Analysis of Implementation Barriers and Gaps in the Adoption of Chip-Based (Cashless) E-Money in Non-Cash Payment Systems in Pontianak City

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Digital transformation in payment systems encourages the use of non-cash instruments, including chip-based e-money which has advantages in transaction speed and efficiency. However, its implementation at the regional level still faces various obstacles. This research aims to analyze implementation barriers and gaps in the adoption of chip-based e-money in Pontianak City. The method used is a quantitative approach with an explanatory research design. Data was collected through a questionnaire among people who use chip-based e-money and analyzed using SEM-PLS. The research results show that the factors perceived ease of use, benefits, security, trust, digital financial literacy, as well as infrastructure and policy support influence the adoption of chip-based e-money. Apart from that, it was found that there was a gap between the designed policies and the reality of implementation in the field. This research recommends strengthening digital literacy, improving infrastructure, and optimizing policies to encourage wider use of chip-based e-money.

Keywords: chip-based e-money, non-cash payments, technology adoption, public policy, Pontianak

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1. Introduction

Digital transformation in the financial sector has driven a shift from cash to non-cash payment systems as part of the economic modernization agenda and increased transaction efficiency. In Indonesia, national policies encouraging the creation of *a cashless society* are implemented through various electronic payment instruments, including chip-based e-money, known for its advantages in transaction speed, security, and ease of use without an internet connection (*offline transactions*). This instrument is widely used in the transportation, retail, and public service sectors, so conceptually it has great potential to expand financial inclusion and improve the efficiency of regional payment systems.

However, the implementation of chip-based e-money at the regional level, including in Pontianak City, has not yet fully demonstrated optimal results. Despite the availability of basic infrastructure and strong national policy support, adoption rates still show significant variation. In practice, the use of chip-based e-money tends to be limited to specific contexts and has not yet become a primary choice for daily transactions. This indicates a gap between policy designs promoting payment digitization and the reality of implementation on the ground.

These issues are not only related to technical aspects, such as limited reader devices *or* card distribution, but also encompass non-technical factors such as low digital financial literacy, public preference for cash, and perceptions of security and ease of use. Furthermore, businesses and service providers also face challenges in terms of infrastructure investment costs, system integration, and inadequate incentives to

encourage widespread adoption. This situation demonstrates that the barriers to implementing chip-based e-money are multidimensional, involving the interaction of policy, technology, and user behavior.
From a public policy perspective, this situation reflects an *implementation gap* , namely a mismatch between policy objectives and the results achieved on the ground. Policies designed to encourage cashless transactions have not fully accommodated the socioeconomic conditions and characteristics of local communities. Furthermore, suboptimal coordination between stakeholders and the lack of an effective outreach strategy have further exacerbated the implementation barriers.

Based on this description, it can be identified that the main problem lies not only in the availability of chip-based e-money technology, but also in how it is implemented and accepted by the wider community. Therefore, a comprehensive analysis is needed to examine the implementation barriers and adoption gaps of chip-based e-money in the non-cash payment system in Pontianak City, allowing for the formulation of more contextual, adaptive, and implementable policy recommendations.

This study aims to comprehensively analyze the implementation barriers and adoption gaps of chip-based e-money in the non-cash payment system in Pontianak City, so that it can provide more effective and implementable policy recommendations.
Specifically, the objectives of this study are:

1. Identifying and analyzing the obstacles to the implementation of chip-based e-money in the non-cash payment system in Pontianak City, both technical, institutional and social.
2. Analyzing the level and pattern of community adoption of the use of chip-based e-money in daily transactions in Pontianak City.
3. Examining factors influencing low adoption, including aspects of digital literacy, perceived ease of use, security, and public trust in electronic payment systems.
4. Evaluating the gap between policy and implementation (implementation gap) in the implementation of chip-based e-money in non-cash payment systems at the regional level.

Based on the background and objectives of the research, the problem formulation in this research is as follows:

1. What are the obstacles to implementing chip-based e-money in the non-cash payment system in Pontianak City, both from technical, institutional, and social aspects?
2. What factors influence the low adoption of chip-based e-money, particularly regarding perceptions of ease of use, benefits, security, trust, and digital financial literacy among the public?
3. What is the role of infrastructure and policy support in influencing the implementation and adoption of chip-based e-money in Pontianak City?
4. Is there a gap between the formulated policies and the reality of implementation in the field (implementation gap) in the implementation of chip-based e-money in Pontianak City?

