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# ENHANCING MOBILE PAYMENT ADOPTION AMONG OLDER ADULTS: PERSPECTIVES FROM COGNITIVE AGE AND STEREOTYPE THREAT

**Tsu-Wu Tien[1], Tsung-Kuang E. Ma[2]*, Ting Chen Chang[3], Bi Feny Hsu[4]**

[1]*Department of Business Administration, I-Shou University, Kaohsiung City, Taiwan*

[2]*Department of Business Administration, I-Shou University, Kaohsiung City, Taiwan*

[3]*Graduate student, Department of Marketing and Tourism Management, National Chiayi University, Taiwan*

[4]*Graduate student, Department of Finance, National Kaohsiung University of Science and Technology, Taiwan*

## Abstract

The rapid proliferation of mobile payment systems has reshaped consumer behavior, yet older adults remain a crucial yet underexplored user segment. This study extends the Technology Acceptance Model (TAM) by integrating two age-specific antecedents, cognitive age and stereotype threat, to examine their influence on mobile payment adoption. Based on a survey of 225 respondents aged 50 and older in southern Taiwan, this research also investigates the mediating roles of perceived ease of use and receptiveness to innovation. The results indicate that both cognitive age and stereotype threat significantly reduce perceived ease of use and receptiveness to innovation. Furthermore, perceived ease of use fully mediates the effects of cognitive age and stereotype threat on mobile payment intention, whereas receptiveness to innovation mediates these effects via indirect-only mediation for cognitive age and partial mediation for stereotype threat. These findings underscore the pivotal role of perceived ease of use and receptiveness to innovation in older adults' technology adoption. The study enriches TAM by incorporating psychosocial factors unique to aging populations and offers practical implications for designing age-friendly payment interfaces, alleviating stereotype-induced anxiety, supplying risk-free trials, and leveraging cognitive age marketing strategies to enhance digital acceptance.

## Keywords

Cognitive Age, Stereotype Threat, Perceived Ease of Use, Receptiveness to Innovation, Older Adults

## 1. Introduction

The rapid expansion of smartphone-enabled mobile internet access and the continued development of mobile applications have created a mature market for mobile payment services. As mobile payment use continues to grow, understanding the factors that shape consumers' willingness to adopt these services has become increasingly important (Gong, Zhang, Chen, Cheung, & Lee, 2020).

As the global population ages, older adults have become an increasingly important consumer segment. The population aged 60 and older is projected to reach 2 billion by 2050, accounting for 22% of the world's population (Huang et al., 2024). Despite this growth, older adults continue to face a digital divide (Chen & Chan, 2011), and research on their adoption of mobile payments remains limited (Ismail & Abdul Wahid, 2022). Nevertheless, older adults are viewed as an important future market for mobile commerce (Huang, 2023). Although mobile phone use among older adults has increased, many still prefer

cash to mobile payments (Yang et al., 2023). Understanding their perceptions of financial technology and the factors that influence mobile payment adoption is therefore important for promoting digital inclusion and participation in the digital economy (Yang et al., 2023). Such knowledge can also inform the development of mobile payment systems and strategies that better address older adults' needs (Wang et al., 2024).

Prior research has applied the Technology Acceptance Model (TAM) to explain mobile payment adoption among older adults. Attitude has been identified as a key determinant of adoption and is shaped by perceived usefulness and perceived ease of use (Yang et al., 2023). Compatibility, individual mobility, and subjective norms have also been shown to predict acceptance of mobile payments (Schierz et al., 2010). However, scholars have argued that TAM should be extended to account for older adults' physiological and psychological characteristics, capabilities, and age-related challenges (Chen & Chan, 2011; Huang, 2023; Huang et al., 2024; Yang et al., 2023). Examining these factors can provide a more complete understanding of older adults' technology adoption processes (Renaud & Biljon, 2008).

Perceived ease of use refers to the degree to which an individual believes that using a particular system will be effortless (Davis, 1989). It is consistently identified as a key determinant of technology acceptance among older adults (Yang et al., 2023). Perceived ease of use influences perceived usefulness and may also directly affect behavioral intention. When older adults perceive a technology as easy to use, they are more likely to adopt it (Huang et al., 2024). Chronological age is generally negatively associated with perceived ease of use (Hauk et al., 2018), partly because age-related changes in vision, hearing, cognition, and motor ability can create barriers to technology use (Chen & Chan, 2011). Habitual preferences and usage-related difficulties may further inhibit older adults' participation in online consumption (Ismail & Abdul Wahid, 2022), while previous negative experiences may foster resistance to subsequent innovations (Chen, 2008).

