

Research Article

Satisfaction Level Analysis QRIS Users Based on Experience and Perception Twitter Users/X Using Naive Baiyes

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Abstract: QRIS (Quick Response Code Indonesian Standard) has become a widely used national digital payment standard. User satisfaction with this service needs to be monitored continuously to ensure its sustainability. This study aims to predict the level of QRIS user satisfaction based on their experiences and perceptions expressed organically on the Twitter social media platform. The method used is sentiment analysis with the Naive Bayes classification algorithm implemented using RapidMiner software. The research data was obtained from Twitter user comments collected through web scraping techniques. The text data then went through a preprocessing stage that included cleansing, stopword filtering, stemming, and tokenizing to be prepared as features ready to be processed by the model. The data was divided into training (80%) and testing (20%) subsets for model training and validation. The results showed that the Naive Bayes model was able to predict user satisfaction sentiment with an accuracy of 80.99%. These findings indicate that the model is highly accurate in identifying satisfied comments and sufficiently sensitive in detecting dissatisfaction. This study concludes that sentiment analysis of Twitter UGC data using Naive Bayes is an effective and efficient approach for predicting QRIS user satisfaction in real time. The practical implication of this study is to provide an automatic feedback system for service providers to monitor public sentiment and take targeted corrective actions.

Keywords: Naive Bayes; QRIS; Sentiment Analysis; Twitter; User Satisfaction.

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1. Introduction

Development Indonesia's digital economy has push transaction non-cash become A inevitability. In context This time, the Quick Response Code Indonesian Standard (QRIS) is here as a monumental breakthrough standardized by Bank Indonesia and the Association System Indonesian Payments (ASPI). QRIS works as unifier various system previous QR code payments fragmented, so that create a more ecosystem efficient and interoperable for merchants and consumers. However, success something technology payment No only measured from aspect adoption, but also from level satisfaction users. Satisfaction users is indicator critical decisive sustainability and loyalty in term long.

Social media, in this digital era, has become a very powerful channel for users for convey experience, perception, and opinion they in a way spontaneous and not filtered. Comments spread across platforms like Twitter represent rich, real-time data source regarding sentiment public. Unfortunately, the massive and unmanageable volume of data structured This present

challenge significant analysis. If done manually, namely eat time, vulnerable to subjectivity, and not scalable.

Therefore that, is necessary a more approach sophisticated and automatic. For extract meaningful insight. Field data science, especially text mining and machine learning, offers solution. For chaotic textual data transformation become structured and accessible information followed up. Based on background behind said, research. This aim. For utilise strength algorithm teotrr in predict level satisfaction QRIS users in general objective and comprehensive based on the digital footprint they leave leave it on social media.

Study. This expected can give contributions that will be enrich existing literature with serve proof empirical and quantitative about User Experience (UX) dynamics and perception in context adoption system digital payments. With focuses on QRIS (Quick Response Code Indonesian Standard) as A standard national, research. This fill in gap academics who are still there is, remember majority studies previously more Lots focused on certain e-wallet or mobile banking applications in a way separated.

Studies. This play a role in enrich and develop the acceptance model technology (Technology Acceptance Model - TAM) with introduce a more approach dynamic and real-time. Contribution methodological is also offered through demonstration comprehensive utilization, development of predictive models use Naïve Bayes algorithm, in particular with handle complexity linguistics Informal language, slang, and typical mixes found in Twitter comments, up to evaluation model performance.

As for the element of novelty or novelty from study. This No only located on the object his specific study, namely QRIS, but also on the approach its holistic variables with integrate aspect experience real users and their perceptions with utilizing User-Generated Content (UGC) from the Twitter platform. Different with majority study satisfaction users who are still depend on the questionnaire vulnerable structured against bias and have limited reach, UGC provides organic, spontaneous, and authentic sound that is immediate reflect opinions and feelings users without intervention researcher.

Approach. This give a richer perspective than with a model that only depend on variables reception technology traditional. Novelty also appears from implementation frequentist Naïve Bayes algorithm used in analysis sentiment text, which is in study. This applied in a way innovative for analyzing survey data quantitative use predict level satisfaction and mapping results analysis sentiment the to in something level more satisfaction structured and able measured, so that produce far- reaching insights more actionable for taker policy.

2. Literature Review

System Payment

In a way terminology system payment consists of on two words, namely " system " and " payment ". The word " system " according to Dictionary General Indonesian is a group working parts together for do something meaning. System Can We interpret as something order or arrangement in the form of structure consisting of from parts or related components One with other in a way orderly and planned for reach the same goal. While the word " payment " is interpreted as displacement mark between two split party. The party in question is party seller and party buyers. So that in every activity economy when happen transfer goods and services Certain will involving what is called with the payment process.

In system payment there is sources of funds for payment used for fulfillment obligation of one party in do activity economy entered to in something account used as payment. Components from sources of funds according to Article 4 of the Bank Indonesia Regulation concerning System Payment is , system payment consists of on mechanisms, infrastructure, institutions, and sources of funding and access to source of funds (Jonardi et al., 2025) .

Whereas system payment is something the system that does arrangement contract, facilities operation and mechanism techniques used For delivery, approval, and acceptance of instructions payments, as well as fulfillment obligation collected payments through exchange of " value " between individuals, banks and institutions other Good domestic and between countries (cross border).

System payment become component in every activity transaction trading goods and services. A economy No will there is trading if No there is payment. With development technology as well as the more size mark transaction as well as risk, system safe and smooth payments the more important. System payment besides required for facilitate transfer of

funds efficient, safe and fast are also very necessary in the compliant world of capital markets provisions, security in settlement every the transaction.

Success system payment can support development system finance and banking whereas risk irregularities or failure system payment will give less impact good on stability payment need regulated and maintained security as well as its smoothness by a institutions that usually carried out by the central bank.

Development System Payment

Formerly public use barter system between goods or service For get the desired item. However, as time goes by developments over time and development technology and information that is so rapid, society start replace tool payment with something more efficient, fast, comfortable, easy and safe.

Development the role of money as tool burning Keep going experience change form, namely in form tool payment check or giro transactions via fund transfer from balance account. With the more progress technology with existence influence public in practical transactions, so in several countries it has starting to develop product payment known electronics with as Electronic Money (emoney) (Kamilah et al., 2024) .

