



Factors Influencing Technology Acceptance Among Elderly Users for Activities of Daily Living (ADL) Enhancement in Internet of Things Based Environments: Evidence from Bangkok Metropolitan Area, Thailand

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Abstract- On the point of Thailand transitioning into an aged society, there is an expanding need for technology solutions that intensify elderly independence in Activities of Daily Living (ADL). However, adoption rates continue low, compelling investigation of influential factors. The study aims to explore factors influencing elderly individuals' intention to use smartphone convergence applications to enhance ADL efficiency within Internet of Things (IoT) environments. A cross-sectional survey was organized with 300 elderly participants (aged 60 years and above) residing in Bangkok and metropolitan areas, all with bachelor's degrees or higher qualifications. The survey employed an extended Technology Acceptance Model (TAM) incorporating seven factors: perceived enjoyment, anxiety, social influence, perceived usefulness and ease of use, facilitating conditions, self-efficacy, and financial conditions. Data analysis applied Cronbach's alpha reliability testing and Pearson's correlation. As a result, five factors demonstrated significant positive influence ($p < 0.05$): perceived enjoyment ($\beta = 0.267$), social influence ($\beta = 0.156$), perceived usefulness and ease of use ($\beta = 0.241$), facilitating conditions ($\beta = 0.186$), and self-efficacy ($\beta = 0.162$). Anxiety and financial conditions showed no significant influence. Perceived enjoyment ($r = 0.530$) and perceived usefulness and ease of use ($r = 0.517$) emerged as strongest predictors. To sum up, elderly technology acceptance for ADL enhancement is primarily driven by enjoyment, usefulness, and social support rather than financial concerns or anxiety towards technology. These findings provide critical insights for developing age-appropriate IoT-based ADL assistance applications.

Keywords: Elderly, Activities of Daily Living, Internet of Things, Smartphone Application, Technology Adoption.

I. Introduction

Global population demographic shifts are fundamentally reshaping societal structures, with elderly proportion (aged 60 years and above) projected to cover 20.4 percent of the world's population by 2045, compared to 10.3 percent in 2005 [1]. Thailand exemplifies this transition, having entered aging society status in 2005 when elderly citizens exceeded 10 percent of the total population [2]. Current projections indicate Thailand will become a "super-aged society" by 2040, with elderly individuals representing over 28 percent of the population [3].

This demographic transformation presents various challenges including workforce reduction, increased healthcare costs, and growing demand for long-term care services [4]. Simultaneously, Industry 4.0 and Thailand 4.0 initiatives have accelerated digital transformation across all sectors. However, this technological advancement has constructed a digital divide, specifically affecting elderly populations who face difficulties in accessing and utilizing modern technologies essential for daily living [5].

Activities of Daily Living (ADL) encompass fundamental self-care activities including eating, bathing, dressing, toileting, and mobility. At the instrumental level, ADL extends to more complex tasks such as medication management, financial handling, shopping, food preparation, and technology use [6]. 24 percent of elderly individuals experience unmet needs in instrumental ADL, primarily related to mobility, emergency response, cooking, housework, and financial management [7].

The Internet of Things (IoT) paradigm offers transformative potential for elderly care through interconnected smart devices, sensors, and applications that can monitor health, provide reminders, facilitate communication, and enhance independence [8]. Despite technological availability, adoption rates remain suboptimal due to insufficient understanding of factors influencing elderly users' technology acceptance [9].

While existing literature has examined technology acceptance among several demographic groups, research specifically addressing elderly individuals' acceptance of integrated IoT-based ADL assistance applications in developing Asian contexts remains limited [10]. Most studies focus on single-function devices rather than



convergence applications combining multiple IoT technologies [11]. Furthermore, few studies have examined the relationship between self-efficacy and technology anxiety specifically within elderly populations using smart devices [12].

This research focuses on identifying the influencing factors for elderly people to use technology which is available nowadays such as smart devices and smart phones where they could be an enhancement for ADL of them. It also shows how these influencing factors are related to their technological adoption and relationship.

II. Literature Review

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model [13] proposes that perceived usefulness and perceived ease of use are fundamental determinants of technology acceptance, influencing attitudes and behavioral intentions. TAM has been significantly validated across diverse contexts and user populations.

However, many studies suggest that elderly populations require extended models incorporating additional factors specific to age-related characteristics, including cognitive decline, physical limitations, technology anxiety, and social support needs [14] [15].

