International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 27 No. 1 Junio 2021, pp.121-130

The Diffusion Of Learning Innovation Based On Electronic Learning System (E-Learning)

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Abstract – Along with the times, the learning process is no longer focused on a particular education center that we understand so far, such as campuses, schools, courses, or training centers. Learning process activities innovate and are aimed at being more affordable in terms of the use of space and time. The problem in this research is how the learning innovation is based on electronic systems. The purpose of this research is to know the diffusion and some innovations in e-Learning. This study uses a mixed-method, namely a combination of qualitative and quantitative by conducting interviews and questionnaires. The analytical method used is the Borda technique to rank the selected criteria. The results of the research show that the most influential thing on innovation efforts in the education system, especially in efforts to adopt technology, is the professionalism of teacher educators, adjusting the applicable curriculum model, and increasing the skills and knowledge of teachers.

Keywords – Diffusion of educational innovation, E-learning, Technology adoption, Borda analysis.

I. INTRODUCTION

Seel & Richey argue that diffusion of innovation is a process of communicating a result or product through strategic planning to be able to bring change to individuals and institutions that apply it (Hussain, 2017). The diffusion process of innovation can be pursued through four stages, including (1) awareness, interest, trying, and adopting. While Rogers defines that the diffusion of innovation as a process of communicating innovation through a channel and a period between members and social systems, including the education system. The innovation diffusion process can be pursued in five stages, including (1) awareness, (2) persuasion, (3) decisions, (4) implementation, and (5) strengthening.

Based on the opinion of these experts, it can be said that the diffusion of innovation is actually not a very easy and simple activity to do, but rather complex, and requires a long time (Siggh & Puja, 2017). Three possible alternatives occur from the results of an innovation diffusion process. First, innovation results can be accepted both individually and institutionally. Both innovation results can be accepted individually but not institutionally accepted. Third, the results of innovation can be accepted institutionally but not individually, meaning that many individuals refuse. To get the results of the diffusion of innovation that can be accepted both individually and institutionally, the diffusion of innovation requires careful planning, hard efforts, high motivation, systematic, gradual, and measurable steps to achieve a quality learning system (Tanja & Nedimoic, 2017). In addition, the success of the diffusion of innovation requires synergy or collaboration from various parties or related stakeholders.

Schiffman (2010) argues that for the diffusion of innovation to be effective and efficient as expected, an understanding of the diffusion of innovation and the theories underlying innovation needs to be understood by every expert in the field of learning technology who carries out innovation activities. Several principles need attention so that the innovation diffusion process can run effectively and efficiently. First, it refers to the systems approach. Second, commitment to quality. Third, customer satisfaction *(customer).*

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Theoretically, the diffusion concept of this innovation inspires every thought of new ideas, as well as how the strategy translates into effective concrete action. Sometimes this new idea has been launched and used by an educational institution, but then it has stopped using it so that it cannot guarantee its continued application. Some come up with new ideas, but immediately the idea is not accepted by the surrounding environment. There are times when a new idea is brought up, so everyone and their institutions immediately accept the idea. This shows that it turns out that carrying out an innovation needs to be supported by the diffusion of innovation that is carried out in stages.

Learning is a series of life-long individual development processes. Learning does not have to be in a formal environment such as schools, campuses, courses or training centers, and individual development (Smith, 2012). By adhering to such a statement, it can be traced that learning must foster an attitude of independent learning ability, regardless of whether there are external factors that affect the learning process such as teaching staff and/or classrooms. Learning, which is said to be a series of lifelong individual development processes, of course, requires the development of an attitude to motivate the ability to learn independently. Another factor that is no less important in determining the success of teaching and learning activities is learning resources. To improve the quality of learning programs it is necessary to be based on a systematic view of teaching and learning activities, which must also be supported by efforts to utilize learning resources, including the internet. This is on the one hand, while on the other hand, the fact shows that standardized learning resources and learning facilities provided and distributed by the government have not been optimally utilized by teachers, trainers, and instructors.