System payment has develop accompanied by with change during a number of century, in line with change essence or the nature and use of money as tool payment. In ancient times coin metal is the first type of money to be circulated wide in various group public as tool payment . The role of coins in its development as tool payment equipped with the presence of paper money considered more comfortable and more Lots make things easier in the transaction process Because more light with cost more creation low (Kamilah et al., 2024) .

Type System Payment

Outline system payment shared become two type: namely system payment cash and system non- cash payments . Difference fundamental lies in the instruments used. The system payment cash using paper money (paper money and coins) as tool payment. While system non- cash payments use method payment with use cards (APMK), checks , promissory notes, giro, debit notes, and electronic money (card -based and server- based) (Yolanda, 2024) .

System payment cash is type common payments carried out by the Indonesian people with using paper money good paper money and coins as tool payment. Cash This consists of from banknotes in denominations of Rp. 1,000, Rp. 2,000, Rp. 5,000, Rp. 10,000, Rp. 20,000, Rp. 50,000, and Rp. 100,000. While for coins consists of from Rp . 100, Rp. 200, Rp. 500, and Rp. 1000 denominations. This in its circulation used For make things easier in transactions. Bank Indonesia is the only authorized bank and institution in issuing and circulating the rupiah currency (NI Putri et al., 2022) .

a. Payment Cash

Payment method cash can done with using money, either types of coins or paper money . In circulation, money is available in various type fractions to make it easier For transacting in Rupiah currency. In policy the most important cash circulation is How fulfil the need for money in society in sufficient nominal amount , type appropriate fractions , exact time , and in decent conditions distributed (Priambodo & Prabawani, 2016) .

Therefore that , cash used in transact must own a number of characteristics important among them (Silaen et al., 2021) :

- 1) Every money spent intended For make things easier smoothness transaction payment cash, can accepted and trusted by society. Regarding with matter said, money is needed own a number of characteristics :
 - a) Easy easy to use and comfortable
 - b) Durable
 - c) Easy recognized
 - d) Difficult falsified
- 2) Cash amount must available in a way enough in society, with notice suitability type the fraction . For this, is required good planning especially in planning procurement and planning its distribution.
- 3) Need attempted availability institutional supporters For realize creation smoothness decent cash flow circulate, good regionally and national .

b. System Non- Cash Payment (Cashless)

System cashless payments basically is system payments made without using the available cash, but use instruments involving service banking in its use. Previously, the tool non- cash payments only limited to paper - based instruments, for example check, bill demand deposits , debit notes , and credit notes . And formed card-based for example ATM card, card debit

and card credit. Payment instrument or non-cash instruments is system payment without using cash that starts introduced in transaction retail in the 1990s (Paramitha & Kusumaningtyas, 2023).

Non-cash transactions is embodiment from system tool payment use cards served by the system banking. The world of banking in a way No direct create innovation technology new in system payment. Attendance system payment new expected can give convenience in transact. This is seen from many facility system non-cash transactions issued by banks and institutions non-bank (Srikaningsih, 2020).

Non-cash payments involving institution intermediary so that the funds can move from party sender to party recipient. If both customers the using the same bank then the process of transferring funds is easier easy, but on the contrary If second customers different banks then needed something other known institutions with institution clearing For success transaction between the banks (Kamilah et al., 2024).

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This matter seen from many facility system non-cash transactions issued by banks and institutions non-bank (Andhika & Ariani, 2025).

Development system payment This supported with existence tool payment with use card (APMK). Which includes in APMK is activities in the payment process use card such as ATM cards, debit cards and credit cards credit. Transaction payment with using the APMK instrument when This is account based, so that settlement transaction carried out at the Bank level with the method chosen by each bank according to the scale operational the network (Seputri et al., 2022).

Non-cash payment instruments can classified become two group, namely tool payment for credit transfer and tools payment for debit transfer. Difference between credit transfer and debit transfer lies in the command money transfer. Based on terminology created by the Bank for International Settlement (BIS), credit transfer is order payment For objective placement of funds from sender to recipient through fund transfer path from sending bank to the recipient bank and it is possible through another bank as intermediary (Seputri et al., 2022).

While debit transfer is fund transfer system where transfer order created or authorized by the party that has the funds and will do the transfer of funds to party other. The transfer order delivered to the party that will receive funds for Then disbursed. Furthermore, the Bank clearing the debit transfer order at the institution clearing, for charge funds to the sending bank (Martinelli et al., 2023).

One of system non-cash payments is QRIS. QRIS is system digital payments that make it easy transaction with use QR code. This including in category tool payment non-cash based electronics, and supports various method payment, okay from e-wallet or application banking. With QRIS, users can do transaction with fast and practical without need cash, make it increasing choices popular among public (Aryowiloto, 2024).

Digital Payments

Digital Payment or also known as digital payments are type payments using electronic media like SMS, internet banking, mobile banking, wallet Electronics, digital payments are one of the service finance the most retail used daily. Service This increase experience for customers who are looking for efficient payments in speed, convenience, and multi-channel accessibility (Suyatna, 2024).

Digital payments are payment based technology. Inside digital payments money is stored, processed, and received in form digital information and its transfer process are initialized through tool payment electronic payment in a way traditional done via cash, check, or card credit while digital is done using certain software, cards payments, and electronic money. Components main from system digital payments include: applications money transfer, infrastructure network, governing rules and procedures utility from system the (MT Putri et al., 2023).