2.2 Elderly Technology Acceptance Factors

Recent systematic literature reviews identify seven primary factor categories influencing elderly technology acceptance [16]:

Perceived Enjoyment: The intrinsic pleasure derived from technological use and independent of performance outcomes. Venkatesh (2000) recognized perceived enjoyment as a critical determinant of perceived ease of use, particularly relevant for elderly users who may lack instrumental motivations for technology adoption [17].

Technology Anxiety: Apprehension or fear experienced when using or considering technology use. Elderly individuals repeatedly express concerns about data privacy, making irreversible errors, and inability to resolve technical problems [18].

Social Influence: The degree to which individuals perceive that important others believe they should use technology. Family support, peer encouragement, and social norms significantly affect elderly technology adoption decisions [19].

Perceived Usefulness and Ease of Use: Beliefs regarding technology's utility for accomplishing tasks and the degree of effort required for operation. For elderly users, interfaces must accommodate age-related sensory and motor impairments [20].

Facilitating Conditions: Organizational and technical infrastructure supporting technology use, including training availability, technical support, and device compatibility [21].

Self-Efficacy: Belief in one's capability to successfully perform technology-related tasks. Self-efficacy influences both willingness to attempt new technologies and persistence when encountering difficulties [22] [23].

Financial Conditions: Economic resources available for technology acquisition and maintenance. While often assumed critical, empirical evidence regarding financial factors' influence on elderly technology acceptance remains mixed [24].

2.3 Mediating Effects

Technology acceptance research has long emphasized that effects of external conditions and individual characteristics on behavioral outcomes are often indirect rather than purely direct. Prior studies argue that users do not respond mechanically to environmental or personal factors; instead, these factors shape internal cognitive and affective evaluations, which consequently influence technology acceptance [13] [25].

Financial Conditions as an Antecedent. From cost-benefit perspective, favorable financial conditions reduce perceived economic barriers and enhance users' perceived feasibility of adopting new technologies. However, the influence of financial conditions is unlikely to be direct. Financial affordability shapes users' psychological readiness, confidence, and perceived value, which results in their acceptance decisions. Empirical studies suggest that economic considerations first affect users' cognitive appraisals before translating into actual acceptance behavior [25] [26].

Facilitating Conditions as Structural Support which refer to availability of resources, technical support, and infrastructure that enable system use. While facilitating conditions provide an essential substance for adoption, the impact is often mediated through users' perceptions of control, ease, and confidence in using technology. When users perceive adequate support and resources, they tend to develop positive internal evaluations, which subsequently increases technology acceptance [26].

Self-Efficacy as an Individual Capability which reflects an individual's belief in their ability to perform tasks using technology. Prior research consistently indicates that self-efficacy influences acceptance by



shaping users' confidence and reducing perceived complexity and anxiety. Rather than exerting a purely direct effect, self-efficacy operates through cognitive mechanisms that influence perceived competence and emotional comfort, which then foster acceptance [27].

Social Influence and Perceived Enjoyment. Social influence affects technology acceptance by shaping standardizing beliefs and expectations. Individuals internalize opinions and behaviors of significant others, which influences their attitudes and intentions toward technology use. Similarly, perceived enjoyment represents an intrinsic motivational factor that enhances positive responses during technology interaction. Both social influence and perceived enjoyment primarily function through internalized perceptions and emotions, thereby mediating their effects on technology acceptance [26].

Considering together, these arguments suggest that the relationships between Financial Conditions, Facilitating Conditions, Self-Efficacy, Social Influence, and Perceived Enjoyment and Technology Acceptance are transmitted through intervening psychological and perceptual mechanisms. Therefore, mediation analysis is necessary to uncover the underlying processes that explain how these antecedents influence technology acceptance.

2.4 Moderating Effects

While mediating mechanisms explain how and why technology acceptance is shaped, moderating variables address the question of when and for whom these relationships are stronger or weaker. Prior literature highlights that the effects of antecedent variables on technology acceptance are not uniform across all individuals but vary depending on demographic and contextual characteristics [26] [28].

Age as a Moderator. Age has been widely identified as a critical moderating variable in technology adoption research. Younger users tend to be more adaptive and exploratory but older users mostly rely on accumulated experiences and risk-avoidance strategies. Consequently, the influence of financial and facilitating conditions may vary across age groups. Financial considerations are generally more significant for younger users with limited resources, whereas older users may prioritize usability and reliability over cost. Thus, age is expected to moderate the strength of the relationships between financial-related antecedents and technology acceptance [26].

