



A Digital Exclusion Approach to Cashless Transaction Adaptation Among the Elderly in Peri-Urban Areas

Ginna Novarianti Dwi Putri Pramesti^{1*}, Diana magfiroh²

Universitas Kuningan, Indonesia^{1*}

Universitas Cendekia Mitra, Indonesia²

Emails: ginnanovaroyanti@gmail.com¹, dianamagfiroh0002@gmail.com²

Abstract

The digitalization of Indonesia's payment system through QRIS and digital wallets has grown rapidly, yet this has not been matched by even readiness across all segments of society, particularly among the elderly in peri-urban areas who face a double vulnerability: age-related limitations compounded by infrastructural constraints. This study aims to identify the forms of digital exclusion experienced by the elderly in adapting to cashless transactions, analyze the individual, social, and infrastructural factors that influence this exclusion, and formulate policy implications for stakeholders. The study employs a descriptive qualitative design with a phenomenological approach, using in-depth semi-structured interviews, non-participant observation at transaction sites, and documentary study involving elderly individuals, family members/caregivers, and payment service providers as informants, analyzed thematically following the Miles and Huberman interactive model. The findings show that digital exclusion is multidimensional, encompassing access, skills, psychological, and service exclusion, with the skills and psychological dimensions being the most dominant, and is shaped primarily by family/community social support and the quality of infrastructure rather than by age alone. These findings imply the need for age-friendly payment service design, strengthened community-based digital literacy programs, equitable distribution of network infrastructure in peri-urban areas, and legal protection of cash option for vulnerable groups.

Keywords: digital exclusion; cashless transactions; elderly; peri-urban areas; digital financial inclusion.

Introduction

Indonesia's payment system has been transforming at an increasingly rapid pace since Bank Indonesia launched the National Non-Cash Movement (GNNT) on 14 August 2014, aimed at creating a safe, efficient, and transparent payment ecosystem (Andriani et al., 2022; Devega et al., 2025; Pratomo & Nugrahanti, 2022). This momentum strengthened further in the wake of the COVID-19 pandemic, when the need to maintain physical distancing accelerated the adoption of digital wallets, contactless debit/credit cards, and, more recently, the Quick Response Code Indonesian Standard (QRIS) as the single standard for QR-code-based payments (Ana Srikaningsih et al., 2022; Ni Ketut Seniati & Desak Nyoman Sri Werastuti, 2024). Some studies even estimate that a cashless society in Indonesia will materialize sooner than originally projected, owing to the accelerated behavioral change during the pandemic. This transaction digitalization is fundamentally designed to expand choice and improve economic efficiency, not to eliminate the public's right to use cash as a legal means of payment (Ajhari, 2024; Barjaktarovic Rakocevic et al., 2025; Cahyasari et al., 2025).

Nevertheless, this acceleration of transaction digitalization has not been matched evenly by readiness across all layers of society. Not every group of citizens is at an equal level of technological readiness, literacy, or infrastructural access to adapt to the cashless payment system. The elderly are frequently cited as one of the segments most vulnerable to marginalization in this process, alongside children, informal workers, and persons with

disabilities, who have historically occupied unbanked or underbanked positions within the formal financial system.

Social facts underscore the urgency of this issue. According to the 2023 Elderly Population Statistics released by Statistics Indonesia (BPS), Indonesia's elderly population has reached approximately 32 million people, or 11.75 percent of the total population, and is projected to rise sharply to 20–25 percent by 2050 as the demographic bonus reverses into an ageing population structure. Of that number, only 49.56 percent of the elderly have used a mobile device, a figure that reveals a still-wide technology access gap within this age group (Saputra, 2026). A viral incident in late 2025 involving a retail outlet refusing cash payment from an elderly customer who struggled to transact digitally further demonstrated that this issue is no longer an abstract discourse but a lived experience faced by the elderly in their daily economic activities (Demirgüç-Kunt et al., 2022).