Digital payments provide improvement payment efficient in a way drastic with reduce cost transactions. They can also increase comfort from digital payments with allow transactions the done in a way fast and safe from various connected devices to network global. In do transaction payment with using digital payment is available a number of profits earned as following (NI Putri et al., 2022):

- a. Transaction more easy and practical
- b. Transaction more safe
- c. Comfort in transact
- d. Speed transaction
- e. Can be used For various service

In Indonesia, there are a number of type digital payments that can We meet . Below This is various type digital payments in Indonesia. There are several type system payment among others (Andhika & Ariani, 2025) :

- a. Electronic Money (E-Money) Electronic Money (E-Money) also called Electronic Cash, Electronic Currency, Digital Money, Digital Cash, or Digital Currency is something method payment installments that use device hard as media and save cash value in electronic media .
- b. Credit Card credit is something something instruments provided by the institution finances that can used as something method payment installments For exchange service or goods , the installments of which can done by the buyer without delay temporary or partly in the term time certain . With have card credit , someone can get services and products on site place special that makes it easier company card credit without using cash .
- c. QR Code Payment QR Code Payment is system payments using barcodes or QR (Quick Response) code that is scanned every do transaction payment . QR code when This become method popular payment because Enough with scan the QR code owned by the merchant (trader) with use smartphone camera , then transaction payment has done without withdraw cash or card that must be swiped to machine Electronic Data Capture (EDC). QR codes are one of them . choice in do payment Because considered more practical , fast , and efficient .

As for the service digital payments in the form of e-wallets or Popular digital wallets in Indonesia are OVO, GoPay , Dana, LinkAja , and ShopeePay . from liputan6.com GoPay stated as the most digital wallet used in Indonesia as much as 81% position second OVO as much as 71%, position third ShopeePay as much as 44% then Funds as much as 41%.

Digital payments provide improvement payment efficient in a way drastic with reduce cost transactions. They can also increase comfort from digital payments with allow transactions the done in a way fast and safe from various connected devices to global network (Ramadhan & Ernaya, 2023) .

Quick Response Code Indonesia Standard (QRIS)

QRIS (Quick Response Code Indonesia Standard) is combination various QR code developed by Bank Indonesia and the Association System Useful Indonesian Payments (SPI) as tool payment using QR Code. QRIS is form step beginning from digital transformation system Indonesian Payments (SPI) which can trusted build support acceleration development economy as well as digital finance in Indonesia (Seputri et al., 2022) .

Quick Response Code Indonesian Standard or normal abbreviated as QRIS (read as KRIS) is unification various QR code types various System Service Provider Payment (PJSP) using QR Code. QRIS was developed by the industry system payment together with Bank Indonesia so that the transaction process with QR Code can more easy, fast, and secure security . All System Service Provider Payments to be made using QR Code Payment must implementing QRIS (Rs et al., 2024) .

This Quick Response Code is code matrix that has form or picture two dimensions which have pattern or a composition consisting of from three side that is side right top , left top and left below , and letters black patterned squares , pixels , and points that can be save data in the form of letters , symbols , and numbers (Kamilah et al., 2024) .

According to Bank Indonesia, the Quick Response Code Indonesian Standard (QRIS) is method more non - cash payments efficient with use One QR code. QRIS is combination various QR code from various System Service Provider Payment System (PJSP) developed by Bank Indonesia (BI) (Wardani & Sari, 2023) . The purpose from development This is For create transaction processes more easy , fast , and secure its security . Along with with many processed digital payments through QR code , Bank Indonesia (BI) as institution finance present innovation new in the form of a QR code that can called with the Quick Response Code Indonesian Standard (QRIS) (Rs et al., 2024) .

QRIS (Quick Response Indonesian Standard) is standard National QR code for facilitate payment QR code in Indonesia launched by Bank Indonesia which works The same with Association System Indonesian Payments (ASPI) on August 17 , 2019 and has official

activated since January 1, 2020 with carry theme The spirit of SUPERIOR, namely Universal, Easy, Profitable and Direct (Rs et al., 2024).

In launching, Governor of Bank Indonesia Parry Warjiyo convey that QRIS carries theme the spirit of UNGGUL (Universal, Easy, Profitable and Direct), which is abbreviation from (Rs et al., 2024):

- a. Universal QRIS can accept all type payments using QR code, so that users No need own various type application payment.
- b. Easy System payment This easy to use, just scan, click, then pay. On the other hand, the system payment this is also easy used by merchants because No need add Lots QR code, enough one QRIS that can scanned with application QR payment.
- c. Profit Transaction with QRIS profitable buyers and sellers Because transaction done in a way efficient through One QR code that can used in all application payments on mobile phones.
- d. Direct Payment with QRIS directly quick processed. Users and sellers accept notification transaction in a way direct

Users just scan the QR Code on QRIS which is available at various merchants that provide it QR transactions. Merchants who work The same with LinkAja, Gopay, OVO, DANA, Bukalapak, and so on. Enough use one integrated QR Code (Aiman et al., 2022). So that whatever application QR payments used consumers, transactions can done.

In rule implementation of QRIS, the nominal transaction limit that can be done maximum of Rp. 2,000,000 per transaction. However, the publisher (PJSP) can set cumulative nominal limit daily or monthly on QRIS transactions carried out by each QRIS user. Determination cumulative nominal limit That with condition publishers have their own considerations management good risk (Rs et al., 2024).

Implementation of QRIS itself is one of the embodiment vision System Indonesia Payment System (SPI) 2025. With the existence of QRIS, it is hoped that transaction payment Can more efficient or easy, inclusion finance in Indonesia more fast, and traders can also more forward and in the end Can push growth economy (Sahir, 2022). The emergence of QRIS in Indonesia has become trend new to the system payment for Lots perpetrator businesses and consumers, so that make things easier they in do transaction safe and fast electronics. The goal from the presence of QRIS is For maximize use existing and clear QR code that is use of QRIS (Kamilah et al., 2024).

QRIS aims nothing else so that digital payments become more easy for society and can supervised by regulators from One doors. There are four aspect QRIS components that are regulated in standardization published by Bank Indonesia, including (Kamilah et al., 2024):

- a. Interoperability refers to the ability QRIS system for Work in a way effective and mutual connected between various provider service payment.
- b. Interconnectivity refers to the ability system For each other connected between One system payment with system other payments that exist in Indonesia. This allows more transactions fast and efficient, because various different payment platforms can each other communicate One each other.
- c. Security is very important aspect in system digital payments, and QRIS has strict standards For ensure transaction still safe. Aspect security This covers protection of personal data and information transaction users, as well as prevent occurrence fraud or access illegal to account or payment data.
- d. Inclusion in QRIS context means that system payment This designed For can accessible to all layer society, without except.

