

## **An Overview of Indian MOOCs**

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### **Abstract**

The Indian education system recently went through a massive and eye-opening change. Our limiting factor, amongst many others, was the lack of adequate physical infrastructure for higher education institutes, resulting in lower enrolments throughout different courses. Though students have always had access to “Massive Open Online Course” (MOOC) platforms for learning, its potential has recently come to light. Moreover, recently, the recommendations of the New Education Policy (NEP) Committee members highlighted the critical role of the “Online Learning” mode in achieving the targets of Sustainable Development Goal 04 (Quality Education). The researchers thus wished to explore India’s readiness to harness and make the most of this platform. This paper aims to explore and compare the significant MOOC platforms used to offer courses in India and the various challenges they face. An in-depth analysis of the four most widely used and developed MOOC Platforms is studied to achieve these objectives. They are NPTEL (2003), mooKIT (2014), IITBombayX (2016), and SWAYAM (2016). The researchers evaluated that a few primary concerns regarding the performance of MOOCs in India include lack of digital infrastructure, need for investment, and adaptability of MOOCs by the learners. It was also realized that there could be a potential compromise in the quality of research work undertaken, the need to enhance the quality of content created and cater to the diversified needs of the Indian students.

*Key Words: NPTEL, SWAYAM, IITBX, mooKIT, Massive Open Online Course, Online Learning*

## I. Introduction

Education is the discipline concerned with the acquisition of knowledge, skills, values, and beliefs. Formal education is composed of stages, including pre-school, primary school, secondary school, and university - the combination of these stages is referred to as the education sector (Marrou, 2021). Education is an integral element of society, given its nature as a merit good. This means that the consumption of a "unit" of education by a student is likely to benefit the student and reap positive, quantifiable external effects in the long run.

The enrollment in "Massive Open Online Course" (MOOC) has increased manifolds recently. The first-ever publication on MOOC was in the year 2009, featured in the journal "International Review of Research in the Open and Distance Learning," titled "The Technological Dimension of Massive Open Online Courses: The Case of the CCK08 Course Tools", by Antonio Fini. However, the concept only gained popularity in October 2011, when one Stanford professor started offering 03 courses for free in the public domain. It saw more than 100,000 registrations, further influencing launching several more such courses worldwide. The potential of these courses to reach the masses earned it the name of 'MOOCs.' Almost after a decade of being in vogue, 220 million-plus students have registered for at least one course on at least one MOOC platform offering them, of which 40 million registrations happened in 2021. This surge in enrollment during 2020-21 mainly resulted from the pandemic, rise in unemployment, and travel restrictions. Nevertheless, the year is termed the "Year of the MOOC." The size and scope of the courses and the platform(s) are still expanding. The USA has been the global leader in growth in enrolments since the conception of MOOCs. However, India is catching up, and it recently became the second biggest nation to receive increased registrations, with as many as 8,83,400 (27%) registration on edX platforms, 15 Lakh on Coursera, and 1.12 Lakh (13%) on Udacity (Pandey, 2016) by 2016. This prompted the government to understand citizens' changing needs and requirements regarding education and improvement in skill sets. Thus several different platforms which specifically cater to these needs were launched in recent years, and the prominent ones include NPTEL, mooKIT, IITBX, and SWAYAM. For offering MOOC, interested institutions can go for 'self-hosted platforms' or use 'licensed platforms' like Coursera. Under the self-hosted platform, the developer can have the freedom to either develop their platform such as IIT Kanpur by creating 'mooKIT,' or use an open-source platform available already. The main objective of this paper is to understand these platforms' theoretical and technical backgrounds and their contribution to enhancing the standard of education.

### ii. Growth potential of moocs

MOOC is, in essence, an asynchronous teaching and learning platform. The process essentially involves using "pre-recorded lectures, resource video materials, lecture notes, assignments, and quizzes" as content and self-assessment at regular intervals. Although, the learning takes place through a scheduled deadline for the completion of coursework, encouraging real-time and simultaneous participation of instructors and students, thus giving a classroom experience

(therefore synchronous). MOOCs enable the instructors to teach the students in rural areas via pre-recorded DVDs, Whatsapp messages, messaging services, and other mobile-based content. This allows quality and equitable access to education to more learners. They can lead to an improvement in the "Gross Enrollment Ratio" (GRE) too. These are publicly accessible – free of cost.

