

E-Learning Success: Requirements, Opportunities, and Challenges

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Abstract

A lot of models and frameworks were suggested to conceptualize and operationalize the e-learning success, and enhance the e-learning and learner performance. Most of these model tries to find out the optimal match among the e-learning components in order to enhance e-learning and learner performance. This chapter explores the e-learning system, its components, e-learning success requirements, opportunities, and challenges that may enable or inhibit e-learning success. As a result, the best fit among the e-learning system components (instructor, learner, course, ICT) is to choose the best mix of the components' characteristics, as well as taking into consideration the contextual factors (individual, institutional, and environmental) that have a direct impact on the e-learning system components and hence impacts the learner performance. On the other side, institutions must take into consideration the e-learning developments, which take two main directions, mainly; technological, and mechanisms developments. As well as the e-learning challenges which can be classified into technological, individual, institutional, environmental, and educational challenges. To cope with these developments and challenges, an adaptation plan must be formulated at the national level. Where achieving the adaptation plan requires analyzing the global tendencies, the successful applications in the field, and the current local situation.

Keywords: E-learning, E-learning success, E-learning requirements, E-learning opportunities, E-learning models

1. Introduction

The COVID-19 pandemic has dramatically changed education. Where sudden and rapid shift occurs from face-to-face classrooms into forms of e-learning and distance learning [1]. This shift in education accelerates the efforts to handle the new sudden trend in e-learning in both the market and research.

The market of e-learning continues it's growing in an accelerated manner. It's highlighted that due to COVID-19, 62% of businesses are affected by changes, and spending more on training in 2021 [2]. As well as the educational institutions which are turning to eLearning tools to provide continuing education to students remotely via the Internet [3]. Tamm (2020) shows that by 2022, the global e-learning industry is projected to surpass \$243 billion, in addition to the eLearning industry growth which is projected to increase to \$370 billion by 2026 [3, 4].

It is highlighted that the rise of e-learning tools has revolutionized the higher education sector, boosting improvements across fields of knowledge and information. Where 85% of learners who have experienced both virtual and in-person classrooms feel that online learning is better or as good as the traditional classroom setting, 67% of educational institutions are in the planning stage of deploying learning management system (LMS) platforms [3].

A lot of models and frameworks were suggested to conceptualize and operationalize e-learning success and enhance e-learning and learner performance. Most of these models try to find out the optimal match among the e-learning components in order to enhance e-learning and learner performance.

In an attempt to find out the optimal match among e-learning components, this chapter will present e-learning success requirements, opportunities, and challenges that may enable or inhibit e-learning success.

2. E-learning success requirements

Figure 1 depicts a model for e-learning system success [5]. The model was developed depending on prior researches and theories including; the information system success model (D&M) [6–8], technology acceptance model (TAM) [9], situational theory of publics (STP) [10], multilayer model of user activity [11–13], action theory [14], situated action theory [15], and GOMS model [12].

The main aspects of the model are the e-learning system, determinants of e-learning success, and learner performance. Where the learner performance depends on the e-learning system and the fit among its components, meanwhile the success of the e-learning systems is determined by the individual characteristics and the institutional and environmental contexts.