Along with the rapid development of Information Technology, the need for a concept and learning mechanism based on Information Technology is inevitable. This concept, known as *e-Learning*, has an influence on the transformation of conventional education to digital form, both in terms of content and systems. Currently, the concept of *e-Learning* has been widely accepted by the world community, as evidenced by the widespread implementation of *e-Learning* in educational institutions and industries. *E-Learning* is an educational system that uses electronic applications to support the development of teaching and learning activities using the internet, intranet, or other computer network media. With *e-Learning it* allows the educational process to occur without going through face to face and the development of knowledge to students can be done easily.

To realize the quality of learning, it is necessary to take comprehensive efforts towards the ability of teachers to use the internet as a learning resource. However, based on developing issues in education, learning in schools or educational institutions has not been effective, even many teachers teach without using learning resources. They teach regularly as is so that the teaching is *teacher-centric*. innovation diffusion efforts are needed so that education is better and of quality by still paying attention to the existing norms in education itself.

This paper has many literatures to support the research, such as literature with title The use of value clarification technique-based- picture story media as an alternative media to value education in primary school (Fariyatul & Bandono, 2017), STTAL Development Strategy To Produce Human Resources That Acknowledge Technology Facing The Industrial Revolution Era 4.0 (Mashudi, Rahman, Bandono, & Hasan, 2019), Innovation Diffusion Model in Higher Education: Case Study of E-Learning Diffusion (Buc & Divjak, 2015), Using the Diffusion of Innovation Theory to Explain the Degree of English Teachers' Adoption of Interactive Whiteboards in the Modern Systems School in Jordan: A Case Study (Jwaifell & Gasaymeh, 2013), Study of Contextual Learning Innovation in Citizenship Education (Komalasari, 2010), Application of diffusion of innovation theory to educational accountability: the case of EFL education in Japan (Sasaki, 2018), Reasons for using or not using interactive whiteboard: Perspectives of Taiwanese elementary mathematics and Science teacher (Jang & Tsai, 2012), Factors influencing faculty adoption ofWeb-based courses in teacher education rograms within the State University of New York (Martin, 2003).

This research is organized as follows, chapter 1 introduction, chapter 2 shows material and methodology, chapter 3 shows the results of data and discussion, chapter 4 conclusion.

II. Materials And Methods

2.1. Innovation in Educational Management

According to Schumpeter, innovation means an effort to create and implement something into one combination so that, with innovation, one can add value to products, services, work processes, and policies not only for educational institutions but also for stakeholders and society. Wina Sanjaya (2010) in her book curriculum and learning, states that innovation is something new in certain social situations and is used to answer or solve a problem (Samarawikrema & Stacey, 2007).

Innovation comes from the word to innovate which means making changes or introducing something new, innovation is sometimes interpreted as an invention, however, the meaning is different from discovery in the sense of discovery or Invention. Discovery has the meaning of discovering something that already exists, for example, the use of inquiry learning models in Natural Sciences subjects, to improve the quality of learning in Indonesia recently developed, actually the learning model has been implemented in other countries or learning models over the internet. Meanwhile, Invention means a complete discovery that hasn't been created before.

The function of innovation in management is to improve performance so that the performance of all parts of management becomes more productive. As for the definition of management itself, according to Gaffar, education management means a systematic, systemic and comprehensive cooperation process in the context of realizing the goals of national education. According to Prajudi Atmosudirdjo (2010) that management is the control and utilization of all factors and resources, which according to a plan (planning), is needed to achieve or complete a certain work goal (Shea, Mccall, & A, 2006).

Management is a unique process, which consists of the following actions: planning, organizing, mobilizing, and controlling, which are carried out to determine and achieve predetermined goals through the use of human resources and other sources. Several principles seem to be a common thread regarding the notion of management, namely: a. Management is an activity, b. Management uses or utilizes other parties, c. Management activities are directed to achieve a specific goal.

2.2. E-learning and its benefits

From this definition, it can be understood that learning with e-learning is electronic-based learning, which can be used offline or online. Besides internet facilities, e-learning also uses hardware such as DVD / VCD, computers, or laptops, as well as network networks that can connect students and teachers. With this utilization, e-learning is often used in distance learning. Romi Satria Wahono (2011) stated that infrastructure e-Learning: can be in the form of personal computers, computer networks, the internet, and multimedia equipment. Apart from the aforementioned facilities, equipment is also needed teleconference if you want to conduct distance learning face-to-face via teleconference (Petruzzelli, 2010).