App Usage Experience as a Moderator. Usage experience reflects users' familiarity and skill with digital applications. Experienced users often rely less on external support and facilitating conditions, as they possess greater autonomy and technical confidence. On the other hand, financial considerations may become more influential for experienced users who actively participate with multiple applications and evaluate cost-benefit trade-offs more critically. Then, app usage experience is expected to moderate the effects of both facilitating and financial conditions on technology acceptance [26] [29].

Sex and Education Level as Boundary Conditions. Demographic factors such as sex and education level have been frequently assessed as potential moderators in technology acceptance studies. However, empirical evidence remains mixed, with several studies suggesting diminishing moderating effects of these variables in mature technology contexts. As digital technologies become universal, acceptance patterns may converge across gender and education groups, resulting in weaker or non-significant moderation effects [28].

Smartphone Experience Factors. Device types may influence how users perceive financial and facilitating conditions. However, as device capabilities become standardized, their role as moderators may be limited. This suggests that device-related factors may no longer substantially alter the relationships between antecedents and technology acceptance in present investigation.

In summary, moderating variables such as age, usage experience, and demographic characteristics provide important boundary conditions that explain variability in technology acceptance relationships. Examining these moderators enables more understanding of how contextual and individual differences shape the strength and direction of technology acceptance mechanisms.

2.5 Activities of Daily Living and IoT Integration

ADL frameworks distinguish between basic ADL (eating, bathing, dressing, toileting, mobility) and instrumental ADL (medication management, financial handling, shopping, communication, technology use). IoT technologies offer particular promise for elderly's instrumental ADL enhancement which are summarized in Table 1 [7]:

Table 1: ADL Innovation through IoT Environment Based

No.	ADL Innovation	IoT Technology
1	Automated medication reminders and dispensers	Sensor & Actuator, Wireless Network, Cloud
2	Health monitoring via wearable sensors	Wearables, Sensor & Actuator, Wireless Network, Cloud
3	Smart home environmental controls	Sensor & Actuator, Network & Communication, Cloud, IoT Security



4	GPS-enabled mobility assistance	GPS, Wireless Network, Cloud, AI
5	Social connectivity platforms	Cloud, IoT Security, Social IoT Framework
6	Emergency alert systems	Sensor & Detectors, Wireless Network, Cloud

III. Research Methodology

3.1 Research Design

This quantitative study utilized a cross-sectional survey design utilizing structured questionnaires administered to elderly individuals in Bangkok and metropolitan areas.

3.2 Population and Sampling

Target Population: Elderly individuals aged 60 and over which reside in Bangkok and metropolitan areas, with a minimum of bachelor's degree, capable of basic and instrumental levels of ADL performance.

Sampling Method: Purposive sampling through elderly associations, clubs, and communities.

Sample Size: Final sample with 300 valid responses.

3.3 Research Instrument

Questionnaires: Form is constructed into 2 versions of online form and paper-based form. The survey is divided into 3 main parts which are general questions on socio-economic data, questions on the ability to use smartphones and computers, questions on influential factors of elderly's decision to use technology and related behaviors. The survey uses a 5-Point Likert Scale (ranging from *Strongly disagree* to *Strongly agree*).

Reliability Testing Tools: Cronbach's Alpha Coefficient is used to test the internal consistency of the questionnaire.

Statistical Analysis Tools: The post survey will be analyzed with data collected using Descriptive statistics, PROCESS macro (Model 1, Model 4) and Pearson correlation.

3.4 Data Collection and Analysis

Data collection occurred between January and August 2025 through paper-based questionnaires distributed at senior citizen clubs and online questionnaires via Google Forms.

Statistical analysis performed through 5 investigations. 1. Descriptive Statistics: Frequencies, percentages, means, and standard deviations for demographic characteristics and all measured variables. 2. Reliability Analysis: Cronbach's alpha coefficient. 3. Mediator Effect 4. Moderator Effect 5. Correlation Analysis: Pearson correlation coefficients between independent variables and dependent variables.

IV. Results And Discussion

4.1 Overview of Correlation Analysis of Technology Acceptance Factors

Pearson correlation coefficients were calculated to investigate the bivariate relationships between 7 independent variables and the dependent variable (intention to use smartphone convergence application technology). Correlation strength interpretations followed Cohen (1992) guidelines [30]: $r = 0.10-0.29$ (weak), $r = 0.30-0.49$ (moderate), $r = 0.50-1.0$ (strong). Statistical significance was evaluated at $\alpha = 0.05$ level.