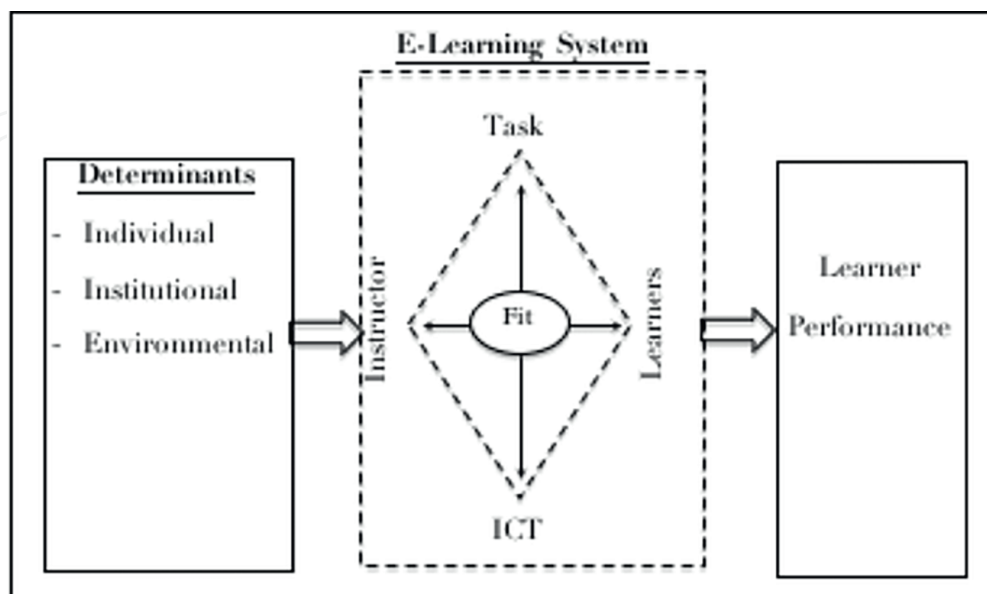


Figure 1. A model for e-learning systems success. Source [5].

2.1 E-learning system

2.1.1 E-learning concept

A number of definitions were formulated for e-learning. Meanwhile, it's defined as the delivery of learning through information, communication, education, and online training [16]. It can be defined as integrating mechanisms and content of learning and Information Technologies [17, 18]. Furthermore, e-learning is a supported learning environment, where, it's accessible, well-designed, student-centered, inexpensive, efficient, and flexible [19, 20].

Therefore, e-learning can be defined as delivering the learning content via Information and Communication Technologies using systems and tools prepared for that.

2.1.2 E-learning system concept

E-learning system refers to using electronic applications and processes to learn via the Internet, network, or standalone computer, in order to enable the transfer of skills and knowledge [21]. Furthermore, an e-learning system as an information system that integrates human entities (i.e., learners and instructors) and non-human entities (e.g., learning management systems), it is crucial to investigate multiple dimensions of success in relation to both entities [22].

2.1.3 Components of E-learning system

It has been reported that an e-learning system consists of four main dimensions, mainly; learners, course (content) to be presented to learners, instructor (presenter) who is responsible for designing the course content and following up the learners' achievement, and the information & communication technology (ICT) which is used to mediate e-learning. Where, achieving high performance, requires a good fit among e-learning system components, where the higher fit between e-learning system components will lead to higher learner performance. This implies that each component of e-learning systems must possess set of characteristics in order to strengthen the fit [5].

2.1.3.1 Instructor (presenter)

It's reported that the instructor characteristics that enable the best fit among the e-learning systems components are enthusiasm, style of presentation, friendliness toward learners, a genuine interest in students, encouraging learner interaction, handling the e-learning units effectively, explaining how to use the e-learning components, keen on using the e-learning units, learners were invited to ask questions/ receive answers, encourage learners to participate in class, encourages and motivates learners to use e-learning, active in teaching the course subjects via e-learning, support, cautious when including e-learning as part of the assessment, timely response, self-efficacy, technology control, focus on interaction, attitude toward the learner, interaction fairness, computer self-efficacy, responsiveness, and instructor attitude toward e-learning [9, 23–31].

2.1.3.2 Learners

It's highlighted that the learner characteristics in the e-learning system are searching for facts, participating actively in discussions, using the PC and applications, not being intimidated by using the e-learning-based courses, learning by absorption, learning by construction, accessing diverse student population, interactive communication, all students have to participate in the discussions, students have to interact with each other both within and outside the online space, flexibility of time and hours, mandatory quizzes and exercises, computer self-efficacy, internet self-efficacy, attitude toward e-learning, students' support, collaboration, interaction, learner control, age, entrance scores, experience, language, learner preferences, locus control, motivation, expected workload, previous e-learning experience, training, engagement, awareness of utilizing E-learning systems, student Online learning activities, student autonomy, and students background [23, 24, 31–40].

2.1.3.3 Course (content)

Course characteristics can be defined as the clear instructions, sufficient course content, the structure of e-learning components, navigation, e-learning components were available all the time, the course materials were placed on-line in a timely manner, good design of the e-learning components, course quality, relevant content, course flexibility, development of courses, course structure, suitability of course content, course flexibility, active Learning, applicable to practice, balance between asynchronous and synchronous activities, cognitive load, design, instructional scaffolding, modeling, problem-based learning, and practice, structure course development technologies, models of courses and their pedagogical design, availability of the course curriculum, course delivery technology, ease of access to courses and services, convenience of course navigation, availability of guidelines for working with course materials, availability of interaction technologies, and adaptability and personalization of the course [24, 28–33, 40].