Objective from inclusion is For ensure that everyone, including those who may previously No own access to service banking or digital payments, can utilizing QRIS (Arinal, 2023).

QRIS is compiled with use standard international EMV Co. Standard This arranged adopted For supports greater interconnection and is open source as well accommodate need country specific so that make it easier interoperability between organizers, between instruments, including between countries. When this format has also been used in various countries such as India, Thailand, Singapore, Malaysia, Thailand, South Korea, and others (Nugroho & Kusumasari, 2025).

QRIS Usage Model

QRIS accommodates 2 (two) models of QR Code Payment usage, namely (Kamilah et al., 2024):

- a) Merchant Presented Mode (MPM) Static The easiest, merchants just need to display one QRIS sticker or print-out is free. Users only perform a scan, enter the nominal amount, enter the PIN and click pay. Notification transaction directly accepted users or merchant. STATIC QRIS mpm is very suitable for business micro and small.

MPM stasis is a QR Code payment that was launched before existence transactions that are initiated and can scanned in a way repetitive use accommodate variety transaction different payments. Static payment QR Codes contain related data identity QRIS users and information of the total value transactions.

While the Dynamic QR Merchant Presented Mode (MPM) is issued through a device such as EDC machine or smartphone and it's free. Merchants must enter the payment amount moreover first, then customer scan the displayed QRIS or printed. Dynamic QRIS MPM is very suitable for merchant scale business medium and large or with transaction volume tall.

dynamic MPM namely the QR Code payment that was launched after existence transactions that will be initiated, then scanned use accommodate One transactions that have been determined. Dynamic QR Code This own equality with static QR Code, namely You're welcome display information related identity QRIS users and related to total value from overall transactions.

Characteristics:

- 1) In a way settlement, transaction done by push payment, where the transaction triggered by the transfer from account customers at the publisher.
 - 2) Need standard for QR.
 - 3) Static MPM does not need investment big Because only in the form of stickers, while for dynamic MPM requires investment edc.
 - 4) Static MPM according For business small and micro, while MPM Dynamic For business medium and large.
- b) Customer Presented Mode (CPM) Enough shows the QRIS displayed from application payment customer for scanned by the merchant. QRIS CPM is higher shown for merchants who need speed transaction tall like provider transportation, parking and modern retail.

CPM is mechanism where to use QRIS customer must show the QR Code to the merchant to use do scanning on a QR Code barcode. This CPM method Can used by all customers. Customers Can determine application which payments are available on mobile or If Not yet own application payment, customer moreover formerly download the application payment. Then customer ensure that balance in the application payment in accordance with nominal for transacting. Characteristics:

- 1) Transaction done by pull payment, where the merchant, through the acquirer, charges payment to account customers.
- 2) Need standard for QR, scanner, and POS applications.
- 3) Need investment for scanners, POS applications, and more education comprehensive to the merchant.
- 4) CPM according to For business medium and large, complement existing non-cash payment models.
- 5) Alternative payment transportation Because can used without signal.

At the beginning implementation, QRIS more centralized to Implementation of QR Code Payment in the form of MPM (Merchant Present Mode) where the merchant will show a QR Code barcode to be scanned by the customer. moment do payment. Before beginning publication, has piloting (trial) was carried out on specification technical Quick Response Code standards and their interconnections.

Benefits of the Indonesian Standard Quick Response Code (QRIS)

The presence of QRIS brings Lots benefits and advantages for business people. With register QRIS, you can get Lots convenience that can be support business We become more progress and develop Rapid growth. Initially, QR codes were popular in Japan. This functioned as tracking vehicles in the section manufacturing, however in development, QR code now used for greater interests wide.

Perception perceived usefulness is how much Far somebody believe that use something system certain will increase performance his work , can explained that utilization something system technology information the if proven beneficial in his job . Some benefits of QRIS for businessmen who can We get .

- a. Fast and contemporary
- b. No no need to bother anymore carry cash
- c. No need Dizzy thinking about whose QR is installed
- d. Protected Because all PJSP QRIS payments have been made Certain own licensed and supervised by Bank Indonesia.
- e. Make it easier transactions .
- f. Provide more Lots alternative payment .
- g. Prevent circulation of counterfeit money .
- h. Make it easier registration marchant .
- i. Make it easier monitoring and analysis finance business .

The benefits of QRIS are interpreted as to what extent is belief somebody that the use of QRIS provides profit for they .

Security and Convenience Qris

According to convenience is existence trust from a that in use technology No need Lots business . Convenience in use something system information can felt when users or individual can feel convenience in utilise something system information said , well from factor its operations and its utilization .

According to users can understand and use technology without Lots difficulty . Use technology will give comfort and improve performance for its users compared to If No use technology . As stated by Davis, someone will use system technology information the If according to him easy in its use (Seputri et al., 2022) .

Based on the above understanding , can concluded that convenience is the level at which a person accept that use something system No considered difficult For understood and not need big business For use it . According to draft convenience , if something technology easy used , then use technology the more used .

According to indicator A technology can it is said own convenience that is (Seputri et al., 2022) :

- a. Easy skilled in use something technology information
- b. Technology very easy information studied
- c. Technology very easy information operationalized

The definition of QRIS is stated as belief somebody that QRIS is easy system used . According to indicator convenience among others (Seputri et al., 2022) :

- a) Easy easy to learn

QRIS was created No difficult For studied which means when somebody do transaction using QRIS, they will direct understand and comprehend the procedures payment in time short . So that No There is difficulty whatever in using QRIS next . QRIS is easy studied as well as make it easier for people in its use .

- b) Can controllable

Controllable means that every transactions using QRIS , can We control every the payment he made with enter appropriate nominal amount with transactions that must be paid.

- c) Flexible

Flexible is ability adapt and work in a way effective in various different situations and individuals / groups . Flexible use of QRIS make users can using QRIS where only and when just without bound time . With thus , in using QRIS can done on a place businesses /merchants that have registered with QRIS system .

- d) Easy easy to use

Easy to use can interpreted that QRIS is very easy used . User will can do transaction with more easy If technology used clear and easy used . QRIS is something service system unpaid payments difficult For used . QRIS is very easy operated and used Because users only need scan the code provided before can do payment .

