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User acceptance of E-Government Services Based on TRAM model

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Abstract. Developing country mostly left behind in adopting e-Government system. Miss-interpretation is assuming e-Government only about the application of technology made fail implementation. It is a whole philosophy that explores a human-citizen centered aspect in organized societies. Further, successful information system determined by user acceptance. Therefore, the evaluation of the performance of e-Government is one of the basic objectives of current government reformation. The research focus is to identify and explore the extent of user acceptance toward e-Government system. The research methodology used in this research is survey based on a questionnaire with TRAM approach and distributed to 230 respondents as customers that had been using e-Government services provided by X institution. The result of the study showed that the personality traits of TR significantly influenced cognitive dimensions of TAM. Through empirical demonstrations indicated that the TRI was said to be antecedents to TAM. The optimism dimension had higher coefficient among others, exhibit the technology users convince that the new technology will improve their productivity, while discomfort had no impact since the users have no doubt or hesitate to use technology.

1. Introduction

The purpose of developing e-Government system is to provide an electronic public service well and meet the needs of society. Yildiz pointed out the importance of formulating the e-government concept model as a reference for the transformation needs of the electronic service-based bureaucratic process by examining each dimension and orientation of public administration that became the focus of e-Government [1]. Some concept or definition of e-government that is well known such as World Bank stated that E-Government is about the optimization of ICT (Information and Communication Technology) in government agency [2]. UNESCO said that e-government refers to the use of ICT by users or community to obtain information and services needed. E-Government is neither the installation of systems and implementation of software applications nor the mechanisms to promote products and services on the market [3]. Thus, e-Government is not about ICT or new technology that

could bring benefit and good relation with internal and external stakeholder. It is a basic principle that includes all of social and technology aspects.

The governance of the country had been made significantly straightforward due to the technological usage, one such technique being thee-government. Information and services availability could be accessed from website or portals of government. The essence of the e-government system is to support ICT infrastructure and strong regulation or policy in the finite environment. The primary purposes of e-government system are to provide public services that needed by the citizen. The website for information dissemination is still most developing country focus to build. From the view of world continent that could be seen from e-Government world ranking, Asia is lagging from other region developed countries like America and Europe in implementing e-Government system [4]. These conditions show that slow development and user adoption of e-Government services especially in Asia region [5]. According to Heeks (2008), it is estimated that total 85% of e-government implementation in developing countries failed. It remains only 15% of the projects to be considered as successes [6]. These indicated including Indonesia also one of developing country still suffered in e-Government implementation [7]. In nation level, PeGI had captured the usage of ICT by government agencies in Indonesia. PeGI (2015) reported government institution in province level had the total average score of 2.50, which is a poor result. Despite the potential benefit of ICT for the government agency, e-Government failure was mostly caused by low level of usage. User acceptance could predict the level of usage of the information system. Since user acceptance determines the success of information system including e-Government, thus a study of factors that affect user acceptance become important to conduct.

The main problem discussed in many pieces of research related to adoption or diffusion of technology is the different rate of technology diffusion itself. Furthermore, new technology could be accepted by a market and rejected by another market or user. An effort knows the progress of e-Government implementation for internal and external stakeholder become the critical point of organization. Therefore, it is necessary to develop ways to measure the success and failure of e-government projects [8][9]. The importance of evaluation is much greater in developing countries, where the resources are scarcer, and the opportunity costs are much higher [10]. In such countries, lack of resources does not become a huge problem since it used optimally based on strategic planning of the organization. Therefore, this study would like to explore the extent of user acceptance for e-Government services. The user acceptance could predict the level of utilization that is crucial being success indicator of technology including e-Government system [11].

2. Literature Review

Based on Roger (1995), the adoption rate of technology differs among users. Some technology or innovation may have a rapid rate of adoption, on the other hand, some innovation adopted more slowly. This important issue is being addressed in adoption or diffusion research especially to explore what factors that influence the users to adopt new technology. A behavioral theory needed to explain the user's attitude and behavior in adopting technology [12]. This theory could be used to predict whether innovation or technology will be a success or fail adopted by potential users or organizations. In another word, a behavioral approach is used to evaluate the technology being implemented [13]. There are some behavioral theories that widely used as best practice model to measure the extent of technology adoption such as TRI (Technology Readiness Index), TAM (Technology Acceptance Model) and UTAUT (The Unified Theory of Acceptance and Use of Technology). All these best practice model were parsimony but very general. Thus it may not be designed for any particular system since each system had unique characteristics that could influence the behaviour of technology adoption [14].