As social perceptions of aging shift, many older adults adopt an age-defying lifestyle and view themselves as younger than their chronological age. These subjective age perceptions can meaningfully shape consumption behavior. At the same time, older adults may fear confirming negative stereotypes about their age group. Stereotype threat can indirectly reduce technology use by increasing anxiety and lowering perceived ease of use (Mariano et al., 2021). However, older adults may also respond to novel product recommendations with compensatory consumption and greater receptiveness to innovation, even when age stereotypes are salient (Zhao & Fu, 2024). Consistent with this view, research suggests that cognitive age may be more relevant than chronological age in explaining innovation acceptance and technology adoption. Older adults who feel younger than their chronological age are often more willing to adopt innovative products and technologies (Hong et al., 2013; Haug & Gewald, 2020).

This study examines the psychological mechanisms underlying older adults' intentions to use mobile payments, focusing on how cognitive age, stereotype threat, perceived ease of use, and receptiveness to innovation influence adoption. Specifically, it investigates whether perceived ease of use and receptiveness to innovation mediate the effects of cognitive age and stereotype threat on mobile payment intention. Accordingly, the study's theoretical contribution lies not merely in adding external variables to TAM, but in specifying how aging-related psychosocial factors shape older adults' technology adoption through two distinct mechanisms. Cognitive age captures the self-perceptual dimension of aging and explains why individuals of similar chronological age may differ in perceived ease of use and receptiveness to innovation. Stereotype threat captures the social-evaluative pressure associated with aging and explains how negative age-related expectations may undermine perceived usability and exploratory motivation. By examining these two antecedents simultaneously, this study distinguishes between an internal self-age pathway and an external social-threat pathway, thereby extending TAM beyond conventional demographic or utilitarian predictors.

## 2. Literature Review

### *2.1 Cognitive Age*

Cognitive age refers to an individual's subjective perception of age rather than chronological age. It may predict behavior and attitudes more effectively than chronological age because it reflects how individuals perceive themselves (Haug et al., 2019). Cognitive age commonly includes four dimensions: feel-age, or how old a person feels; look-age, or how old a person believes they appear; do-age, or the age group whose behavior most closely matches their own; and interest-age, or the age group whose interests most closely resemble their own (Caboral-Stevens, 2016; Hu et al., 2024). Individuals may draw on these dimensions when evaluating their cognitive age (Haug et al., 2019), and older adults frequently perceive themselves as

 

younger than their chronological age (Caboral-Stevens, 2016).

Consumers with lower cognitive age are more likely to adopt new practices or purchase new products when they perceive the benefits. This pattern suggests a more discerning attitude toward innovation rather than unquestioning acceptance (Schiffman & Sherman, 1991). There is a significant negative correlation between actual age and perceived ease of use of technology (Hauk et al., 2018). This relationship indicates that as individuals age, they perceive technology as less easy to use. However, among older non-computer users, there is no significant correlation between age and perceived ease of use; factors such as technical experience and personality are stronger predictors (Mitzner et al., 2016). In contrast, cognitive age has been considered a more accurate and effective predictor of technology acceptance behavior and attitudes (Hu et al., 2024; Yang & Shih, 2020).

Older adults who feel younger tend to be more confident and in control of their lives, leading them to adopt a more positive attitude toward new technologies (Hu et al., 2024). Older adults with lower cognitive age are often more innovative, confident, willing to embrace change and personal challenges, and proactive in seeking new experiences (Schiffman & Sherman, 1991). Consumers with lower cognitive age are more proactive in seeking information (Stephens, 1991; Lee & Min, 2023) and are more easily influenced by social trends, making them more willing to try new technologies (Stephens, 1991). Szmigin and Carrigan (2000) found that older adults' consumption of new products in specific categories may become more "age-defying," and older adults with stronger cognitive abilities exhibit higher receptiveness to innovation (Wilkes, 1992). This may be because they need novel products to compensate for limited social connections and information channels (Zhao & Fu, 2024). Based on the above research, this study proposes the following two hypotheses:

H1: Cognitive Age has a significant negative effect on Perceived Ease of Use.
H2: Cognitive Age has a significant negative effect on Receptiveness to Innovation.