- e) Clear and can clear and understandable

Clear and Understandable meaning in every stage transaction using QRIS not complicated and can understood with clear.

Whereas according to There is a number of indicator convenience use that is (Kamilah et al., 2024) :

- a. System easy understandable (understandable) Understand about system or method QRIS work is very important For support QRIS implementation in society especially for MSMEs .
- b. Use Practical (does not require a lot of mental effort) The purpose of using QRIS is For make it easier both the merchant and consumers . Which with the existence of QRIS transactions payment more practical Because only use one QR Code.
- c. System easy easy to use The QRIS system is very easy to use For used . If MSME actors want to use or open QRIS then moreover formerly do registration through one of the PJSPs, after finished registration and administration then the merchant will get API Key Integration in the form of a static QR Code or dynamic QR Code.
- d. System easy operated in accordance desire individual .

QRIS security is already guaranteed by Bank Indonesia itself Because supervised from One door . Bank Indonesia as a regulator in the field of system payment , push implementation and use of electronic money mainly For reduce the amount of money circulating in society . With using QRIS, regulators hope aspect protection consumer become easy things For implemented Because organization service system payment only provide One QR service for various type application digital payments (Yolanda, 2024) .

Perception security defined as threats that create state , condition , or potential events cause difficulty economy through data source or network that is experiencing damage , collection and modification of data, refusal services , and/ or fraud and abuse authority. According to Liu, the term system security in a way general refers to the steps proper and efficient security . Data and assets owned by consumer must protected through control security administration to theft , fraud , and hacking (Agustini & Syafrida, 2024) .

According to Kamilah et al. (2024) state that customer Certain will trust and use mobile payments because tight security . Generally system mobile payment security must be fulfil standard security transaction such as : accountability , which is defined as ability something party For show that somebody responsible answer on transaction such as authentication , confidentiality , integrity , authorization , availability , and non- detection (assurance) as well as ensure that users No can claim that transaction happen without to the best of my knowledge they . According to indicator security between other :

- a. Guarantee security Guarantee Security is A protection carried out to technology information used . Guarantee security provided by the bank in the form of protection Good from aspect security transaction payment like the existence of a PIN, or guarantee security other For avoid threat from parties who do not responsible answer.
- b. Data confidentiality Data confidentiality is something the type of data that shows that the data No can known or accessed by other parties who are not authorized For know it . Data confidentiality is guaranteed by the bank so that the data No spread to other parties who do not authorized .

Whereas According to Seputri et al. (2022) indicator security includes :

- a. Guarantee security Guarantee security play a role important in overcome concern consumer to misuse of personal data and easy data transactions damaged . When there is guarantee security , customers feel safe do transactions .
- b. Data confidentiality Data confidentiality is one of the factor important for data owner , therefore That confidentiality information buyer must guarded completely .
- c. Sales image Sales image is evaluation to activities and products offered something company .
- d. Quality product Quality product Can obtained from experience customer moment use product or service .

From several the above indicators , the author take conclusion For use indicators put forward by that indicator security includes : guarantee security , data confidentiality , image sales and quality product .

Security is ability or effort in do control For protect customer data from fraud and theft , related assets/data information personal need done encryption . When the user feel safe in use A services , they will tend committed For use it . Therefore that , can concluded that security is something ability control For prevent fraud even theft information of a nature confidential or privacy data consumer (Marchsada & Hindrayani, 2025) .

Behavior Users

Developments in the modern era provide change technology for consumer in shopping . Consumers No must visit place seller , but rather purchase via website, marketplace, WhatsApp , etc. Changes this also happens in the system payment cash Good with use debit card or credit switch to payment digitally with various applications issued by leading banks or company provider service others . Communication marketing carried out digitally is a marketing strategy that uses digital media For communicate with consumer online .

Use technology in tract finance give convenience especially in matter digital payments . Technology financial in activity business as provider service finance in modern devices . The perpetrator business must respond fast with existence change draft payment No only with cash go digital (online) to face competition growing business strict . The existence of change fintech technology provides alternatives and convenience payment to consumers .

Behavior users is a series real action implemented individuals , who are affected from various factor including factor cognitive and outcome . Factors This guide users in selection and use product in accordance with preference they . Behavior users defined as dynamics interaction between influence and awareness , behavior and environment Where man do exchange aspects life . In general , behavior users This usually shared become two Category : Behavior users Rationale and Behavior users Irrational .

Theory behavior users can explained as following :

Behavior rational users marked with choose product Based on optimal needs and uses . Rational users will choose suitable product with need they , do verification quality product guaranteed , and considering ability financial they For buy product said . In matter this , they more tend focusing on the utilitarian aspect , seeking products that provide benefit appropriate concrete with objective they For buy goods the .

On the contrary , the behavior irrational users covers actions influenced by emotions , prestige , and style live . User irrational Possible tempted by attractive advertisements and promotions , choose goods branded or labeled with price high , and sometimes buy goods No Because needs , but only For improve social status or fulfil aspect emotional they . They tend follow trends and concentrate on aspects hedonistic , seeking experience and happiness emotional moment shopping .

Behavior users that include second category This reflect complexity in the process of taking decision users . Sometimes , users can nature rational in One context use and irrational in context others . Understanding deep about behavior users allows company For more Good in designing marketing strategies and products that meet diverse needs and preferences users , both rational ones and irrational .

Usage Decision

Related decisions with use product is a complex process that involves Lots factor individuals who have an influence on how much effective and useful product said . According to For make decision , people must go through a certain process . Research say convenience greatly influences decision usage , also supported by the results research conducted by choice use influenced by convenience .

Shift big behavior divided consumers becoming a cashless society is transaction finance with method payment electronic in activity economy as replacement cash payments . Cashless society has objective The same in transact finance using debit, credit , or method electronics that can accessible via gadget so that make it easier consumers .

Development technology that continues to proceed For make it easier life society can also We feel in matter transact . According to system payment electronic part from activity payment between owner banking business or service public . Payment method This use network technology modern communication facilitated by the internet.