2.1. TRI (Technology Readiness Index)

Technology readiness was introduced by Parasuraman (2000). Definition of technology readiness is a "customers' desire to adopt new technologies for improving their productivity in life and business.

The one is a promising theory that could be used all parties to know the difference process of people to adopt new technology [15][16]. User readiness is an important indicator that influences user acceptance to any technology offered [15]. Throughout the process of technology adoption, the user had a personal opinion about the technology-based product or service. Thus, this opinions according to Parasuraman (200) would be evaluated under dimensions as personality traits: Optimism, Innovativeness, Discomfort, and Insecurity.

Two main dimensions such as optimism and innovativeness were called contributors that could enhance the readiness of adopting the technology, while Discomfort and Insecurity stating negative feeling are inhibitors in TR pressing the preparedness as shown in figure 1. Optimism is about individual's tendency to believe that technology would bring good results in life and business, Innovativeness is an individual's lead about technological products, Insecurity is about individual's trust to technology security or privacy, while Discomfort represents consumer's anxiety in technical terms [15]. In practice, each dimension illustrated person with high optimism will convince that the new technology will be useful to increase the productivity of users. The person with high innovativeness is happy to try experiments with new technology. The person with high insecurity feels doubt about the capability of new technology to fulfill the complete transaction and the person who discomfort think that the system was not suitable for them and thus they are unpleasant [15].

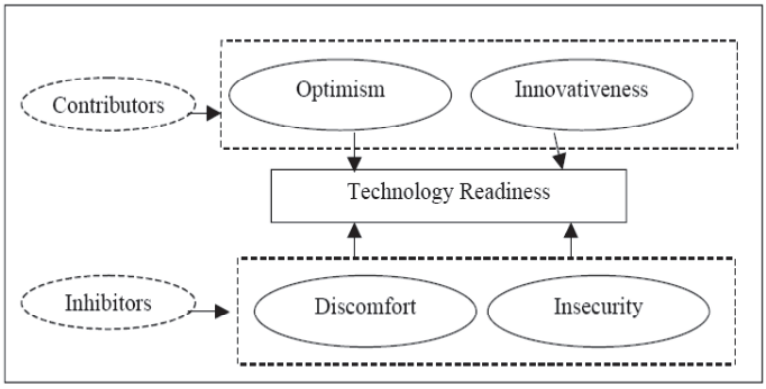

Figure 1. Technology Readiness Index (TRI) Model [15]

Figure 1 shows that people readiness of technology affected by personality traits. TRI indicates people faith or conviction toward technology and not determine the capacity of people to adopt it. Based on this concept, the people overall belief about technology could be theorized which also indicate their usage of technology-based product and services [15]. Based on technology readiness scores, there are five categories of user: explorers, pioneers, skeptics, paranoids, and laggards. Type explorers are dominant in technology readiness because they have optimism and innovativeness and on the other hand, they only have little discomfort and insecurity. Explorers are quickly attracted to the existence of the latest technology and usually being a leader to try the new technology. In contrast, laggards are the last group of adopters of latest technology because they tend inhibitors and weakness in contributors factors.

Other categories of user like pioneers, skeptics, and paranoids show more variant in technology perceived. The type of pioneers with dominant optimism and innovation like explorers, but they are weak in discomfort and insecurity. Sceptics indicated low confidence and innovativeness and showed small inhibiting level that needs to be convinced in advance about the benefits of using technology. On the other hand, paranoids with high optimism and interested in new technology but in the same they feel discomfort and insecure [17].

Table 1. Characteristic of Technology Segmentation

Technology Segments	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	High	High	Low	Low
Pioneers	High	High	High	High
Sceptics	Low	Low	Low	Low
Paranoids	High	Low	High	High
Laggards	Low	Low	High	High

The Parasuraman & Colby shows that types of explorers and pioneers liable to use new technologies prior than other types [16].