### *2.2 Stereotype Threat*

Stereotype threat is a psychological state in which individuals fear confirming a negative stereotype about their social group or being evaluated through that lens (Barber, 2020). This threat can impair performance (Steele & Aronson, 1995). Age-related stereotypes often portray older adults as cognitively slower, less able to process information, and less competent with technology (Barber, 2020; Mariano et al., 2020, 2021). Older consumers are also often portrayed as less open to innovation and more attached to established brands and traditional products, tendencies commonly attributed to risk aversion, socioemotional selectivity, nostalgia, attachment to familiar objects, and habitual behavior (Zhao & Fu, 2024). Exposure to these stereotypes may impair performance or encourage avoidance of technology-related tasks (Mariano et al., 2021). Perceived difficulty is closely linked to age stereotypes and may heighten feelings of vulnerability. Conversely, stronger self-efficacy can reduce technology anxiety and encourage use (Westberg, Reid, & Kopanidis, 2021).

Charness and Boot (2009) argued that age stereotypes about older adults' ability to adapt may reduce their willingness to adopt new technologies. When older adults internalize negative beliefs about their technological competence, their motivation and confidence to learn may decline, leading them to perceive new technologies as more difficult to use (Levy, 2009). Stereotype threat may therefore reduce technology use by increasing anxiety and lowering perceived ease of use (Mariano et al., 2021). Within TAM, technology-related anxiety is an important antecedent of perceived ease of use (Mariano et al., 2021; Venkatesh, 2000). Stereotype threat may also reduce openness to innovation. Nevertheless, Zhao and Fu (2024) found that older adults may engage in compensatory consumption, including a preference for innovative products, when novelty offers an opportunity to counter negative age stereotypes. On balance, this study proposes the following hypotheses:

H3: Stereotype Threat has a significant negative effect on Perceived Ease of Use.
H4: Stereotype Threat has a significant negative effect on Receptiveness to Innovation.

### *2.3 Technology Acceptance Model*

The Technology Acceptance Model (TAM), developed by Davis (1989) based on the Theory of Reasoned Action, is a widely used framework for explaining users' acceptance of new information systems and technologies. TAM suggests that technology adoption intentions are primarily driven by users' attitudes toward use and perceptions of usefulness. Both perceived usefulness and attitude are influenced by

perceived ease of use. When users perceive a system as easy to use, they are more likely to view it as applicable, fostering positive attitudes and higher usage intentions. Research shows that perceived ease of use directly influences older adults' intentions to use mobile payments (Wang et al., 2024). When older adults find mobile payment systems easy to use, they are more likely to perceive them as applicable (Yang et al., 2023). Perceived ease of use is a key factor in older adults' acceptance of technology products (Venkatesh et al., 2003), and perceived difficulty can reduce older adults' willingness to use technology (Charness & Boot, 2009; Renaud & Biljon, 2008). Age-sensitive interface design and user education can therefore enhance perceived ease of use and usage intention. Recent studies on older adults' digital and fintech adoption increasingly suggest that technology acceptance is shaped not only by usefulness and ease of use, but also by digital inclusion, platform design, trust, risk perception, and age-related psychological readiness (Huang et al., 2024; Wang et al., 2024; Yang et al., 2023; Zhao & Fu, 2024). In mobile payment contexts, these findings suggest that extended TAM models should go beyond chronological age and incorporate subjective and social-psychological mechanisms to explain heterogeneity among older users.

Individual Innovativeness reflects an individual's willingness to try new technologies. Higher individual innovativeness is associated with more favorable perceptions of new information technologies, including stronger perceived ease of use (Agarwal & Prasad, 1998; Lewis et al., 2003; Schillewaert et al., 2005). For highly innovative individuals, learning and mastering new technologies may require less time and effort because they are more willing to explore unfamiliar systems and new consumption experiences. Consumers with high innovation capabilities are more likely to explore multiple information sources and embrace new consumer experiences, whereas those with lower innovation capabilities prefer familiar options (Kamboj & Sharma, 2022). Receptiveness to innovation is often regarded as an important psychological characteristic that influences consumers' willingness to adopt innovative products (Zhao & Fu, 2024). Therefore, this study proposes the following hypothesis:

H5: Perceived Ease of Use mediates the effects of Cognitive Age and Stereotype Threat on Mobile Payment Intention.
H6: Receptiveness to Innovation mediates the effects of Cognitive Age and Stereotype Threat on Mobile Payment Intention.

## 3. Research Method

This section presents the research framework, measurement instruments, sampling procedure, data collection process, and the assessment of reliability and validity.

### *3.1 Research Framework*

Figure 1 presents the proposed research framework. Drawing on the literature reviewed above, the model proposes that cognitive age and stereotype threat influence mobile payment intention through perceived ease of use and receptiveness to innovation. Accordingly, this study further examines the mediating effects of perceived ease of use and receptiveness to innovation, thereby providing a more comprehensive theoretical foundation.

