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A Structural Equation Model of Innovation Effects on the Quality of Life of the Elderly in Bangkok and Its Vicinity

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ABSTRACT

Bangkok, Thailand, is a major economic hub with a large and growing elderly population. This research aimed to (1) examine the quality of life of the elderly in Bangkok and its vicinity, (2) examine innovation models affecting their quality of life, and (3) propose future business policy directions for the elderly. The study population comprised an estimated 1,447,606 elderly residents of Bangkok and its surrounding provinces, from which a sample of 400 people was drawn using a questionnaire. Frequency, percentage, mean, and standard deviation were used for descriptive analysis, and Structural Equation Modeling (SEM) was used for the analysis of the innovation model. The findings were as follows: (1) the elderly's overall quality of life was at a moderate level, with physical health at a high level; (2) the structural model of innovation effects on the elderly's quality of life (EQIE) was consistent with the empirical data (CMIN/DF = 2.686, NFI = .963, CFI = .976, TLI = .967, RMSEA = .022), meeting all specified fit criteria, and all three hypothesized paths (H1–H3) were supported.

Keywords: Innovation model, quality of life, elderly, structural equation modeling

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Introduction

In Bangkok, older adults increasingly use technology for healthcare, communication, and learning - such as health applications, video calls, and online training - to improve their quality of life. Thailand has become a fully aged society, with Bangkok home to a particularly large elderly population. The ability to access and use technology is therefore important for promoting the elderly's quality of life across several dimensions. Technology use can support self-reliance and reduce dependency, allowing older adults to communicate with family, conduct financial transactions, and access health services independently and safely. It can promote health and well-being through health-tracking applications and devices, support continued learning and skill development, and facilitate participation in social and digital activities. At the same time, protecting older users from online threats - for example, through guidance on antivirus software and password management from families and communities - remains an important complementary concern.

Thailand's population structure is transforming into an aged society more rapidly than in many other countries. Policy responses have included corporate tax reductions for businesses that employ seniors and the provision of mortgage loans, pensions, and other benefits for elderly citizens; these are incorporated into the draft 20-Year National Strategy (2017–2036), which addresses the challenges of an aging population (Bank of Thailand, 2018) and aligns national development toward the Sufficiency Economy Philosophy (Department of Older Persons, 2018). As of the reference year cited in the Department of Older Persons' report, Thailand had approximately 64 million people overall, of whom about 7.5 million - roughly 12% of the population - were aged 60 years or older (Department of Older Persons, 2018). [The original manuscript cited two different years - 2016 and 2018 - for the Department of Older Persons for these two separate statistics, but only the 2018 report appears in the reference list; the authors should confirm the correct source and year for each statistic before publication.]

A range of assistive and health-related innovations for the elderly has been developed and studied in the Thai and international literature, including body-sensor and wearable monitoring technologies (Tiemcharat, 2018), smart canes and walking aids (Singmaay & Laothao, 2019; Sitthaworn & Roongrungruangduboon, 2018; Sukmanee & Chanklang, 2016; Tuammee Hathairat et al., 2022), fall-prevention programs (Atwinittrakan & Im-arb, 2019), and innovations in hip-fracture care for elderly patients (Baerwald Erickson, 2020). At a broader level, population aging across information societies has generated a growing eHealth research agenda for older adults (Vancea & Solé-Casals, 2016), while methodological work on structural and confirmatory factor analysis in Thai social-science research (Rungsungnern, 2011; Yotongyot & Munsakorn, 2011; Panphakdee, 2016) has informed the analytical approach adopted here.

Despite this body of work, most existing studies examine individual assistive devices or single dimensions of elderly well-being in isolation, and few have empirically tested, through structural equation modeling, how a set

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of innovations collectively affects a validated, multidimensional model of elderly quality of life in the Bangkok metropolitan context. This represents a clear research gap: up-to-date, Bangkok-specific evidence linking innovation adoption to elderly quality of life, tested within a single empirically validated structural model, is currently lacking.

To address this gap, the present study synthesizes the quality-of-life literature (anchored in Schalock's, 2004, quality-of-life framework) with the innovation-adoption literature (Andriani et al., 2017; Felin & Zenger, 2020) to develop and test an integrated model - the Effect of Quality Innovation for the Elderly (EQIE) model - linking innovation with the elderly's quality of life. This integration also grounds the study's third objective: because the model identifies which innovations elderly respondents most need and value, its results directly inform the business-policy recommendations that objective 3 calls for, closing the gap between the diagnostic (objectives 1–2) and applied (objective 3) aims of the research.

