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Integrated QR payment system: Cashless payment solution in developing countries from the perspective of MSMEs

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Abstract

This study explores the implementation of QRIS (Quick Response Code Indonesian Standard) based cashless payment systems among MSMEs in Jakarta. Using descriptive and explanatory survey methods, the data were analyzed through Partial Least Square (PLS). The main focus of the research is to examine the effect of Mobile Usefulness and Perceived Ease of Use variables on Attitude Toward Using and Behavioral Intention to Use QRIS. The results showed that Mobile Usefulness has a positive and significant impact on Attitude Toward Using and Behavioral Intention to Use. Perceived Ease of Use also has a significant effect on Attitude Toward Using, but not on Behavioral Intention to Use. This study identifies QRIS adoption challenges, such as infrastructure limitations, low digital literacy, and people's preference for cash. This research provides strategic recommendations for the government and startups to accelerate QRIS adoption, increase digital inclusion, and prepare for a cross-border payment ecosystem by 2025. By understanding user attitudes and intentions, this study contributes to the development of more inclusive and efficient cashless payment solutions for MSMEs in Indonesia.

Keywords: Attitude toward using, Behavioral intention to use, MSMEs, Perceived ease of use, QRIS, Mobile usefulness.

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1. Introduction

1.1. Background

Technology is getting faster and more sophisticated, and it is increasingly playing an important role in various fields. All professional fields need technology to facilitate the delivery of information and accelerate organizational performance. In Asia, Indonesia has the third highest number of internet users. This shows that the penetration of internet users in Indonesia has increased significantly from year to year, implying that people are now using the internet in their daily lives. The business

world, as one of the important components of the country's economy, is very much affected by this technology, which can be said to have shifted business activities from the traditional transaction system to digital-based transactions.

Mobile payments are emerging as the preferred way to shop online. The existence of a large millennial population and the presence of an untapped market in terms of unbanked families are opportunities that will shape the future growth of digital payments in Indonesia.

This event is not only held in Indonesia; according to a report [1], 64% of consumers in the Southeast Asian region showed positive results, with consumers stating that they are comfortable using cash. The countries of the Association of Southeast Asian Nations (ASEAN) have gone a step further, committing to integrate cashless payments across their membership by 2025. This indicates that the ASEAN digital payment ecosystem will grow, as well as high consumer acceptance to go cashless. As a result, as the trend of digital payments evolves, ASEAN members must be ready, as well as fintech companies and micro, small, and medium-sized merchants, to enable consumers to make transactions [2].

By definition, digital payments allow users and retailers to make quick business transactions in small or large amounts. Digital payments come in many forms in different countries, from card-based to mobile-based. With the increase in m-payment adoption and a decrease in cash usage, the costs associated with cash can be reduced. These costs include the printing, storing, and distribution of cash incurred by banks and the government [3].

The QR code is an effective information transmission medium, which is widely used in product traceability, advertising, mobile payment, passport verification, and other fields [4]. The QR code is defined as 40 symbol versions (to carry various data payloads) and four user-selectable Error Correction Levels (ECLs): L, M, Q, and H, which can correct up to 7%, 15%, 25%, and 30% of the error codewords, respectively, when attacked by defacement. The larger QR version can offer a higher data payload, where the QR code can hold a maximum capacity of 2956 bytes for a 40 code version [5]. The adoption of digital payment systems has rapidly grown in many countries. More recently, new electronic payment platforms such as e-wallets and other mobile payment applications have become popular. A cashless society may have emerged in some countries long ago. However, some countries, including Thailand, are in the process of moving into a digital payment society [6]. The innovative QR code payment system was introduced to Thailand in the fourth quarter of 2017. Since each bank has launched the QR code payment system to the public, all banking service providers have been competing with each other to be leaders in the area of QR code payment systems by increasing the number of transactions and merchants that accept QR code payment modes both in Thailand and in foreign countries. As a result, despite the differences in the classification of cashless payment solutions, we agree that QR code payments benefit consumers and retailers alike [7].