*Note: Hypotheses H5 and H6 are integrated into a parallel mediation framework during statistical testing to estimate joint indirect effects.*

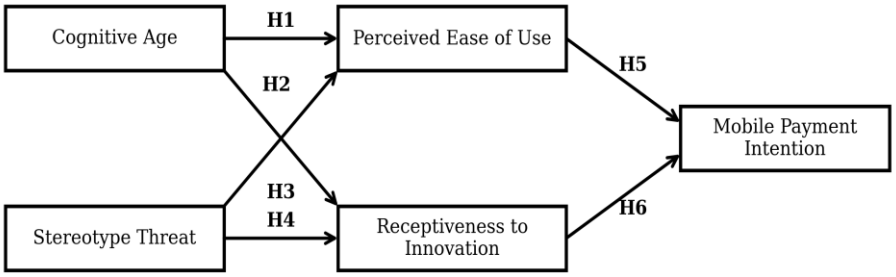


Figure 1 Research Framework

 

### *3.2 Research Variables and Questionnaire Design*

Two data collection approaches were used in this study: electronic surveys and paper-based questionnaires. Measurement items for the principal constructs were adapted from established, validated sources. Cognitive age, stereotype threat, and receptiveness to innovation were measured using scales developed by Zhao and Fu (2024). Perceived ease of use was assessed using Davis's (1989) instrument, whereas mobile payment intention was adapted from Maduku and Thusi (2023) with minor modifications to align with the present study's objectives. Cognitive age was evaluated using a five-point categorical scale, with responses ranging from 5 years older or more (5 points) to 5 years younger or more (1 point). In contrast, all other constructs were assessed on a five-point Likert scale anchored at 1 (strongly disagree) and 5 (strongly agree).

The questionnaire comprised multiple sections corresponding to the study's constructs. The first section measured cognitive age (Cronbach's $\alpha = 0.758$) using five indicators: the perceived gap between one's (1) felt age and actual age, (2) appearance and actual age, (3) behavior and that typically associated with one's age group, (4) interests and those of one's peers, and (5) memory decline and that of people of the same age. The second section assessed stereotype threat (Cronbach's $\alpha = 0.891$) with five items capturing respondents' perceptions of age-related stereotypes, such as being viewed as older adults, considered less competent at work, presumed to have poor memory, subjected to stereotypical treatment during consumption (e.g., clerks assuming older consumers are less capable of using technology), and perceived as unable to operate technology products. The third section measured perceived ease of use of mobile payments, defined as consumers' evaluation of the effort required to use mobile payment systems. Five items were adapted for this construct, including the ease of learning to use mobile payments, the ease of completing transactions, the minimal effort required, the ease of use on digital devices, and an overall perception of mobile payment systems as easy to use. This construct demonstrated strong reliability (Cronbach's $\alpha = 0.95$). The fourth section assessed receptiveness to innovation (Cronbach's $\alpha = 0.94$) using a five-item scale measuring respondents' openness to novel products and experiences. Representative items included interest in viewing new or different products, willingness to try unfamiliar products, interest in exploring new stores or restaurants, preference for new rather than familiar products, and willingness to adopt new inventions. The fifth section measured mobile payment intention with a four-item scale assessing respondents' propensity to adopt and advocate for mobile payment systems. Items assessed respondents' willingness to use mobile payments when required, intended frequency of use, likelihood of recommending mobile payments to others, and openness to adopting mobile payments upon a peer's recommendation. The sixth section collected socio-demographic information—age, gender, education level, and occupational category—to describe the sample characteristics and provide contextual information for interpreting the findings.

Harman's single-factor test was conducted because self-report questionnaires are vulnerable to common method variance (CMV) when data are collected from a single source. Following Podsakoff et al. (2003), CMV is problematic if a single factor accounts for most of the total variance. The principal component analysis showed that the first factor explained 35.98% of the variance—well below the 50% threshold—suggesting that CMV is not a serious threat to this study's validity.