Go Contactless is done during pandemic demand public For maintain distance and minimize Possible No do contact physical . When the activity daily still running , digital media is becoming one of the the solution . Scan the QR code to do transactions and payments without existence contact physical . Digital media allows consumer as little as Possible do contact physique with provider products and services . Changes behavior consumer in digital phenomenon during pandemic , doing transaction sell buy online with utilise cashless payments (Aiman et al., 2022) .

3. Method Study

Research Data

The data that becomes foundation study This is a curated private primary dataset in a way special . Data sources obtained from comments and discussion public discussing QRIS on social media platforms , namely Twitter. Secondary data obtained by researchers with collect related data with research , namely journal journal related research and also as many as 605 comment data has collected .

Implementation Method

Implementation method in study This use naive baiyes algorithm is common approach used in data analysis and mining association . Naive Bayes is A algorithm classification in machine learning which is based on Bayes' Theorem with the " naive " assumption that every features (attributes) used is independent (free) one each other, even though in the reality often No .

The essence of this " naive " assumption is that existence something feature certain in A class No There is the relationship with existence feature others . Although assumptions this is very strong and rare true in the real world , algorithms This turns out to be very powerful and effective , especially For task classification text , spam filtering, system recommendation .

Design Testing

Design data mining testing aims For ensure that model or naive baiyes algorithm in data mining developed can give accurate and relevant results in processing data. The following is a number of steps that can be taken designing data mining testing :

Identification Problem

Stage beginning in study This is identification problem . In the phase this , the problem that will be completed defined in a way clear and specific . In context this , the issue raised is classification sentiment , where objective mainly is For analyze and categorize text data (e.g reviews , tweets, or comments) into class class sentiment certain , for example positive and negative . Explanation room clear scope and objectives at the stage This become foundation for all over stages study furthermore .

Data collection

After the problem identified , stage furthermore is data collection . Data used is material standard main in study this . The data can obtained from various sources , such as social media , review platforms , or relevant public datasets . The data collected usually in text format raw which represents expression sentiment from users . The quality and quantity of data collected greatly influences to performance of the model to be built .

Data Preprocessing

Text data raw that has been collected generally Still No structured and contains noise. Therefore that , the preprocessing stage is very critical For clean and prepare data to be ready processed more continue . Preprocessing consists of from a number of step main :

- a) Cleansing: Eliminating characters that are not required , such as sign read , symbols , numbers , or character special that is not relevant For analysis text .
- b) Filtering: Filter out unwanted words meaningful (stop words) such as "and", "the", "in", to focus on words that contain sentiment.
- c) Stemming: Reducing words to form basically (root word) for equalize word variations, for example " running " and " running " become " running ".
- d) Tokenizing: Breaking Down text into more units small like words or phrases (tokens) for make it easier analysis.

Data Sharing

After the data goes through the preprocessing process, the data is then shared become two main subsets :

- a) Training Data : The part of the data used For training a Naive Bayes classification model . Learning model patterns and characteristics sentiment from this data .
- b) Testing Data: The data section used For test performance of the model that has been trained . This data play a role For evaluate to what extent the model can generalize learned patterns to new data .

Analysis and Results

At the stage this , the analysis process sentiment done with utilizing the Naive Bayes model that has been built . The test data that has been processed entered to in the model for predicted class sentiment . Prediction results This Then analyzed more carry on For get insight

into distribution sentiment in the dataset, such as percentage sentiment positive , negative , and neutral .

Modeling Naive Bayes Classification

Stage This is the core of methodology research . The Naive Bayes algorithm is used For building a classification model sentiment . This model utilise probability conditional and Bayes' theorem for predict class sentiment based on existing word features . The advantages of Naive Bayes such as efficiency good computing and performance on text data make it suitable For task classification sentiment .

Testing

Once the model is built , testing is carried out. done For measure model performance . The test data that has been prepared previously used as input to the model. The model will predict sentiment each instance in the test data, and the results prediction the Then compared to with the actual label (ground truth).

Prediction Sentiment / Accuracy

Based on results testing , carried out calculation metric evaluation like accuracy , precision , recall, and F1-score for measure model performance . Accuracy become indicator main thing that shows percentage overall correct prediction . Measurement results accuracy This determine how much effective Naive Bayes model in classify sentiment on the given data .

Finish

finish stage signifies end from the research process . At this point this , all stages has completed , started from identification problems , data processing , model building , to evaluation results . Final conclusion taken based on results obtained , and recommendations or suggestions for development more carry on can given .

4. Results and Discussion

Implementation and Testing

Implementation and testing in study This done in a way systematic use device RapidMiner Studio software version 2025.1.1. Overall stages study designed based on methodology that has been described in Chapter III, with focus on implementation Naive Baiyes algorithm for predict sentiment QRIS users based on comment data from Twitter. The process begins from raw data loading, transformation text , model building , to evaluation model performance. Each stage explained in a way details below this, accompanied by with examples of input and output for give clear picture regarding the process carried out .

Identification Problem

- a. Problems main issues faced in analysis sentiment related to QRIS is nature of opinion data users on social media who do not structured massive and vulnerable to interpretation subjective . For overcome matter this research This designed with apply something approach based Systematic Natural Language Processing (NLP) and Machine Learning .
- b. For addressing the bias and subjectivity inherent in manual analysis , research This propose use Naive Baiyes algorithm as a core classifier. Advantages main Naive Baiyes lies in the ensemble learning paradigm , where the results classification the end of the construction in a way random . Mechanism This inherently reduces variance and overfitting, so produce more models stable and reliable compared to single models .
- c. Study This in a way special aim For explore and validate potential the recognized Naive Baiyes algorithm its advantages in various domains, but Not yet fully implemented in context analysis QRIS sentiment. Exploration This No only stops at model training , but also includes hyperparameter optimization using technique like Grid Search for extract performance best from the model. Naive baiyes performance Then will compared to with a comparative model such as Support Vector Machine (SVM) for demonstrate its effectiveness in a way empirical.