2.2. TAM (Technology Acceptance Model)

Another behavioral theory that well known to predict user behavior in adopting technology is TAM. TAM was extensively used especially in the domain of Information Systems (IS/IT) in purpose to obtain a more comprehensive perspective and a better explanation of the process of user acceptance of technology [18]. TAM concept offers a simple yet powerful explanation related to technology acceptance and usage behavior [11].

The main factor in the model of TAM have perceived usefulness and perceived ease of use of technology as a reasonable act in the context of technology users, Thus, the strong reason why people use technology influenced by perceived usefulness and perceived ease of use. Based on Davis (1989), the level of IT utilization by the user will be largely determined by the level of user acceptance, while user acceptance can be predicted from perceived usefulness and perceived ease of use [11]. Based on Davis (1989), both of factors could explain the behavioral aspects of users and found significantly influence user acceptance of the technology. These findings were also supported by other studies [19][20][21].

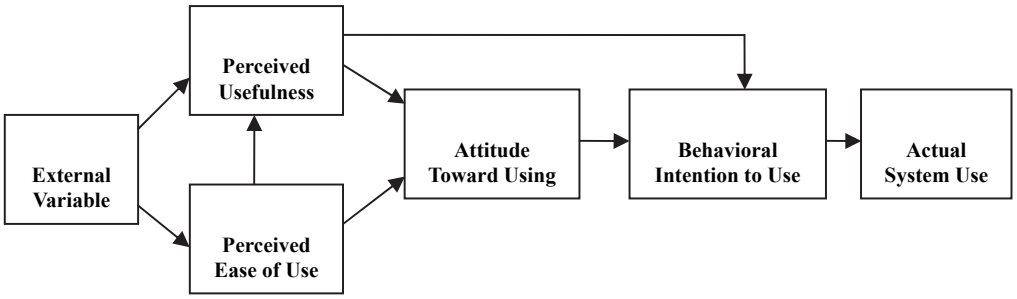

Figure 2. Original Model of TAM [11]

According to figure 2 above, it could be seen that there is five construct in original TAM model including perceived usefulness, perceived ease of use, attitude toward using, behavioral intention and actual system use. Initially, TAM incorporated attitude toward using variable, but later expelled it because of its weak effect in mediating the relation between behavioural intention to use and user belief [22]. In its development, TAM has become a widely used model for predicting attitudes, desires, and behaviors in the use of new technologies. This model explains about 40% of the variance of individual willingness to use information technology [22]. Perceived usefulness is influenced by perceived ease of use while both beliefs factor determined by external variables, such as people trust, facilitating condition, social influence, gender, age, etc. [22][23].

Although the perceived of usefulness and perceived of ease of use has been widely proven as a factor affecting behavior intention, but the relative strength of the two variables is different where the

perceived of usefulness is considered as the primary factor determinant of behavior and has higher explanatory power than the perceived of ease of use. It can be possible because the primary consideration of individuals to use a system/technology is usefulness, while the degree of comfort in using it will be considered later [11][23]. Nowadays, TAM had been widely used in many fields to explore user behavior in using new technology. In practically, TAM could measure the level of user's technology adoption [23][24][25].

3. Research Methodology

Model TRI evaluates people readiness to adopt technology based on personality traits factor; they are optimism, innovativeness, discomfort and insecurity factor. Parasuraman (2000) said that a person with explorer type tend to adopt the latest technology since they have high TR. In other words, this kind of people has high optimism and innovativeness and low discomfort and insecurity [15]. Surprisingly evidence shows users that have current technology readiness did not use the kind of technology offered [25][26]. Based on evidence from the fieldwork indicates that TRI model could not satisfactorily explain why do specific individual adopt new technologies whereas other's don't? In other words, TR is incapable of defining user adoption process of technology, and it is vital for the organization that provides technology-based products or services. Thus, an effort had been made by some researchers to improve TRI model based on hypothesizing that the personality traits in TRI model were antecedents to technology acceptance model. In other words, psychological characteristics influenced the cognitive dimensions of TAM [23][27]. Lin (2007) try to construct an integrated TRI and TAM model called TRAM (Technology Readiness Acceptance Model) to explain the user behavior in adopting technology-based e-services by combining TR with the two dimension of TAM, perceived usefulness and perceived ease of use [24]. Basgoze (2015) also connected or integrated TR into TAM in the context of mobile shopping intention [25]. Walczuch (2007) incorporate TRI and TAM to measure the relation between both models [28]. Among the existing acceptance model, TAM (Davis, 1989) become the most popular best practice model since it had robust and parsimony measurement model [24][25].