### *3.3 Data Collection*

The study targeted individuals aged 50 years and older to assess their acceptance of mobile payment systems, using both online and paper-based surveys conducted in southern Taiwan. A two-stage survey design was used to achieve an adequate sample size. In the first stage, data were collected via an online questionnaire distributed through Google Forms. In the second stage, paper-based questionnaires were administered in Tainan City and Kaohsiung City in southern Taiwan, primarily in public places and community locations accessible to older adults. Eligible participants were required to be aged 50 years or older and able to understand the questionnaire items. Responses from participants younger than 50 years, incomplete questionnaires, and patterned or inconsistent responses from the paper-based surveys were excluded before analysis. Before completing the survey, respondents were informed of the study's academic purpose, the voluntary nature of participation, anonymity, and their right to withdraw. No personally identifiable information was collected. Research personnel explained the purpose and instructions, when necessary, but did not intervene in the actual responses. Paper-based responses were subsequently digitized and integrated with online responses to facilitate data organization and statistical analysis. The final dataset consisted of 225 valid responses. Because both online and paper-based convenience sampling channels were used, an exact response rate could not be calculated.

### *3.4 Reliability and Validity*

Cronbach's alpha values for all constructs were above 0.7, exceeding the standard suggested by DeVellis and Thorpe (2022), indicating that the measured items were reliable. Based on the literature review, the scales used in this study were deemed suitable and relevant. Therefore, the questions in the formal questionnaire were measured using the scholars' proposed scales after the survey. As a result, the questionnaire can be considered to have high content validity. To determine construct validity, Composite Reliability (CR) should be greater than 0.7, and Average Variance Extracted (AVE) should be greater than 0.5 (Bagozzi & Yi, 1988). The CR of the factors in this study ranged from 0.891 to 0.972, and the AVE ranged from 0.733 to 0.895, indicating that the factors had good explanatory power for the observed variables.

## 4. Analysis and Results

### *4.1 Sample Structure*

A total of 225 valid responses were obtained, reflecting a sample with diverse demographic characteristics. Descriptive analyses were conducted for gender, age, educational attainment, and occupation. The findings showed that women constituted 53.3% of respondents; the largest age group was 50–54 years (41.8%); university or college education accounted for the largest share of educational attainment (44.4%); and business or service-related occupations were the most common (38.2%).

### *4.2 Descriptive Statistics*

Table 1 presents the means, standard deviations, and correlation coefficients for the study variables. The results indicate that the independent variable, cognitive age, was significantly and negatively correlated with the mediating variables, perceived ease of use and receptiveness to innovation. Similarly, stereotype threat showed significant negative correlations with both perceived ease of use and receptiveness to innovation. Moreover, the dependent variable, mobile payment intention, was significantly and positively correlated with both mediating variables, indicating a consistent pattern across these relationships.

For descriptive statistics, the mean cognitive age score was 2.87, indicating that respondents, on average, perceived themselves as slightly younger than their chronological age. The mean stereotype threat score was 2.79, suggesting that participants did not strongly identify with age-related stereotypes. The mean values for the remaining constructs ranged from 3.40 to 3.75, indicating that respondents generally expressed attitudes ranging from neutral to agreement.

Table 1 Descriptive statistics and correlation coefficient

| | M | SD | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 1. Cognitive Age | 2.87 | .603 | - | | | | |
| 2. Perceived Ease of Use | 3.75 | .816 | -.274** | - | | | |
| 3. Receptiveness to Innovation | 3.68 | .734 | -.327** | .496** | - | | |
| 4. Stereotype Threat | 2.79 | .900 | .403** | -.303** | -.201** | - | |
| 5. Mobile Payment Intention | 3.40 | .952 | -.261** | .813** | .523** | -.266** | - |

* : p<0.1 ; ** : p<0.01 ; *** : p<0.001.

### *4.3 Hypothesis Testing*

Mediation was examined using hierarchical regression analyses following Baron and Kenny's (1986) causal-steps approach. Tables 2–5 present the regression models and their statistical significance.

Three regression models were estimated to examine the influence of cognitive age on mobile payment intention and to test the mediating role of perceived ease of use. The results are reported in Table 2. In Model 1-1, cognitive age had a significant negative effect on perceived ease of use ($\beta = –0.274$, $p < .001$), indicating that older adults with higher cognitive age report lower perceived ease of use, thereby supporting Hypothesis H1. The model explained 7.5% of the variance ($\Delta R^2 = .075$; $F = 18.152$, $p < .001$).

In Models 1-2, cognitive age had a significant negative effect on mobile payment intention ($\beta = –0.261$, $p < .001$), explaining 6.8% of the variance ($\Delta R^2 = .068$; $F = 16.245$, $p < .001$). In Model 1-3, cognitive age and perceived ease of use were entered simultaneously. Perceived ease of use had a significant positive effect on mobile payment intention ($\beta = 0.802$, $p < .001$). In contrast, the effect of cognitive age became nonsignificant ($\beta = –0.041$, $p > .05$). The model explained 66.2% of the variance ($\Delta R^2 = .662$; $F = 217.825$, $p < .001$), indicating a substantial improvement in explanatory power.