Data Collection and Loading

Data used in study This is the primary data collected from social media platforms like Twitter. The data saved in Excel file format containing two column main, namely " Comments " column which contains text review users has through a manual annotation process with Positive and Negative labels . This data Then loaded to in RapidMiner environment uses Excel's Read operator. As following is loaded data snippet:

	A	B	C
1	no	teks	label
2		1 yang bisa banggain dari indonesia saat ini	positive
3		2 qris ini bener bantu buat yang jarang punya uang cash di dompet	positive
4		3 simpel tinggal scan asal ada saldo beres	positive
5		4 transaksi di pasar pun bisa qris mantap emang	positive
6		5 qris gak pakai biaya admin	positive
7		6 qris emang praktis banget buat bayar-bayar	positive
8		7 kalau semua pembayaran cuma bisa lewat qris bisa jadi blunder	negative
9		8 hasil yang sangat bermanfaat keren banget	positive
10		9 jujur qris itu membantu di kehidupan yang cashless	positive
11		10 bantu banget apalagi sekarang jarang bawa cash	positive
12		11 sangat membantu kalau pas beli pedagang kesulitan memberikan ke	positive
13		12 selalu pake qris mudah gak ribet gak perlu kembalian	positive
14		13 qris sangat bermanfaat untuk masyarakat indonesia	positive
15		14 kita harus bangga bahwa indonesia punya qris	positive
16		15 qris harusnya bisa go internasional	positive
17		16 kita baru sadar ternyata ini salah satu aset kita yang berharga	positive
18		17 memang bermanfaat banget qris ini	positive
19		18 jadi bermasalah klo pergi ke daerah yg masih jarang pakai qris	negative
20		19 mantap betul qris ini	positive
21		20 keren banget sih ini qris	positive

Figure 1. Data Set.

The data become base for the entire analysis process more continue . Selection of data that has been labeled with Good ensure that the model is built can Study from correct and relevant patterns .

Text Data Preprocessing and Transformation

preprocessing stage is stage very critical quality results modeling . Text data raw that is not structured must through a series transformation For changed become forms that can processed by a machine learning algorithm . Stage This includes :



Figure 2. Processing.

a. Cleaning

Cleaning is stage second from text preprocessing that works For delete all sign read, emoji, and identify data that has similarity or similarities.



Figure 3. Cleaning.

b. Filtering

1. Folding Case: All character changed become letter small in a way automatic during the tokenization process for avoid duplication of the same word only Because difference capitalization.

```

seetTest.....Sentimen
sua ok ga pemikirannya ga nyampe ke sini DV.....Negatif
sua bos dari jamae dahulu udah atakng diaangkut pautkan dgn progam yg gk ada kadannya Herantri hari hgt manusia x
go wktirib diri sentiri lya kullian bisa makana anak yg gk bisa makan 5 kali sehari lrv ortunya
lakin.....Positif
akanya kuu maksudu ber2 hierarki dari atas ke bawah tuh emg2nya tuh pdg ga berDV.....
HISS.....Negatif
ng gmn?.....
atau memang tau jumlah puterganya berapa bisa share ke aku kuu mungkin lewat de jadi buat jaga bikin rancangan baru
klo memang beneran dipotong buat makan siang gratis?.....Negatif
adnya dipotong berapa kak mungkin kakak lebih paham? kalo tahun kemarin yg aku pegang masih 3Rjt perbulan selama
setahun kakak tau gak tahun ini dikurangi berapa biar bisa bikin rancangan baru kalo memang tau
akDV?.....Negatif
dun ni niat biar ga onon onon prabowo.....
ah ini.....Negatif
sudah kakak? DV? Baik Kak kalau begitu terima kasih banyak sebelumnya atas penjelasan dan sharingnya
kaka?i DV.....
errama goblok sana H2S aja udh dikurangi lu ma progam apaan lagi semua tuh endingnya dijalanin pemerintah daerah
rtirya ya dikurangi lagi.....
atau juaan mg lewar makana itu juaan sangat bermanfaat kalo peralatan-pralatan sekolah lebih
spertitika?.....Negatif
a kidal friend?.....Negatif
etahun ngerasaah kursi itu di sma setahun ngerasaah kursi memang bukan per tua DV?.....
lauruh beryakar sama buzzer yg dibayar dari uang palakDV?.....Negatif
ng kalau reply pake akun private kshaca mit reply lu.....
sua DV? atau minta bantuan ke Baidikbud setempat coba hepek nya.....Positif
lun capak cek ngerang se org tolong.....Positif
lunas mau nulis anjir kaku begini.....
kshidin di daerah mana ini gue terakbir sklh itu DV? sekolah gue malah udh gak pake papan tulis lagi tapi pake
lactboard canggih yg nulis nya apa pake layar sentuh.....Positif
    
```

Figure 4. Folding Case.

2. Stopwords: Conjunctions that do not informative (such as "and", "the", "in", "which") are filtered out using the Stopwords Filter operator with support dictionary Indonesian. This is done For reduce noise and improve quality generated features.

no	teks	label
1	yang bisa bangga dari indonesia saat ini	positive
2	qris ini bener bantu buat yang jarang punya uang cash di dompet	positive
3	simpel linggal scan asal ada saldo beres	positive
4	transaksi di pasar pun bisa qris mantap emang	positive
5	qris gak pakai biaya admin	positive
6	qris emang praktis banget buat bayar-bayar	positive
7	kalau semua pembayaran cuma bisa lewat qris bisa jadi blunder	negative
8	hasil yang sangat bermanfaat keren banget	positive
9	jujur qris itu membantu di kehidupan yang cashless	positive
10	bantu banget apalagi sekarang jarang bawa cash	positive
11	sangat membantu kalau pas beli pedagang kesulitan memberikan ke	positive
12	selalu pake qris mudah gak ribet gak perlu kembalian	positive
13	qris sangat bermanfaat untuk masyarakat indonesia	positive
14	kita harus bangga bahwa indonesia punya qris	positive
15	qris harusnya bisa go internasional	positive
16	kita baru sadar ternyata ini salah satu aset kita yang berharga	positive
17	memang bermanfaat banget qris ini	positive
18	jadi bermasalah klo pergi ke daerah yg masih jarang pakai qris	negative
19	mantap betul qris ini	positive
20	keren banget sih ini qris	positive

Figure 5. Stopwords .

c. Stemming

Using the Stem (Snowball) operator with configuration Indonesian for return each token to form base he said (root word). This process help in grouping variations of words that have meaning similar.