Quick Response Code Indonesian Standard (QRIS) is a QR Code standard for digital payments through server-based electronic money applications, electronic wallets, or mobile banking. The use of QRIS is regulated in PADG No. 21/18/2019 concerning the Implementation of the QRIS International Standard for Payment issued by Bank Indonesia (BI) [8]. One of the institutions that has helped develop digital finance through policies is Bank Indonesia. Bank Indonesia has realized that the presence of business actors, micro, small, and medium enterprises (MSMEs) can help support the country's economy. Various efforts and strategies have been made by Bank Indonesia to provide guidance to MSMEs that have become mentored. This includes providing provisions and skills development, as well as how to promote through digital marketing. In conducting digital marketing coaching for MSMEs, Bank Indonesia can immediately introduce digital payment so that it aligns with Bank Indonesia's task of increasing the use of digital finance [9]. However, with the number of adoptions achieved in less than two years since QRIS was officially implemented in January 2020, the adoption rate in Indonesia towards a cashless economy is very fast. QRIS adoption is only 85% of the 10.45 million MSMEs, implying that non-cash adoption for the largest economic contributor is still low. According to a report by Bank Indonesia, 48 payment system service providers have been granted permission to conduct non-cash transactions [10].

As the number of electronic payment systems increases, e-wallets are growing in popularity by offering a variety of services such as food delivery and bill payments [10]. This is advantageous not only for buyers, but also for merchants, who accept e-wallets as a payment method due to faster transaction processes, efficient cash management, and lower labor costs. This type of transaction is typically conducted in a physical store, where customers scan a code (QR) with their mobile device to confirm the payment. Merchants have provided several e-wallet products that use the QR Code system, including OVO QR Code (e-wallet), GO-PAY QR Code (e-wallet), and LINK AJA QR Code (e-wallet) [11]. In cashless transactions, merchants often use OVO QR Codes in their stores because customers dominate using the application [12].

However, to increase mass adoption, Indonesia faces several challenges. A more common problem that Indonesia and many other developing countries face in terms of adoption is the lack of infrastructure [13]. However, transaction security, cash-loving public behavior, financial inclusion, low penetration of digital payments or access to facilities, lack of digitalization knowledge, and socialization are specific issues facing Indonesia that hinder merchant adoption in accepting digital payments [14]. Despite the lack of infrastructure and issues in Indonesia, the goal of this study is to understand retailers' perspectives on QR code payments and retailers' readiness for an integrated cashless ecosystem across the country.

The proposed model is designed with Indonesia's problems in mind. This study will focus on micro, small, and medium retailers as the majority of QRIS adopters and will examine whether retailers in Indonesia show a positive attitude towards the adoption of QRIS as a QR code payment service. As a result, understanding merchants' attitudes towards QR code payment services can help the Indonesian government and Indonesian startups in increasing the adoption of digital merchants, reaching the digital ecosystem in the country, and preparing for cross-border digital payments by 2025. A literature review, data analysis, findings and implications, and conclusions are included in the following sections.

1.2. Problem Limitation

QRIS is a standardization of payments using Bank Indonesia's QR Code method, making the transaction process with QR Code easier, faster, and safer. This research focuses on the use of QRIS in developing countries. The population in this study consists of MSMEs in Jakarta.

2. Literature Review

2.1. Review of Research Results

2.1.1. Mobile Usefulness

Mobile usability refers to the extent to which technology can generate significant value in improving individual performance in transacting [15]. Essentially, people will use certain technologies if they perceive benefits such as speed, safety, and comfort. In particular, the technology examined in this study is the use of QR codes in mobile payments. Before consumers adopt a technology (in this case, QR codes), they will assess the perceived usability of other payment systems [16], for example, by comparing cash payments with QR codes. The results of this evaluation can manifest as consumer attitudes. In line with this, Davis [17] stated that the main antecedents that affect attitudes in adapting to technology. Several previous studies have revealed that mobile usability influences consumer intentions and attitudes toward adapting to the use of technology [18-20]. Based on this description, the first and third hypotheses are proposed as follows; this research is measured using several indicators [21], namely Helps with Daily Life and Flexibility.