Research objectives

1. To study a model for measuring the quality of life of the elderly in Bangkok and its vicinity.
2. To study innovation models affecting the quality of life of the elderly in Bangkok and its vicinity.
3. To propose future business-policy directions for the elderly in Bangkok and its vicinity, based on the innovation needs identified in objectives 1 and 2

Conceptual Framework

The framework centers on a second-order latent construct, EQIE (Effect of Quality Innovation for the Elderly), which is measured through three first-order latent constructs: *Effect* (the elderly's perceived physical, autonomy-related, and social outcomes of using the innovations, measured by indicators f1–f4), *Quality* (the elderly's quality of life across the physical health, autonomy, social integration, and happiness dimensions defined by Schalock, 2004, measured by indicators q1–q6), and *Innovation* (the elderly's evaluation of five specific technological innovations - a smart sensor, a smart robot, a smart shower room, a smart walking cane, and mobile applications - measured by indicators i1–i5, consistent with innovation-adoption research emphasizing perceived usefulness and ease of use as drivers of adoption; Andriani et al., 2017; Felin & Zenger, 2020).

Three primary hypotheses were tested: H1 (Innovation has a significant effect on EQIE), H2 (Quality has a significant effect on EQIE), and H3 (effect has a significant effect on EQIE), These hypotheses reflect the theoretical expectation that a common underlying factor - the elderly's overall receptiveness to, and engagement with, innovation - simultaneously shapes their perceived effects, quality of life, and evaluation of specific innovations.

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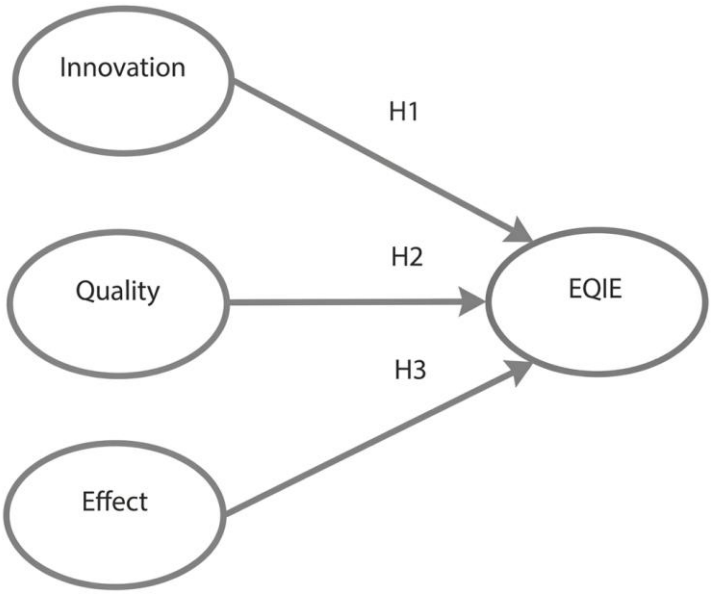


Figure 1 Conceptual Framework

In this study, the researcher applies the well-being hypothesis put forth by Schlock, L. R. (2004: 386). good physical health self-reliance integration of society excellent mood in interpersonal relationships

Research Methodology

Population and Sample

The population for this study comprised an estimated 1,447,606 Thai nationals aged 60 years or older residing in Bangkok, Pathum Thani, and Nonthaburi.

[The authors should cite the specific source and year of this population figure - e.g., the relevant Department of Older Persons or National Statistical Office report - as the origin of this statistic is not specified in the original manuscript.] A sample of 400 respondents was determined using Yamane's formula for an unknown/large population at the 95% confidence level [the authors should confirm and report the specific sample-size formula, confidence level, and margin of error actually used].

Data were collected using a questionnaire employing an accidental (convenience) sampling approach. The authors acknowledge that probability-based approaches (e.g., stratified random sampling across the three provinces) are generally preferred when the resulting data will be analyzed using structural equation modeling, because SEM's estimation and fit statistics assume a representative sample. Accidental sampling was used here for practical reasons of access to elderly respondents across the three provinces; this trade-off is noted explicitly

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as a limitation of the study (see Limitations and Directions for Future Research) rather than treated as fully equivalent to probability sampling.