 

These findings indicate that when perceived ease of use is included as a mediator, the direct effect of cognitive age on mobile payment intention disappears, indicating full mediation. In other words, cognitive age influences mobile payment intention among older adults primarily through perceived ease of use, thereby supporting Hypothesis H5.

Table 2 Regression analysis of Cognitive Age, Perceived Ease of Use, and Mobile Payment Intention

| Independent Variable | Perceived Ease of Use | Mobile Payment Intention | |
|---|---|---|---|
| | Model 1-1 | Model 1-2 | Model 1-3 |
| Cognitive Age | -0.274*** | -0.261*** | -0.041 |
| Perceived Ease of Use | | | 0.802*** |
| Δ $R^2$ | 0.075 | 0.068 | 0.662 |
| Adj. $R^2$ | 0.071 | 0.064 | 0.659 |
| F | 18.152 | 16.245 | 217.825 |

* : p<0.05 ; ** : p<0.01 ; *** : p<0.001.

Table 3 presents regression results testing whether receptiveness to innovation mediates the relationship between cognitive age and mobile payment intention. In Model 2-1, cognitive age had a significant negative effect on receptiveness to innovation (β = –0.327, p < .001), indicating that individuals with higher cognitive age are less receptive to innovation, thereby supporting Hypothesis H2. The model explained 10.7% of the variance ($\Delta R^2$ = .107; F = 26.622, p < .001).

In Model 2-2, cognitive age also had a significant negative effect on mobile payment intention (β = –0.261, p < .001), accounting for 6.8% of the variance ($\Delta R^2$ = .068; F = 16.245, p < .001). In Model 2-3, when both cognitive age and receptiveness to innovation were entered simultaneously, receptiveness to innovation had a significant positive effect on mobile payment intention (β = 0.490, p < .001), whereas the effect of cognitive age weakened and became nonsignificant (β = –0.100, p > .05). The model explained 28.3% of the variance ($\Delta R^2$ = .283; F = 43.718, p < .001).

These results indicate that including receptiveness to innovation accounts for the effect of cognitive age on mobile payment intention. Because the direct effect became nonsignificant in the regression model, the evidence is more consistent with indirect-only mediation than with partial mediation for this pathway. Therefore, Hypothesis H6 is supported with respect to the mediating role of receptiveness to innovation.

Table 3 Regression analysis of Cognitive Age, Receptiveness to Innovation, and Mobile Payment Intention

| Independent Variable | Receptiveness to Innovation | Mobile Payment Intention | |
|---|---|---|---|
| | Model 2-1 | Model 2-2 | Model 2-3 |
| Cognitive Age | -0.327*** | -0.261*** | -0.1 |
| Receptiveness to Innovation | - | | 0.49*** |
| Δ $R^2$ | 0.107 | 0.068 | 0.283 |
| Adj. $R^2$ | 0.103 | 0.064 | 0.276 |
| F | 26.622 | 16.245 | 43.718 |

* : p<0.05 ; ** : p<0.01 ; *** : p<0.001.

Table 4 presents regression results testing whether perceived ease of use mediates the relationship between stereotype threat and mobile payment intention. In Model 3-1, stereotype threat had a significant negative effect on perceived ease of use (β = –0.303, p < .001), indicating that older adults experiencing stronger stereotype threat perceive mobile payments as less easy to use. This supports Hypothesis H3. The model explained 9.2% of the variance ($\Delta R^2$ = .092; F = 22.592, p < .001).

In Model 3-2, stereotype threat also significantly reduced mobile payment intention (β = –0.266, p < .001), explaining 7.1% of the variance ($\Delta R^2$ = .071; F = 16.924, p < .001).

In Model 3-3, stereotype threat and perceived ease of use were entered simultaneously. Perceived ease of use had a strong positive effect on mobile payment intention (β = 0.807, p < .001), whereas stereotype threat was nonsignificant (β = –0.021, p > .05). The model explained 66.1% of the variance ($\Delta R^2$ = .661; F = 216.732, p < .001), indicating a substantial increase in explanatory power.

Collectively, these results demonstrate that perceived ease of use fully mediates the relationship between stereotype threat and mobile payment intention. Thus, the negative impact of stereotype threat on older adults' adoption of mobile payments operates primarily through perceived ease of use, supporting Hypothesis H5.

