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Analysis of key factors influencing adaptation to e-money on transmetro Pekanbaru

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ABSTRACT

Social adaptation is an important process for individuals or groups in adjusting to new circumstances, including the adoption of technological innovations. The implementation of E-Money as a mandatory payment method in the Transmetro Pekanbaru public transportation system is a significant change, requiring passengers to adapt to this new system. This study aims to analyze the factors that influence passenger adaptation to E-Money using a descriptive quantitative approach. This research was conducted in Pekanbaru, with data collected through interviews with a sample of 100 respondents, which was determined from a population of 34,918 passengers using Slovin's formula with a margin of error of 10%. Data analysis was conducted to identify demographic and economic factors that influence adaptation. The results show that age, gender, occupation, income, education, private vehicle ownership, and E-Money ownership significantly affect the level of passenger adaptation to E-Money. Users who are younger, female, more educated, self-employed, or students, and who already possess E-Money tools such as BRIZZI (a type of E-Money card) or QRIS (Quick Response Code Indonesian Standard) tend to adapt more quickly. A significant finding is the dominance of QRIS and the combination of BRIZZI and QRIS as preferred payment methods. However, the intensity of Transmetro usage does not significantly affect the adaptation rate. These findings suggest that strategies targeted at increasing E-Money adoption should take these demographic and socio-economic factors into account, especially by focusing on providing an accessible and user-friendly payment system for less adapted passenger groups. This study contributes to understanding the social adaptation process in the context of digital payment innovations and provides practical implications for policymakers and Transmetro Pekanbaru management in improving the effectiveness of E-Money implementation.

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Introduction

Public transportation services are essential in tackling urban mobility challenges (Mutiani et al., 2020; Rakhmad, 2021). In Indonesia, the government has implemented various measures to improve public transportation systems, including the introduction of bus services to address congestion in major cities such as Pekanbaru (Saputri & Atmojo, 2023). Pekanbaru, with a population of 1,020,308 as of 2023, faces pressing issues related to traffic density and the urgent need for reliable transportation to support the city's economic, educational, and

social activities. Recognizing these challenges, the Pekanbaru City Government introduced the Mass Public Transportation system, branded as Transmetro Pekanbaru, in 2009 (Hantoro, 2021). This initiative was designed not only to serve as an alternative to private vehicles but also to promote sustainable urban development by reducing greenhouse gas emissions and fostering a culture of public transit usage (Mutiani et al., 2020; Rakhmad, 2021). As part of its commitment to continuous improvement, the government has since integrated various technological advancements into the system to enhance service quality and adapt to the growing demands of urban mobility (Porru et al., 2020).

In July 2023, as part of its Smart City vision, the government introduced an electronic payment (E-Money) system for Transmetro Pekanbaru. Developed in collaboration with BRI Bank, the system mandates the use of BRIZZI cards or QRIS-based E-Wallets for ticket payments (Momoh-Musa & Nwaiwu, 2021). This transition to E-Money represents a significant step forward in modernizing payment systems, aligning with the broader goals of creating a more efficient, secure, and user-friendly public transportation experience (Ayuningtyas et al., 2024; Joshi & Dwivedi, 2024; Niami et al., 2024). By streamlining the payment process, the system aims to reduce delays caused by cash transactions, enhance operational efficiency, and minimize the risks associated with handling physical cash, such as theft or mismanagement (Cariaga et al., 2023; Putrevu & Mertzanis, 2024). The previous cash-based system was fraught with challenges, including the inconvenience of managing small denominations, the frequent occurrence of lost or misplaced money, and the difficulties faced by both passengers and operators in providing and receiving accurate change (Aldaas, 2021; Arroyo-Arroyo et al., 2021; Suprun et al., 2020; Susanto et al., 2022). These inefficiencies disrupted daily operations and led to a less satisfactory experience for passengers (Monsuur et al., 2021; Tae et al., 2020).

