed survey schedule was prepared with a 5-point Likert scale for measuring the respondent 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 curriculum (5 items). MOOC services of academic library (8 items), MHRD policy and support (5 items), Improved quality of higher education (5 items). Demographic data on age, gender and education was also collected. The full scales are available in the Appendix 1.

The content validity of the scale was determined by the help of three subject area experts. The expert's personal experience and knowledge plays a crucial role in establishing the content validity. There are not specific rules for deciding upon the number of experts. Validation from many experts would reduce the probability of reaching on to a common decision, hence, the number of three to five experts is suggested to achieve the chance of agreement (Zamanzadeh et al., 2015). This step helps in refining the language of the instrument and also to understand whether the instrument is able to achieve the desired research objectives.

#### 3.3.2 Sampling and Procedure

The survey engaged faculty and library professionals who have had a 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 is 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, 2011. The primed respondents were first explained about the purpose and usefulness of the study and were reassured that their

responses will be kept confidential. The respondents were guided through the questionnaire followed by a short gratitude message. Data has been collected from 300 participants, 236 complete responses were received, which were then considered for inclusion in the final analysis. Hence, this survey had a 78.67% response rate. The average age of participants in this survey was 34.4 years. More female (154), than male (82) participants have been included in this survey out of 236 selected responses.

### 3.4 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 was determined using the Fornell-Larcker ratio, average variance extracted and the composite reliability. The observed values for these measures are recorded in Table 3.

Table 3: Scale properties

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 H.E.	0.91	0.63	0.81

According to Bagozzi and Yi (2012), the construct's ability to measure the desired characteristics is called the construct validity. Construct validity is determined using convergent and discriminant validity. FLR (Fornell-Larcker Ratio) is used to estimate the convergent validity of the measure (Fornell and Larcker, 1981). The discriminant validity is determined by plotting the square root of average variance extracted values along with their correlation with other items in the construct according to Fornell and Larcker (1981). On doing this plotting for this construct, the values of square root of AVEs were higher than their correlation values with all other items in the construct. Hence, it was concluded that the research model achieved satisfactory values for discriminant validity. Chin (1998) suggested AVE greater than 0.50 as the indicator of acceptable measurement error. The observed values of AVEs have passed the recommendation. The convergent validity is determined using the composite reliability (CR) values. Chin (1998) suggested CR greater than 0.60 as the indicator of achieving convergent validity. All observed values had CR values more than 0.60. Hence, 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 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 values 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 the table 4 below:

Table 4: Fit indices for the research model

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		

### 3.5 Main Effects

The gamma values ( $\gamma$ ) 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 the figure 3 below with the symbol (\*\*\*)