This issue becomes even more complex when placed within the context of peri-urban areas transitional zones between urban centers and rural regions characterized by digital infrastructure, internet networks, and electricity distribution that are not yet as evenly developed as in core urban areas, yet no longer entirely rural in character either. A study of the semi-urban community in Airmadidi, North Minahasa, for instance, found that community preferences for digital versus cash money are strongly influenced by limited technological infrastructure and low digital literacy, even though the area is culturally and economically close to a major city. A similar, potentially sharper, condition may be experienced by elderly people in peri-urban areas, who face a compound vulnerability: age-related and technological-cognitive limitations on one hand, and limited infrastructure and digital support services on the other.

On one hand, the national digital literacy index and financial inclusion index continue to show an upward trend year after year, indicating the aggregate success of the national digitalization program. On the other hand, these national, average-based figures may conceal real disparities experienced by specific groups and regions, including the elderly in peri-urban areas, who tend to be statistically underrepresented in national-scale surveys. This gap between macro-level achievement and micro-level reality forms the theoretical starting point of this study: that aggregate progress in financial digitalization does not automatically reflect equitable inclusion for all segments of society.

Theoretically, this phenomenon can be explained through the concept of digital exclusion a condition in which certain groups are unable to access, utilize, or derive equal benefit from digital technology compared to other groups, which in turn widens pre-existing socio-economic gaps. This concept has evolved from the first-generation notion of the digital divide, which focused on physical access to devices and the internet, toward second- and third-generation digital divides that highlight differences in usage skills (digital skills) and differences in the tangible outcomes derived from technology use. In the context of cashless transactions, digital exclusion among the elderly can manifest in various forms, ranging from the inability to operate digital wallet applications, difficulty understanding QR codes, concerns about the security of personal data, to the absence of adequate assistance from family members or service providers.

Prior literature on the adoption of digital payments in Indonesia has so far been dominated by studies on Micro, Small, and Medium Enterprises (MSMEs) and younger generations (Gen Z and millennials) in urban areas, employing the Technology Acceptance

Model (TAM), which emphasizes perceived ease of use and perceived usefulness as the primary determinants of usage intention (Bustami et al., 2026; Lusiana, 2025). These studies consistently find that perceptions of ease and security significantly influence urban young people's intention to use QRIS, whereas research on information technology utilization among the elderly in Indonesia remains limited and tends to focus on health or general literacy aspects rather than specifically on the practice of adapting to cashless financial transactions (To'at et al., 2025).

Based on this review, several significant research gaps were identified. First, the majority of research on digital payment adoption focuses on merchant/MSME subjects or young urban consumers, while the elderly, as end-users of cashless transactions, have relatively not become the main focus of study. Second, research on the digital divide among the elderly is generally generic and nationally scaled, with few studies taking peri-urban areas with their distinct infrastructural and socio-cultural characteristics, different from both core urban and purely rural areas as a specific unit of analysis. Third, the approaches used in previous studies generally rely on technology acceptance models (TAM/UTAUT) oriented toward individual intention and perception, with few using a digital exclusion framework as an analytical lens to understand the process of adaptation rather than mere acceptance or rejection of cashless transactions among the elderly.

This study seeks to fill that gap by offering the novelty of specifically applying a digital exclusion approach to unpack the process of cashless transaction adaptation among the elderly in peri-urban areas, an intersection of subject and locus that has rarely been explored simultaneously in prior literature. Unlike technology acceptance approaches, which are predictive and intention-oriented, the digital exclusion approach in this study allows for a more contextual exploration of the structural and social mechanisms that hinder or facilitate elderly adaptation, including the role of family support, community, and local policy in mitigating the risk of digital-financial marginalization among older age groups.