However, while the shift to E-Money addresses conventional payment, its implementation has introduced new challenges, particularly for passengers who are unfamiliar with or unaccustomed to using digital payment methods. This highlights the need for ongoing efforts to educate and support users to ensure a seamless transition and to fully realize the benefits of a cashless payment system. Initial observations reveal significant barriers to the adoption of E-Money by passengers. Challenges include limited socialization and public awareness about the E-Money system, difficulties in accessing BRIZZI cards and top-up facilities, and resistance from certain demographic groups, such as older individuals accustomed to cash transactions. These obstacles have led to instances of passengers borrowing cards, offering cash in lieu of balance replacement, or being unable to board buses due to insufficient card balances. Such issues underscore the practical difficulties in adapting to digital payment systems, which may hinder the broader objectives of the Smart City initiative.

Research on technology adoption in transportation payment systems has been conducted at both national and international levels, providing an important theoretical basis for understanding the challenges and opportunities in the implementation of digital payment systems. Previous studies show that factors such as ease of use, trust in the technology, supporting infrastructure, as well as people's digital literacy play an important role in the successful adoption of new technologies (Febrinda & Ningsih, 2023; Kuberkar & Singhal, 2020; Nikou et al., 2022). For example, research in Nigeria by (Farinloye et al., 2024) highlights the importance of public trust in digital payment systems in increasing e-payment adoption in public transportation. Meanwhile, local research by (Sunarya et al., 2024; Widianti et al., 2024) in Indonesia revealed that low digital literacy is a major challenge in the use of e-payments among public transportation users. Thus, this research aims to complement previous studies by focusing on the context of Transmetro Pekanbaru public transportation system, which offers specific insights into the adoption of digital payment technology in a city with unique urban characteristics.

This study seeks to examine the adaptation of Transmetro Pekanbaru public transportation system passengers as E-Money users. Specifically, it aims to explore the factors influencing passenger readiness, identify challenges faced in adopting the digital payment system, and evaluate the effectiveness of government socialization efforts. By addressing these concerns, the research intends to provide actionable insights to support policy enhancements, improve public transportation services, and facilitate the successful transition to cashless payment systems in urban areas. These findings will also contribute to the broader discourse on smart city initiatives and the digital transformation of public services.

Literature Review

Social Adaptation

Adaptation is a process of self-adjustment carried out by an actor to their environment and changing themselves according to the circumstances of their environment. Adaptation can occur naturally or artificially.

Electronic Money (E-Money)
Quoted from Bank Indonesia, E-Money is electronic / non-cash money where the value of money is based on the amount of money deposited first to the E-Money issuer, the value of the money is stored in a server, a chip that is only used as a means of payment (Karimah & Alisah, 2024; Raissa, 2022). The use of E-Money is only done by attaching a card or using the E-Wallet application to a sensor device (Fahlepi et al., 2023; Kusdiana, 2023).

According to Bank Indonesia Regulation Number 11/12/PBI/2009 concerning Electronic Money article 1 paragraph 3, Electronic Money is a means of payment that meets the following elements: a. Issued on the basis of the value of money deposited in advance by the holder to the issuer; b. The value of money is stored electronically in a medium such as a server or chip; c. Used as a means of payment to merchants who are not the issuers of the electronic money; and d. The value of electronic money deposited by the holder and managed by the issuer is not a deposit as referred to in the law regulating banking (Indradewi & Putra, 2023; Lelono et al., 2024; Suwardi, 2023). Examples of chip-based electronic money are banking products, for example FLAZZ from BCA, BRIZZI from BRI and MTT from PT. MRT (Jakarta Mass Rapid Transit) while server-based, namely LinkAja, OVO Cash, GoPay, Dana and ShopeePay.

Electronic Money (E-Money) applied to Transmetro Pekanbaru is a form of modification and replication of existing program innovations, currently applied in the E-Money payment system. E-Money uses Near Field Communication (NFC) technology which aims to speed up the payment process, safe and practical without waiting for change (Malarvizhi et al., 2022; Tobing et al., 2023).

