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# Online Purchase Environment Using Blockchain-Based Solutions:
# An acceptance of online grocers

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**Abstract**
The Internet has enabled e-commerce activities, including online grocery purchases. Although all users dream of a hassle-free and safe transaction, not all online payment methods are safe and acceptable. Thus, one of the solutions is to integrate blockchain technology. However, the acceptance of Blockchain among urban users still needs to be discovered. This paper aims to determine the factors affecting the acceptance of Blockchain and online delivery networks for grocery purchases in urban areas. A total of 384 responses were collected among urban online purchasers through questionnaires. The independent variables, namely Accuracy, online payment, and Cybersecurity, significantly impact the dependent variable.

Keywords: Online Grocers; Blockchain; Purchasing; Environment

## 1.0 Introduction
The process of gaining and maintaining customer trust has grown more complex as e-commerce goes inescapably online (Keen, Liang, & Sham, 2022). Consumers now expect complete transparency on what they buy through an integrated and transparent purchasing pipeline because they can access various options. However, not all online payment options are secure and reliable for customers, particularly those who live in cities and engage with online grocery purchases daily. Current businesses can only gain their clients' trust if they provide answers to queries about how safe, accurate, and transparent an online purchase can be. Failure to do that will frequently result in losing their business. According to previous studies, nearly half of the consumers who switch brands do so because they no longer trust the brand. The blockchain concept is revolutionary because it allows all parties to write, read, share, and use the same information in the most secure ways possible in real-time(Chacko, Mayer, & Jacobsen, 2023). There is a shared source of information since the data on a blockchain is dispersed among all users. Although everything is transparent, everyone engaged still has a say in who sees what. Therefore, the primary objective of the research is to examine the factors affecting the adoption of the blockchain system among present e-commerce customers for online grocers in an urban area. Apart from that, the research also intends to establish a blockchain-based solution model for online grocery users.

## 2.0 Literature Review

### 2.1 Definition of Blockchain
Blockchain is a transaction ledger spread over a peer network, each block containing transaction data and the previous block's cryptographic hash (Chacko, Mayer, & Jacobsen, 2023). They also stated that multiple nodes duplicate all network blocks; thus, cryptocurrency depends on implementing Blockchain. Cryptography ensures safe, tamper-resistant, authentic, and verifiable transactions (Van & Shirazi, 2023). Each network transaction is valid only when the network participants verify that the algorithm has reached that agreement (Sham, Hussin, Abdamia, Mohamed, & Rou, 2020). However, much of the study focuses solely on the concept of Blockchain implementation without understanding the factors of acceptance among e-commerce users, especially online grocery customers in Malaysian urban area who often makes online purchases through Blockchain technology. This paper intends to fill the gap by examining factors of Blockchain adoption among them.

### 2.2 Online Grocery
Over the last decade, the online grocery market has grown steadily and accounted for 1.1 billion yearly, representing 2.8% of the online shopping market, compared to only 1.8% in 2012 (Meister, Winkler, Schmid, & Axhausen,2023). Concerning in-store and online grocery shopping during the pandemic, many studies have reported substantial increases and enormous potential in online market shares among consumer segments, especially in grocery shopping (Colaço & Silva, 2022). However, there is still a lack of studies focusing on the security and visibility of the transaction on online grocery purchases.