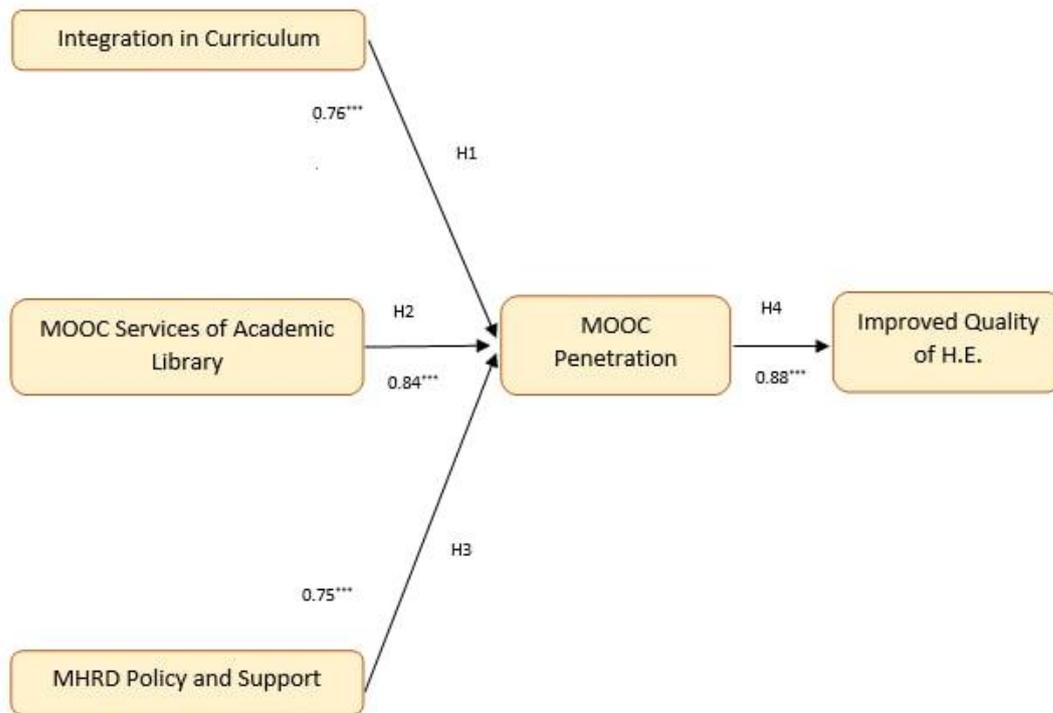


Figure 3: ‘Improved Quality of H.E.’ Structural Equation Model

## 4. Discussion

### 4.1 Academic library services for MOOCs

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

- i. Extension of Existing Library Services, and
- ii. New Library Services

Following is the classification of the ‘Academic library services for MOOCs’ based on (i) extension of existing library services and, (ii) new library services (Table 5).

Table 5: Classification of MOOC Services of Academic Library

MOOCs as an extension of Existing Library Services	Citations	Scope of New Library MOOC Services	Citations
Teaching reference services for MOOCs	Luan (2015)	Support services for development of new	Lombardo et al. (2018)

		MOOCs	
Copyright services for MOOC resources	Luan (2015), Chen (2014)	Digital platform for peer-discussion on MOOCs	Ackerman et al. (2016), Kop et al. (2011), Sit et al. (2005)
Provide physical space for MOOC learning	Mazurov (2015), Luan (2015), Ning et al. (2016)	Development and management of a university wide digital MOOC platform for access, instruction, evaluation, feedback and support, based on artificial intelligence	Chatterjee and Nath (2014), Mune (2015), Ning et al. (2016), Wang (2017), Jie (2019)
Reliable broadband access	Chen (2014)	MOOC technical support	North et al. (2014)
Library network for sharing of digital resources	Wang (2017)	Centralized MOOC administration	Marrhich et al. (2020)
Training students and instructors on latest technology to use MOOCs	Marrhich et al. (2020), Chatterjee and Nath (2014)	MOOC pedagogy training for instructors	Pérez-Sanagustín et al. (2017)
Index, ranking, organizing and cataloging MOOCs	Zheng et al. (2015), Jie (2019)	Student counselling for MOOCs	Kaushik (2020), Alarimi et al. (2015)
Technical infrastructure for MOOCs	Chatterjee and Nath (2014), Marrhich et al. (2020)	MOOCs with embedded links for resources	York and Vance (2009), Hoffman and Ramin (2010), Luan (2015)
Promoting MOOCs	Jie (2019)	MOOC knowledge services for students	Luan (2015), Yuan (2015)
Training students in English language to understand MOOCs	Chatterjee and Nath (2014), Fini (2009), Gulatee and Nilsook (2016)	Development of faq's for student self-service	Mune (2015)
Preserving and archiving MOOCs	Lombardo et al. (2018)	Mobile access of MOOCs, resources and services	York and Vance (2009), Hoffman and Ramin (2010), Yang (2015)
Learning resources for MOOCs	Ackerman et al. (2016), Shapiro et al. (2017), Hart (2012)	Information retrieval training for MOOCs	Jie (2019)
Continual improvement of digital learning resources for MOOCs	York and Vance (2009), Yanxiang (2016), Hoffman and Ramin (2010)	Technical team for MOOC support	Jie (2019), Wang (2017)
Digitization of traditional resources	Yanxiang (2016), Yang (2015)	Coordinate in MOOC instruction, design, development and management	Jie (2019)
Developing open educational resources for MOOCs	Kendrick and Gashurov (2013),	Evaluation of prospective MOOCs for	Lombardo et al. (2018)

	Mune (2015), Yanxiang (2016),	inclusion	
Cybrarian services	Luan (2015), Yang (2015)		
Programs for information literacy of MOOC students	Ackerman et al. (2016), Ning et al. (2016), Jie (2019), Luan (2015)		
Inter-departmental coordination for MOOC based education	Wang (2017)		

#### 4.2 The Relationship between 'MOOC Penetration' and the 'Quality of Higher Education'

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 the Higher Education (H.E.) 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 below in Table 6.

Table 6: *Relationship between Level of MOOC penetration and the quality of Higher Education*

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.

##### Case 1: MOOC adoption by individual users.

MOOCs are playing an important role for students and young professionals for skill development and career development (Pappano, 2012). The recent development in technology and 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 10 million registered MOOC users in India for coursera. As per the statistics, India has second most number of registered MOOC users after only the United States. Although the statistics look very attractive, the reality is, only 5 to 10 per cent of people complete the entire course due to a high dropout rate (De Coutere, 2014). 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 high dropout rate. These issues make this case least desirable for MOOC penetration and adoption in a developing nation like India.