The questionnaire covered the Effect, Quality of life, and Innovation constructs described in the Conceptual Framework, using multi-item scales for each construct. Content validity was reviewed by content experts [the authors should report the resulting Index of Item-Objective Congruence, IOC, value] and the internal consistency reliability of each scale was assessed [the authors should report the corresponding Cronbach's alpha value(s)] prior to full data collection.

This research followed standard ethical principles for research involving human participants, including older adults: participation was voluntary, informed consent was obtained from all respondents (or, where applicable, from an accompanying caregiver/family member), and individual responses were kept confidential and reported only in aggregate form. *[The authors should report the name of the institutional ethics review board and the approval reference number under which this study was conducted.]*

Data Analysis

Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to analyze respondent characteristics and general opinion levels. Structural equation modeling (SEM) was used to test the measurement and structural relationships among the Effect, Quality, and Innovation constructs and the second-order EQIE construct.

The SEM analysis followed the standard two-step procedure. First, a confirmatory factor analysis (CFA) was conducted to verify that each observed indicator (f1–f4, q1–q6, i1–i5) loaded significantly on its intended first-order construct. [The authors should report the standardized factor loadings, composite reliability (CR), and average variance extracted (AVE) for each construct, and the discriminant validity assessment (e.g., AVE vs. squared inter-construct correlations) from the CFA output; these values are referenced in Figure 2 of the original manuscript but are not reported in tabular form and should be added.] Second, the full structural model, including the second-order EQIE construct, was estimated to test H1–H3. Prior to SEM estimation, the data were also screened for univariate/multivariate normality and multicollinearity among observed indicators [the authors should report the specific normality statistics, e.g., skewness/kurtosis or Mardia's coefficient, and multicollinearity diagnostics, e.g., tolerance/VIF, used].

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Results

1. Respondent Characteristics

Table 1. Personal factors of respondents (N = 400)

Variable	Category	n	%
Province	Bangkok	160	40.0
	Pathum Thani	137	34.3
	Nonthaburi	103	25.8
Gender	Female	234	58.5
	Male	166	41.5
	60–69 years old	144	36.0
	70–79 years old	94	23.5
	80 years old and above	41	10.3
Marital status	Married	216	54.0
	Single	124	31.0
	Divorced/widowed	60	15.0
Education	High school	180	45.0
	University	157	39.3
	Not educated	42	10.5
	Student	21	5.3
Financial status	Not enough money to spend, but no debt	140	35.0
	Have money left over	135	33.8
	Have debt	125	31.3
Family type	Family with more than 1 person	214	53.5
	Nuclear family	186	46.5

* The “Under 60 years old” category (121 respondents, 30.3%) is inconsistent with the study population as defined (“Thai nationals 60 years of age or older”) in the original manuscript. This discrepancy was flagged by the reviewers and could not be resolved without additional information from the authors. The authors should verify whether these 121 respondents should be reclassified, excluded from the elderly-specific analyses, or whether the population definition itself requires correction, and should revise the sample description and any affected analyses accordingly before publication.

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Most respondents were female (234, 58.5%); male respondents accounted for 166 (41.5%). The largest age group was 60–69 years (144, 36.0%). Married respondents accounted for 216 (54.0%). High-school education was most common (180, 45.0%). Regarding financial status, 140 respondents (35.0%) reported not having enough money to spend but no debt, while 125 (31.3%) reported having debt. Most respondents lived in a family with more than one member (214, 53.5%).

2. Quality of Life and Innovation Needs of the Elderly

Overall, the elderly respondents' quality of life was rated at a moderate level, with physical health rated at a high level. Economically, many respondents relied on supplementary income and government pensions, commonly lived with grandchildren, and sought support from their children during illness. Physically, respondents generally lacked regular exercise despite government-promoted screening programs (e.g., for diabetes), tended to avoid unhealthy foods, and perceived limited support from private organizations. In terms of autonomy, respondents generally made their own decisions regardless of others' opinions, while showing some hesitancy toward tasks requiring self-control or expressing personal views. Socially, respondents frequently participated in volunteer work and community activities and maintained strong ties with neighbors and family. Regarding happiness, proximity to children, family time, adaptability, acceptance of the past, and social participation were identified as key contributors to a fulfilling life. Overall, while the elderly in this sample faced financial, health, and social challenges, they also demonstrated resilience, community involvement, and a generally positive outlook.

