

Adoption of Electronic Toll Application Analysis

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ABSTRACT

The aim of this study is to observe readiness of Bandung highway driver when E-Toll Card. Using integrated Technology Acceptance Model (TAM) and Theory Planned Behavior (TPB), data was collected through questionnaires to 100 Bandung Highway Driver respondents and analyzed using SPSS. The result was found that the respondents have good perceptions for all variable TAM and TPB overview and the perceived usefulness positively influenced attitude for the user if E-Toll Card was implemented in all Bandung Highway Gateway. Perceived Behavioral Control, Perceived Usefulness, Subjective Norm, & Attitude positively influence intention to use E-Toll Card. It can be concluded that Bandung people are ready to use E-Toll, therefore, Bandung Jasa Marga can start implement e-toll service in all Bandung Gateway Highway.

Keywords: Electronic Toll Collection, Technology Acceptance Model (TAM), Theory Planned Behavior (TPB).

INTRODUCTION

Indonesia transportation services divided into three mode services, the service is an air transport service, marine transportation services and land transportation services. The Government gives solutions to handle the traffic jam problem, one of the solution is building a highway. Bandung is one of the cities that experienced an increase in the number of vehicles every year about 11% (Ardia, 2013). Based on Jasa Marga data, there has been increased volume of daily traffic on average in Tol Purbaleunyi from 2012 to 2013 as many as 9496 vehicles

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per day, the congestion at the checkouts due to the increased volume of daily traffic on the motorway it cannot be avoided. Then it will be found congestion at the toll booth payments due to transactions carried out manually, which takes a long time (Larasati, 2013). The increasing volume of daily traffic Purbaleunyi highway due to the increased number of tourists who come from outside the city as much as 10-15 % annually (Nurmatari, 2013) who visited at the weekend and public holidays, the congestion at the checkouts cannot be avoided on toll payment counter. To solve congestion problems with toll plazas, JasaMarga as highway operators had some solutions to solve it. One of the solutions is implementing automated transaction using contactless smart card called E-Toll Card. E-Toll Card first implemented was in some highways at Jakarta (Jasamarga, 2014). Based on the data owned by Jasa Marga in March 2013 using the E -toll transaction card has been increased to 20 % of the total toll payment transactions are performed. The increasing use of transactions using e - toll card queue due to pressure levels and reduce congestion at toll payment counter especially in segments that have high congestion (Aliya, 2013). However, not all Bandung Highway Gateway use e-toll card, despite there is increasing daily traffic volume and long queue in Bandung Highway exit or in gateway that because people choose to use highway than public streets and increasing tourists from outside Bandung on weekend and public holiday.

The objective of our study is to uncover Bandung Highway user readiness and adoption if E-Toll Card was implemented in Bandung. E-Toll Card will implemented in Bandung Highway but with this research about Bandung Highway user would help government to know readiness Bandung Highway user if E-Toll Card was implemented in Bandung. In order to provide solid theoretical bases of examining the important factors that influence E-Toll Card adoption, this paper integrates two theoretical models, technology acceptance model (TAM) (Davis, 1989) and Theory Planned Behavior (TPB) (Ajzen, 1991) and also to know Bandung Highway perception about variables technology acceptance model (TAM) and theory planned behavior (TPB). The research question of this study is knowing the percentage effect of perceived usefulness, perceived ease of use, Attitude, Subjective Norm and Perceived Behavioral Control of the Intention to use E-Toll card when E-Toll implemented in Bandung. And knowing the perceptions of respondents about the variables perceived usefulness, perceived ease of use, Attitude, Subjective Norm, Perceived Behavioral Control and intend using when the E-Toll implemented in Bandung. As the focus of this study is to know Bandung Highway user adoption and readiness by using integration TAM and TPB on research framework to examine behavior and acceptance E-Toll card adoption if E-Toll Card was implemented in Bandung Highway.

This paper is organized as follows : Section 2 reviews the literature; Section 3 lays out the methodology; Section 4 contains a discussion of the empirical findings; and Section 5 provides conclusions and recommendations.