The urgency of this study lies in three dimensions at once. Demographically, Indonesia's continually rising proportion of elderly people demands more serious policy attention to the inclusivity of the national payment system. Socially, incidents of cash-payment refusal that have surfaced in the public sphere confirm that the risk of economic exclusion for the elderly is actual, not merely potential, requiring an adequate empirical and data foundation to formulate targeted mitigation. Academically, the scarcity of studies specifically addressing the intersection of the elderly and peri-urban areas creates a knowledge gap that risks producing financial digitalization policies that are not fully inclusive, as they are not grounded in a deep understanding of the group most at risk of being left behind.

Based on the background, social facts, literature review, and research gaps outlined above, this study aims to identify and describe the forms of digital exclusion experienced by elderly people in the process of adapting to cashless transactions in peri-urban areas, analyze the individual, social, and infrastructural factors that influence the level and pattern of this digital exclusion and formulate policy implications and practical recommendations for stakeholders including monetary authorities, payment service providers, and local governments to promote more equitable digital-financial inclusion for the elderly in peri-urban areas.

Building on this conceptual framework, this study puts forward the central argument that elderly adaptation to cashless transactions in peri-urban areas is not determined solely by age

or individual reluctance toward technology, but is shaped to a greater extent by the complex interaction between limited local digital infrastructure, the scarcity of age-friendly service design, and weak social support systems for digital assistance in their surrounding environment. In other words, digital exclusion among the elderly in peri-urban areas is hypothesized to be more structural than personal in nature, such that effective intervention strategies should be directed at improving the supporting ecosystem, rather than solely at training the individual skills of the elderly.

Method

The unit of analysis in this study is the individual elderly person (aged 60 years and above) residing in a peri-urban area who has direct experience whether as a user, a limited user, or a non-user of cashless payment transactions in daily economic activities, such as shopping at minimarkets, paying bills, or transacting at traditional markets that have adopted QRIS. In addition to the elderly as the primary unit of analysis, this study also includes supporting units of analysis in the form of actors surrounding the elderly who play a role in this adaptation process, namely family members or caregivers, as well as service providers such as cashiers, branchless banking agents (*laku pandai*), and banking/fintech service staff at the research sites. The inclusion of these supporting units of analysis is important because digital exclusion cannot be fully understood solely from the standpoint of the elderly individual but must also be understood through the social relations and service ecosystem surrounding them.

This study employs a descriptive qualitative design with a phenomenological approach (Creswell & Creswell, 2023). The choice of a qualitative design is based on the consideration that digital exclusion and the process of adapting to cashless transactions among the elderly constitute a social phenomenon rich in meaning, context, and subjective experience, and therefore cannot be adequately explained through quantitative variable measurement alone. The phenomenological approach was chosen because this study seeks to explore and understand, in depth, the lived experience of the elderly how they make sense of, confront, and adapt (or fail to adapt) to the digital payment system amid the infrastructural and social-support constraints of peri-urban areas. This design also allows the researcher to capture the nuance and variation of experience across informants, which is difficult to reduce to numbers, while remaining open to the emergence of new themes throughout the research process, rather than confining itself to rigidly predetermined hypotheses from the outset.

Data sources in this study are divided into primary and secondary data. Primary data were obtained directly from research informants selected using purposive sampling with specific criteria (age, area of residence, and transaction experience), comprising twelve elderly individuals as the primary informants, together with family members/caregivers and payment service providers in the peri-urban areas that serve as the research locus. Secondary data were obtained from supporting documents and literature, such as official statistical reports (BPS, Bank Indonesia, OJK), regulations and policies related to the digital payment system, publications of prior research, and media coverage of issues concerning digital exclusion and cashless transactions among the elderly. This combination of data sources is intended to enrich perspectives while strengthening the credibility of the research findings through source triangulation.