2.1.2. Perceived Ease of Use

The variable of perception of ease of use means how a person believes that there is no need to spend a lot of effort in using a system Amora and Fearnley [22]. The perceived ease of use is also interpreted as a benchmark, where users believe the technology is easy to use and understand [23]. From the definition above, it can be understood that the perception of ease of use describes a person's view when a system technology is used, considering the efficiency of time, cost, effort, and so on when using it. This view will determine whether someone will use the new system/technology. Some of the indicators such as in the research of Davis [17]; Olatokun and Olalekan [24]; Susanto and Aljoza [25] and Madi, et al. [26] are: the system is easy to understand and access, does not require much effort in using the system, the system is very flexible, the system is easy to learn, the system is easy to work with and the overall system is easy to use. Indicators of Perceived Ease of Use:

1. QRIS system is easy to use
2. The QRIS system is easy to learn
3. The QRIS system is easy to use on Outlets that have collaborated

Perceived Ease of Use Indicators:

1. Easy to Learn
2. Easy to operate (Understandable)
3. Flexible,
4. Controllable,
5. Ease of Use.

2.1.3. Attitude Toward Using

Attitude towards use is a form of negative or positive feelings for a person to perform a behavior Davis [17]. Indarsin and Ali [27] stated that the attitude of using is a form of a person's willingness to adopt the presence of technology before making it a habit/routine.

When looking at something, attitude is born from a person's thoughts and beliefs, which can lead to acceptance or rejection. Attitude is the first foundation for a person to act according to existing beliefs and considerations. The indicators in the measurement of this variable according to Davis [28] and Yahyapour [29] are: the use of the system is a good idea, the use of the system is something fun, the use of the system is a wise one. The decision and use of the system is something positive. Schiffman and Kanuk [30] in Chowdhury and Salam [31] describe an attitude model consisting of three indicators, namely:

1. Cognitive Component,
2. Affective component,
3. Conative Components.

2.1.4. Behavioral Intention to Use

Behavioral intention is the level of use of computer technology in a person that can be predicted from the attitude and attention of the technology user [32]. Behavioral intention also depends on the products and services used; if the products and services can provide benefits, then users will definitely show satisfactory behavior in using these products and services, which can arouse the user's interest and intention to always use these products and services [33]. Behavior is a person's specific actions towards a particular object. The intention to use is a person's attitude in using a certain product in the future [34].

Behavioral intention to use describes a person's interest or intention to do something. Behavioral intention to use is a construct that is said to be a relatively accurate determinant of the current use of technology or system and the use of the system again in the future [35]. When someone is already interested in using technology, then it is very possible or even sure that someone will use it. To measure the intention of using behavior, there are several indicators based on what has been

done by Aprilia, et al. [36]; Dingel, et al. [37]; Venkatesh and Davis [38] and Yahyapour [29] are: intending to use the system, estimating the use of the system, planning to recommend other users to intend to use it, and predicting to use the system in the future. According to Ferdinand [39] interest can be identified through indicators, namely:

1. Transactional Interest,
2. Preferential Interest,
3. Referential Interest.

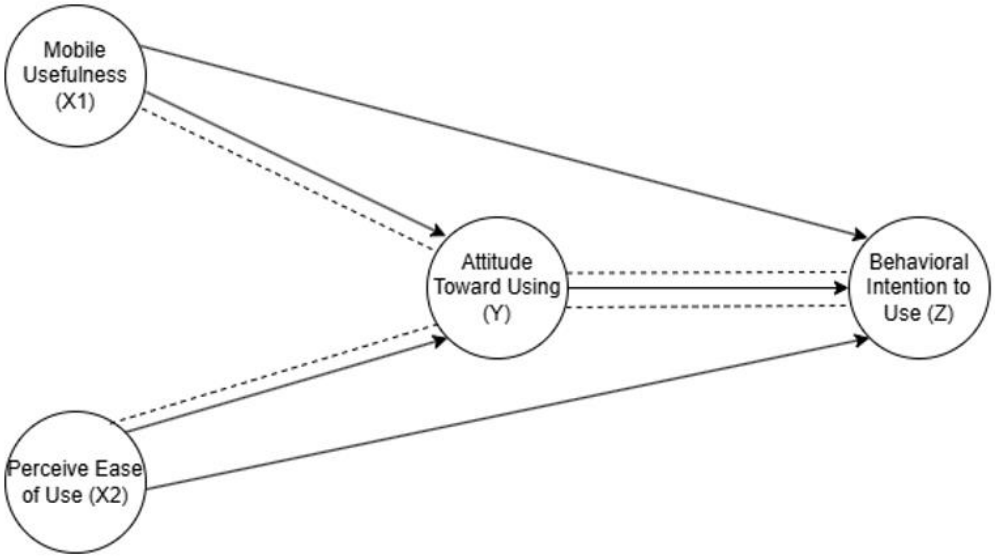

Figure 1.
Research Hypothesis Framework.