The characteristics of E-Learning include a. Make use of electronic technology services. Teachers and students, students and fellow students, or teachers and fellow teachers can communicate relatively easily without being limited by things that are protocol, b. Taking advantage of the advantages of computers (digital media and computer networks), c. Using self-learning materials stored on a computer so that teachers and students can access them anytime and anywhere if they need it, d. Utilizing learning schedules, curriculum, learning progress results, and matters related to educational administration can be viewed at any time on the computer.

E-learning facilitates interaction between students with materials or subject matter. Students can share information or opinions about various matters relating to lessons or the needs of students' self-development. In addition, teachers can place learning materials and assignments that must be done by students in certain places on the web to be accessed by students. According to their needs, teachers can also provide opportunities for students to access certain study materials and exam questions that can only be accessed by students once and within a certain period.

2.3. Elements of Innovation Diffusion.

According to Rogers in Sciffman and Kanuk (2012), there are four main elements of the innovation diffusion process, namely: an innovation, communicated through certain communication channels, within a period and occurs among members of a social system. a). Innovation is an idea, action, or item that is considered new by someone. In this case, the novelty of innovation is measured subjectively according to the views of the individual who accepts it. b). A communication channel is a tool for conveying innovative messages from the source to the recipient (Dooley, 1999). If communication is intended to introduce an innovation to a large and widespread audience, then the more appropriate, fast, and efficient channel of communication is the mass media. But if communication is intended to change the attitude or behavior of the recipient personally, then the most appropriate communication channel is an interpersonal channel. c). Period, namely the process of making an innovation-decision from the moment someone finds out until deciding to accept or reject it. Confirmation of this decision is closely related to the dimension of time. At least the time dimension is seen in the innovation decision-making process, the innovativeness of a person relatively earlier or slower in accepting innovation, and the speed at which innovation is adopted in social systems. d). The social system is a collection of different units functionally and bound in cooperation to solve problems to achieve common goals.

Innovation is something new ideas, behaviors, products, information, and practices that are not widely known, accepted, and used/applied, implemented by the majority of community members in a particular locality, which can be used or encourage changes in all aspects of community life for the sake of always realizing improvements to the quality of life of each individual and all members of the community concerned (Scheffler & Logan, 1999).

2.4. Role of Information Communication Technology in Learning.

Information and communication technology is a variety of aspects that involve technology, engineering, and management techniques used in the control and processing of information and its use, computer relations with humans, and matters relating to social, economic, and cultural. Information and communication technology is something that supports recording, storing, processing, retrieving, transmitting, or delivering and receiving information (Tabata & Johnsrud, 2008).

Information and communication technology is the study or use of electronic equipment, especially computers, to store, analyze and distribute any information, including words, numbers, and pictures. The use of information and communication technology in the field of education, such as the use of computers and computer networks, provides an opportunity for every learner to access learning materials that are presented in an interactive form via computer networks. The utilization of information and communication technology is expected to be able to increase the success of teaching and learning, decrease dropout rates, decrease absenteeism in class and get equal educational opportunities that can reach all people from all walks of life who live anywhere. For this reason, the application of information and communication technology to be effective should be adapted to the prevailing life or culture in society. The diversity of levels of life and culture in society requires various technologies to provide educational services, including computers with the internet. The Internet is a global digital information network.