There are two distinct types of MOOCs available globally. Firstly, the ones emphasizing the "connectivist philosophy," and, secondly, resembling the traditional course type. Stephen Downes coined "cMOOC" and "xMOOC, to distinguish the two. cMOOCs follow the principle of "connectivist pedagogy," encouraging modifications in teaching materials with changing needs of the learners. Additionally, cMOOCs encourage learners and support to engage in collaborative dialogues and knowledge-building processes. The xMOOCs, however, still follow the traditional course format involving a specified and pre-determined syllabus of recorded lectures and self-assessment tests and assignments. The instructor takes the lead role in such a setting, and students' contribution is limited to seeking advice and guidance.

Several suggestions under the New Education Policy (NEP) 2020 were given to improve the quality of education provided in nation's the higher education institutes (HEIs). Few necessary measures include establishing the "Academic Bank of Credit" (ABC), which would enable digital storage of the academic credits earned from various registered and recognized MOOCs and institutes, later to be considered while awarding any degree. It also aims to increase the "Gross Enrolment Ratio" from 26.3% (2018) in HEIs, including vocational education to 50% by 2035. A dedicated unit to develop digital content, digital infrastructure, and capacity improvement will be established under the Ministry of Education's (MoE) mentorship to look after the online learning needs of both primary and HEIs. The policy aims to achieve 100% youth and adult literacy by 2030. As the committee report, "IT be taken up for teacher training, adult literacy, remedial education and as a learning tool in higher education. This would also include developing online skill-based courses."\* Thus, bringing it under the purview of digital learning. This paper wishes to understand how to incorporate MOOCs in achieving the same.

The key objectives of Sustainable Development Goal Number 04 (SDG 4) also make it imperative to study the readiness of our digital infrastructure to enhance the quality of education. To enable member nations to achieve the motto, "*Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.*" The important ones highlighting the HEIs and to be met by 2030 are target Target 4.3 ensures equal and gender bias-free access to affordable and quality technical, vocational and tertiary education, including university, target 4.4 focuses on substantially increasing the number of youth and adults with relevant technical and vocational skills for employment, decent jobs, and entrepreneurship goals, target 4.6 ensuring inclusive development of numeracy and literacy skills for youth, and target 4.7, provides acquiring knowledge and skills to promote sustainable development in all forms. This paper wishes to understand how to incorporate MOOCs in achieving the same. Objectives of this paper includes

1. To focus on exploring and comparing the significant MOOC platforms used to offer courses in India.

2. Understanding the various challenges faced by the MOOC platforms in India

### iii. Mooc platforms in india

#### 1. National Programme on Technology Enhanced Learning (NPTEL)- 2003

NPTEL is a collaborative venture of IISc (Bengaluru) and IITs (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati, and Roorkee), launched in 2003, fully funded by the Ministry of Education (MoE), Government of India. This project aims to enable access to quality education to all corners of the country and offers close to 600+ courses for certification every semester in about 22 different disciplines. The development of NPTEL can be divided into different phases.

- Phase I (2003-2009): 235 visual content, comprising of videos, were developed and telecasted on <http://nptel.iitm.ac.in> (now non-operational).
- Phase II (2009-14): 600 video-based and web-based courses were prepared and recorded, compatible with indexing and keyword search. Also, a YouTube channel was initiated.
- Phase III (2014 onwards): An optional NPTEL Online Certification has been offered for a small fee of Rs 1,000 through a proctored-examination, which has seen over 1,00,000 registrations to date.

NPTEL takes advantage of the 'open-source technology' platform for running various courses. It is powered by "Google's open-source platform," named "Course- Builder." The courses are offered mainly in a visual format, where the lectures are recorded in a classroom structure, with occasional use of PowerPoint presentations to provide content. NPTEL has one of the largest online repositories in the world in basic sciences, engineering, selected arts and humanities, and management subjects. Its YouTube channel is one of the most subscribed educational channels, with over 130 crores views and 40+ lakh subscribers. The channel has visual content of more than 56,000 hours, transcribed and subtitled into English, of which 12000 hours of content is translated into Indian regional languages. It also has the "most accessed library" of peer-reviewed educational content globally.