### 2.3 Cyber Security
In Malaysia, most consumers prefer to shop online; as depicted in Fig. 1. The figures clearly show that the number of online delivery platforms and online shoppers in Malaysia is increasing exponentially. It also reflects that the risk of scams or hacks being exposed to online shoppers increases and may affect them. Moreover, most urban users must be exposed to the Blockchain concept, leaving them unaware of the system's safety when an online transaction is a concern. These are the things that keep them from using Blockchain. Although implementing Blockchain can benefit delivery platforms and urban users, only some are aware of and willing to use the system. This led to rampant online scams and the leak of financial information to third parties, which resulted in a loss (Pui, 2019). This was further supported by Ku-Mahamud, Omar, Abu Bakar, and Muraina (2020), who conducted a similar survey in Malaysia, claiming that Malaysia's blockchain technology awareness is still low. Their research also concluded that the low awareness of Blockchain leads to high potential cybercrime affecting money transactions and personal de
tails leakage. Fig. 1 shows the critical grocery delivery platform usage from Jan- March 2020 among Malaysian online customers.
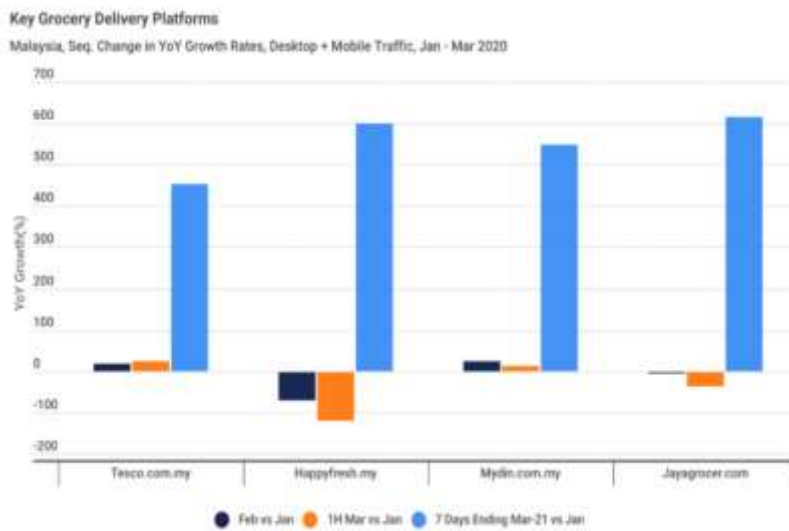


Fig. 1: Key grocery delivery platforms
*(Source): Lim (2020).*

This statement complies with the twelve Malaysia Plan (2016-2020) and Economic Development Plan. Both plans highlighted the importance of developing Blockchain technology to improve online retail market services' efficiency, safety, and reliability. With the increase in online platform delivery, a Blockchain system must be implemented to provide a safer online shopping environment by improving product accuracy and quality and reducing bank fraud and hacking incidents.

### 2.4 Accuracy
Around 23% of consumers return the products they purchase as they receive the wrong product when they shop online. Kibet, Bayou, and Esquivel (2019) conducted a similar survey in Nepal and claimed that the delivery of a defective product was a Nepalese online

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shopping issue. In addition, Ali, Cao, Allen, Liu, Ling, and Cheng (2023) claimed that delivery accuracy is one factor that influences the selection of a service provider. Urban consumers expect to receive products that are the same as the order they place. Urban consumers cannot physically touch or feel the effects, so they can only rely on the product description. In this case, the product description is vital in helping urban consumers decide. It is supported by Rodriguez-Diaz, Jimenez, Bejarano, Bernal-Ch'avez, and Gelbukh (2022), who agreed that the accuracy of a product description is deemed an essential determinant of customer satisfaction in online shopping. When the product description is detailed, urban consumers are less likely to get the wrong product they do not expect. It indicates that urban users are satisfied when they get the right product they need (Liu, Wang, Li, Li, Wu, Huang, Cheng, Li, Wang & Zhou, 2020). They have also supported the statement that the more information about the product, the higher its satisfaction with online shopping. Implementing Blockchain in online grocery delivery platforms can improve accuracy by ensuring that urban consumers receive the right products and minimize accuracy issues. Apart from accuracy, authenticity is another element that online users look for when online purchasing is a concern.

*2.5 Authenticity*
The term Authenticity relates significantly to the product's quality. This has been among the common issues  (Chawla & Kumar, 2022) for online shoppers when they shop online. This statement is supported by Vaidya, Zhang, and Li (2019), who argued that the product's quality was one of the problems associated with online shopping. When users purchase from online grocery stores, they do not have a guarantee of product quality. Due to the nature of online shopping, which does not allow customers to touch or feel the quality of the product personally thus, customers can only rely on the comments made on the website to determine the quality of the product. However, users can only sometimes rely on product reviews, which are sometimes misleading and inaccurate. This aligns with a study by Ruanguttamanun and Peemanee (2022). They studied the e-service quality and purchase intention among 385 Lazada shoppers and found that e-service quality was negatively correlated with purchase intentions. Thus, implementing Blockchain in online grocery delivery platforms can be a positive move as the system can control product authentication and improve product quality.