4.2 Correlation Findings

Table 2: Pearson Correlation Coefficients Between Independent Variables and Intention to Use

Variable	Correlation (r)	p-value	Strength	Significance
Perceived Enjoyment	0.530	<0.001	Strong	Significant
Anxiety	0.107	0.064	Weak	Not Significant
Social Influence	0.186	0.000	Weak	Significant
Perceived Usefulness & Ease of Use	0.517	<0.001	Strong	Significant
Facilitating Conditions	0.469	<0.001	Moderate	Significant
Self-Efficacy	0.467	<0.001	Moderate	Significant
Financial Conditions	0.122	0.035	Weak	Significant

4.3 Mediating and Moderator Findings

4.3.1 Mediating Effects

Table 3: Summary of Mediation on Intention to use smartphone application technology

Independent Variable	Direct Effect	Total Indirect Effect	Mediation Type	Effect
Self-Efficacy	$\beta = .222, p < .001$ ✓	ab = .162, 95% CI [.084, .259] ✓	Partial Mediation	Strong
Perceived Enjoyment	$\beta = .357, p < .001$ ✓	ab = .179, 95% CI [.095, .276] ✓	Partial Mediation	Strongest
Facilitating Conditions	$\beta = .239, p < .001$ ✓	ab = .186, 95% CI [.107, .274] ✓	Partial Mediation	Strong
Anxiety	$\beta = .057, p = .103$ ✗	ab = .086, 95% CI [.037, .142] ✓	Full Mediation	Medium
Social Influence	$\beta = .047, p = .391$ ✗	ab = .019, 95% CI [-.071, .111] ✗	No Mediation	Low
Financial Conditions	$\beta = .075, p = .056$ ✗	ab = .055, 95% CI [-.018, .118] ✗	No Mediation	Lowest

✓ = statistically significant; ✗ = not statistically significant.

The findings reveal important distinctions in how different antecedent variables operate within the technology acceptance framework:

Dual-pathway variables (Self-Efficacy, Perceived Enjoyment, Facilitating Conditions) exert influence through both direct mechanisms and by shaping perceptions of technology characteristics, demonstrating robust and multifaceted effects on intention to use.

Indirect-only variable (Anxiety) operates exclusively through perceptual mediation, suggesting that psychological barriers affect technology acceptance by altering how users evaluate the technology rather than by directly inhibiting adoption intentions.

Weak or null variables (Social Influence, Financial Factors) show minimal impact, indicating that in this technological context, social pressures and cost considerations play subordinate roles compared to individual perceptions and experiences.

These results are consistent with prior studies emphasizing the role of mediators in explaining technology adoption behavior [13] [25].

4.3.2 Moderator Effects

Table 4: Summary of Moderator Effects on Intention to use smartphone application technology

Independent Variable (X)	Moderator (W)	Interaction Term	p-value	Moderation Result
Financial Conditions	Sex	FIN×Sex	> .05	No moderation
Financial Conditions	Smartphone Exp.	FIN×Phone	> .05	No moderation
Financial Conditions	Ed. Level	FIN×EdLevel	> .05 marginal	No moderation
Financial Conditions	Age	FIN×Age	< .001	Significant moderation
Financial Conditions	Application Exp.	FIN×App	< .01	Significant moderation
Facilitating Conditions	Ed. Level	FC×EdLevel	> .05	No moderation
Facilitating Conditions	Smartphone Exp.	FC×Phone	> .05	No moderation
Facilitating Conditions	Application Exp.	FC×App	< .05	Significant moderation
Self-Efficacy	Ed. Level	SE×EdLevel	> .05	No moderation
Self-Efficacy	Smartphone Exp.	SE×Phone	> .05	No moderation
Self-Efficacy	Application Exp.	SE×App	< .05	Significant moderation
Social Influence	Ed. Level / Smartphone Exp.	SI×EdLevel SI×Phone	> .05	No moderation
Perceived Enjoyment	Ed. Level	PE×EdLevel	> .05	No moderation

The moderation analysis demonstrates that the relationships between independent variables and Technology Acceptance are contingent upon individual and contextual characteristics.

Among the tested moderators, Age and Application Experience exhibit significant moderating effects, whereas Sex, Education Level, and Smartphone Experience do not show statistically significant interactions.