Method

This study employs a descriptive quantitative research method, aiming to analyze and describe the adoption of E-Money in Transmetro Pekanbaru. The research was conducted in 2024 at the Sukaramai Trade Center Bus Stop, one of the primary stops in the Transmetro Pekanbaru network, chosen due to its high passenger volume and diverse demographic profile. The specific period of the study was in 2024, aligning with the initial phase of the E-Money system implementation, which allows researchers to capture real-time adaptation challenges and strategies. To minimize bias, anonymity and confidentiality were assured to respondents during data collection. Additionally, a pilot test of the interview guide was conducted with five passengers to refine the questions and ensure clarity. Researchers also triangulated data from multiple sources (e.g., interviews, observations, documentation).

Population and Sampling
The population of this study includes 34,918 Transmetro Pekanbaru passengers, with specific characteristics such as diverse age groups, income levels, and varying frequencies of Transmetro usage. The population data was obtained from the 2023 Pekanbaru City Transportation Agency report. To determine the sample size, the Slovin formula was applied with a tolerance level of 10%, resulting in a sample size of 100 respondents. This tolerance level was chosen to balance the precision of data representation and logistical feasibility. The Slovin formula calculation is as follows: $n = N / (1 + Ne^2)$. Where: n = sample size, N = population size (34,918), e = margin of error (10% or 0.1) and $n = 34{,}918 / (1 + 34{,}918 \times 0.01) = 100$ respondents

The sampling technique used is random sampling, ensuring that all passengers in the general category of Corridor 01 have an equal chance of being selected. This approach minimizes selection bias and ensures that the sample reflects the diversity of the population.

Techniques of Data Collection
Three primary data collection techniques were employed in this study to ensure comprehensive and reliable findings. First, observation was conducted by closely monitoring the ticketing process and passenger interactions at the Sukaramai Trade Center Bus Stop. This approach focused on identifying passenger payment behaviors and adaptation strategies when using E-Money. Second, semi-structured interviews were carried out with selected passengers, merchants, and bus staff to gain deeper insights into their experiences and challenges with the adoption of E-Money. Each interview lasted approximately 20–30 minutes, with measures taken to ensure the respondents' anonymity, thereby reducing response bias. Lastly, documentation was used to collect relevant data from government reports, Transmetro operational documents, and passenger payment transaction records. This technique served to support and validate the findings obtained from observations and interviews, ensuring that the study's conclusions were well-grounded and credible.

Operational Definitions of Variables
To ensure consistency and clarity in data collection and analysis, the following variables have been defined operationally. These definitions provide a framework for categorizing respondents' demographic characteristics,

socioeconomic status, and behavioral patterns related to Transmetro Pekanbaru usage: (1) Age. Categorized into five groups (21–31, 32–42, 43–54, 55–66 years); (2) Gender: Classified into two categories (man and woman); (3) Work: Categorized based on employment status, including laborer, merchant, civil servant, self-employed, student, and other; (4) Income Level: Classified into three ranges based on monthly income (IDR 0–2 million, IDR 2–4 million, IDR 4–6 million); (4) Last Education: Classified into four levels, including no school, Elementary School, Junior High School, Senior High School, Bachelor's Degree, Master's Degree; (5) Intensity of Transmetro Pekanbaru Usage: Measured in terms of the number of trips per week; (5) Ownership of Private Vehicle: Classified into two categories (have and don't have); (6) Payment Methods: Includes E-Money adoption (e.g., BRIZZI cards, QRIS) and traditional cash-based transactions.

Data Analysis

The collected data were analyzed using descriptive statistical techniques, such as frequency distributions and cross-tabulations, to identify patterns and trends in E-Money adoption. The analysis was performed using Microsoft Excel to ensure accuracy and reliability of results. Key variables analyzed included passenger demographics, frequency of Transmetro usage, and payment method preferences. Excel functions were utilized to effectively summarize the data, enabling clearer identification of trends and relationships among the variables.

Results and Discussions

Factors Affecting Adaptation

In knowing what are the factors that can affect passengers in adapting to the Transmetro Pekanbaru E-Money innovation, it can be seen from the identity information of the respondents themselves.