According to Davis (1989), TAM model is straightforward but powerful parsimony model. If we observed further, unfortunately, TAM model also has some limitation such as not taking into account of social influence and condition of facilities that encourage user behavior in using technology [11]. In another word, TAM does not take into consideration external variables of the system such as social influence, facilitating condition, etc. Also, TAM model used to measure user behavior only in the voluntary environment, not a mandatory one. In the optional use of information technology, the measure of success is based on user acceptance. The end user has full freedom whether the user will use or leave the technology [29][30]. On the other hand, the indicator of success in the mandatory environment is user satisfaction. Thus, TAM model could not explain user behavior of mandatory technology. The other limitation of TAM models is explicitly designed only for a particular system (system-specific) not for technology beliefs (individual-specific) likely in TR model. Therefore, Susskind (2004) suggested supporting the finding to this research and extending TAM by considering TR model into TRAM model. Further, TRAM model indicated why people who have high TR do not certainly use new technology because they influenced two main constructs in TAM that determine adopting technology behavior [24].

Based on the previous research, the conceptual model used in this research refer to TRAM (Technology Readiness Acceptance Model) had been developed by other researchers as follow [24][25][28]. Thus, there are nine hypotheses proposed in this research as follows:

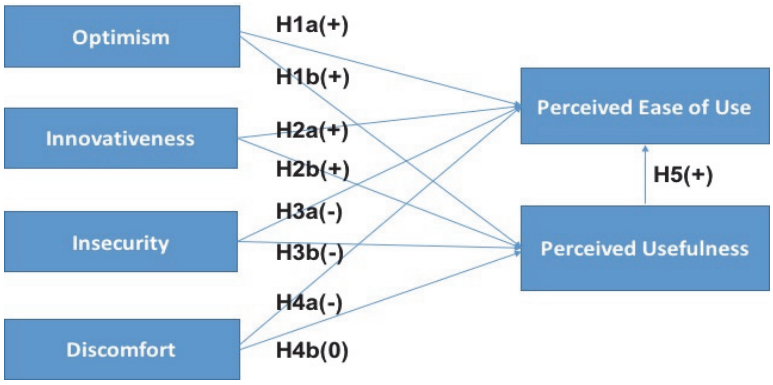

Figure 3. Conceptual Research Model (TRAM)

H1a : Optimism (OPT) significantly positive affects the Perceived Ease of Use (PEOU)
H1b : Optimism (OPT) significantly positive affects the Perceived Usefulness(PU)
H2a : Innovativeness (INN) significantly positive affects the Perceived Ease of Use (PEOU)
H2b : Innovativeness (INN) significantly positive affects the Perceived Usefulness(PU)
H3a : Insecurity (INS) significantly negative affects the Perceived Ease of Use (PEOU)
H3b : Insecurity (INS) significantly negative affects the Perceived Usefulness(PU)
H4a : Discomfort (DIS) significantly negative affects the Perceived Ease of Use (PEOU)
H4b : Discomfort (DIS) does not significantly affect the Perceived Usefulness(PU)
H5 : Perceived Ease of Use (PEOU) significantly positive affects the Perceived Usefulness (PU)

The online survey was conducted to distribute the questionnaire to consumers or users that have been using single technology in the context of e-Government services. Our experiment was for individual's own choice of a software system or technology. Thus the participant was not asked to rate a specific technology. Instead, the participants were asked to select technology they use most related to e-Government services. The questionnaire consist of total 48 item of measurement, where TRI has 36 issues (10 questions for optimism; 7 pieces for innovativeness; 10 items for discomfort; 9 items for insecurity) adapted from Parasuraman (2000) and TAM (6 issues for perceived usefulness; 6 items for perceived ease of use) has 12 things [21]. The questionnaire was designed in 5 Likert scales, where 1=" strongly disagree" and 5="strongly agree". This study collected a total 230 respondents, but the completed questionnaire only 208 data that could be analyzed further (respond rate 90,4%). The respondents were public as e-Government service users that chosen by purposive sampling.