LITERATURE RESEARCH

The study of electronic toll collection service adoption by Farn *et al.*, (2006) that aim to uncover the vehicle user intention to use and adoption Electronic Toll Collection at Taiwan using the integration Technology Acceptance Model (TAM) and Theory Planned Behavior (TPB) result was Both TAM and TPB predict user intends to use and adoption Electronic Toll Collection. Customer's intention on purchasing airlines E-Ticket by Rofiq and Sari, (2013), analyze customer user intention to buy an airplane ticket using E-Ticketing shows that user intention was affected by perceived usefulness to buy an airplane ticket using E-Ticketing.

Factor influencing citizen adoption of E- Government in developing countries (Hujran *et al.*, 2013, shows that perceived usefulness and perceived ease of use significantly influenced E-Government adoption in Jordan. Factors affecting the adoption of online banking, an integration of technology acceptance models, and theory planned behavior (Yaghoubi and Bahmani, 2010) shows that perceived usefulness, perceived behavioral control to have a positive influence to online bank adoption at Ishafan. Firdaus (2013) on The effectiveness of using smart phones to support the business activities of young entrepreneurs in Bandung using Technology Acceptance Model also showed that perceived usefulness can be felt when use smart phones to support business activities.

Analysis of usefulness and ease of use for letter management application using the technology acceptance model approach at XYZ companies in Surabaya (Paramita and Mudjahiding, 2014). The aim of this research is to uncover perceived usefulness and perceived ease of use effect towards user letter management application using technology acceptance model approach. The result of this research is perceived ease of use is the key of implementing management letter application. Analysis of project management information system (PMIS) implementation using the technology acceptance model method, case study at PT. Indosat Tbk (Rizal, 2014) shows that all of the factors that defined in technology acceptance models have positive influenced toward intention to use PMIS. Prototype levies toll road payment system based on RFID (Primadani and Widodo, 2012) discuss about using Radio Frequency Identification (RFID) in identification processes and payment process at highway to deduct congestion at toll plaza. Analysis factor that influenced intention to use the new product (case study, E-Money Flazz card BCA) (Ratmansyah, 2011) shows that perceived behavioral control, subjective norm and perceived usefulness influenced intention to use E-Money Flazz Card BCA. The k. User acceptance of MyKad as an E-Commerce tool of Malaysia (Fadil, 2009) shows that a technology acceptance model modification positively influenced intention to use MyKad as E-Commerce tool of Malaysia.

The aim of this study is to determine readiness of the Bandung highway driver if E-Toll Card will be implemented in Bandung Highway Gateway using integrated Technology Acceptance Model (TAM) and Theory Planned Behavior (TPB). The research about Bandung Highway Driver readiness to adopt E-Toll Card uses integrated Technology Acceptance Model (TAM) and Theory Planned Behavior (TPB) never been conducted. Therefore, this research will provide valuable information to business people about Bandung Highway Drivers readiness for adopting E-Toll Card.

Based on previous research that is closest to the research to be carried out are research done by Ratmansyah (2011) and Farn *et al.* (2006). The reason for choosing it because there are similarities research is research conducted to determine the factors that affect interest in the use of new products. The difference with the research conducted by Rahmatsyah is not perceived behavioral control and the use of subjective norms that exist in previous research. The reason for choosing the research conducted by Farn *et al.* (2006) because there are similarities research that until now the lack of intention to use of E-Toll Collection or E-Toll Card although the E-Toll Card. The difference between research conducted by Farn *et al.* (2006) is that, in this research conduct of Bandung Highway Drivers that know about advantages E-Toll Card that never use E-Toll Card and in Bandung Highway Driver have not yet implemented.

METHODOLOGY

In this research, the sampling method used is non probability samplings and the sampling technique is convenience samplings. Samples of this research are Bandung Highway User who understand about E-Toll Card. Data collection method is by giving questionnaires to 100 Bandung Highway users. The sample calculation used Bernoulli formula calculation because the size of the population was unknown. The data were analyzed used simple regression linear with help SPSS 20 computer programs.