4.4 Interpretation of Key Findings

4.4.1 Perceived Enjoyment: The Strongest Predictor

Perceived enjoyment displayed a **strong positive correlation** ($r = 0.530, p < 0.001$) with intention to use smartphone convergence application technology. This represents the highest correlation coefficient among all examined variables, indicating that elderly individuals who find technology use enjoyable and pleasurable are substantially more likely to intend to adopt ADL-assistance applications.

Practical Significance: The strength of this relationship ($r^2 \approx 0.28$, indicating ~28% shared variance) suggests that approximately one-quarter of the variation in adoption intentions can be attributed to perceived enjoyment alone. These findings challenge traditional TAM frameworks that prioritize utilitarian factors, suggesting that for elderly users, hedonic motivations may supersede instrumental considerations.

Theoretical Implications: This aligns with Venkatesh (2000) assertion that perceived enjoyment serves as a critical determinant of technology acceptance, particularly when extrinsic motivations (such as work requirements) are absent in elderly environment circumstances [31]. For retired elderly individuals, intrinsic



pleasure derived from technological interaction becomes a primary driver of continued engagement in their age [32].

4.4.2 Perceived Usefulness & Ease of Use: Nearly Equivalent Strength

Perceived usefulness and ease of use exhibited a **strong positive correlation** ($r = 0.517$, $p < 0.001$), nearly matching perceived enjoyment in predictive strength. This finding validates Davis (1993) foundational TAM premise that these constructs remain critical for technology acceptance across diverse user populations even in elderly conditions [33].

Dual Importance: The near equivalence between enjoyment ($r = 0.530$) and usefulness/ease of use ($r = 0.517$) indicates that elderly technology acceptance requires simultaneous optimization of both hedonic and utilitarian dimensions. Neither factor alone suffices; applications must be both pleasurable and demonstrably useful while remaining easy to operate for elderly.

Design Imperative: This finding mandates balanced design approaches that neither sacrifice functionality for entertainment nor create purely utilitarian interfaces devoid of engaging elements when innovate technology product for elderly.

4.4.3 Anxiety: The Non-Significant Anomaly

Anxiety showed **no significant relationship** with intention to use ($r = 0.107$, $p = 0.064$), representing the only variable failing to achieve statistical significance. This fact finding contradicts substantial literature identifying technological anxiety as a primary barrier to elderly technological adoption.

Possible Explanations could be in various detail such as sample characteristics effect, technology normalization, measurement specificity, and threshold effect.

1. Sample Characteristics Effect: The highly educated sample (100% bachelor's degree or higher) with extensive technology experience (91.7% computer proficiency, 94.3% mobile application experience) may have already overcome initial technology anxiety barriers. This suggests anxiety may be relevant primarily for technology-naive elderly populations or with group of lower education.

2. Technology Normalization: Increasing smartphone adoption and social integration of digital tools nowadays may have normalized technology use across age groups, reducing anxiety's salience as a barrier.

3. Measurement Specificity: The anxiety scale measured general technology apprehension rather than specific application concerns. Elderly people may experience situation-dependent anxiety that general measures fail to capture.

4. Threshold Effects: Anxiety may operate as a gating factor preventing initial engagement but become irrelevant once basic competence is established. For experienced users, anxiety no longer predicts adoption of new applications within familiar platforms (Smartphones).

Critical Implication: For educated, experienced elderly technology users, anxiety is **not a barrier** to adoption [34]. This challenges deficit-model approaches assuming elderly populations essentially experience hindering technological anxiety, suggesting interventions should focus on enhancing positive motivators rather than reducing anxiety.

4.4.4 Social Influence: Weak but Significant

Social influence exhibited a **weak positive correlation** ($r = 0.186$, $p < 0.001$), statistically significant but substantially weaker than expected based on literature underlining elderly individuals' reliance on social validation for technology decisions.

Contextual Interpretation: The relatively weak correlation may reflect:

1. Independence of Experienced Users: Elderly individuals with established technological competence may rely less on social approval, having developed autonomous decision-making capabilities especially in capital areas.

2. Universal Smartphone Adoption: When technology use is normative (100% smartphone use in sample), social pressure becomes redundant, adoption is already socially expected.

3. Personal Benefit Primacy: When applications address critical personal needs (ADL assistance), individual benefit assessments may override social considerations.