*2.6 Blockchain in the Retail Market*
Blockchain is a secret of new digital currency in Malaysia's retail market. Blockchain has introduced a new channel between the supplier and the customer and a proper supply chain distribution (Miraz, Hassan & Sharif, 2020). They have also agreed that blockchain technology has opened up a new medium for transactions between stakeholders in retail markets. There is a need for Blockchain as a stronghold of ideas in the retail market to provide the necessary conditions for Blockchain to be implemented in the retail supply chain market.

It is agreed that building on the Blockchain enables a global peer-to-peer network that forms an open platform that can offer neutrality, reliability, and security to online grocery users (Miraz,  Hassan, & Sharif, 2020). On the other hand, early researchers (Kamilaris, Fonts & Boldú, 2019) also highlighted that the Blockchain system for online payment could ensure a transparent and secure transaction between the supplier and customer. Fig. 2 explains the process. This study focused on the Blockchain food supply chain system (Kamilaris,  Fonts & Boldú, 2019). Their primary focus is developing blocks from the provider's right to users' consumption along the chain. However, their research ignores the user acceptance factors for Blockchain in e-commerce and grocery shopping for the urban dweller, leaving the gap unknown. Please do not change the margins of the template, as this can result in the footnote falling outside the printing range.
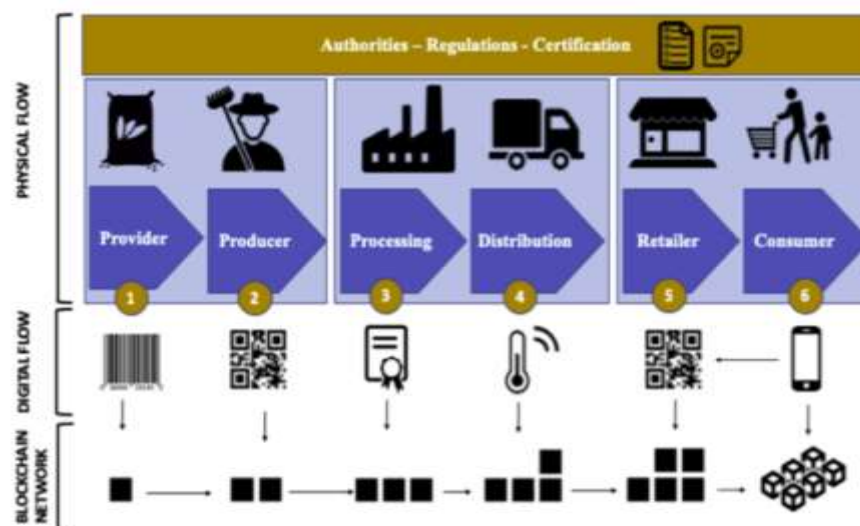


Fig. 2: A simplified food supply chain system source
*(Source): Kamilaris et al., (2019).*

## 3.0 Methodology

This study uses a quantitative approach (Sham, Hussin, Abdamia, Mohamed, & Rou; Lim et al.,2022). The respondents were selected among the online shoppers who live in an urban area and have experience purchasing groceries through an e-commerce platform (Meister, Winkler, Schmid, & Axhausen,(2023). Based on Krejcie and Morgan's (1970) table in determining the sample size, 384 respondents were selected based on the statistics referring to the targeted population of 28.7 million Malaysian internet Users reported by the Malaysian Communications and Multimedia Commission Report (2019). The study proceeds with a self-administrated questionnaire (Potter et al.,2023; Mohd Johan, Md. Syed & Adnan, 2022) adopted using the same tools as a previous researcher who surveyed food supply chain integrity in Malaysia (Rashid & Bojei, 2019). Measurement of the construct was as follows:

Table 1: Coefficients in regression analysis

| Construct | Measurement |
|---|---|
| Accuracy | Transparency source |
| | Information relating to the product |
| | Received right product |
| Authenticity | Traceability |
| | Verify the data's authenticity |
| | Credibility |
| Cybersecurity | Scam or hack risk exposed |
| | Intelligent contracts |
| | Safe and Secure Information |
| Online payment | Stable and Secure |
| | Reducing banking fraud |
| Adoption of Blockchain | User acceptance of using Blockchain System |

*Source: (Rashid & Bojei, 2019)*

To run the regression (Mohd et al.,2022)., each construct will be assigned a value of 1 to 5 (Saad, Ishak, Abu Bakar, Sandhu & Mahmood, 2022) depending on their level of satisfaction. Multiple regressions were computed from there (Keen, Liang, & Sham, 2022).

## 4.0 Findings

Multiple regression illustrates the Relationship between the independent and dependent variables. In this context, R-squared ($R^2$) measures were used to indicate and explain the dependent variables in this study. TABLE 1 shows the model summary of the regression analysis.

Table 2: Model summary of regression analysis

| Model | R | $R^2$ | Adj. $R^2$ | Std Err of the Est. | Change Statistics | | |
|---|---|---|---|---|---|---|---|
| | | | | | $R^2$ | F | df1 |
| 1 | 0.897[a] | 0.804 | 0.802 | 2.19872 | 0.804 | 388.670 | 4 |

Table 2 shows the model summary of Multiple Linear Regression. The adjusted $R^2$ value of the Model is 0.802, and the $R^2$ value is 0.804. The R-value of 0.897 shows a strong correlation between the predictors (IV) and a criterion variable (DV). It indicates that the independent variables Accuracy, Authenticity, Cybersecurity, and Online Payment Method account for 80.4% of the variance in the acceptance of Blockchain among urban consumers.

Table 3: Coefficients in regression analysis

| Model | Un-Std. Coeff. | | Std Coeff. | | | Coll. Stats. |
|---|---|---|---|---|---|---|
| | B | Std. Err. | Beta | t | Sig | Tol. |
| Const. | 3.320 | 0.313 | | 10.619 | 0.000 | |
| Accuracy | 0.223 | 0.047 | 0.270 | 4.475 | 0.000 | 0.160 |
| Authenticity | -0.019 | 0.060 | -0.023 | -0.321 | 0.758 | 0.101 |
| Cyber Security | 0.141 | 0.050 | 0.183 | 2.815 | 0.005 | 0.122 |
| Online Payment Method | 0.451 | 0.042 | 0.512 | 10.715 | 0.000 | 0.227 |

*Dependent Variable: Adoption of Blockchain*

The coefficients in regression analysis show that accuracy (β = .270, p < .05), Cybersecurity (β = .183, p < .05), and online payment method (β = .512, p < .05) have made a significant contribution to the prediction of the criterion variable. This is because their significant values are all less than 0.05. Besides, the online payment method has the most significant beta coefficient, 0.512. Hence, it is the strongest unique predictor in predicting the acceptance of Blockchain among urban consumers as compared to accuracy (0.270), authenticity (-0.023), and Cybersecurity (0.183). Authenticity has the smallest beta coefficient, which is -0.023. It shows that it is the

weakest unique predictor in predicting the acceptance of Blockchain among urban consumers as compared to accuracy (0.270), Cybersecurity (0.183), and online payment method (0.512).

*4.1 Final Regression Equation*
Below is the final regression equation of the Model based on the significant value. The equation is shown:

$$\hat{\gamma} = \beta_0 + B_1 X_1 - B_2 X_2 + B_3 X_3 + B_4 X_4 \tag{1}$$
$$\hat{\gamma} = 3.320 + 0.223\, X_1 - 0.019 X_2 + 0.141\, X_3 + 0.451\, X_4 \tag{2}$$

$\hat{\gamma}$        = Adoption of Blockchain System
$\beta_0$        = Constant
$B_1 - B_4$ = Regression Coefficients by the Model
$X_1$        = accuracy
$X_2$        = authenticity
$X_3$        = Cybersecurity
$X_4$        = Online Payment Method

Using the final regression equation, the blockchain adoption model among urban online grocery shoppers was measured using two extremes. One is that all urban consumers are delighted with all constructs given to adopting the blockchain system and were assigned number 5. Another condition is tested where all urban consumers indicated dissatisfaction with the given construct to test on the Blockchain adoption and were assigned number 1.