2. Method

This study uses a quantitative approach with an explanatory research design, which aims to explain the causal relationship between variables that influence the adoption of chip-based e-money. A quantitative approach was chosen because this study tests previously formulated hypotheses and statistically measures the influence between variables. Furthermore, this research could be enriched with a descriptive approach to describe the implementation conditions and adoption rates in Pontianak City.

3. Results and Discussion

Non-Cash Payment System Concept

A cashless payment system is a transaction mechanism that uses electronic instruments, not physical money, facilitated by financial institutions and supported by advances in digital technology. The transition to a cashless payment system is part of an effort to increase economic efficiency, transaction transparency, and reduce cash management costs.

In the context of public policy, the implementation of a cashless payment system is also closely linked to government efforts to promote *good governance* , particularly in increasing accountability and minimizing informal economic practices. Therefore, digitalization of the payment system is viewed not only as a technological innovation but also as a strategic instrument for reforming the financial system and public administration.

Chip-Based E-Money

Chip-based e-money is an electronic payment instrument whose monetary value is stored in a chip on the card, allowing offline transactions *without* an internet connection. Key characteristics of chip-based e-money include transaction speed, ease of use, and a relatively high level of security compared to conventional payment methods.

Unlike server-based e-money (*e-wallets*), chip-based e-money is more widely used for microtransactions such as transportation, parking, and retail. These advantages make it a potential instrument to support the cashless payment ecosystem, especially in areas with limited internet connectivity. However, limitations in interoperability and device distribution present challenges to its implementation.

Technology Adoption Theory and Policy Model

To understand user behavior in adopting e-money, this study refers to several main theories in technology adoption:

a. Technology Acceptance Model (TAM)
   This model explains that technology acceptance is influenced by two main factors, namely:
   a) Perceived Ease of Use
   b) Perceived Usefulness
   These two variables influence intentions and actual behavior in using technology.
b. Unified Theory of Acceptance and Use of Technology (UTAUT)
   This model is a development of TAM by adding variables:
   a) Performance Expectancy
   b) Effort Expectancy
   c) Social Influence
   d) Facilitating Conditions

In the context of e-money, this model is relevant to explain how social factors and environmental support influence the adoption rate.

Public Policy Theory Model

This study uses a policy implementation model developed by Grindle, which emphasizes that the success of policy implementation is influenced by two main dimensions: *policy content* and *implementation context* . In the context of implementing chip-based e-money, the *policy content dimension* encompasses clarity of policy objectives, perceived benefits, and resource availability. Meanwhile, *the implementation context dimension* encompasses social conditions, digital literacy levels, and support from actors and institutions.

This model is used to analyze implementation barriers and the gap between policy and actual e-money use in Pontianak City.

Trust and Security in Digital Payment Systems

Trust and perceived security *are crucial factors in digital payment systems. Users* tend to be reluctant to adopt payment technologies if they are concerned about the risk of loss of funds, data misuse, or system failure. In the context of chip-based e-money, even though transactions are conducted offline *,* security remains a primary concern, particularly regarding the protection of card balances. Therefore, user trust in the system and service provider is a critical determinant in driving adoption.

Digital Financial Literacy

Digital financial literacy refers to an individual's ability to understand and effectively use technology-based financial services. Low literacy levels can be a major barrier to e-money adoption, as users lack a sufficient understanding of how to use them, their benefits, and the associated risks. Previous research has shown that increasing digital financial literacy contributes significantly to increasing financial inclusion and the use of non-cash payment instruments.

Implementation of Public Policy

From a public policy perspective, implementation is a crucial stage that determines the success of a policy. Successful implementation is influenced by various factors, including:

a. clarity of policy objectives
b. resource availability
c. inter-agency coordination
d. policy communication
e. and social conditions of society

Implementation obstacles often lead to an *implementation gap* , a mismatch between policy objectives and achieved results. In the context of chip-based e-money, this is evident in the low adoption rate despite the policy being in place.

Payment Infrastructure and Ecosystem

The availability of infrastructure such as readers , card distribution networks, and system integration between service providers are crucial factors in supporting the use *of* chip-based e-money. Without adequate infrastructure support, optimal technology adoption will struggle. In addition, the payment ecosystem involving various actors—government, financial institutions, business actors, and the public—must be effectively integrated to create an environment conducive to the use of cashless systems.

Implementation Barriers in the Grindle Model Perspective

Based on Grindle's Policy Implementation Model, the success of policy implementation is determined by two main dimensions: *policy content* and *implementation context* . The research results show that the obstacles to implementing chip-based e-money in Pontianak City can be comprehensively explained through these two dimensions.