2.1.3.4 Information and communication technology (ICT)

To achieve the best fit, ICT must be easy on-campus access to the Internet, satisfying speed, easy to use, information was well structured/presented, pleasant, Interaction, easily contact the instructor, can use any PC at the university, can use the computer labs, reliable, can use banner, efficient information technology infrastructure, user-friendly platform, computer playfulness, usability [24, 31, 33, 35].

To achieve the best fit among the e-learning systems components, the Situational Theory of Publics [10] show that classifying learners into different groups based on their level of awareness about the task, and the extent to which they do the task will enhance the fit between the learner and the task. On the other hand, the learner must have technical skills and knowledge to navigate online learning in order to achieve a fit between the learner and technology. Where, the Multilayer Model of User Activity [11–14] adds that achieving fit between the human (instructor and learner), the computer (ITC), and the task occurs through four levels of interaction. Where each level provides the context for the level below it starting from the task level until reaching the lexical level; which is closest to the resources that are needed to physically implement this task. Meanwhile, the GOMS model [12] enables predicting the required

time for completing the task and urges to use the best interface, which achieves the best performance for the user.

2.2 Determinants of E-learning system

It's highlighted that the determinants of an e-learning system can be divided into three main dimensions, mainly, individual, institutional, and environmental determinants [5].

2.2.1 Individual dimension

Refers to the individual learner's perception of the impact of using an e-learning platform in terms of her/his learning performance [6]. Where individualism and collectivism; which is the degree to which students' social behavior is driven by personal rather than collective goals, is an important determinant of e-learning success [41]. Furthermore, it's highlighted that learners perceived collaboration quality and interaction with others, and user satisfaction appears to be an important success factor in e-learning systems [42].

2.2.2 Institutional dimension

Refers to the support from the institution; which may include supporting department, library service and help desk service. It has been reported that institutional support has a strong impact on e-learning systems' success [31, 43].

The support aspects that have an influence on e-learning systems are culture, recognition of work, providing training, reward systems, organizational learning culture, management support, institutional policy, information security policy, teaching and learning strategies and policies, computer training, clear direction, technical support, technological infrastructure technical resources availability, and time availability to learn [23, 24, 32–34, 44].

Furthermore, it has been reported that the learning management system which includes application and integration, communication, assessment, content, cost, and security has a significant impact on e-learning success [45].

2.2.3 Environmental dimension

It has been reported that environmental factors have an impact on e-learning success. These factors include social influence, learners' perceived interactions with others, subjective norms, student consensus, group and peer interaction, authority, and faculty and societal pressure [24, 46, 47].

2.3 Learner performance

2.3.1 Performance concept

It's highlighted [48] that performance is referred to as the result of a pattern of action carried out to satisfy an objective, according to some standards, where performance-related goals are improving the human ability to handle the physical load or demands of the work situation. Therefore, performance can be measured by reducing errors, improving quality, reducing the time required to complete tasks, and end-user

acceptance of the system [48]. The educational outcomes include satisfaction, knowledge, attendance, adherence, and self-reported change in practice [33, 49].

2.3.2 E-learning and learner performance

It's reported that e-learning enables the learner to gain more freedom in the e-learning process, where, the learner can acquire and transfer knowledge, enhanced communication among learners, the ability to conduct an open discussion, each learner gets more of equal standing, responses can be made around the clock with no restrictions, higher motivation, and involvement in the process on the part of the learners, the study is based on various sources of information; including online data banks and net experts located by the student, the student learns "how" and less "what" [5, 50]. Furthermore, the content can be easier and faster to modify and update [51]. Meanwhile, online learning produces collaborative learners who can learn in groups [52].

2.3.3 Achieving the best learner performance

Figure 1 shows that learner performance is determined by the e-learning system components fit (instructor, learner, task, ICT), where the higher fit will lead to higher learner performance. As well as, taking into consideration the contextual factor (individual, institutional, environmental) that affects the degree of fit among e-learning components.