The main objective behind offering certificate programs is to improve students' employability in the resource market or prepare them better to pursue a suitable higher education program. Typically, 04, 08, or 12-week online courses on various sciences and humanities topics relevant to the learners in higher education and introductory core courses are being offered. These are developed with appropriate tools and technologies to improve their significance. From March 2014 till Dec 2021, 3496 courses were completed, having more than 1.58 Crore enrollments, of which approximately 15.1 lakh students registered for examination to avail certificate of completion.

To further improve the enrolment of students in the courses, a new initiative of 'Local Chapters' in HEIs have been launched, named 'NPTEL-SWAYAM.' These chapters will be run by an instructor of the registered institute, who would act as a 'Single Point of Contact' (SPOC) agent. The SPOC will be kept in the loop with the latest NPTEL initiatives, further disseminating the information

amongst the students. SPOC must also arrange professionals for various courses and ensure that students benefit. SPOK will also be required to clarify learners' doubts if any.

NPTEL offers several other initiatives to promote inclusive learning, such as,

- 'Fee waiver support' for students coming from economically weak backgrounds.
- Multiple laboratory workshops are organized for the course toppers in person to give learners a hands-on experience.
- To improve students' employability skills and prepare them for industry jobs, internships for course toppers with course instructors.
- Employment Assessment and Training support and recruitment support such as interviews and business communication such as writing and speaking are provided.
- They also offer GATE Exam preparation; a portal gives free video content for learning and practice and previous year's question papers.
- NPTEL also sponsors the traveling cost and conference registration fees for SPOC agents from different 'Local Chapters'. Thus, helping them stay updated and informed of the latest trends, benefiting their students.

## **2. mooKIT - 2014**

mooKIT is a 'lightweight' yet powerful MOOC management system conceived, developed, and designed at IIT Kanpur. The development aimed to reduce the existing complexities to host and manage open courses in developing nations with underdeveloped internet connectivity. So far, mooKIT has delivered approximately 60 courses in India and abroad. More than 200,000 learners from more than 90 countries across the world have registered in the various courses offered.

mooKIT received its initial funding from "TEQIP IITK", followed by "Commonwealth of Learning" by employing mooKIT in several courses offered worldwide through the initiatives of "MOOCs for Development", and "AgMOOCs." It was substantially funded by the 'Pandit Madan Mohan Malaviya National Mission on Teachers and Teaching' (PMMMNMTT), Department of Higher Education, MoE. The major platforms used to host the MOOCs currently require the presence of advanced level technologies in the nation, which is generally missing in developing countries. mooKIT is ideally structured to resolve the problems of low-bandwidth and low-transmission capacity using the existing MOOC platform. It provides an indicator that highlights the current bandwidth of the connection. The learner can then modify the content streaming option, such as playing only audio or playing audio in sync with the PPT slides, giving a video-like experience. In case of even lower bandwidth, the learner can request a phone call on the mobile connection and listen to the audio content for learning. This feature benefits rural learners who do not have smartphones, laptops, internet connectivity, or high bandwidth. The only instrument required thus is a simple phone. mooKIT comes with the support of a high-tech analytics interface enabling instructors and learners to view their course activities and plan their studies accordingly. "Drupal" is the Content Management System (CMS) used to develop mooKIT. It offers four types of solutions based on the requirements of the institutions:

- **mooKIT Standard:** It streams only one course at a time that can do away with video streaming. However, YouTube content may be incorporated for accessing content.
- **mooKIT Enterprise:** It is suitable to run multiple online courses simultaneously. Learners are a part of a portal and enroll in the course(s) of their interest.
- **mooKIT Replicated:** It is aimed to provide quality content to areas with low bandwidth. It is done by caching the content on local servers. The servers are expected to sync regularly for upgradation.
- **mooKIT Personal:** This platform operates on devices with low-frequency and low storage capacity, such as cellular phones, resulting in the limited scope of social interactions.

### 3. *IITBombayX - 2014*

'IITBombayX' was developed and managed by IIT-Bombay, it operated on the "Open edX", an open-source platform, since 2014. It is a non-profit MOOC platform receiving funding from the "National Mission on Education-Information and Communication Technology" (NME-ICT), the "Ministry of Human Resource Development (MHRD), GoI. It offers 63 courses on multiple subjects covering major disciplines. It is dedicated to improving learners' educational options, both on-campus and off-campus. The platform also gathers data to understand the students' learning styles better. The Open-edX powers IITBX, which is a compact version of the official "edX platform" launched by Harvard University and MIT in 2013.