Data collection techniques were carried out through three complementary methods. First, in-depth semi-structured interviews were conducted using an interview guide developed based on indicators of digital exclusion, while remaining flexible enough to probe issues that arose spontaneously during the interviews. Second, non-participant observation was conducted at transaction sites such as traditional markets, minimarkets, and digital payment agents in peri-urban areas, in order to directly observe elderly practices and interactions when transacting in a cashless manner, including technical obstacles and the forms of assistance received from others. Third, documentary study was conducted on the relevant secondary data mentioned above, to strengthen context and verify field findings. All interviews were recorded (with informant consent) and transcribed verbatim to ensure data accuracy prior to analysis.

Data analysis in this study employed thematic analysis based on the interactive model of Miles and Huberman, consisting of data reduction, data display, and conclusion drawing/verification carried out cyclically. In the data reduction stage, interview transcripts and observation notes were coded to identify initial categories relating to the forms, factors, and impacts of digital exclusion experienced by the elderly. These categories were then grouped into broader themes through the data display process, before tentative conclusions were drawn and continuously verified and refined as more field data were gathered. To maintain the trustworthiness of the findings, this study applied source triangulation (comparing data from the elderly, family members, and service providers) as well as method triangulation (comparing the results of interviews, observation, and documentation), so that the resulting interpretations can be methodologically justified.

Results and Discussion

This section presents the research findings organized into three sub-sections, each directly responding to the three research objectives formulated in the introduction: (1) the forms of digital exclusion experienced by the elderly, (2) the factors influencing this pattern of exclusion, and (3) the adaptation strategies that emerged in the field as an empirical basis for policy recommendations.

Forms of Digital Exclusion in Cashless Transaction Adaptation

Interviews and field observations involving twelve elderly informants in peri-urban areas show that the obstacles experienced in cashless transactions are not singular but layered across several dimensions. Most informants were able to recognize the existence of QRIS or digital wallets, yet only a small proportion were truly able to operate them independently without assistance from others. Observations at several transaction points minimarkets, traditional markets, and payment agents revealed a recurring pattern of elderly individuals asking cashiers or people nearby to help complete QR code scanning or payment confirmation.

"I saw my grandchild just tap the phone and it's done right away. When I hold it myself, I already get confused about which button to press." Informant L3, 71 years old, homemaker

"I still carry cash to the market. At the big minimarket checkout, I've started trying to use my child's account." Informant L7, 66 years old, retiree

To clarify the variation and distribution of the identified forms of digital exclusion, the findings are summarized in the thematic matrix in Table 2 below.

Table 2. Matrix of Forms of Digital Exclusion Among Elderly Informants (n=12)

Form of Exclusion	Field Manifestation	Number of Informants Affected
Access exclusion	Lack of an adequate personal device, limited data quota/package, or complete reliance on a device owned by a family member	5 of 12 informants
Skills exclusion	Able to recognize the application/QRIS but unable to independently operate the transaction steps (login, scanning, PIN confirmation)	9 of 12 informants
Psychological exclusion (trust/security concerns)	Concerns about online fraud, transfer errors, or personal data leaks that create reluctance to try	7 of 12 informants
Service/design exclusion	Application interface judged to have small text, an overly lengthy process flow, and a lack of proactive assistance from merchant staff	8 of 12 informants

Source: Data Processed

The data above show that the digital exclusion experienced by the elderly in peri-urban areas is not merely a matter of lacking access to devices, but is centered more on limited operational skills and psychological barriers in the form of concerns about the security risks of digital transactions. Most informants actually own or can access a device, but have not yet developed the confidence or technical competence to use it independently for financial transactions.

From these findings, four main patterns or tendencies were identified. First, access exclusion is a minority form compared to the other forms of exclusion, indicating that the primary issue has shifted from mere device ownership toward the ability to make use of it. Second, skills exclusion is the most dominant form, experienced by the majority of informants, underscoring a gap between passive technological recognition and active technical mastery. Third, the psychological dimension characterized by a lack of self-confidence and security concerns is also a significant obstacle that is frequently overlooked by aggregate, quantitative digital literacy indices. Fourth, service and application designs that are not yet age-friendly further burden the adaptation process, showing that exclusion also originates from the service-provider side, not solely from the limitations of users themselves.