Effect of Age on Overall Adaptation Rate

As for finding out whether age has an influence on the level of adaptation of E-Money innovations for Transmetro Pekanbaru passengers, it can be seen in the table below:

Table 1 <Effect of Age on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Age	21-31 Years	0	11	16	**27**
	32-42 Years	0	6	12	**18**
	43-54 Years	1	13	7	**21**
	55-66 Years	8	22	4	**34**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

Table 1 shows the relationship between age and the level of user adaptation to the E-Money payment system in Transmetro Pekanbaru, with three adaptation categories: Laggards, Late Majority, and Early Majority. The age group of 21-31 years (27 people) is mostly in the Early Majority category (16 people), indicating that young users tend to quickly adopt new technology due to their comfort with digital technology. The same can be seen in the 32-42 age group (18 people), where 12 people fall into the Early Majority category.

In contrast, the 43-54 age group (21 people) is dominated by the Late Majority (13 people), and only 1 person belongs to the Laggards, indicating that this group is slower in adopting technology. The 55-66 age group (34 people) had the highest resistance, with 22 people in the Late Majority and 8 people in the Laggards, indicating the slowest adaptation due to old habits and limited technological literacy.

The Effect of Gender on Overall Adaptation Rate

As for whether gender has an influence on the level of adaptation of E-Money innovations in Transmetro Pekanbaru passengers, it can be seen in the table below:

Table 2 <The Effect of Gender on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Gender	Man	5	23	7	**35**
	Woman	4	29	32	**65**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

Table 2 illustrates the relationship between gender and the level of user adaptation to the E-Money payment system in Transmetro Pekanbaru. Of the total 100 respondents, 35 are men and 65 are women. In the Laggards category, there are 5 men and 4 women, showing an almost equal number. However, in the Late Majority category, the number of women (29 people) is greater than men (23 people), indicating that women are slightly slower in technology adoption than men at this stage. In contrast, in the Early Majority category, women dominated with 32 people compared to only 7 men. This suggests that women tend to adapt and adopt technology faster than men, especially at the early majority stage. Overall, although women have a larger number of respondents, they show a more progressive pattern of adaptation than men. This could be influenced by women's needs or habits in using public services such as Transmetro, which makes them more open to digital solutions.

Effect of Work on Overall Adaptation Rate

As for whether the work has an influence on the level of adaptation of E-Money innovation in Transmetro Pekanbaru passengers, it can be seen in the table below:

Table 3 <Effect of Work on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Work	Laborer	4	18	4	**26**
	Merchant	3	14	3	**20**
	Civil Servant	0	0	6	**6**
	Self Employed	0	3	17	**20**
	Student	0	8	8	**16**
	Other	2	9	1	**12**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

Table 3 shows the relationship between job type and the level of user adaptation to the E-Money payment system in Transmetro Pekanbaru. Out of a total of 100 respondents, the laborer group has the largest number in the Laggards (4 people) and Late Majority (18 people) categories, with only 4 people in the Early Majority. This indicates a relatively slow adaptation rate among this group, which may be due to limited technological literacy or a preference for traditional payments. Merchants also have a similar pattern, with 3 people in the Laggards and 14 people in the Late Majority, and only 3 people in the Early Majority.

Meanwhile, respondents who are civil servants are all in the Early Majority (6 people), indicating rapid adaptation to technology due to better access to information and education. The self-employed group dominates the Early Majority category with 17 people, indicating progressive adaptation due to business needs that drive the use of technology. Students have a fairly balanced distribution between Late Majority (8 people) and Early Majority (8 people), indicating moderate but promising adaptation. Other groups are mostly in the Late Majority (9 people) and Early Majority (2 people), indicating slower adaptation.

Effect of Income on Overall Adaptation Rate

As for whether income has an influence on the level of adaptation of E-Money in Transmetro Pekanbaru passengers, it can be seen in the table below.