Table 4 Regression analysis of Stereotype Threat, Perceived Ease of Use, and Mobile Payment Intention

| Independent Variable | Perceived Ease of Use | Mobile Payment Intention | |
|---|---|---|---|
| | Model 3-1 | Model 3-2 | Model 3-3 |
| Stereotype Threat | -0.303*** | -0.266*** | -0.021 |
| Perceived Ease of Use | | | 0.807*** |
| Δ $R^2$ | 0.092 | 0.071 | 0.661 |
| Adj. $R^2$ | 0.088 | 0.066 | 0.658 |
| F | 22.592 | 16.924 | 216.732 |

* : p<0.05 ; ** : p<0.01 ; *** : p<0.001.

Table 5 presents regression results examining whether receptiveness to innovation mediates the relationship between stereotype threat and mobile payment intention. In Model 4-1, stereotype threat had a significant negative effect on receptiveness to innovation (β = –0.201, p < .001), indicating that older adults experiencing stronger stereotype threat are less receptive to innovation, thereby supporting Hypothesis H4. The model explained 4.0% of the variance ($\Delta R^2$ = .040; F = 9.353, p < .001).

In Model 4-2, stereotype threat significantly reduced mobile payment intention (β = –0.266, p < .001), explaining 7.1% of the variance ($\Delta R^2$ = .071; F = 16.924, p < .001). In Model 4-3, both stereotype threat and receptiveness to innovation were included. Receptiveness to innovation had a significant positive effect on mobile payment intention (β = 0.489, p < .001). The negative effect of stereotype threat on mobile payment intention weakened but remained significant (β = –0.167, p < .01). The model explained 30.0% of the variance ($\Delta R^2$ = .300; F = 47.670, p < .001).

These findings suggest that receptiveness to innovation partially mediates the relationship between stereotype threat and mobile payment intention. Thus, stereotype threat affects mobile payment adoption among older adults both directly and indirectly through receptiveness to innovation, supporting Hypothesis H6.

Table 5 Regression analysis of Stereotype Threat, Receptiveness to Innovation, and Mobile Payment Intention

| Independent Variable | Receptiveness to Innovation | Mobile Payment Intention | |
|---|---|---|---|
| | Model 4-1 | Model 4-2 | Model 4-3 |
| Stereotype Threat | -0.201*** | -0.266*** | -0.167** |
| Receptiveness to Innovation | - | | 0.489*** |
| Δ $R^2$ | 0.04 | 0.071 | 0.3 |
| Adj. $R^2$ | 0.036 | 0.066 | 0.294 |
| F | 9.353 | 16.924 | 47.67 |

* : p<0.05 ; ** : p<0.01 ; *** : p<0.001.

To further strengthen the mediation analysis, a bootstrap mediation test with 5,000 resamples was conducted. The results showed that the indirect effect of Cognitive Age on Mobile Payment Intention through Perceived Ease of Use was significant (β = -.247, 95% CI [-.352, -.138]). The direct effect became nonsignificant after Perceived Ease of Use was included, indicating full mediation. The indirect effect of Cognitive Age through Receptiveness to Innovation was also significant (β = -.151, 95% CI [-.235, -.079]). Together with the regression results, this pattern indicates a significant indirect effect through Receptiveness to Innovation, with indirect-only mediation for the cognitive age pathway. Similarly, the indirect effect of Stereotype Threat through Perceived Ease of Use was significant (β = -.245, 95% CI [-.363, -.121]), and the direct effect became nonsignificant, indicating full mediation. Finally, the indirect effect of Stereotype Threat through Receptiveness to Innovation was significant (β = -.098, 95% CI [-.177, -.025]), while the direct effect remained significant in the regression model, indicating partial mediation. These bootstrap findings provide additional support for the robustness of the mediation hypotheses.

 

Table 6 Bootstrap mediation analysis of indirect effects

| Mediation model | Direct effect | Indirect effect | 95% bootstrap CI |
|---|---|---|---|
| CA-PEU-BIU | -.061 | -.247 | [-.352, -.138] |
| CA-RI-BIU | -.156 | -.151 | [-.235, -.079] |
| ST-PEU-BIU | -.021 | -.245 | [-.363, -.121] |
| ST-RI-BIU | -.167 | -.098 | [-.177, -.025] |

Note. Bootstrap resamples = 5,000; CA = Cognitive Age; ST = Stereotype Threat; PEU = Perceived Ease of Use; RI = Receptiveness to Innovation; BIU = Mobile Payment Intention. Bootstrap estimates are unstandardized coefficients; regression coefficients in Tables 2-5 are standardized.