These findings reinforce the theoretical framework of second- and third-generation digital exclusion, which emphasizes that the digital divide is no longer solely a matter of physical access to devices, but a matter of the skills gap and the outcome gap experienced by users. In the context of the elderly in peri-urban areas, these findings also show that exclusion is multidimensional and interwoven: limited skills trigger psychological concerns, which in turn

reinforce reluctance to try, creating a cycle that hinders the sustainability of the adaptation process unless intervened upon from outside.

Factors Influencing the Pattern of Digital Exclusion

Further investigation into the context underlying the forms of exclusion described in the previous sub-section shows that the pattern of elderly digital exclusion is influenced by a combination of individual, social, and infrastructural factors. Interviews with elderly informants, family members, and payment service providers revealed that physical condition (eyesight, fine motor ability), prior exposure to technology during working years, the availability of a caregiver at home, and the quality of local internet signal all interact to shape the elderly's level of readiness to adapt.

"The signal here comes and goes, especially when it rains. My mother gets even more reluctant to try again when the app takes a long time to load." (Informant K2, 39 years old, child of an elderly informant)

"What matters most is having someone accompany you. If there's a child at home willing to teach, then it becomes possible. If you're alone, well, you just use cash." (Informant L5, 69 years old, market vendor)

To map the relationship between factor categories and their influence on the adaptation process, the findings are summarized in Table 3.

Table 3. Factors Influencing the Pattern of Elderly Digital Exclusion

Factor Category	Specific Factors Identified	Influence on the Adaptation Process
Individual	Physical condition (eyesight, fine motor skills), prior technology exposure, level of education	Determines the initial speed and comfort in learning payment application features
Social	Availability of a family caregiver, community/neighbor support, collective peer-group experience	The main determinant of continued use; the absence of a caregiver correlates with reverting to a cash preference
Infrastructural	Internet network stability, electricity availability, reach of cashless agents/merchants near the place of residence	Limits opportunities to practice and produces failed-transaction experiences that reduce confidence
Institutional/Service	Application interface design, availability of assisting staff at merchants, cash-cashless acceptance policy	Affects the level of objective ease experienced, regardless of the elderly individual's own ability

Source: Data Processed

These data confirm that the elderly's readiness to adapt to cashless transactions does not stand alone as a personal attribute but is highly dependent on the support available in their surrounding environment, both human support (family, community) and system support (network, service design). From these findings, four patterns can be identified. First, the social factor of having a family caregiver emerged as the factor most frequently cited by informants as determining the success or failure of adaptation, surpassing the influence of age alone.

Second, infrastructural factors such as unstable internet networks in peri-urban areas were consistently reported as a source of failed-transaction experiences that reduced the elderly's confidence to try again. Third, individual factors such as physical condition affect the technical comfort of using an application, but their role tends to be mitigable when adequately supported by social factors. Fourth, institutional factors namely the scarcity of age-friendly service design and the limited number of assisting staff at transaction sites show that the responsibility for adaptation should not be placed entirely on the elderly individual.

The interpretation of these patterns reinforces this study's central argument that digital exclusion among the elderly in peri-urban areas is structural rather than purely personal in nature. The interaction between weak local infrastructure, the scarcity of inclusive service design, and varying levels of social support shows that factors beyond the individual elderly person's control play a role equal to, or even greater than, age or physical condition alone. These findings shift the perspective away from the narrative of the "technologically clumsy elderly," which tends to blame the individual, toward an understanding that it is the supporting ecosystem that needs to be improved for the adaptation process to proceed more inclusively.

Elderly Adaptation Strategies and the Empirical Basis for Policy Recommendations

These strategies range from full delegation to family members, the situational use of a combination of cash and cashless payments, to informal learning through social interaction with fellow elderly people.