##### Case 2: Institutional adoption (Voluntary)

The institutional adoption of MOOC based curriculum is an ideal state for MOOC adoption, but very few institutions in India are known to have adopted MOOCs. More so, the private institutions are even less in number, where MOOC integration has been practised. The reason being the high cost of infrastructure and human resources to manage and maintain MOOC based curriculum, lack of top management control in administering MOOC based courses. Another reason is no return on investment for the institution on adopting MOOC based curriculum (Marrhich et al., 2020). For this scenario, the higher education institution would need to decide upon the right strategy for adopting MOOC based curriculum. This decision would depend upon several parameters, such as the level of resources available with the institution, the quality of the teaching staff, the type of courses they offer, the level of student performance etc.

##### Case 3: Institutional adoption (Policy Based)

The Policy-Based integration of MOOC courses in 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 student perspective, the completion rates of MOOCs would increase (McGreal et al., 2013) due to availability of facilitator instruction for students for the MOOC based curriculum (Sinclair et al., 2015; Kop et al., 2011; Gulatee & Nilsook, 2016) and the availability of guidance to the students, which plays a crucial role in timely completion of MOOCs (Barnard et al., 2009). The students would also benefit from academic library services for MOOCs such as, information retrieval, technology training, reading and writing skills, language skills before undertaking MOOC courses (Kerr et al., 2006).

The legitimacy and acceptance of the MOOCs would enhance due to credit transfer and credit recognition of MOOCs (Pérez-Sanagustín et al., 2017; Kundu & Bej, 2020). The confidence of employers and institutions on MOOCs can be addressed by arranging proctored assessment of MOOC coursework (Chen, 2014; Hew & Cheung, 2014). Due to centralized administration of MOOC based curriculum, there would be efforts to include every department (Wang, 2017) and the workload on faculty and staff would be distributed and managed accordingly (Marrhich et al., 2020).

This would be instrumental in overcoming the obstacle of ‘Tradition Barrier’ for MOOCs by providing instruction, discussion, support and resources for students and instructors (Ma & Lee, 2019; Chatterjee & Nath, 2014).

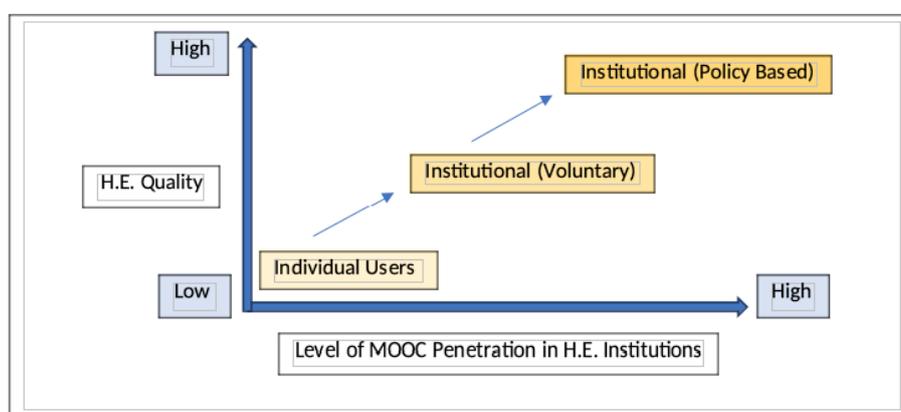


Figure 4: Relationship between Level of MOOC penetration and the quality of Higher Education

#### 4.3 Decision Model for MOOC Integration into 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 models. 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 (Deci & Ryan, 1985). A low instructor autonomy means that the instructor has lesser 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 the high level of self-directed and personalised learning (Beaudoin, 1990; McLoughlin & Lee, 2010). 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 are flexible 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 (Zhang, 2013).

Zhang (2013), 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 categorised in the proposed MOOC Integration Model based on the continuum of autonomy for instructors and students as shown in Table 7.

Table 7: *Decision Model for MOOC Integration into the curriculum*

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 learnings 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 his or her 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 forty percentage of total credits in each semester. Major MOOC providers like Coursera and EdX have started to associate credits based on online proctored exams with their monetised 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 of 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 few tutorials, lab 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.
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This decision model for MOOC integration into academic curriculum can be understood in the form of a quadrant diagram (Figure 5).