"IITBX" is based on the principle of the blended learning pedagogy that offers a combination of both offline classroom-like learning and online learning. This allows direct supervision during the classroom sessions and academic freedom due to the self-paced learning and assessment during the online sessions. However, course completion shall be compulsory to attain credits. This model is named "Blended Learning - MOOC Model of IIT Bombay (BLMM)." India's top institutes and universities offer MOOC courses to learners in the nation, mainly via this system.

IITBombayX offers 04 types of MOOCs depending on varying needs:

**EduMOOCs:** These target learners trying to widen their knowledge base in different disciplines. The MOOCs offered are vast extensions of the IIT Bombay courses. The quality of teaching is equivalent to that of classroom teaching.

**SkillMOOCs:** It aims to improve employability or enhance the present skills. The primary focus of these MOOCs is on career development by advancing in their career.

**TeachMOOCs:** The target audience is academicians and professionals in the teaching field looking to enhance their teaching skills. TeachMOOCs introduce them to various teaching pedagogies. These are primarily offered blended, accommodating online and offline sessions.

**LifeMOOCs:** These offer short-courses to pursue life-long learning by the working professionals and others desiring. These MOOCs can be used as a precursor to any other domain of MOOCs or benefit learners in improving their careers.

### 4. *Study Webs of Active–Learning for Young Aspiring Minds (SWAYAM)- 2016*

MOOC program initiated by the GoI, aimed to achieve the "three cardinal principles of Education Policy- access, equity, and quality." This effort seeks to make the best teaching-learning resources accessible to all, thus promoting inclusive and equitable educational growth. It, therefore, seeks to bridge the digital gap for disadvantaged students and allow them to learn and become employable. SWAYAM platform was initiated by the 'Ministry of Human Resources Development (MHRD) in collaboration with the 'All India Council for Technical Education (AICTE) in association with Microsoft was explicitly designed to improve the welfare of the working professionals, school and college dropouts, as well as students from rural background. The unique features of SWAYAM, rather its strength lies in its qualitative evaluation system, equity access, recognition of credits, and cheap costs. The initiation of SWAYAM took place in 2003 with the introduction of the NPTEL. The initial focus was on engineering, applied science, and arts and humanities discipline; in 2009, study material of all disciplines in the HEIs was incorporated under the National Mission of Education launch through ICT (NME-ICT).

The courses hosted on SWAYAM should follow the 04 quadrants, firstly, Video lecture, secondly, downloadable or printable specialized study material. Thirdly, self-assessment tests and quizzes; and lastly, providing an online discussion forum for doubt clearance. To ensure that the quality of contents produced and delivered is maintained, nine National Coordinators have been recognized for the task. They are listed below in table number 1.

**Table 1**

Sr. No.	Name of the Institute	Beneficiary
1	All India Council for Technical Education (AICTE)	Open for all Under-Graduate and Postgraduate Education
2	National Programme on Technology Enhanced Learning (NPTEL)	Engineering Students, Under-Graduate and Postgraduate Education
3	University Grants Commission (UGC)	Non-technical Postgraduate education
4	Consortium for Educational Communication (CEC)	Undergraduate education
5	National Council of Educational Research and Training (NCERT)	School education
6	National Institute of Open Schooling (NIOS)	School education

7	Indira Gandhi National Open University (IGNOU)	Out-of-school students
8	Indian Institute of Management, Bangalore (IIMB)	Management studies- Under-Graduate and Postgraduate Education
9	National Institute of Technical Teachers Training and Research (NITTTR)	Teacher Training program Out-of-School Education

Source: Authors Own

The courses on the platform are available for free of cost to the public domain and learners at large. To obtain a certificate for the enrolled course, the learners are expected to register for a proctored examination at a nominal cost. The eligibility criteria for the credential vary from course to course, and the same is announced on the course page in advance. The higher education institutes approving credit transfers from SWAYAM courses can demand the issued certificate to verify the grade obtained. UGC issued the 'Credit Framework' for online courses through 'SWAYAM Regulation 2016,' suggesting the Universities identify courses for credit transfer to the student's academic record for courses completed. Similarly, a gazette notification in 2016 was also released by AICTE for credit transferability.