2.15. Research Hypothesis

This study tests the impact of various factors on behavioral intention and technology use in the metaverse, based on the UTAUT model. The proposed hypotheses aim to assess these relationships and their effects on technology use:

H1: Mobile Usefulness has a significant influence on Attitude Toward Using QRIS in developing countries

H2: Perceived Ease of Use has a significant influence on Attitude Toward Using QRIS in developing countries.

H3: Mobile Usefulness has a significant influence on Behavioral Intention to Use on QRIS in developing countries.

H4: Perceived Ease of Use has a significant influence on Behavioral Intention to Use on QRIS in developing countries

H5: Mobile Usefulness on Behavioral Intention to Use has a significant influence through Attitude Toward Using on QRIS in developing countries

H6: Perceived Ease of Use on Behavioral Intention to Use has a significant influence through Attitude Toward Using on QRIS in developing countries

3. Research Methods

Research methods were carried out to test this study using the Partial Least Squares (PLS) method. Previous research that has similarities with this study in the number of variables and the presence of intervening variables is one of the basic references for the researcher to choose to use the PLS method. The model used in this study is causal modeling, which examines relationships and influences, also known as path analysis. To test the hypothesis proposed in this study, the model fit analysis technique used is SEM (Structural Equation Modeling), which is operated using the SMARTPLS 4.0 program.

This research was carried out through three stages, namely an in-depth literature study related to theories and previous research in accordance with this research. Furthermore, from the literature study, the formulation of a theoretical framework and hypothesis was made. In the final stage, to obtain data, a survey was conducted by distributing questionnaires to respondents. The data from the questionnaire results were then analyzed using the PLS-SEM method.

SEM is a statistical modeling technique that is very cross-sectional, linear, and general. SEM has evolved and has a function similar to multiple regression, but it seems that SEM is a more powerful analytical technique because it considers interaction modeling and non-linearity. It accounts for correlated independent variables (correlated error terms), multiple latent independents where each is measured using multiple indicators, and one or two latent dependent variables that are also measured by several indicators [40].

3.1. Place and Time of Research

3.1.1. Research Venue

This research will be carried out at the Faculty of Economics and Business, State University of Jakarta.

3.1.2. Research Time

This research will be carried out for nine months (from the preparation stage to the research report), namely from March to December 2024.

3.2. Population and Sample

3.2.1. Population

Population is a generalization area consisting of objects/subjects that have certain qualities and characteristics that are determined by the researcher to be studied and then drawn conclusions. The population in this study is MSMEs in Jakarta.

3.2.2. Sample

The sample is part of the number and characteristics possessed by the population. In this study, sampling was carried out using the purposive sampling technique. This technique is conducted by selecting subjects not based on strata, random selection, or region, but based on certain objectives [41]. Purposive sampling is a technique for determining samples with specific considerations. This means that each subject taken from the population is deliberately selected based on certain goals and considerations. The sample used in this study focuses on MSMEs in East Jakarta. The technique for determining the number of samples in this study uses the Slovin formula. The researcher uses the Slovin formula because, in drawing samples, the number must be representative so that the research results can be generalized, and the calculation does not require a table of sample numbers but can be done with simple formulas and calculations.

4. Results and Discussion

The results of the discussion will be presented in the form of an existing PLS which will then be formed in modeling which will later have the output of the existing fit model and an example is made as follows:

4.1. Average Variance Extracted (AVE) dan Composite Reliability

Next, the reliability value can be measured through the Average Variance Extracted (AVE) and Composite Reliability values. The AVE value will show the variance value obtained by each variable. The AVE value test criterion is 0.5; however, the higher the AVE value, the better it will be and it will show a stronger diversity of indicators. Meanwhile, the Composite Reliability value test is > 0.7. The higher the Composite Reliability value, the greater the reliability value of a variable.