Table 4 <Effect of Income on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Income	0 - IDR. 2.000.000	7	43	18	68
	IDR 2.000.001 - IDR 4.000.001	2	7	11	20
	IDR 4.000.002 - IDR 6.000.002	0	2	10	12
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

Table 4 shows the relationship between income level and the level of user adaptation to the E-Money payment system in Transmetro Pekanbaru. Of the total 100 respondents, the majority came from the low-income group (0-IDR 2,000,000), with 68 people. Most of them are in the Late Majority category (43 people), while 18 people are in the Early Majority, and 7 people in the Laggards. This suggests that the low-income group is slower to adapt, either due to limited access to technology or a preference for cash payments.

The middle-income group (IDR 2,000,001-IDR 4,000,001) consists of 20 people, with a more even distribution of 7 people in the Late Majority, 11 people in the Early Majority, and only 2 people in the Laggards. This suggests that this group is starting to show better adaptation than the low-income group.

Meanwhile, the high-income group (IDR 4,000,002-IDR 6,000,002) has the least number of respondents, at 12 people. Most of them are in the Early Majority category (10 people), with only 2 people in the Late Majority and none in the Laggards. This reflects that higher income groups tend to adopt digital payment technology faster due to better access to technology and a higher understanding of its benefits.

The Effect of Education on Overall Adaptation Rate

As for whether education has an influence on the level of adaptation of E-Money in Transmetro Pekanbaru passengers, it can be seen in the table below:

Table 5 <The Effect of Education on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Last Education	No School	0	0	0	**0**
	Elementary School	0	0	0	**0**
	Junior High School/or Equivalent	1	4	2	**7**
	Senior High School/Vocational School/ Equivalent	8	35	12	**55**
	Bachelor's Degree	0	13	25	**38**
	Master's Degree	0	0	0	**0**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

The data shows the relationship between the last level of education and the level of adaptation to the E-Money system. In the low education category (Junior High School or Equivalent), the total number of users is only 7 people, with the majority in the Late Majority (4 people) and the rest in the Laggards (1 person) or Early Majority (2 people). This group has the least number of users and tends to be slower to adopt technology.

Secondary education (Senior High School/ Vocational School or Equivalent) has the largest number of users, 55 people. Most were in the Late Majority (35 people), indicating slower adoption, but there were 12 people in the Early Majority and 8 people in the Laggards. This reflects that although the technological literacy of this group is quite high, technology adoption is still hampered by other factors such as habits or preferences.

The higher education (Bachelor's Degree) group is dominated by the Early Majority, with 25 out of a total of 38 users being in this category. The rest are in the Late Majority (13 people), with no Laggards. This pattern suggests that higher education has a direct relationship with faster levels of digital literacy and technology adaptation, as users in this group are more exposed to technology in their daily lives.

Effect of Usage Intensity on Overall Adaptation Rate

As for whether the intensity of using Transmetro Pekanbaru has an effect on the level of E-Money adaptation in a week, you can see in the table below:

Table 6 <Effect of Usage Intensity on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Intensity of Using TMP	1-2	0	2	14	**16**
	3-4	1	9	10	**20**
	5-6	1	5	5	**11**
	7-8	1	12	2	**15**
	9-11	2	15	5	**22**
	12-14	4	9	3	**16**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

The data shows the relationship between the intensity of use of Transmetro Pekanbaru (TMP) and the level of adaptation to the E-Money system. Users with low intensity (1-2 times) tend to be in the Early Majority category (14 out of 16 people), indicating that despite the low frequency of TMP usage, they have a higher readiness to adopt E-Money technology. The medium intensity group (3-6 times) has a total of 31 users. Most

of them are in the Late Majority (14 people), while the number in the Early Majority and Laggards are almost equal. This reflects that at this frequency of use, the adoption of E-Money technology still faces resistance.