## 5. Conclusion

This study extends the Technology Acceptance Model (TAM) by incorporating two antecedents particularly relevant to older adults: cognitive age and stereotype threat. It also specifies perceived ease of use and receptiveness to innovation as mediators. The findings show that cognitive age and stereotype threat negatively influence perceived ease of use and receptiveness to innovation, which, in turn, positively affect mobile payment intention. Perceived ease of use fully mediates the effects of cognitive age and stereotype threat, underscoring that perceived usability is the primary mechanism through which these age-related antecedents shape mobile payment adoption. By contrast, receptiveness to innovation shows a differentiated mediation pattern: indirect-only mediation for cognitive age and partial mediation for stereotype threat, suggesting that openness to new experiences plays a reinforcing role but operates differently across the two antecedents. These results support the relevance of TAM and show that subjective age and age-related social pressures shape technology adoption through distinct psychological mechanisms.

This study contributes to research on technology adoption among older adults by identifying two complementary psychological pathways. The first is a competence–usability pathway, in which cognitive age and stereotype threat shape perceived ease of use. The second is a novelty–innovation pathway, in which these antecedents influence receptiveness to innovation. Together, these pathways provide a more nuanced account of older adults' adoption of mobile payments. The findings also reinforce the theoretical relevance of cognitive age as a predictor of technology-related perceptions. In addition, they clarify that stereotype threat may influence adoption intention indirectly by reducing perceived usability and openness to exploration. This offers a more nuanced account of older adults' digital adoption behavior and distinguishes the proposed framework from extended TAM models that primarily rely on demographic, utilitarian, or system-related predictors.

Despite its contributions, this study has several limitations. First, its cross-sectional design and reliance on self-report measures limit causal inference and may introduce common method bias. Second, the sample was drawn from southern Taiwan and included a relatively large proportion of respondents aged 50–54 years, which may limit generalizability to adults aged 65 years and older and to other cultural contexts. Taiwan's relatively advanced digital infrastructure and widespread mobile payment ecosystem may also differ from those in countries or regions where cash remains dominant, smartphone access is limited, or financial infrastructure is less developed. Cultural norms regarding aging may further influence the strength of stereotype threat. Third, other well-established determinants of technology adoption among older adults, including digital literacy, trust in financial platforms, privacy concerns, perceived financial risk, prior technology experience, health conditions, and socioeconomic resources, may also shape adoption intention. Finally, focusing on intention rather than actual behavior limits the external validity of the findings.

Future research should address these limitations in several ways. First, scholars should incorporate additional constructs, such as perceived usefulness, attitude, trust, privacy concerns, perceived financial risk, and digital literacy, to develop a more comprehensive extended TAM. Second, longitudinal designs could assess whether cognitive age and stereotype threat have lasting effects on actual mobile payment use. Third, cross-cultural studies could compare whether the proposed mechanisms operate similarly across countries with different mobile payment infrastructures and cultural views of aging. Fourth, experimental studies could manipulate stereotype-reduction messages, interface design, or training interventions to provide stronger causal evidence. Finally, future research could apply SEM, PLS-SEM,

bootstrapped mediation, or longitudinal mediation models to provide more rigorous estimates of indirect effects.

From a managerial perspective, the findings offer several actionable insights. First, improving perceived ease of use through age-friendly interface design, such as large fonts and buttons, high-contrast displays, simplified transaction flows, voice guidance, confirmation prompts, error-recovery cues, and practice trials or on-site assistance, can reduce barriers to adoption. Second, mitigating stereotype threat requires avoiding age-stigmatizing labels in marketing communications, implementing peer demonstrations or community mentoring programs, providing private practice environments to minimize social comparison pressure, and using positive examples of older adults successfully using mobile payments. Third, fostering receptiveness to innovation can be achieved through curiosity-driven marketing, low-risk experiential activities, and early-adopter communities that encourage co-creation. Financial institutions, retailers, and policymakers may also support community-based digital literacy programs that combine mobile payment education with fraud-prevention training. Finally, tailoring strategies to users' cognitive ages is essential. Individuals with younger cognitive ages should be targeted with messages that emphasize efficiency and convenience, whereas those with older cognitive ages should be reassured with messages that emphasize safety, simplicity, and reliability.

In summary, this study demonstrates that cognitive age and stereotype threat influence older adults' adoption of mobile payments through distinct psychological pathways. Theoretically, it enriches the TAM framework by integrating social-psychological antecedents and clarifying dual adoption mechanisms. In practice, it highlights that promoting digital adoption among older adults requires prioritizing usability, alleviating social pressures, and stimulating exploratory motivation.

 

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