**Table 2: Pattern of Credit Transfer**

Provider	Course Format	Learning Pedagogy	No. of Courses	No. of Users	Institutional Credits	Platform Language
<b>NPTEL</b>	Time-Bound	E-Learning	1210	15 Lakh	Partially	English
<b>mooKIT</b>	Time-Bound	E-Learning and Offline	12	1 Lakh	Partially	English, Hindi, Kannada, French, Russian, Ukrainian
<b>IITBx</b>	Time-Bound Self-Paced	E-Learning	63	12.5 Lakh	Partially	English
<b>SWAYAM</b>	Time-Bound Self-Paced	E-Learning and Offline	175	25 Lakh	Complete	English, Hindi



**SWAYAM- NPTEL MOOCs superior to other e-learning portals such as edX and Coursera due to the following reasons:**

- NPTEL is primarily based on the AICTE curriculum and aims to bring together the best content for the topics from various disciplines. Courses under NPTEL are offered by faculty from top-ranked institutions where active research work in their domains is undertaken.
- Indian instructors can understand the students' background and the Indian schooling system and modify or disseminate the content using different approaches. Examples from the Indian context are used, making the topic more relatable.
- Except for SWAYAM-NPTEL MOOCs, no other MOOC portals conduct a proctored examination to verify the student credentials. The exam has to be attended in person, in offline mode compulsorily. Online methods are not permitted. Making it, it's the best selling point. Courses offered on Udemy, Coursera, and other platforms often issue a 'Certificate of Completion' with zero academic contribution since the learning validity cannot be tested.
- The assignments offered on several MOOC portals often carry forward the same tasks for long durations, making it highly susceptible to easy manipulation by students in arriving at answers. The same is avoided in courses offered at the SWAYAM-NPTEL platform, as instructors are requested to prepare new assignments every semester. Also, the final exam question papers are designed with minimal repetition.
- The e-certificate has a QR code that can be scanned and verified from the NPTEL servers.
- NPTEL works closely with Indian colleges and universities through its Local Chapter program. There is an NPTEL coordinator in every local chapter college. This person has access to all information such as course-wise participant enrollment, exam registration details, hall tickets, final exam marks, and e-certificates - of learners who have declared as belonging to that college. These coordinators have direct access to support teams at NPTEL to resolve any issues concerning courses/exams. NPTEL works with the colleges closely, getting feedback and making changes to the learning process to make the MOOCs adoption more effective, ensuring maximum benefit for the learners.

**Iv. Challenges for moocs in India**

The primary issues regarding the performance of MOOCs in India are discussed in detail below. Few of them include lack of digital infrastructure, need for investment, adaptability of MOOCs by the learners, focus on enhancing the quality of content created for MOOCs, and catering to the diversified needs of the Indian students.

1. **Lack of digital infrastructure:** MOOC platforms require high-speed internet connections due to the high quality of content in their short-term courses. India, still a developing country, cannot provide easy access to computers. Moreover, the uninterrupted Internet facility and computer devices still come under luxurious items, thus confining their availability mainly to

urban localities. Similarly, the limited availability of essential infrastructure has resulted in the limited reach of MOOCs. Digital infrastructure needs to be further developed to provide nationwide connectivity.