4. Result and Discussion

Initially, the instrument was examined in term of their validity and reliability. According to Sugiyono (2007), an instrument is said to be valid means the measuring tool used to get the data (measure) is valid. Reliable instruments are instruments which, when used multiple times to measure the same object, will produce consistent data. In this research, the validity test was conducted by calculating Pearson Product-Moment Correlations between measurements of each variable.

The Pearson Correlation coefficient showed that all item met the minimum requirement (>0.396 for 208 respondent). Thus the object is said to be valid. Regarding reliability, this study used Cronbach's alpha for each variable of item's scale (Ghozali, 2002). The result of reliability test showed that each variable also met the requirement where Cronbach's alpha coefficient exceed 0.60 (>0.60). Thus, the instrument had good validity and reliability in their scale.

The second step is hypotheses testing based on regression analysis using SPSS tool of IBM 22 version 2013. As explain in research methodology, there are nine hypotheses related to TRAM model being tested in the context of e-Government services. These hypotheses divided into 3 model of regression as follows:

$$Y1 = a + b1X1 + b2X2 + b3X3 + b4X4 + e \quad (1)$$

$$Y2 = a + b1X1 + b2X2 + b3X3 + b4X4 + e \quad (2)$$

$$Y2 = a + b1Y1 + e \quad (3)$$

Where :

Y1 = Perceived Ease of Use (PEOU)
Y2 = Perceived Usefulness (PU)
X1 = Optimism (OPT)
X2 = Innovativeness (INN)
X3 = Insecurity (INS)
X4 = Discomfort (DIS)
a = The direct link between independent and dependent variables
e = Error Residue

The first model tested was regression model of Y1, where each variable of TR (Optimism, Innovativeness, Insecurity, and Discomfort) toward one of TAM variable, Perceived Ease of Use, as follows:

Table 2. Regression Model of Perceived Ease of Use (Y1)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.459	.559		2.611	.011
	Optimism	.550	.074	.589	7.465	.000
	Innovative	.298	.091	.296	3.281	.001
	Insecurity	-.194	.090	-.193	-2.167	.033
	Discomfort	-.020	.089	-.019	-.224	.823

a. Dependent Variable: PEOU

Based on table 2 above can be produced by multiple linear regression equation:

$$Y1 = 1.459 + 0.550X1 + 0.298X2 – 0.194X3 – 0.20X4 \quad (4)$$

Based on the t-Test conducted, we could see that hypothesis H1a is supported in this study because Optimism had significantly positive influenced Perceive Ease of Use. The result showed positive coefficient regression (0.550), and the probability of significant was 0.000 (<0.05) with t-value 7.465 (>t table). Hypothesis H2a is also supported in this study since Innovative had significantly positive influenced Perceived Ease of Use. The coefficient regression obtained was positive (0.298) and the probability of significant 0.001 (<0.05) with t-value 3.281 (>t table).

Hypothesis H3a is accepted in this study because Insecurity had significantly negative influenced Perceived Ease of Use. The result showed that negative coefficient regression (-0.194) and the probability of significant was 0.033 (<0.05) with t-value -2.167 (>t table). On the other hand, Hypothesis H4a is not supported in this study since Discomfort had no significantly influenced Perceived Ease of Use. The coefficient regression obtained was negative (-0.20) and the probability of significant 0.823 (>0.05) with t-value -0.224 (<t table).