Figure 2 depicts the e-learning components fit as the match among the computer design (ICT) and the user (instructor, learner) and task [5]. It's reported that achieving the best fit can be achieved by task analysis, reducing user efforts, training the user well, and using suitable interface objects and colors [48]. ISO 9241 standard highlights the interaction goals as effectiveness, efficiency, and satisfaction [53].

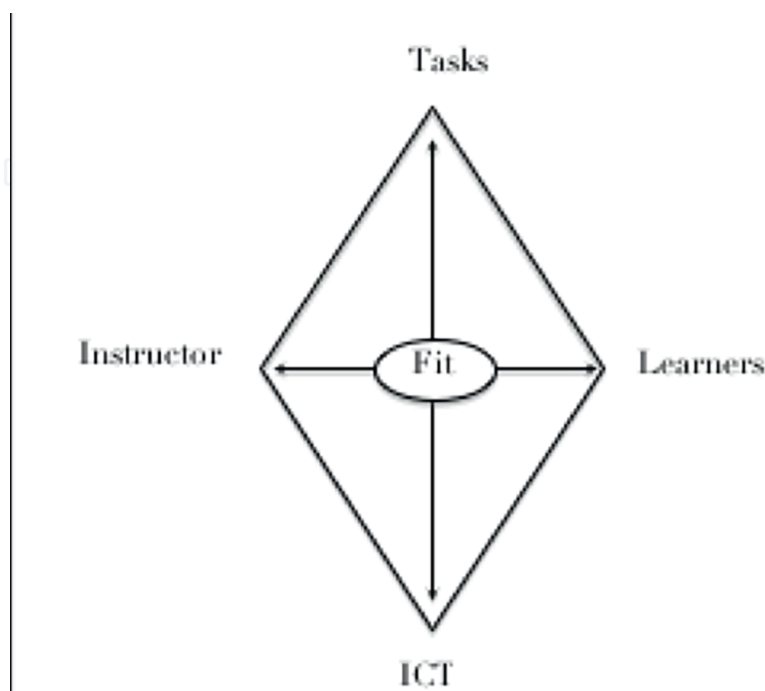


Figure 2.
The interrelationship among E-learning components. Source: [5].

Where effectiveness is the accuracy and completeness with which specified users can achieve specified goals in particular environments. Efficiency is achieving goals with minimal resources. Satisfaction is the acceptance and comfort by users of the system.

3. E-learning opportunities

The development of e-learning takes two main directions, mainly; technological, and mechanisms developments.

3.1 Technological developments

Building a more inclusive e-learning environment involves making technological choices built on flexibility and an ability to respond quickly to changes in constantly evolving technology and informational resources [54]. It's reported that deploying and managing e-learning systems require huge investments in IT and many educational institutions cannot. Where, cloud computing is envisioned to be the next-generation architecture of the IT industry, and promotes the delivery of powerful computing resources as a service. Therefore, there is a potential value for cloud computing as a platform for e-learning. It's highlighted that cloud computing promotes on-demand self-service, enables applications to be accessed through heterogeneous platforms, location-independent pooling of computing facilities for serving multiple, and enables scalability of services provided [55]. In addition, the adoption of cloud computing provides flexibility in storage, sharing, and access for both learners and content providers. As well as using new tools mainly; virtual reality (VR), augmented reality (AR), and social networks that allow introducing new elements in the learning process. Furthermore, mobile learning which enables the use of mobile technologies in the learning process [56].

3.2 Mechanisms developments

The development of e-learning is rapidly expanding. Where, e-learning has become one of the most important and potentially significant, and efficient instructional methods to improve teaching, learning, and assessment [57]. As well as improving time management skills, technical and communication skills, and gamification skills, enabling searching any study material, and enabling instructors to use lots of study material [58].

These developments and changes made higher education replace virtual universities and cross-border education with e-learning [54]. In addition, open communication and management approaches will become the driving techniques to enhance learning skills in virtual environments, which will meet the new requirements of societies [54]. Furthermore, the recent trends in the assessment of students' academic performance at the university level demand a new approach to assessment using e-learning in which assessment plays an integral part in instructional activities. Where the results showed that e-assessment would yield objective results with great reliability [57].