"For big monthly shopping, I ask my child to transfer the money first. But for small snacks at the local shop, I still keep my own small change." (Informant L9, 64 years old, retired teacher)

"I learned from my arisan (rotating savings group) friend. She said it's easy as long as you don't rush pressing the buttons, so I followed her way of doing it." (Informant L4, 67 years old, homemaker)

These various adaptation strategies, along with their level of sustainability, are summarized in Table 4 as an empirical basis for formulating policy implications in the discussion section.

Table 4. Elderly Adaptation Strategies Toward Cashless Transactions in Peri-Urban Areas

Adaptation Strategy	Description	Sustainability/Risk
Full delegation	Handing over the entire digital transaction process to a child/grandchild/caregiver	Prone to being unsustainable if the caregiver is not always available; creates dependency
Cash-cashless hybrid	Using cashless payment for large/scheduled transactions while still holding cash for small daily needs	Relatively sustainable as it provides a sense of control, but limits the full efficiency benefits of cashless payment
Informal social learning	Learning through observation and guidance from fellow elderly people within social groups (arisan, religious study groups, elderly posyandu)	Potentially sustainable and replicable as a basis for community-based literacy programs
Merchant avoidance/selection	Selectively transacting only at places that still accept cash or provide cashier assistance	Risks limiting the elderly's economic choices and may reinforce long-term exclusion

Source: Data Processed

These data show that the elderly are not passive actors in the face of the transformation of the payment system but actively construct coping strategies to balance the demands of digitalization with the limitations they possess, even though some of these strategies do not yet fully address the root causes of exclusion. At least four strategy patterns were identified from these data. First, the delegation strategy is the most common yet the most vulnerable pattern, as it creates long-term dependence on third parties and does not build the elderly individual's own independence.

Second, the cash-cashless hybrid strategy indicates a pragmatic, partial adaptation, in which the elderly retain control over small-value transactions while making use of cashless payment for certain needs. Third, informal social learning through peer groups has proven to be a relatively effective and sustainable mechanism, indicating strong potential for community-based digital literacy approaches. Fourth, the merchant avoidance/selection strategy shows that some elderly individuals choose to limit their economic space in order to avoid the risk of failed transactions, a form of adaptation that may actually deepen economic exclusion in the long run.

The findings in this sub-section provide a concrete empirical basis for the third research objective, namely the formulation of policy implications. The relative success of the informal social learning strategy indicates that policy intervention should ideally not focus solely on one-way individual training, but on strengthening and institutionalizing the social support mechanisms that have already grown organically within the community, while encouraging payment service providers to design interfaces and assistance schemes that are more age-

friendly, in order to reduce reliance on delegation or avoidance strategies that risk deepening exclusion.

Discussion

In summary, this study found that the digital exclusion experienced by the elderly in peri-urban areas in adapting to cashless transactions is multidimensional, encompassing access, skills, psychological, and service exclusion, with the skills and psychological dimensions being the most dominant. This pattern of exclusion is shaped by the interaction of individual, social, infrastructural, and institutional factors, with family and community social support proving to be the most decisive factor compared to age alone (Tamara, 2024; Zuliana, 2024). In response, the elderly developed various adaptive strategies delegation, hybrid, social learning, and avoidance some of which are vulnerable and others of which show potential for sustainability as a basis for policy intervention.

Why these patterns emerge can be explained through the interconnection of factors that operate cyclically. Limited digital infrastructure in peri-urban areas creates repeated failed-transaction experiences, which then breed psychological concern and reduce the elderly's confidence to try independently. This condition, in turn, drives the elderly to depend on a caregiver, so that their technical skills are never truly honed because tasks are always delegated. Meanwhile, service designs that are not yet age-friendly reinforce this cycle by failing to provide space for the elderly to practice safely and gradually. Thus, digital exclusion among the elderly is not a static condition, but the result of a feedback loop between infrastructure, psychological experience, and service design that mutually reinforce one another.