2. **Need for Investment:** Development, management, and distribution of MOOC platforms require a colossal inflow of investments. The various costs incurred include hiring human resources, social overheads, content creation, etc. The exact needs to be met by further liberalizing the conventional restrictions and regulations. Public-Private Partnerships must also be encouraged for the design and maintenance of MOOCs.
3. **The adaptability of MOOCs by the learners:** The primary mode of communication between the instructor and learner is written. Thus, resulting in underdeveloped speaking skills amongst the learners, which will further require enrollment in a traditional course. MOOCs also don't offer any interaction between learners enrolled for the course, resulting in a feeling of isolation (Hoxby, 2014). The lack of social support has a significant effect on the learning and well-being of the learner (Tsai and Weng, 2015). Moreover, practical courses requiring offline training and hand-holding may not be suitable for online training. Adoption of technology itself can be a challenge experienced by the learners.
4. **Enhancing the quality of the content:** The most important stakeholder to improve the standard of MOOC courses is a highly skilled teacher/instructor. Along with inefficient, limited infrastructure to facilitate high-quality delivery of MOOCs, there is a shortage of full-time skilled teachers in the country. Several recommendations under the New Education Policy 2020 to correct these gaps are given. Such as adopting the credit transfer mechanism, promoting MOOCs, etc. It also emphasizes conducting teacher's training from time to time.
5. **Diversified Needs:** In a diverse and multicultural country like India, where several languages are spoken, courses only in one language can limit the potential of the courses. NEP focuses on vocational and technical training, which requires multilingual training and educational content. It doesn't mean we do away with English since it is a globally acceptable communication medium, but merely be more inclusive, keeping in mind the varied needs of the society. Although it was noticed while converting the content in regional languages, its uniformity and quality were compromised. Moreover, designing the course material, delivering it, and managing the MOOC platforms was a challenge in itself too.
6. **A possible tragedy of the commons:** For instance, learner X could not enroll in a course offered by IIT Bombay (IITB) but attempted all 30 MOOCs led by IITB Professors and earned credits equivalent to a degree program. On the other hand, another learner, Y, pays 1000 times more fees for similarly titled offline classes. What is the measure to test which mode of study is more beneficial? Will student X be as skillful as some learner Y who enrolled at IITB and obtained the certificates? If learner Y later cannot differentiate himself from student X, a tragedy of commons will occur where, moving forward, no learner will be willing to pay for the course anymore. Even if the institute argues that MOOC credits are inferior to classroom credits, the quality of content then becomes questionable.

7. **Quality of research compromised:** There is a direct correlation between teaching and research. The act of teaching in class, filled with spontaneous interactions and new methods for an explanation, can promote productivity in the research work. In MOOCs, such interactions are missing, adversely affecting the quality of teaching. However, discussions related to ongoing research work can also result in potential intellectual property losses. There are multiple opportunity costs here too. Planning, creating, editing, and managing MOOCs can be highly time-consuming, resulting in minimum contribution in the research field, thus reducing the growth potential and quality of the faculty and MOOC.
8. **The gender gap in enrollments:** It was observed that there exist gender disparities in the enrollment rate. The underrepresentation of women in the traditional courses, such as STEM discipline, is directly reflected in MOOCs offering similar subjects and titles. (Macleod et al., 2014) There is no recent study proving representation of women is better in the social sciences. Thus one can conclude that the gender gap exists even in 'online' learning. However, Bayeck (2016) indicates the enrolment rates of the women candidate improve when collaborative/group courses are offered.
9. The trend so far suggests that most learners enrolling in the MOOCs are either degree holders or pursuing one and are employed (Bayek, 2016). The year 2020 was an exception where unemployed enrollment improved due to massive firing, a repercussion of the economic shutdown.
10. Relies on Self-Motivation: The learners are expected to be self-motivating and self-directed, which is amongst the various factors affecting the acceptance and usage of MOOCs (Milligan et al., 2013). The success of MOOCs must also not be measured based on completion rates but on learning benefits. It is difficult to measure the same since most MOOCs' feedback rate is meager (Murugesan et al., 2017).

Thus, a complete restructuring of the E-learning/MOOC platform is required to match the changing needs and requirements of our student's present and future demands.

## V. Conclusion

India is following the global trend of offering online courses via the MOOC platform, and statistics is performing an exceptional job. Various MOOC platforms, as discussed in the paper, are used to prove the courses. The MOOC platforms are relative 'in fact' though since their inception happened recently. Except for the NPTEL, many platforms are just between 1-5 years of age, with little to no concrete research work on these MOOCs are present. This paper's objective was to theoretically understand the same and understand the MOOCs' preparedness to handle the new 'online studying' trend. There's immense scope in further research in this field, such as understanding the current state of the popularity of these MOOCs amongst the learners and teachers alike. The readiness of digital infrastructure to disseminate the courses via MOOCs, the role of capital investment, the role played by Ed-Techs in enhancing the quality of MOOC content, etc., can also be assessed. A thorough comparative analysis of the mentioned factors can clarify the role of MOOCs moving forward.

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