It's reported that the higher education system, a skill-oriented professional discipline requires adequate skill development among the learners, which changes over time depending upon the development of methods and techniques of the concerned professional discipline and the requirement of professional competency

in the marketplace. Furthermore, IT development for access and utilization of information is dramatically changing the role of teaching from the custodian role of teaching to the role of facilitator and distributor. Furthermore, the purpose of higher education is to provide skills for developing professionals who link people and information, where, the basic skills required are the intellectual organization of information and processing, management, retrieval, and provision of information to its students [59].

These developments and changes require developing mechanisms that strengthen the e-learning process. Those mechanisms include; asynchronous and synchronous learning; where, synchronous learning is a teaching method in which the learner and the instructor interact virtually at a particular time, meanwhile, asynchronous learning is a teaching method where the contact between the instructor and the learner is delayed. Another important mechanism is micro-learning which allows students to learn lessons in a short time. Furthermore, gamification enables using the game elements in the learning process. In addition to an individual approach where the psychological and intellectual abilities of the student are taken into account. As well as using new approaches to the assimilation and updating of knowledge [56]. As well as the availability of e-learning facilities will help to get the best out of the instructors. As well as the delivery of the lecture materials will also be made easy, and learners will, at any point in time, have access to the materials [60].

To cope with the continuous developments and changes an adaptation plan must be formulated at the national level. It's highlighted that, making local adaptations to education management by following the new developments in education management that arise due to technology and social change. Achieving this adaptation requires analyzing global tendencies, the successful applications in the field, and the current local situation [61]. The developments must take into consideration all types of education; school education, the training market, the training services offered by consulting firms to companies, courses, and other skill-building training. These developments will be effective when it's formulated in the national development plans (National Educational Technology Plan) which embrace all society citizens and are included in the education policies and future strategies of the countries [61].

4. E-learning challenges

Implementing e-learning may face some challenges. These challenges can be classified into technological, individual, institutional, environmental, and educational challenges.

4.1 Technological challenges

It's highlighted that the connectivity, technological, and self-regulation issues are challenges that may face the e-learning systems [62, 63]. As well as, the enabling technologies including the used technologies for the e-learning systems, content management systems, and the proper infrastructure and bandwidth requirements needed [64]. In addition to the Technical failures on the Internet, and poor scalability of the software; such as technical failures during a live broadcast on any site (the quality of sound and video, a time lag between the instructor and the students [56].

Furthermore, e-learning challenges reported include inadequate Information and Communication Technology (ICT) infrastructure [65], and e-learning tools'

preferences that differ among nations [58]. In addition to the lack of IT proficiency [59], and technical difficulties in creating an e-course; which is the systematization of educational material and the development of an electronic space for its placement) [56].

4.2 Individual challenges

The reported challenges which are concerned the instructor, or learner when using an e-learning system may include the isolation of some learners and lack of social interaction, lack of direct contact with the instructor [54], and instructors may be challenged by competency, operational, self-regulation, and isolation issues [62]. Furthermore, the limited skills for the use of e-learning [63], lack of motivation [66], and negative perceptions toward e-Learning [65].

Another reported challenge is personalization; which is concerned with adapting the course content in such a manner that suits the different learners' styles, preferences, and needs. Where visual learners often prefer visual stimulants, auditory learners prefer auditory stimulants, and kinesthetic learners prefer tactile stimulants. As a result, personalization is crucial to help in maximizing and speeding up the learning process. Especially when learners deal with different technological devices [64].

4.3 Institutional challenges

The main challenges that may face institutions while implementing e-learning are lack of financial support where an e-learning system requires expensive hardware and software that requires a huge investment [59]. E-learning system support, change management [62], lack of knowledge, resources, and training [67]. Furthermore, challenges that may occur are existing organizational structures, inadequate e-learning policies [65, 67].

4.4 Environmental challenges

It's reported that political and religious challenges may be sensitive for the trainers, educators, and the country. Meanwhile, cultural challenges, where the traditional education culture methods and techniques and tools differ from e-learning technology methods and tools. In addition to, language challenges [58]. Furthermore, lack of collaboration among e-learning participants is reported as one of the important challenges for e-learning success [65].