At high intensity (7-14 times), the dominance of Late Majority is increasingly visible, especially in the 9-11 times (15 people) and 12-14 times (9 people) groups. The Laggards group is also quite significant at the highest intensity (4 people at 12-14 times), indicating that despite frequent use of TMPs, resistance to E-Money adoption remains, possibly due to habit or personal preference. Overall, the intensity of TMP usage is not entirely directly proportional to the level of E-Money adaptation. Low-intensity users tend to be more adaptive, while high-intensity users show greater resistance.

The Effect of E-Money on Private Vehicle Ownership on Overall Adaptation Rate

As for finding out whether the ownership of a private vehicle affects the level of overall adaptation, it can be seen in the table below:

Table 7 <The Effect of Private Vehicle Ownership on Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Private Vehicles	Don't have	8	43	15	**66**
	Have	1	9	24	**34**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

Based on the data in Table 7, respondents who do not own a personal vehicle are more dominant across all adoption categories, particularly in the Late Majority group with 43 people, followed by Early Majority with 15 people and Laggards with 8 people. On the other hand, the group that owns a personal vehicle is relatively smaller, with 1 person in the Laggards, 9 people in the Late Majority, and 24 people in the Early Majority.

When viewed in total, the majority of respondents are in the Late Majority category (52 people), which indicates that most people tend to be late in adopting private vehicle ownership. On the other hand, the Early Majority and Laggards groups are much smaller, reflecting that private vehicle adoption is not so fast for them. Overall, the data reflects a pattern of slow adoption of private vehicle ownership, with most being in the slower adopter category compared to the faster adopter category.

The Effect of E-Money Capital on the Overall Adaptation Rate

As for finding out whether there is an influence between the type of E-money and the level of adaptation of E-money Transmetro Pekanbaru, you can see in the table below:

Table 8 <The Effect of E-Money Capital on the Overall Adaptation Rate>

Category		Q. Overall Adaptation			Total
		Laggards	Late Majority	Early Majority	
Type of *E-Money*	Does Not Have	5	2	0	**7**
	Have BRIZZI	3	17	5	**25**
	Have a QRIS	1	22	15	**38**
	Have Both	0	11	19	**30**
Sum		**9**	**52**	**39**	**100**

Source: Researcher Data Processing 2024

This table shows the distribution of respondents based on whether or not they own various digital payment methods, such as not owning E-Money, BRIZZI, QRIS, and both (BRIZZI and QRIS), in relation to the technology adoption category. Respondents who do not have E-Money Capital are very few, only 7 people, with the majority being in the Laggards category (5 people). Meanwhile, for BRIZZI ownership, respondents in the Late Majority category (17 people) dominate, followed by Early Majority (5 people) and Laggards (3 people), totaling 25 people.

For QRIS ownership, the highest number of respondents were in the Late Majority category with 22 people, followed by Early Majority (15 people), and only 1 person in Laggards, making it the more widely adopted payment method. For the "Have Both" category (having both BRIZZI and QRIS), the most respondents are in the Early Majority (19 people), while the Late Majority and Laggards are much less with 11 and 0 people, respectively.

Overall, the data shows that the majority of respondents adopted digital payment methods slowly, especially in the Late Majority. Ownership of QRIS and a combination of both (BRIZZI and QRIS) showed a faster adoption trend compared to those without E-Money.

Overall Innovation Adaptation Rate

E-Money is a new innovation applied to the Transmetro Pekanbaru payment method. In the process of adapting innovations, the researcher looks at how the adaptation of Transmetro Pekanbaru passengers in adopting E-Money innovations and passengers experience an adaptation process to this innovation. The overall adaptation can be seen in the table below.

Table 9 <Overall Adaptation Rate>

No.	Category	Score	Frequency	Frequency
1	Laggards	24 – 40	10	10%
2	Late Majority	41 – 57	51	51%
3	Early Majority	58 – 72	39	39%
Total			100	100%

Source: Researcher Data Processing 2024

This table shows the overall level of adaptation based on the Laggards, Late Majority and Early Majority categories. Of the total respondents, the majority were in the Late Majority category (51%), reflecting a moderate or slower tendency to adapt to new technologies or innovations. In contrast, the Early Majority group includes 39% of respondents, indicating a group that is quicker to adopt innovations but is still below half the population. Meanwhile, only 10% of respondents are classified as Laggards, which is the slowest group in adopting technology.