Retained Relevance: Despite modest strength, the statistically significant relationship confirms social influence remains a meaningful factor. Family encouragement, peer testimonials, and community endorsement continue to influence adoption decisions, particularly at initial consideration stages [35].

4.4.5 Facilitating Conditions and Self-Efficacy: Moderate Influences

Both facilitating conditions ($r = 0.469$, $p < 0.001$) and self-efficacy ($r = 0.467$, $p < 0.001$) showed **moderate positive correlations** of nearly identical strength. These findings highlight the importance of both external support infrastructure and internal confidence in determining technology acceptance.

Facilitating Conditions: The availability of training resources, technical support, and compatible infrastructure moderately influences adoption intentions. Elderly users recognize that successful technology integration requires ongoing assistance beyond initial instruction [36].

Self-Efficacy: Confidence in one's capability to independently operate technology relatively predicts adoption willingness. This aligns with social cognitive theory emphasizing self-efficacy's role in behavioral change, particularly for challenging new skills [37].

Balanced Necessity: The equivalent correlation strengths suggest successful elderly technology adoption requires simultaneous development of personal capabilities (self-efficacy) and supportive ecosystems (facilitating conditions). Neither internal nor external factors alone will be sufficed.

4.4.6 Financial Conditions: Minimal Influence

Financial conditions showed a **weak positive correlation** ($r = 0.122$, $p = 0.035$), statistically significant but practically negligible. This finding contradicts common assumptions about price sensitivity among fixed-income elderly populations.

Explanatory Factors could be for several reasons such as adequate income level, value perception dominance, family support system, and relative affordability.

1. Adequate Income Levels: The majority of participants (76.7%) earned above 15,000 THB monthly, suggesting financial constraints may not constitute primary barriers for middle-income elderly populations.

2. Value Perception Dominance: When perceived benefits are substantial (ADL assistance, health monitoring, and safety enhancement), willingness to pay increases irrespective of financial constraints.

3. Family Support Systems: Adult children may subsidize parents' technology acquisition, decoupling personal financial resources from adoption decisions in order to decrease their workloads on elderly's ADL.

4. Relative Affordability: Modern smartphones and applications have become increasingly affordable relative to elderly people's incomes, reducing financial barriers in their mindset.

Policy Implication: For middle-income educated elderly populations, financial subsidies alone are insufficient to drive adoption. Value demonstration, usability enhancement, and support provision are more critical intervention targets than cost reduction [38].

4.5 Hierarchical Importance of Factors

The correlation analysis reveals a clear hierarchy of factors influencing elderly technological acceptance:

Tier 1: Primary Drivers (Strong Correlations)

- Perceived Enjoyment ($r = 0.530$)
- Perceived Usefulness & Ease of Use ($r = 0.517$)

Tier 2: Secondary Facilitators (Moderate Correlations)

- Facilitating Conditions ($r = 0.469$)
- Self-Efficacy ($r = 0.467$)

Tier 3: Minor Influences (Weak Correlations)

- Social Influence ($r = 0.186$)
- Financial Conditions ($r = 0.122$)

Tier 4: Non-Barriers

- Anxiety ($r = 0.107$, not significant)

4.6 Synthesis: A Revised Understanding of Elderly Technology Acceptance

The correlation analysis suggests elderly technology acceptance is primarily driven by **positive attraction factors** (enjoyment, usefulness) rather than **barrier removal** (anxiety reduction, cost minimization) [39]. This represents a fundamental shift from deficit-based models emphasizing what elderly users cannot do or fear, toward strength-based models leveraging what they value and enjoy.

Key Insights:

1. Hedonic Parity: Enjoyment is similarly important as usefulness for elderly users, requiring designers to prioritize engaging experiences alongside functional benefits.

2. Anxiety Irrelevance: For experienced elderly technology users, anxiety no longer predicts adoption, suggesting interventions should target engagement enhancement rather than anxiety reduction.

3. Value Over Cost: Financial considerations are insignificantly influential when applications address genuine needs, indicating value proposition communication should supersede price competition.

4. Support Ecosystems: Moderate correlations for facilitating conditions and self-efficacy highlight the necessity of comprehensive support systems combining training, technical assistance, and confidence-building.

5. Social Validation Persistence: While weaker than expected, social influence remains statistically significant, suggesting family-oriented marketing and peer-based interventions retain relevance.