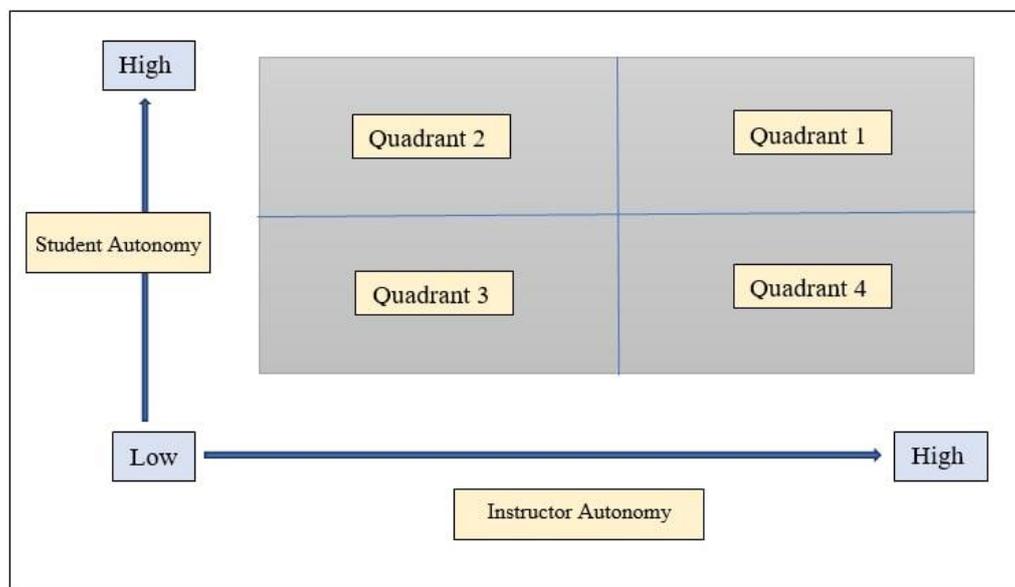


Figure 5: Decision Model for MOOC Integration into the curriculum

## 5. Conclusion

The idea of MOOC (Massive Open Online Course) 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 MOOCs. This disruptive innovation has opened tremendous opportunities for learners across the globe to get access to high-quality education and peer learning at affordable costs 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 would not only increase their educational quality but also reduce their delivery costs (Matkin, 2012).

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.

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 the central policy-making authority, like MHRD (Ministry of Education) in the case of India was developed. This research model has been tested empirically to understand the relationships between the proposed variables.

Integration of MOOC into the university curricula, 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.

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

## Declarations

Availability of data and material: The data collected in the current study are not publicly available since this study is part of an ongoing research.

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Acknowledgements: Not Applicable.

## Appendix 1. Survey Items

Constructs	Items	Measures
Integration in curriculum (IC)	IC1	Integration of MOOCs into curriculum will increase the MOOC completion rate of students.
	IC2	Integration of MOOCs into curriculum will reduce the technological barrier for MOOC students.
	IC3	Integration of MOOCs into curriculum will reduce the psychological barrier for MOOC students.
	IC4	Integration of MOOCs into curriculum will increase the quality of participation of MOOC students.
	IC5	Integration of MOOCs into curriculum will provide meaningful learning experience to the MOOC students.
MOOC services of academic library (ML)	ML1	Library's technical assistance for MOOCs will increase student adoption of MOOC course.
	ML2	Customized information and advanced information Services of library will increase student adoption of MOOC course.
	ML3	MOOC information literacy programs of library will increase student adoption of MOOC course.
	ML4	Technology training by library will increase student adoption of MOOC course.
	ML5	English Language Training by library will increase student adoption of MOOC course.
	ML6	Support services of library will increase student adoption of MOOC course.
	ML7	The availability of a collection of open educational resources for MOOCs will increase student adoption of MOOC course.
	ML8	Availability of e-learning resources from academic library will increase student adoption of MOOC course.
MHRD policy and support (MS)	MS1	MHRD support and policies can produce trained instructors for MOOC based pedagogy.
	MS2	MHRD can provide open access digital platforms for MOOC distribution.
	MS3	MHRD can provide open educational resources on mobile devices for access in remote areas.
	MS4	MHRD can provide educational resources in regional languages for increased MOOC adoption by non-English speaking students.
	MS5	MHRD can help in credit-recognition and credit-transfer of MOOC based education.
Improved quality of higher education (QE)	QE1	MOOC adoption in higher education would increase employability of students.
	QE2	MOOC adoption in higher education would provide better curriculum for students.
	QE3	MOOC adoption in higher education would increase research aptitude of students.
	QE4	MOOC adoption in higher education would increase overall quality of education delivery.
	QE5	MOOC adoption in higher education would improve quality of teaching faculty.

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