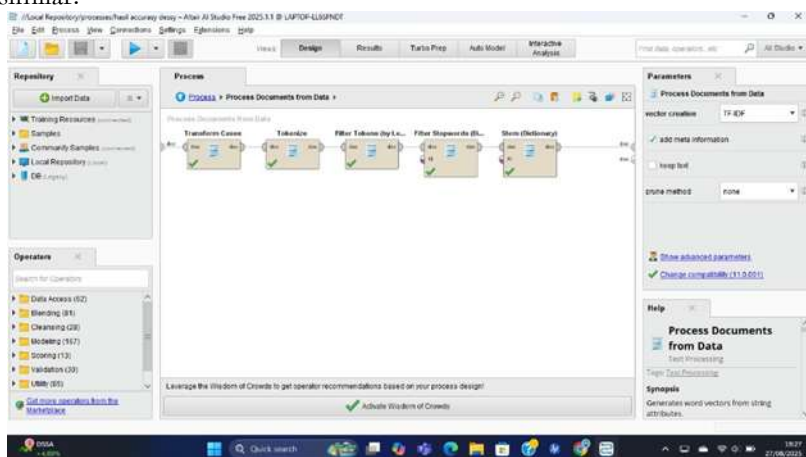


Figure 6. Stemming.

d. Tokenization

Using the Tokenize operator to break text comment into individual word units called tokens.

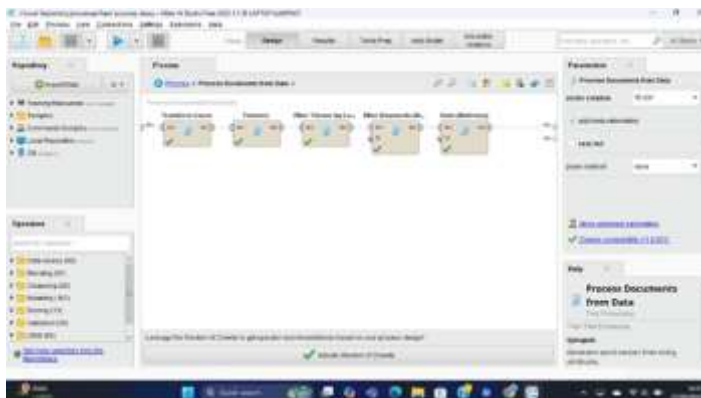


Figure 7. Tokenization.

The division of training data and test data can be seen based on comparison 80 % : 20% of the total sample study This namely 605 rows of data, training data used as many as 484 and test data as many as 121 rows of data

Modeling with Naive Baiyes

The dataset that has been through preprocessing then changed become vector feature numeric use TF-IDF (Term Frequency- Inverse Document Frequency) method for catch importance every word in documents and the whole corpus . The data is then shared become two subsets using the Split Data operator with 80:20 ratio , where 80% of the data is used as training data For building the model, and 20% of the data was used as test data for test model performance .



Figure 8. Implementation Algorithm .

Naive Baiyes Algorithm Then applied to training data using the Naive Baiyes operator . At stage this , done hyperparameter optimization for increase model performance . The model that has been trained Then applied to the test data using the Apply Model operator to do prediction sentiment .

Test Results .

Based on results tests conducted against testing data that is not Once seen by the model during the training process , obtained results model performance as following :



Figure 9. Accuracy Results.

a. Accuracy: 80.99%

Accuracy micro average of 80.98% shows that the model is overall can predict sentiment with correct on almost 81% of the total test data.

b. Precision and Recall:

- 1) For class Positive , Precision reaches 92.31% which means that from all prediction positive that the model did , 92.31% of which is true . Recall for class Positive is 78.06%, which shows that the model is successful identified 78.06% of all case true positive .
- 2) For class Negative , Precision is 66.25% and Recall reaches 86.89%. High recall For class Negative show that the model is very good in detect comments negative , although sometimes misclassified a number of comment neutral or positive as negative (which is reflected from Precision which is more low) .

With thus , it can concluded that the Naïve baiyes model that was built No only reach level satisfactory accuracy (> 80 %), but also capable of give outlook valuable business . These results answer objective study with show that naïve baiyes algorithm effective For predict sentiment QRIS users, and analysis feature importance succeed identify aspects QRIS services that are most noticed by users.

5. Conclusion and Suggestions

Conclusion

Based on results research that has been done about prediction level satisfaction QRIS users based on experience and perception users use Naïve Baiyes algorithm , can concluded a number of matter as following : 1) Comprehensive text data preprocessing has succeed implemented For transforming social media comment data that is not structured become optimal representation for machine learning modeling . Stages carried out includes tokenization, case folding, stopword removal, and stemming using dictionary Indonesian . This process proven effective in clean noise and improve quality features , so that the data is ready For processed more continue . 2) Naive Baiyes Algorithm show accurate and reliable performance in predict level satisfaction QRIS users . Based on evaluation using test data, the model is built reach accuracy of 80.99% with an average micro F1-score of 80.98%. This result show that Naive Baiyes capable handle complexity and noise in text data with good , and suitable used For analysis sentiment in context digital finance . 3) Research This succeed answer all over question research questions (RQ) submitted in Chapter I, at the same time fulfil objective research that has been determined . In addition that , research this also works fill the research gap with leveraging multiplatform data and implementing more ensemble algorithms advanced compared to study previously which is still depend on method statistics traditional or algorithm classic .

Suggestion

Although has give significant results , research This own a number of limitations , including : 1) Data used only covers comment from social media platforms selected , so that Possible No represent all over population QRIS users in Indonesia. 2) Sentiment label used in model training is subjective , though has through a manual annotation process .

Based on existing limitations , as follows is a suggestion for development future research: 1) Expansion data sources with enter more many social media platforms as well as review from e-wallet and banking applications For increase data representation. 2) Exploration other algorithms such as Deep Learning (LSTM, BERT) or other ensemble methods For compare and improve accuracy prediction . 3) Development of real-time models that can integrated with monitoring dashboard For interest analysis sustainable . 4) Study comparative between area or segment users (eg : generation young vs adult , urban vs rural) for understand variation perception towards QRIS.

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