The role of Information and Communication Technology is 1. Replacing the role of humans, namely by carrying out tasks or process automation activities, 2. Strengthening the role of humans, namely presenting information, tasks, or processes, 3. Restructuring or making changes to a task or process, In his book Telecommunication and Information-Based Curriculum. Munir mentioned that there are 6 roles of Information and Communication Technology in education, namely a). as a skill and competency. Each stakeholder must have the competence and expertise to use information and communication technology for education. Information is the "raw material" of knowledge that must be processed through the learning process. Processing that uses ICT requires its skills. b). as a learning infrastructure Currently, many teaching materials are stored in a digital format with various models such as multimedia. Learners - instructors and learners - are actively moving from one place to another. The learning process should be able to be done anywhere and anytime. Differences in geographic location should not be a limitation for learning. "The network is the school" will become a new phenomenon in the world of education. c). as a learning resource. Science is developing so fast. Great teachers scattered in various parts of the world. Books, teaching materials, and references are updated continuously. Without technology, the learning process that is up to date takes a long time. d). as a learning tool and facility The delivery of knowledge should consider the context of the real world. Provides illustrations of various scientific phenomena to accelerate the absorption of teaching materials. Students are expected to explore their knowledge more freely and independently. Knowledge acquisition comes from the interaction between students and teachers. The ratio between teachers and students in the process of providing facilities. e). as a support for learning management Every individual needs continuous learning support every day. Transactions and interactive interactions between stakeholders require management back-office strong. The quality of services in the management of education administration should be improved gradually. People are a very valuable and at the same time limited resource in institutions. f). as decision-support information and communication technology enables educational institutions or other authorities to effectively evaluate and monitor all teachers in the classroom, whether using conventional learning in the classroom or using a distance learning system. Information and communication technology used for distance learning gives teachers the possibility to do learning wherever they are (Zayim, Yildirim, & O, 2006).

2.5. Borda Analysis Method.

Group Decision Support Systems were very popular in the 1980s as a tool in finding solutions to solve problems in workgroups, so this system is also known as a group decision support system (Saediman, 2015). There are three important steps in solving problems in this system, namely a). Determination of criteria and alternatives. b). Evaluation of the criteria preference value against alternatives by the decision-makers of each section. c). Evaluation of weight values collected into one group to determine the choice of the group (Ishida., 2017).

The Borda method proposed by its founder Jean Charles de Borda in the 18th century is one of the methods that can be used in determining the best alternative which is selected from several alternatives. Each alternative will be ranked based on its weight to be an option for decision-makers. The greatest weight is the first ranking of the best alternatives from the choice of decision-makers.

The specialty of the Borda method is that it can overcome difficulties in other methods where something that is not in the first rank will be automatically removed. The basic idea in the Borda analysis method is to weigh the choice of criteria so that they are sorted into the first rank, second rank, and so on. The assessment of the importance of the criteria is carried out as follows, the first is ranking the most important criteria first, and ranking the criteria that are considered less important in the next ranking order. The next step is that the 1st ranking value is changed to the m-1 weighted rank, and the 2nd rank is changed to the m-2 weighted ranking, where the m rank becomes the weighted ranking m = 0.

2.6. Research Methodology

To solve problems in the observed research, steps are needed and determined to describe the approach and model of the problem. The steps taken are:

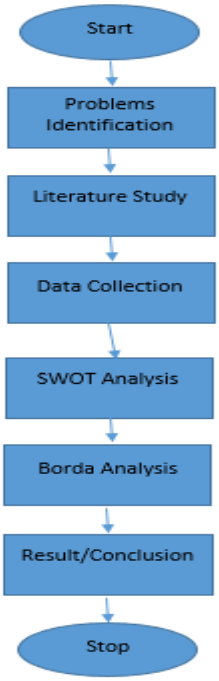

Figure 1: Research Methodology Flowchart.

III. Result And Discussion

3.1. E-Learning and SWOT Analysis.

The advantages of E-Learning. E-learning can be quickly accepted and then adopted is because it has advantages or advantages, namely a). Cost reduction, b). Flexibility. Can learn anytime and anywhere, as long as it is connected to the internet, c). Personalization. Students can study according to their learning abilities, d). Standardization. With e-learning overcoming any differences that come from the teacher, such as: how to teach, material and different mastery of the material, to provide a more consistent quality standard, e). Effectiveness. the retention rate and application of lessons through methods e-learning increased by 25% compared to training using traditional methods, f). Speed. The speed of distribution of subject matter will increase because the lessons can be quickly delivered via the internet.