Where X = 1 (Very Dissatisfied)
$$\hat{\gamma} = \beta_0 + B_1 X_1 - B_2 X_2 + B_3 X_3 + B_4 X_4$$
$$\hat{\gamma} = 3.320 + 0.223\,(1) - 0.019(1) + 0.141(1) + 0.451(1)$$
$$\hat{\gamma} = 3.320 + 0.223\,(1) - 0.019(1) + 0.141(1) + 0.451(1)$$
$$\hat{\gamma} = {}_{4.1}$$
Where X = 5 (Very Satisfied)
$$\hat{\gamma} = \beta_0 + B_1 X_1 - B_2 X_2 + B_3 X_3 + B_4 X_4$$
$$\hat{\gamma} = 3.320 + 0.223(5) - 0.019(5) + 0.141(5) + 0.451(5)$$
$$\hat{\gamma} = 3.320 + 0.223(5) - 0.019(5) + 0.141(5) + 0.451(5)$$
$$\hat{\gamma} = {}_{7.3}$$

The multiple regression equation above is the estimation equation used for predictions. The main finding in this study shows that when the satisfaction value on each independent variable is 5 (delighted), the Model will explain the acceptance of Blockchain, which will increase by seven folds. Compared to when the satisfaction level is indicated by 1 (very dissatisfied), the acceptance of Blockchain will drop by four folds. The simulation model will predict the value of the Blockchain adoption when the change in the value of each construct changes.

*4.2 Discussion*
This study's result aligns with the Blockchain theory as discussed by Wang & Su (2020), who stated that combining Blockchain with the energy sector is a new cross-cutting research area as a step in transaction improvement and transparency transaction. Not only that, but another study done by Wu, Wang, Cai, Guo, Guo, & Rong (2019) also supported the current research by concluding that as an innovated and revolutionized technology, Blockchain has been applied in many fields, such as cryptocurrency, food traceability, identity management, or even market prediction and as a marketing tool to improved the online transaction and boosted the confidence level of the online users. Using the transaction cost theory in a previous study by Schmidt & Wagner (2019), a similar conclusion on the effect of blockchain acceptance will have a better understanding of how Blockchain might influence supply chain relations, specifically regarding transaction costs and governance decisions. This reflects similar findings in Malaysia's urban area purchasing environment.

## 5.0 Conclusion
Three main factors, accuracy, cybersecurity, and online payment methods, may influence Blockchain technology acceptance among e-commerce users. The proposed Model supported some discussion from a previous study which stated that with proper accuracy regarding the information given and received by users and the physical product received, the Blockchain system would be adopted

among the urban residents due to trustworthiness. The Model also highlighted the influence of cybersecurity factors and online payment methods, which have become another critical adoption factor of Blockchain among urban online shoppers. This is because when they believe the system is hack-free, there will be higher chances for its adoption during online transactions. Although this research limits its scope to exclude the awareness of the technology, cultural, and other demographic elements in the adoption model, future work might focus on the Blockchain transaction policy in Malaysia by considering all aspects mentioned. Also, future studies could be extended to the acceptance of the rural area community towards the new purchasing system and the impact on the new millennia purchasing environment. Among the critical recommendation to overcome the issues they face is by looking at and improving the independent variable tested in this study which has significantly affected the acceptance of the Blockchain technology proposed. The success of the implementation lies in understanding the factors affecting the acceptance of Blockchain itself.

## Acknowledgments

## Paper Contribution to Related Field of Study

As the paper tap into the factors of the acceptance of Blockchain technology, this paper will give a new insight into the factors that will lead towards the acceptance of Blockchain technology as a new form of payment for online grocery purchases. The finding from the study could be used as a basis for planners to design a new method of transaction incorporating Blockchain technology to produce a more transparent transaction full of accuracy. The main implication of the findings could also encourage online business providers to formulate and improve strategies aimed at disseminating information about blockchain technologies and online purchases, particularly to online grocers.

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