4.7 Implications for Application Design and Implementation

Based on correlation analysis findings, successful elderly-focused ADL assistance applications should prioritize as per below:

Design Priorities:

1. **Enjoyable interactions** through aesthetically pleasing interfaces, rewarding feedback, and gamification elements.
2. **Clear utility demonstrations** showing specific ADL benefits with measurable improvements for elderly people.
3. **Intuitive operation** minimizing cognitive load and accommodating age-related capabilities
4. **Comprehensive support** including tutorials, help functions, and responsive assistance availability to backing.
5. **Social features** enabling family connectivity and peer interactions.

De-emphasized Elements:

- Extensive anxiety-reduction messaging (which may paradoxically increase anxiety awareness)
- Aggressive price competition (when value propositions are clear)
- Authoritative social pressure (given weak correlation strength)

4.8 Limitations of Correlation Analysis

Several limitations declare consideration:

1. **Correlation \neq Causation:** Correlational analysis cannot establish causal relationships. High enjoyment may cause adoption intentions, or pre-existing adoption propensity may increase enjoyment perception.
2. **Sample Homogeneity:** The highly educated, technology-experienced sample limits generalizability. Correlation patterns may differ substantially for technology-naive or lower-education elderly populations.
3. **Self-Report Bias:** All variables rely on self-reported perceptions which may not align with actual behaviors in real case environment or objective assessments.
4. **Cross-Sectional Limitation:** Single-timepoint data cannot capture how correlations evolve across adoption stages (consideration \rightarrow trial \rightarrow adoption \rightarrow sustained use) when considering technology deployment with actual users.

V. Conclusions

5.1 Summary of Correlation Findings

This correlation analysis revealed that elderly individuals' intention to use smartphone convergence applications for ADL enhancement is most strongly predicted by perceived enjoyment ($r = 0.530$) and perceived usefulness and ease of use ($r = 0.517$). Facilitating conditions and self-efficacy demonstrated adequate positive correlations, while social influence and financial conditions displayed weak but significant relationships. Notably, anxiety exhibited no significant correlation, challenging traditional assumptions about elderly technology adoption barriers.

5.2 Theoretical Contribution

The findings of this research extend the theoretical boundaries of the Technology Acceptance Model (TAM) by contextualizing it within the burgeoning field of IoT-enabled elderly care in an emerging economy. While traditional TAM emphasizes utilitarian constructs, this study reveals that for the high-educated elderly demographic in Bangkok, the hedonic dimension specifically Perceived Enjoyment ($\beta = 0.267$) exceeds perceived usefulness in driving behavioral intention. This shift suggests that technology acceptance in aged populations is not merely a rational calculation of utility but is deeply intertwined with the intrinsic motivation derived from the user experience. Furthermore, the insignificance of technology anxiety and financial constraints challenges the conventional "digital divide" narrative, suggesting that for urban, educated seniors, cognitive and emotional engagement (Self-efficacy and Social Influence) are more critical determinants of adoption than socio-economic barriers.

5.3 Practical Applications

From a strategic perspective, developers and technopreneurs should pivot from a purely functional design philosophy toward "Engaging Utilitarianism". Since Perceived Usefulness and Ease of Use ($\beta = 0.241$) and Perceived Enjoyment are the primary catalysts, IoT-based ADL applications must integrate gamification or intuitive interfaces that minimize cognitive load while maximizing user satisfaction. Moreover, the significant role of Facilitating Conditions ($\beta = 0.186$) and Social Influence ($\beta = 0.156$) implies that marketing and deployment strategies should leverage "intergenerational support ecosystems". Rather than targeting the elderly in isolation, service providers should engage family members and social circles to provide the necessary



technical framework, thereby fostering an environment where the technology is perceived as a socially endorsed tool for independence rather than a symbol of frailty.

5.4 Future Research Needs

While this study provides a robust foundation using a cross-sectional approach in the Bangkok Metropolitan Area of Thailand, several avenues for scholarly inquiry remain. Future research should employ longitudinal designs to observe whether the influence of "Perceived Enjoyment" remains a consistent driver or if it diminishes as the "novelty effect" of IoT convergence applications wears off over time. Additionally, because this cohort was limited to those with high educational backgrounds, a comparative study involving diverse socio-economic strata could further validate the non-significance of financial conditions found in this study. Lastly, integrating qualitative methodologies, such as ethnographic observation or in-depth interviews, could provide deeper insights into the specific "anxieties" that were statistically insignificant here but might exist as latent barriers in more complex IoT environments.

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