Weaknesses of E-Learning, in e-learning, several problems that are often faced must be considered, namely: a). Access problems to be able to implement e-learning, such as the availability of internet networks, electricity, telephone, and other

infrastructure, b).availability problems Software (software). How to cultivate inexpensive software, c). The problem of its impact on the existing curriculum, d). Problems Skill and knowledge. Obstacles, however, the use of the internet for learning or e-learning is also inseparable from various obstacles, namely a). Lack of interaction between teachers and students or even between students themselves. This lack of interaction can slow down the formation of values in the teaching and learning process, b). The tendency to ignore academic or social aspects and vice versa encourages the growth of business aspects, c). The learning and teaching process tends towards training not education, d). Changing the role of teachers from previously mastering conventional learning techniques, now also required to master learning techniques using the internet, e). Students who do not have high learning motivation tend to fail, f). Not all places have internet facilities (maybe this is related to problems with the availability of electricity, telephone or computers), g). Lack of personnel who know and have internet skills and lack of mastery of computer languages. However, e-learning still has great opportunities and acceptance, in addition to the principle of complete ease and effectiveness. E-learning can direct the virtual culture of students who previously only had the orientation of using the internet to be limited to games and social networks. It is hoped that with e-learning, students will be able to find learning directions in front of computer monitors and other visual learning devices. This will certainly have a positive effect on the positive culture of the nation.

From processing the data that has been collected from the respondents, it is faced with several advantages, disadvantages, opportunities, and constraints on the diffusion of E-learning learning innovations, it can be concluded that the following strategies a). Improve the professionalism of teacher educators, b). Providing easy and affordable internet facilities and infrastructure, c). Adjustment of applicable curriculum models, d). Policies that benefit the E-learning model, e). Increase the role of parents in the supervision of students, f). Update software that is always used, g). Increased Skill and Knowledment from teachers, h). Implementation of intensive communication between teachers and students and parents, i). Computer dissemination and campaigns in all things.

3.2. Borda analysis to determine the weight of the criteria.

Validation of the criteria is carried out by assessing the level of importance and ranking the criteria, where the criteria that are considered the most important preference are placed in 1st order, then the criteria that are considered less important are placed in 2nd place and so on until the 4th order according to the number predetermined criteria. Then the data is then processed again through the recapitulation process which results in the recapitulation of the expert questionnaire.

Table 1. The results of the recapitulation of the criteria questionnaire data

No	Criteria	Code	EXPERT ASSESSMENT ORDER					
			X1	X2	X3	X4	X5	X6
1	Y1	K1	1	9	1	9	5	1
2	Y2	K2	3	7	2	8	6	2
3	Y3	K3	5	5	3	7	7	8
4	Y4	K4	7	3	6	4	1	9
5	Y5	K5	9	1	7	3	2	3
6	Y6	K6	2	8	8	2	3	4
7	Y7	K7	4	6	9	1	4	5
8	Y8	K8	6	4	4	6	8	6
9	Y9	K9	8	2	5	5	9	7

After the recapitulation results are obtained, the next step is to carry out the weighting process on the criteria using the Borda method to obtain criteria based on the results of the ranking order.

Table 2. Results of the ranking of criteria for selecting a strategy approach

No	Criteria	Ranking	Weight
1	K1	35	0,162037
2	K2	24	0,111111
3	K3	29	0,134259
4	K4	14	0,064815
5	K5	22	0,101852
6	K6	17	0,078704
7	K7	28	0,12963
8	K8	20	0,092593
9	K9	27	0,125

Based on the results of the total weight value in Table 2 above, it is known that the strategies that have a big influence in determining the E-learning innovation study are:

Table 3. Results of Weighting Criteria for E-learning Strategy

No	Code	Strategy	Weight
1	Y1	Improve the professionalism of teacher educators	0,162037
2	Y3	Adjustment of applicable curriculum models	0,134259
3	Y7	Increased Skill and Knowledment from teachers	0,12963
4	Y9	Computer dissemination and campaigns in all things	0,125
5	Y2	Providing easy and affordable internet facilities and infrastructure	0,111111
6	Y5	Increase the role of parents in the supervision of students	0,101852
7	Y8	Implementation of intensive communication between teachers and students and parents	0,092593
8	Y6	Update software that is always used	0,078704
9	Y4	Policies that benefit the E-learning model	0,064815