Table 1.
Average Variance Extracted (AVE) dan Composite Reliability.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Attitude Toward Using(Y)	0.954	0.956	0.96	0.767
Behavioral Intention To Use (Z)	0.972	0.973	0.974	0.777
Mobile_Usefulness(X1)	0.97	0.97	0.973	0.718
Perceived Ease of Use(X2)_	0.952	0.953	0.958	0.756

Next, it can be seen in Table 1 that the Composite *Reliability* Attitude Toward Using (Y) value is 0.96, Behavioral Intention To Use (Z) is 0.974, Mobile_Usefulness (X1) is 0.973, Perceived Ease of Use (X2)_is 0.958. The *Average Variance Extracted* (AVE) value for the variable Attitude Toward Using (Y) is 0.667, Behavioral Intention to Use (Z) is 0.677, Mobile_Usefulness (X1) is 0.718, Perceived Ease of Use (X2) is 0.656. All variables have an AVE value of > 0.5 and a *Composite Reliability* value of > 0.7, so it can be concluded that all variables of this study are declared reliable.

4.2. Hypothesis Testing

After conducting the outer model and inner model analysis tests, the next step is to analyze the measurement results of structural relationships or relationships between constructs (hypothesis test). In hypothesis testing, it can be seen from the t-statistical value and probability value. For hypothesis testing, namely by using statistical values, for alpha 5% the t-statistical value used is 1.96. So that the criteria for accepting or rejecting the hypothesis Ha is accepted and H0 is rejected because the t-statistic > 1.96. To reject or accept the hypothesis using probability, Ha is accepted if the p value < 0.05 [40].

Table 2.
Path Coefficient.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values	Status
Attitude Toward Using(Y) -> Behavioral Intention To Use (Z)	0.022	0.023	0.033	2.153	0.02	Accepted
Mobile_Usefulness(X1) -> Attitude Toward Using(Y)	0.04	0.04	0.011	3.597	0	Accepted
Mobile_Usefulness(X1) -> Behavioral Intention To Use (Z)	0.971	0.971	0.004	261.198	0	Accepted
Perceived Ease of Use(X2) -> Attitude Toward Using(Y)	0.933	0.933	0.006	160.306	0	Accepted
Perceived Ease of Use(X2)_-> Behavioral Intention To Use (Z)	-0.045	-0.05	0.032	1.428	0.154	Rejected

- *Hypothesis 1 Attitude Toward Using (Y) and Behavioral Intention to Use (Z)*

The hypothesis aims to test the influence between Attitude Toward Using (Y) and Behavioral Intention To Use (Z). Based on the results of the Path Coefficient calculation in Table 2, it can be seen that the Original Sample value is 0.023, t-statistic is 0.668 > 1.96 and the P Values are 0.504 > 0.05. Thus, it can be concluded that the variable Attitude toward using has no effect positively and significantly on Behavioral intention to use (Z) [42].

- *Hypothesis 2 Mobile_Usefulness (X1) and Attitude Toward Using(Y)*

The hypothesis aims to test the influence between mobile usefulness (X1) and Attitude Toward using (Y). Based on the results of the Path Coefficient calculation in Table 2, it can be seen that the Original Sample value is 0.04, t-statistic is 0..3597 > 1.96 and the P Values value is 0 > 0.05. Thus, it can be concluded that the variable Mobile usefulness (X1) has a positive and significant effect on Attitude Toward Using (Y) [43].

- *Hypothesis 3 Mobile_Usefulness (X1) and Behavioral Intention to Use (Z)*

The hypothesis aims to test the influence between mobile usefulness (X1) on Behavioral intention to use (Z)Based on the results of the Path Coefficient calculation in table 2, it can be seen that the Original Sample value is 0.971, the t-statistic is 261.1987 > 1.96 and the P Values value is 0 > 0.05. Thus, it can be concluded that the Mobile usefulness variable has a positive and significant effect on Attitude Toward Using (Y) [43-45].