The second model tested was regression model of Y2, where each of TR (Optimism, Innovativeness, Insecurity, and Discomfort) toward TAM variable, Perceived Usefulness, as follows :

Table 3. Regression Model of Perceived Usefulness (Y2)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.195	.686		1.744	.089
	Optimism	.761	.110	.693	6.909	.000
	Innovative	.312	.135	.310	2.310	.026
	Insecurity	-.240	.116	-.256	-2.074	.044
	Discomfort	-.097	.105	-.103	-.919	.363

a. Dependent Variable: PU

Based on Table 3 above can be produced by multiple linear regression equation:

$$Y2 = 1.195 + 0.761X1 + 0.312X2 – 0.240X3 – 0.097X4 \quad (5)$$

Based on the t-Test conducted, we could see that hypothesis H1b is supported in this study because Optimism had significantly positive influenced Perceive Usefulness. The result showed positive coefficient regression (0.761), and the probability of significant was 0.000 (<0.05) with t-value 6.909 (>t table). Hypothesis H2b is also supported in this study since Innovative had significantly positive influenced Perceived Usefulness. The coefficient regression obtained was positive (0.312) and the probability of significant 0.026 (<0.05) with t-value 2.310 (>t table). Hypothesis H3b is supported in this study because Insecurity had significantly negative influenced Perceived Usefulness. The result showed that negative coefficient regression (-0.240) and the probability of significant was 0.044 (<0.05) with t-value -2.074 (>t table). Besides, hypothesis H4b is also supported in this study since Discomfort had no significantly influenced Perceived Usefulness. The coefficient regression obtained was negative (-0.097) and the probability of significant 0.363 (>0.05) with t-value -0.919 (<t table).

The result indicated that the Optimism also had higher coefficient regression than another dimension correlated to Perceived Usefulness. It means Optimism variable was the most dominant variable in TR model among others. The last model tested was regression model of Y1 toward Y2 as follows :

Table 4. Regression Model of Perceived Ease of Use Toward Perceived Usefulness

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.843	.610		3.020	.004
	PEOU	.563	.145	.506	3.889	.000

a. Dependent Variable: PU

Based on Table 4 above can be produced by multiple linear regression equations:

$$Y2 = 1.843 + 0.563Y1 \quad (6)$$

Based on the t-Test conducted, we could see that hypothesis H5 is supported in this study because Perceived Ease of Use (PEOU) had significantly positive influenced Perceive Usefulness (PU). The result showed positive coefficient regression (0.563), and the probability of significant was 0.000 (<0.05) with t-value 3.889 (>t table).

Besides, the result indicated the personality traits in TR significantly influenced technology use or adoption. It can be proved by empirically that the TRI is an antecedent to TAM model. The result also indicates that the optimism had a higher coefficient than other dimensions. It means optimism variable

is the most dominant variable in TR model among others. In practical implication, high confidence indicates user's belief about technology was positive that the new technology would increase the productivity of them. They convince that the technology could offer more control, flexibility, and efficiency in their lives. Innovativeness also significantly positive influenced the perceived ease of use and perceived usefulness. It means the users in institution X was critical to the new technology. They are aware of the newest development of technology and is happy to try experiments with new technology first than others. Insecurity negatively influenced the perceived ease of use and perceived usefulness, as predicted. Insecure users have low trust to technology security or privacy. Discomfort had no impact on perceived ease of use, not expected finding. The possible explanation is that the technology users in X Government Institution has no doubt or hesitate to use technology. They are not feeling of being overwhelmed by it. Finally, perceived ease of use also positively affected perceived usefulness, as predicted. This finding was supported by previous research [21]. It indicated that technology users would consider the ease of use factor in adopting new technology.

5. Conclusion

Based on the result and analysis obtained that the personality traits of TR (Technology Readiness) significantly impacted the cognitive dimension of TAM (Technology Acceptance Model), the perceived ease of use and the perceived usefulness. The hypotheses were supported that TRI was antecedents to TAM Model. Therefore, TRAM model is proven by empirically could indicate user adoption in technology satisfactorily. Furthermore, TRAM model could be used to explain why do certain individual adopt new technologies whereas other's don't because TRAM not only considers for a particular system (system-specific) but also include technology beliefs (individual-specific). According to Parasuraman and Colby (2001), optimism and innovativeness represent technological facilities inducers; they induce people to embrace new technologies. On the other hand, discomfort and insecurity work as inhibitors, they demotivate or postpone new technologies embracement. Even though they coexist inside us, the inducing and inhibiting dimensions of technological facilities act separately, and each user may show different inducing or inhibiting combinations. Thus, the manager should learn and improve the TR of users as a public customer to gain technology adoption successfully in an organization.

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