The analysis that conducted in this research is a descriptive analysis using continuum line and simple regression linier for each hyphotesis. Step this study until get the hypothesis are; Initial observations were made is to look at the phenomenon that is around the importance of the phenomenon of the congestion at the entrance highway Bandung whereas PT Jasa Marga has offered several solutions to avoid congestion at the door of the highway that is the automation E-Toll Card, which until now has not implemented at all the toll booth Bandung. Data collection, at this stage of data collection, began searching articles about traffic jams at the toll booth, the level of daily traffic at the toll booth Purbaleunyi and data on the implementation of E-Toll Card in Jakarta toll. Data collection also by finding the journal associated with the implementation of E-Toll Card. Problem Definition, Once the data collected is enough, the next step is to define the problem. Definition of the problem in this study is due to the E-Toll Card is RFID-based products used for the payment of tolls and did not previously exist in the city, the problem here is the readiness of Bandung toll road users, if the E-Toll implemented. Theoretical framework used in this study is the theory relating to the adoption of E-Toll Card namely operations management, operations management trends, management of technology, products, electronic toll collection, planned behavior theory and technology acceptance models. Preparation of the hypothesis is based on the framework used in the study were obtained from the journal Farn *et al.* entitled The study of electronic toll collection service adoption: an integrated model that discusses the adoption of E-Toll Card that uses integration technology acceptance model (TAM) and the planned behavior theory to obtain 7 hypotheses. The hyphotesis in this research are,

H1, Attitude have significant effect positive on intention to use if E-Toll card was implementing in Bandung Highway.

H2, Subjective Norm have significant effect positive on intention to use if an E-Toll card was implementing in Bandung Highway.

H3, Perceived Behavioral Control have significant effect positive on intention to use if E-Toll card was implementing in Bandung Highway.

H4, Perceived Usefulness have significant effect positive on Attitude if E-Toll card was implementing in Bandung Highway.

H5, Perceived Usefulness have significant effect positive on intention to use if an e-Toll card was implementing in Bandung Highway.

H6, Perceived Ease of Use have significant effect positive on Attitude if E-Toll card was implementing in Bandung Highway.

H7, Perceived Ease of Use have significant effect positive on Perceived Usefulness if E-Toll card was implementing in Bandung Highway.

RESULT AND DISCUSSION

Result

Characteristics of respondents used in this study is a toll road users of Bandung, where the data collection respondents using primary data obtained by distributing questionnaires to 100 the toll road users are aware of e-Toll Card. Data on the characteristics of respondents obtained can be the background for the adoption of RFID applications in the product E-Toll Card for toll road users Bandung. respondents were female as much as 63% or as many as 63 people, while respondents Male sex as much as 37% or as many as 37 people. In this research shows that more female respondents than male dominated - men. of the 100 respondents surveyed can be seen that 18% or 18 respondents had a monthly income of > USD. 3,500,000, 19% or 19 respondents had a monthly income of Rp. 2,500,000 - Rp. 3,500,000, 25% or 25 respondents had a monthly income of <IDR. 1,500,000 and 38%, or 38 respondents have opinions per month as much as Rp. 1,500,000 - Rp. 2,500,000. employment status of respondents' highway users Bandung is as much as 58% or 58 respondents' status as a student, 7% or 7 respondents' status as civil servants, 19% or 19 respondents' status as private employees, 9% or 9 responder status as entrepreneurs and as much as 7% or 7 people have outside employment status that have been mentioned above. the intensity of the respondents passed the toll road is as much as 65% or 65 respondents highway passing through the city of Bandung 1-2 times a week, 27% or 27 respondents highway passing through the city of Bandung 3-4 times a week and as much as 8% or 8 respondents passing through the toll road in Bandung > 4 times a week. Based on analysis that conducted in this research, the result are:

Descriptive analysis using continuum line

Descriptive analysis using continuum line conducted for each variables in this research. The result are:

Table 1 Descriptive Analysis

Variable	Percentage	Description
Perceived Usefulness	77,78%	Good
Perceived Ease of Use	79,8%	Good
Attitude	86%	Very Good
Perceived Behavioral Control	74,2%	Good
Subjective Norm	72%	Good
Intention to Use	79,2%	Good

Based on Table 1, the result are:

1. Bandung highway drivers perception for variable perceived usefulness is 77.78%
2. Bandung highway drivers perception for variable perceived ease of use is 79,8%
3. Bandung highway drivers perception for variable attitude is 86%
4. Bandung highway drivers perception for variable perceived behavioral control is 74,2%
5. Bandung highway drivers perception for variable subjective norm is 72%
6. Bandung highway drivers perception for variable intention to use is 79,2%

Hyphotesis Testing

The research model presented earlier was tested using T Test. T Test is part of simple regression linear and can be used to analysis whether independent variable have a significant effect to dependent variable in partial way. T-Test conducted to determine whether the hypothesis was accepted or rejected by comparing between T table and T statistics. If T statistics is bigger than T table, the hypothesis accepted. Here the result of hypothesis testing:

Table 2 Hyphotesis Testing Result

Variable	T Table	PU	ATT	IU
PU	1,98422		6,183	6,542
PEOU	1,98422	7,412	5,269	
ATT	1,98422			5,074
SN	1,98422			5,464
PBC	1,98422			6,624

Based on Table 2, the Hypothesis testing results are:

- Attitude have significant effect on intention to use on E-Toll Card adoption in Bandung Highway, H₁ accepted.
- Subjective norm have significant effect on intention to use on E-Toll Card adoption in Bandung Highway, H₂ accepted.
- Perceived behavioral control have significant effect on intention to use on E-Toll Card adoption in Bandung Highway H₃ accepted.
- Perceived usefulness have significant effect on Attitude on E-Toll Card adoption in Bandung Highway H₄ accepted.
- Perceived usefulness have significant effect on intention to use on E-Toll Card adoption in Bandung Highway, H₅ accepted.
- Perceived ease of use have significant effect on intention to use on E-Toll Card adoption in Bandung Highway, H₆ accepted.
- Perceived ease of use have significant effect on perceived usefulness on E-Toll Card adoption in Bandung Highway, H₇ accepted.

Percentage influence between variables

The hypothesis presented earlier was tested using R square. R square can use to know percentage effect between variable. Here the result of percentage influence between variable:

Table 3 Percentage Between Variable

Variable	PU	ATT	IU
PU		28,1%	28,1%
PEOU	34,2%	22,1%	
ATT			20,8%
SN			23,4%
PBC			30,9%

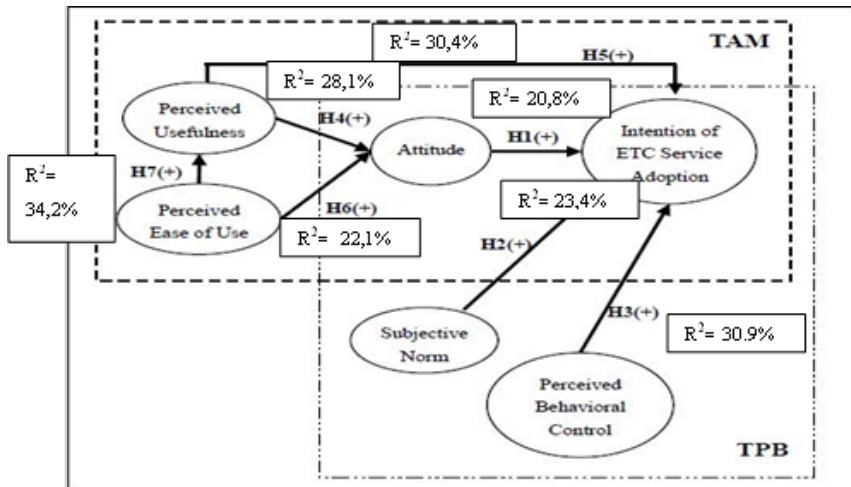
Based on table 3, the result are:

- Intention to use percentage influence from Attitude about 20,8% and the rest is influenced explained by other variables.
- Intention to use percentage influence from Subjective norm about 23,4% and the rest is influenced explained by other variables.
- Intention to use percentage influence from Perceived Behavioral Control about 30,9% and the rest is influenced explained by other variables.
- Attitude percentage influence from Perceived Usefulness about 28,1% and the rest is influenced explained by other variables.
- Intention to use percentage influence from Perceived Usefulness about 30,4% and the rest is influenced explained by other variables.