4.5 Educational challenges

The highlighted educational challenges are differences in education systems, where, each country has its education system and policies [58]. As well as insufficient contact classes, and a lack of evaluation, where, there is no mechanism for assessing teaching effectiveness and quality of study materials of e-learning program courses [59] lack of guaranteed results [56]. Furthermore, different challenges may occur to instructors, and learners depending on the course methods (synchronous, asynchronous, blended, theoretical, lab-based, collaborative, and cooperative [54, 64]. While low quality of interaction, lack of class activities and forceful adoption of e-learning, limited student motivation, and limited engagement and satisfaction are reported as challenges to e-learning success [66, 67].

5. COVID-19 pandemic as a catalyst for future E-learning

As a result of the imposition of restrictions on mobility during the COVID-19 pandemic, educational institutions were forced to shift from face-to-face to online learning [68]. This pandemic is improbable to be the last. Therefore, interested institutions and governments should not lose sight of that [69]; they must consider the pandemic as a catalyst for the digital transformation of learning [70].

It's reported that there are negative attitudes toward e-learning acceptance during the lockdown situation and its effects on students' academic performance [69]. The reported reasons for these negative attitudes include some students who were found to experience internet problems, communication problems, and unfavorable live conditions. [68]. Furthermore, uploading amounts of material more and more times in a short time [70]. Besides time management capability problems and low quality of teaching [68]. In addition to the lack of practical work in the laboratory and communication with teachers or other students [71]. As well as, the influence on the character of students, where some students are getting nervous due to the necessity of always being on the internet [71].

These problems and challenges require interested institutions and governments to analyze their students' learning habits and preferences, as well as the internal and external challenges and problems, in order to make superior decisions that help in sustainable e-learning. The reported recommendations concerning these decisions include ensuring internet quality, ICT improvements, and accessibility as the most important factors that impact e-learning behavior [71]. Furthermore, it's proposed that the blended learning model, could adapt learners to new realities and resolve most of the problems while embracing all positive lessons from the pandemic lockdown [70, 71]. Where, implementing this model requires using e-learning as a complementary part of the education process [69], and sharing practical assignments with students on a predefined basis [70]. Additional recommendations were reported, mainly; providing additional classes on computer literacy [69, 70], providing dual training for both instructors and learners in the educational context [72], and pedagogical updates for teachers on how to use digital educational platforms and how to manage classes, discussions, evaluations, and communications with students [70], and ensuring the quality of the student's home environment [68].

6. Conclusion

E-learning can be defined as delivering the learning content via Information and Communication Technologies using systems and tools prepared for that. Where, a lot of models and frameworks were suggested to conceptualize and operationalize e-learning success, and enhance e-learning and learner performance.

The e-learning system consists of four main dimensions, mainly; learners, instructor, course (content), and information and communication technology (ICT). Where achieving high performance, requires a good fit among e-learning system components, where a higher fit between e-learning system components will lead to higher learner performance. Meanwhile, a good fit can be achieved by selecting the best mix for the e-learning system components' characteristics. Taking into consideration the contextual factors (individual, institutional, environmental) that affect the degree of fit among e-learning components.

E-learning developments take two main directions, mainly; technological, and mechanisms developments. Where building a more inclusive e-learning environment involves making technological choices built on flexibility and an ability to respond quickly to changes in constantly evolving technology and informational resources. Meanwhile, mechanisms developments are concerned with the e-learning product and methods that enable e-learning success. To cope with the continuous developments and changes an adaptation plan must be formulated at the national level. Where achieving the adaptation plan requires analyzing the global tendencies, the successful applications in the field, and the current local situation.

Implementing e-learning may face some challenges that hinder implementing successful e-learning. These challenges can be classified into technological, individual, institutional, environmental, and educational challenges. This implies that the institutions must plan well to overcome these challenges.

As a result of the negative attitudes toward e-learning acceptance during the lockdown situation; interested institutions and governments must consider the COVID-19 pandemic as a catalyst for the digital transformation of learning. They have to analyze students' learning habits and preferences, as well as the internal and external challenges and problems, in order to make superior decisions that help in achieving sustainable e-learning; such as ensuring the infrastructure quality, using the blended learning model, and providing dual training for both instructors and learners in the educational context.

Acronyms and abbreviations

AR	Augmented reality
D&M	Information system success model
GOMS	Goals, Operators, Methods, and Selection
ICT	Information and communication technology
ISO	International Organization for Standardization
LMS	learning management system
STP	Situational theory of publics
TAM	Technology acceptance model
VR	Virtual reality

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