Compared with prior research, these findings show both similarities and important differences. In line with the study of the semi-urban community in Airmadidi, which found that preferences for digital money are influenced by limited infrastructure and digital literacy, this study likewise confirms the crucial role of infrastructural factors in non-core-urban areas (Kulon, 2026). However, previous studies on QRIS adoption among Generation Z in major cities and among MSME actors tend to emphasize perceived ease and security as the sole determinants of usage intention through the Technology Acceptance Model framework, whereas this study finds that, for the elderly, intention or perceived ease alone is insufficient to explain adaptation behavior social support and institutional design factors play a far more determinant role. The novelty of this study lies in the shift of the unit of analysis from individual, intention-based approaches commonly used in studies of younger generations, toward an understanding of the adaptation process that is relational and structural among the elderly, a perspective that has rarely been raised in the literature on cashless society in Indonesia (Islamiyah et al., 2020).

More broadly, these findings carry meaning that extends beyond the individual context of the elderly alone. The phenomenon of digital exclusion among peri-urban elderly people can be read as a reflection of a more structural inequality in the process of national economic digitalization, in which aggregate progress in the payment system is often designed following the logic of market efficiency and the preferences of the majority user group (the young, productive, urban population), without adequately accommodating the needs of structurally minority groups such as the elderly in peripheral areas. In this sense, digital exclusion is not

merely a technological issue, but also a matter of social justice in the design of inclusive digital-economic policy (Noer et al., 2020; Supanji Setyawan, 2022).

Reflecting on these findings, the digitalization of cashless transactions carries real positive functions, such as efficiency, protection from the risk of losing cash, and transaction transparency, but on the other hand carries the potential for dysfunction if applied uniformly without considering the diversity of users' capacities. The positive consequences of successful adaptation include increased economic independence for the elderly and reduced physical security risk from carrying cash (Judijanto, Andiena Nindya Putri, et al., 2024; Judijanto, Putri, et al., 2024). Conversely, the negative consequences that emerge from these findings include increased elderly dependence on third parties, a potential narrowing of economic participation space due to avoidance strategies, and the risk of further marginalization if the cashless trend continues to develop without an inclusive transition scheme for vulnerable groups.

Based on the overall findings, this study recommends a number of policy actions. First, digital payment and banking service providers should be encouraged—through Bank Indonesia and OJK regulation to develop age-friendly interface designs, including large-font options, simplified transaction flows, and layered confirmation mechanisms to reduce security concerns. Second, local governments and civil society organizations need to strengthen and institutionalize community-based digital literacy programs that leverage elderly peer social networks, which have proven organically effective, rather than relying solely on one-way formal training.

Third, telecommunications infrastructure providers and the government need to prioritize equitable improvement of internet network quality in peri-urban areas as a fundamental prerequisite for successful digital-financial inclusion. Fourth, national payment system policy needs to explicitly maintain the cash option as a legally protected transitional mechanism for vulnerable groups, to prevent economic exclusion arising from unilateral "cashless only" policies implemented by business actors.

Conclusion

This study concludes that digital exclusion experienced by the elderly in peri-urban areas in adapting to cashless transactions is a multidimensional phenomenon encompassing limited operational skills, psychological barriers in the form of security concerns, and service designs that are not yet age-friendly. The elderly's readiness to adapt to the digital payment system is determined more by the supporting ecosystem, including family support, community networks, network infrastructure, and inclusive service design, than by age or individual reluctance alone. Digital exclusion among peri-urban elderly people is therefore structural and relational, not merely personal. This study extends the digital exclusion framework into cashless financial transaction adaptation among the elderly and provides an empirical mapping of forms of exclusion, determining factors, and adaptation strategies. Future research should expand the scope of peri-urban areas, develop longitudinal designs, and consider a mixed-method approach to strengthen the transferability and understanding of elderly adaptation to digital payment systems.

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