- Attitude percentage influence from Perceived Ease of Use about 22,1% and the rest is influenced explained by other variables.
- Perceived Usefulness percentage influence from Perceived Ease of Use about 34,2% and the rest is influenced explained by other variables.

Hence, based on the results above, it can be draw the model as in figure 1. below

Figure 1 The Model Result



Discussion

Based on the result of this research and previous research have similar result that variable perceived behavioral control have strong effect on intention to use and variable perceived ease of use have strong effect on perceived usefulness. There is different results from this research and Farn *et al.* is perceived usefulness on intention to use have strongest effect while in Farn *et al.* (2006) perceived usefulness has no significant effect on intention to use. The difference because there is difference demography between Indonesia and Taiwan.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = n-1 due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value amounted to 6.183 due $t\text{-calculated} > t\text{-table}$ or $6.183 > 1.98422$ hence H_0 rejected and H_1 accepted that concluded Perceived Usefulness Attitude positively affect the use of E-Toll Card if implemented in Bandung and based R square that 28.1% of the variable attitude can be explained by the variable perceived usefulness while the remaining 62% is explained by other variables outside the model. Based on analysis of respondents to the perceived usefulness of variables are in either category to have a percentage of 77.78% and respondents to the Attitude variables are in either category with a percentage of 86%. It can be concluded that the perceived usefulness variables adoption E-Toll positive effect on attitude variable adoption of E-Toll directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = $n-1$ due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value which can be seen in table 4.10 of 6.542 due t calculate $> t$ table or $6.542 > 1.98422$ hence H_0 rejected and H_1 accepted that concluded Perceived Usefulness Intention To use affect positively the use of E-Toll Card if implemented in Bandung and based R square that 30.4% of the variable intention to use can be explained by the variable perceived usefulness while the remaining 62% is explained by other variables outside the model. Based on analysis of respondents to the perceived usefulness of variables are in either category to have a percentage of 77.78% and respondents to the intention to use a variable in either category with a percentage of 79, 2%. It can be concluded that the perceived usefulness variables adoption E-Toll good effect on the variable intention to use directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = $n-1$ due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value which amounting to 5.269 due t -calculate $> t$ -table or $5.269 > 1.98422$ hence H_0 rejected and H_1 accepted that concluded that Perceived ease of use positively influence Attitude in the use of E-Toll Card if implemented in Bandung and based R square, note that 22.1% of the variable attitude can be explained by the variable of perceived ease of use while the remaining 64.553% is explained by other variables outside the model.

Based on analysis of respondents to variable perceived ease of use in either category with a percentage of 79.8% and respondents to the attitude of variables in either category with a percentage of 86%, It can be concluded that the variable of perceived ease of use adoption of E-Toll good influence on the attitude variable directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = $n-1$ due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value amounting to 7.412 due t -calculate $> t$ -table or $7.412 > 1.98422$ hence H_0 rejected and H_1 accepted that concluded Perceived ease of use Perceived Usefulness positively affect the use of E-Toll Card if implemented in Bandung and based R square that 34.2% of the variable perceived usefulness can be explained by perceived ease of use while the remaining 52.474% is explained by other variables outside the model.