- *Hypothesis 4 Perceived Ease of Use (X2) and Attitude Toward Using(Y)*

The hypothesis aims to test the influence between Perceived ease of use (X2) on Attitude Toward Using (Y) Based on the results of the Attitude Toward Using (Y) Path Coefficient calculation in table 2, it can be seen that the Original Sample value is 0.9331, t-statistic is 160.306 > 1.96 and the P Values are 0 > 0.05. Thus, it can be concluded that the variable perceived ease of use has a positive and significant effect on Attitude Toward Using (Y) [42, 46, 47].

- *Hypothesis 5 Perceived Ease of Use (X2) and Behavioral Intention To Use (Z)*

The hypothesis aims to test the influence of Perceived Ease of Use on Behavioral Intention to Use (Z). Based on the results of the Path Coefficient calculation in Table 2, it can be seen that the Original Sample value is 0.023, the t-statistic is 0.668 > 1.96, and the P Values are 0.504 > 0.05. Thus, it can be concluded that the variable Perceived Ease of Use (X2) has no positive and significant effect on Behavioral Intention to Use (Z) [48-50].

Table 3.
Indirect Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values	Status
Mobile_Usefulness(X1) -> Attitude Toward Using(Y) -> Behavioral Intention To Use (Z)	0.001	0.001	0.001	0.656	0.512	Rejected
Perceived Ease of Use(X2)_ -> Attitude Toward Using(Y) -> Behavioral Intention To Use (Z)	0.021	0.021	0.031	1.658	0.1	Accepted

- *Hypothesis 6 Mobile_Usefulness (X1) using Attitude Toward Using(Y) and Behavioral Intention to Use (Z)*

The hypothesis aims to test the influence between mobile usefulness (X1) through Attitude toward using (Y) on Behavioral intention to use (Z). Based on the results of the Path Coefficient calculation in Table 2, it can be seen that the Original Sample value is 0.001, t-statistic is 0.656 < 1.96 and P Values are 0.512 > 0.05. Thus, it can be concluded that the variable Mobile usefulness has no effect positively and significantly through Attitude Toward Using (Y) on behavior intention to use (Z) [43, 51, 52].

- *Hypothesis 7 Perceived Ease of Use(X2) using Attitude Toward Using(Y) and Behavioral Intention to Use (Z)*

The hypothesis aims to test the influence between Perceived ease of use (X2) on Attitude Toward Using (Y) Based on the results of the Attitude Toward Using (Y) Path Coefficient calculation in table 2, it can be seen that the Original Sample value is 0.9331, t-statistic is 160.306 > 1.96 and the P Values are 0 > 0.05. Thus, it can be concluded that the variable perceived ease of use through to use (Z) Attitude Toward Using (Y) has no effect on positive and insignificant effects on behavior intention to use (Z) [53-55].

5. Conclusions, Implications, and Suggestions

Based on the research conducted on the implementation of the QRIS-based digital payment system among MSMEs in Jakarta, several key findings were obtained. First, Mobile Usefulness has a positive and significant impact on both Attitude Toward Using and Behavioral Intention to Use QRIS. This indicates that the more beneficial users perceive mobile technology in transactions, the more likely they are to accept and adopt QRIS. Second, Perceived Ease of Use significantly

affects Attitude Toward Using but does not directly influence Behavioral Intention to Use. This suggests that while QRIS is considered easy to use, ease of use alone is not enough to drive users' intention to adopt it.

Despite its benefits, QRIS adoption still faces several challenges, including infrastructure limitations, particularly in areas with limited internet access; low digital literacy, which makes some MSMEs hesitant to use digital payment systems; and the public's preference for cash, which remains dominant in small business transactions. To enhance QRIS adoption, this study provides several strategic recommendations. The government and fintech startups should accelerate education and awareness campaigns regarding the benefits of QRIS for MSMEs. Additionally, efforts should be made to increase digital inclusion through training programs and financial literacy initiatives. Furthermore, preparations for a cross-border digital payment ecosystem should be strengthened, in line with ASEAN's goal to integrate digital payment systems by 2025.

Overall, this study provides valuable insights into the factors influencing MSMEs' adoption of QRIS and offers strategic directions to improve the acceptance of digital payment systems, supporting Indonesia's transition toward a more inclusive digital economy.

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