This analysis shows that most of the population tends to wait until innovations are more established before adopting them, with more than half of them in the Late Majority. This illustrates a common pattern of adoption, where moderates and conservatives dominate, while the more innovative (Early Majority) and very slow (Laggards) groups make up only a minority. Technology adaptation or innovation seems to rely more on this middle group to achieve widespread diffusion.

Discussion

This research provides important insights into the level of adaptation to digital payment systems among users of Transmetro Pekanbaru services. The results of this study show that the majority of users are in the Late Majority category (51%), followed by Early Majority (39%) and Laggards (10%). This finding is in line with several previous studies (Nur & Wahyudimas, 2024; Sitinjak et al., 2023; Subarsono, 2021) that state that the adoption of public transportation technology in Indonesia generally experiences delays, with the majority of new users adopting innovations after receiving encouragement in the form of certain policies or incentives. However, when compared to studies related to the implementation of digital payment systems in other major cities, such as Jakarta or Surabaya, the adaptation rate in Pekanbaru appears slower. This may be due to differences in technology penetration rates, policy socialization, or local preferences.

Users who are younger, female, more educated, self-employed, or students, and who already possess E-Money tools such as BRIZZI or QRIS, tend to adapt more quickly. A significant highlight of this study is the dominance of QRIS usage (38%) and the combination of BRIZZI and QRIS payment methods (30%) compared to only BRIZZI (25%) or no digital payment system at all (7%). These results indicate a shift in user preferences towards more flexible and integrated payment solutions. This finding is surprising, given that QRIS is relatively new compared to BRIZZI, which has been available for much longer. This indicates that the practicality and ease of access of QRIS can encourage faster adoption, even though most users are still classified as Late Majority. However, the intensity of TMP usage is not entirely directly proportional to the level of E-Money adaptation; low-intensity users tend to be more adaptive, while high-intensity users show greater resistance.

The practical implication of this finding is the importance of strengthening policies that support the increased adoption of digital payments in Transmetro Pekanbaru. Local governments and Transmetro managers can accelerate adoption by increasing socialization about the benefits and convenience of digital payment systems, providing incentives, such as discounts or loyalty points for users who switch to QRIS or BRIZZI, and ensuring the availability of supporting facilities, such as a stable internet network and QRIS scanners in each fleet. In addition, this policy can be strengthened by educating the public about the safety and convenience of using digital payment technology so that user confidence can continue to increase. With these steps, the digital payment system has the potential to improve Transmetro Pekanbaru's operational efficiency while increasing service user satisfaction.

Conclusion

The adaptation rate of Transmetro Pekanbaru users to E-Money innovation is influenced by various demographic and economic factors, including age, gender, occupation, income, education, private vehicle ownership, and E-Money capital owned. Users who are younger, female, more educated, self-employed, or students, and who already possess E-Money tools such as BRIZZI or QRIS, tend to adapt more quickly. A significant finding is the dominance of QRIS and the combination of BRIZZI and QRIS as preferred payment methods, despite QRIS being a relatively new innovation compared to BRIZZI. This supports the idea that convenience and integration drive adoption, even among passengers categorized as Late Majority. However, the intensity of Transmetro usage did not significantly influence adaptation rates, suggesting that individual readiness and access to E-Money tools outweigh familiarity with the transportation service itself.

This study has some limitations that should be acknowledged. The sample size was relatively small, and the focus on a single location (Pekanbaru) limits the generalizability of the findings to other regions. Furthermore, the cross-sectional design of this study does not capture the dynamic, long-term process of adaptation, which could vary over time. Future studies should consider conducting longitudinal research and expanding the scope to include other cities or regions to better understand how demographic, economic, and contextual factors influence E-Money adoption in public transportation. These insights could guide the development of targeted strategies to promote digital payment systems more effectively.

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