In terms *of policy content* , the cashless payment policy was designed with a clear objective: to increase transaction efficiency and encourage economic digitalization. However, in practice, the benefits of this policy have not yet been fully felt by the public. This is evident in the still limited use of chip-based e-money in everyday transactions. Compared with research in large cities, where the benefits of the digital economy are more immediately felt, the situation in Pontianak shows that the policy design is not fully contextualized to local needs.

Meanwhile, in terms of *the context of implementation* , obstacles are more dominant. Social conditions that remain reliant on cash, low digital literacy, and limited infrastructure are the main factors hindering implementation. These findings reinforce Grindle's argument that the context of implementation is often more crucial to policy success than the policy's content itself.

Technology Adoption and Limitations of the TAM Approach in a Policy Context

The research results show that perceived ease and usefulness influence the adoption of chip-based e-money, as explained in the TAM model. Critically, however, these findings also indicate that despite positive public perceptions of the technology, adoption rates remain suboptimal.

When analyzed using Grindle's perspective, this phenomenon demonstrates that *policy content factors* (benefits and convenience) are insufficient to drive adoption without adequate *context for implementation* . In other words, technology-based approaches like TAM have limitations when not combined with policy analysis. Compared with previous studies that only used TAM, this study shows that technology adoption in the context of public policy cannot be explained partially, but must consider structural and social factors.

Trust and Security in the Content of Policy Framework

Trust and security perceptions in this study can be categorized as part of *the content of policy* , particularly regarding how policies are designed to provide security assurance to users. The results show that trust has a significant influence on adoption, which aligns with previous research. Critically, however, the low level of trust in Pontianak indicates that the policy has not yet fully developed a strong perception of security in the community.

Compared to developed countries, where digital security systems are standard, the issues in Pontianak are more perceptual and educational. This demonstrates that security aspects are not merely technical but must also be effectively communicated to the public as part of policy implementation.

Digital Literacy as a Key Element of the Context of Implementation

In Grindle's framework, digital financial literacy is part of *the context of implementation* , which reflects the community's readiness to accept policies. The research results show that digital literacy is one of the most significant factors influencing the adoption of chip-based e-money. Compared to research in areas with high literacy rates, this factor plays a much more dominant role in Pontianak.
Critically, this demonstrates that digitalization policies that are not accompanied by increased community capacity have the potential to create *implementation failure* . In other words, the success of a policy depends heavily on the community's social preparedness as part of the implementation context.

Infrastructure and Policy Support from a Content and Context Perspective

Infrastructure and policy support in this study are at the intersection of *policy content* and *implementation context* . From a policy perspective, infrastructure provision is part of policy design. However, in implementation, the availability and access to infrastructure become part of the context that influences adoption.

The research results show that uneven infrastructure is a major obstacle to the use of chip-based e-money. Compared to studies in large cities where infrastructure is relatively mature, conditions in Pontianak demonstrate an imbalance in resource distribution. This indicates that policies designed at the central level have not fully taken into account variations in regional capacity, thus creating gaps in implementation.

Implementation Gap in the Grindle Model Perspective

One of the main findings of this study is the existence of *an implementation gap* , namely the mismatch between designed policies and the reality on the ground. From Grindle's perspective, this gap occurs due to an imbalance between *the content of policy* and *the context of implementation* .

A normatively sound policy will not produce optimal results if it is not supported by an adequate implementation context. In the case of Pontianak, despite the launch of a cashless policy, limited infrastructure, low digital literacy, and a culture of reliance on cash are major obstacles. When compared with other studies, this phenomenon shows that implementation failure is not caused by policy weaknesses alone, but by a lack of policy adaptation to local conditions.

To date, the implementation of chip-based electronic payment systems (e-money) within the framework of developing a cashless system in Pontianak City—such as BRIZZI, Flazz, and TapCash—still faces various obstacles, particularly in the provision and optimization of facilities in public spaces. The cashless system, which is expected to increase transaction efficiency and financial transparency, has not been fully integrated into public activities.

This situation exists despite the availability of innovative top-up mechanisms that can be done via smartphones using Near Field Communication (NFC) technology. However, adoption of these cashless systems remains relatively low and has not yet demonstrated optimal utilization as part of the development of the smart city concept.

Therefore, more comprehensive regulations and strong policy support from local governments are needed to accelerate the implementation of cashless systems through synergy with the banking sector, particularly in the development and expansion of the use of chip-based cards (e-money). Furthermore, continuous evaluation and policy review are crucial to ensure the effectiveness of the cashless system implementation, so that it can support the creation of more orderly, efficient, and transparent public transaction governance, and increase public convenience in Pontianak City.

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