Based on analysis of respondents to variable perceived ease of use in either category with a percentage of 79.8% and respondents to the perceived usefulness of in either category with a percentage of 77, 78%. It can be concluded that the variable of perceived ease of use adoption of E-Toll good effect on perceived usefulness variables directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = $n-1$ due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value which amounting to 5.074 due t -calculate $> t$ -table or $5.074 > 1.98422$ hence H_0 rejected and H_1 accepted thus concluded Intention To Use Attitude affects positively the use

of E-Toll Card if implemented in Bandung and based R square note that 20.8% of the variable intention to use can be explained by the variable of attitude while the remaining 79.327% is explained by other variables outside the model.

Based on analysis of respondents to variable attitude in either category with a percentage of 86% and respondents to the intention to use a variable that in either category to have a percentage of 79.2%. It can be concluded that the attitude variables influence the adoption of E-Toll good to variable intention to use directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = n-1 due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value amounting to 5.464 due t-calculate > t-table or 5.464 > 1.98422 hence H₀ rejected and H₁ accepted that concluded Subjective Intention To Use Norm affect positively the use of E-Toll Card if implemented in Bandung and r-square note that 23.4% of the variable intention to use can be explained by the subjective norm variable while the remaining 78.040% is explained by other variables outside the model.

Based on analysis of respondents to the subjective norm variable which can be seen in Table 4.5 are in either category with a percentage of 72% and respondents to the intention to use a variable are in either category with a percentage of 79.2%, It concluded that subjective norm variable adoption of E-Toll good effect on the variable intention to use directly.

Based on the coefficient table t which is determined by looking at the value of t distribution table with a significance level $\alpha = 0.05$ and a degree of freedom (df) = n-1 due to the amount of data as much as 100, the degree of freedom (df) used was 99, thus obtained t table at 1.98422 and the T value which amounting to 6.624 due t-calculate > t-table or 6.624 > 1.98422 hence H₀ rejected and H₁ accepted that concluded Perceived Behavioral Intention To Use Control influence positively the use of E-Toll Card if implemented in Bandung and r-square note that 30.9% of the variable intention to use can be explained by the variable of perceived behavioral control while the remaining 74.085% is explained by other variables outside the model.

Based on analysis of respondents to the variable Perceived Behavioral Control which can be seen in either category with a percentage of 74.2% and respondents to the intention to use a variable that in either category with a percentage of 79, 2%. It can be concluded that the perceived behavioral control variables adoption of E-Toll good effect on the variable intention to use directly.

CONCLUSION AND RECOMMENDATION

Conclusions

1. The adoption of RFID applications in the product E-Toll, show that the influence of perceived usefulness variable to variable attitude is 28.1%, the effect of perceived usefulness variable to variable intention to use is 30.4%, the effect of perceived ease of use of the attitude variables was 22.1%, the effect of perceived ease of use of the variable perceived usefulness is 34.2%, the effect of attitude towards variable intention to use at 20.8%, the effect of subjective norm variable to variable intention to use by 23.4%, and the final effect of perceived behavioral control variable to the intention to use was 30.9%, so it can be concluded that the variables Technology Acceptance Model (TAM) and the model Theory of Planned Behavior (TPB) has positive effect directly or indirectly to the adoption of E-Toll Card.
2. The adoption of RFID applications in the product E-Toll, also show that the influence of variables perceived ease of use of the variable perceived usefulness have the greatest influence on the adoption of RFID applications in the product E-Toll at 34,2%. This is consistent with the analysis of respondents to the perceived usefulness of variables that are in both categories to have a percentage of 77.78% and the perceived ease of use in both categories have a percentage of 79.8%. It can be concluded that the variable of perceived ease of use adoption of E-Toll good effect on perceived usefulness variables directly against the intention of the use of E-Toll Card.

Recommendations

1. Since the survey results revealed the influence of the variable to variable perceived usefulness perceived ease of use has the greatest percentage is 34.2 %, which represents the second variable toll road user perception that the E -Toll card will assist in the payment transaction motorway, it's good E-toll Card can be implemented in Bandung.
2. Further research is recommended where respondents men and women have the same number in sample in order to reduce bias on the variable attitude towards variable intention to use, because the level of variable attitude shows is very important, while based on hypothesis testing variables attitude has the smallest effect for variable intention to use.

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