The results of the analysis in the Borda method are the final decisions that are used as a result of group decisions where the initial data is in the form of a strategic approach table carried out with the previous SWOT analysis and then made in the form of a matrix table. From the results of the various data values obtained, it is then processed again at the stage of determining the alternative value which is carried out by providing a value for the acquisition of the first rank with the value n-1 where n is the number of alternatives. In table 4.3, you can see the results of determining the alternative value where Y1 strategy gets a total value of 35, Y2 strategy with a total value of 24, Y3 strategy with a total value of 29, Y4 strategy with a total value of 14, Y5 strategy with a total value of 22, Y6 strategy with a total value of 17, Y7 strategy with a total value of 28, Y8 strategy with a total value of 20 and Y9

strategy with a total value of 27 with a total value of 216 alternatives. Then, from the results of the acquisition of the value of each alternative, the weight value of each alternative can be determined according to table 4.3 with the results for the strategy. Y1 obtained a weight value of 0.162, for Y2 strategy a weight value was 0.111, for Y3 strategy a weight value was 0.134, for Y4 strategy an alternative weight value was 0.064, for Y5 strategy a weight of 0.101, for Y6 strategy with a weight of 0.078, for Y7 strategy with a weight of 0.129, for strategy Y8 with a weight of 0.092 and strategy for Y9 with a weight of 0.125. Based on the results of determining the weight value for each alternative, the ranking order of the choice of the strategic approach can be determined according to table 4.3 which is the final result of the alternative ranking where the first rank is the Y1 strategic approach with a value of 0.162, the Y3 strategy approach is the second rank with a value of 0.134, the Y7 strategic approach. with a value of 0.129, the Y9 strategic approach with a weight of 0.125, the Y2 strategy approach with a weight of 0.111, the Y5 strategic approach with a weight of 0.101, the Y8 strategic approach with a weight of 0.092, the Y6 strategic approach with a weight of 0.078 and the last ranking is the Y4 strategic approach with a value of 0.064.

From the results of the weighting of the criteria, it is known that 3 strategies have the most influence on efforts to diffuse E-learning educational innovations, namely increasing the professionalism of teacher educators, adjusting the applicable curriculum model, and increasing the skills and knowledge of teachers.

The development of information and technology requires teachers to carry out work in a professional manner. A teacher must have four competencies, namely competence: pedagogical, personal, social, and professional. These four competencies must be attached to every teacher in carrying out their duties as educators and teachers in schools. Regarding professional competence, one indicator of teacher professionalism in the management of classroom learning is being able to develop learning media. Media as a component in the system has a function as a means of non-verbal communication. As a component of the system, it means that the media absolutely must exist or must be used in every lesson. It is said so because if one of the components is not there, the results obtained will not be optimal.

The role of media in the teaching process can be placed as 1) A tool to clarify teaching materials when the teacher delivers lessons. In this case, the media is used by the teacher as a variation of the verbal explanation regarding the teaching materials. 2) Tools to raise or cause problems to be studied further and solved by students in the learning process. At least the teacher can place the media as a source of questions or stimulation of student learning. 3) Learning resources for students, meaning that the media contains materials that must be studied by students both individually and in groups. Thus, it will help a lot with the task of teachers in teaching activities.

The educational curriculum should also be adapted to the demands of the times in terms of the use of information technology without leaving the morality of education itself. Currently, Moodle has the facility to be run online without additional installation first. Through this facility, the required equipment resources do not have to have high specifications. The school is of the view that the use of the e-learning application is following the application of the 2013 curriculum. However, currently, the school lacks the human resources capable of implementing this application.

IV. CONCLUSION

Based on the results of the analysis and discussion, the following conclusions can be drawn:

a. The use of information and communication technology in the field of education, such as the use of computers and computer networks, provides an opportunity for every learner to access learning materials that are presented in an interactive form via computer networks. The utilization of information and communication technology is expected to be able to increase the success of teaching and learning, decrease dropout rates, decrease absenteeism in class and get equal educational opportunities that can reach all people from all walks of life who live anywhere. For this reason, the application of information and communication technology to be effective should be adapted to the prevailing life or culture in society. The diversity of levels of life and culture in society requires various technologies to provide educational services, including computers with the internet. The Internet is a global digital information network.

b. Three strategies have the most influence on efforts to diffuse E-learning educational innovations, namely increasing the professionalism of teacher educators, adjusting the applicable curriculum model, and increasing the skills and knowledge of teachers.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

ACKNOWLEDGMENTS

This research has been Supported by Indonesia Naval Technology College (STTAL) Surabaya Indonesia.

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