With respect to innovation needs, respondents expressed a high level of demand for ease of use and appealing design across five innovations evaluated: a smart sensor, a smart robot, a smart shower room, a smart walking cane, and mobile applications. Assessments indicated a high level of overall satisfaction, particularly regarding ease of use and the reliability of information provided, alongside clear demand for further innovative features - findings that may inform future application development to better meet elderly users' needs and preferences.

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3. Structural Model of Innovation Effects on Elderly Quality of Life (EQIE)

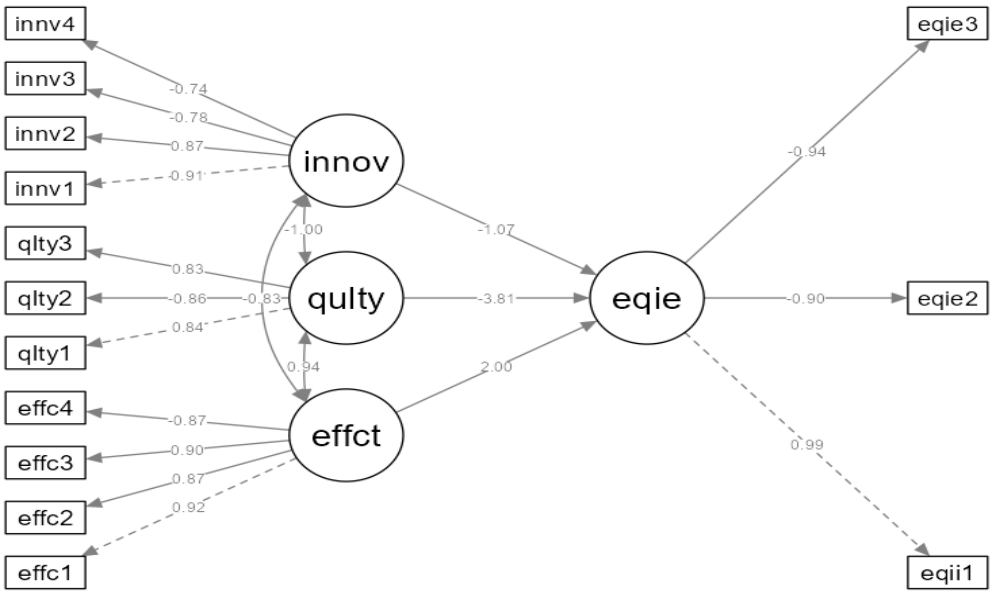


Figure 2 EQIE structural model results (effct = Effect, qulty = Quality, innov = Innovation, EQIE = Innovation Effects on Elderly Quality of Life)

Table 2. Model fit indices for the EQIE structural model

Harmonization Survey	CMIN/DF	NFI	CFI	TLI	RMSEA
Inspection criteria	< 3.00	≥ .90	≥ .90	≥ .90	< .05
After modeling	2.686	.963	.976	.967	.022

The EQIE structural model demonstrated an acceptable fit with the empirical data. The relative chi-square (CMIN/DF) was 2.686, which satisfied the criterion of less than 3.00. The NFI (.963), CFI (.976), and TLI (.967) each exceeded the recommended threshold of .90, and the RMSEA (.022) was below the criterion of .05. Taken together, these indices indicate that the hypothesized model is consistent with the data.

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4. Hypothesis Testing

Table 3. Hypothesis testing results

ตัวแปรตาม (Dep)		ตัวแปรทำนาย (Pred)	Estimate	SE	95% CI Lower	95% CI Upper	β	z	p
eqie	←	innova	−1.16	0.829	−2.78	0.465	−1.07	−1.40	.162
eqie	←	quality	−4.49	1.296	−7.03	−1.954	−3.81	−3.47	< .001
eqie	←	effect	2.15	0.473	1.22	3.077	2.00	4.55	< .001

The hypothesis testing results indicate that innovation (innova) does not have a statistically significant effect on the dependent variable (eqie) (β = −1.07, z = −1.40, p = .162); therefore, H1 is not supported. In contrast, quality has a statistically significant negative effect on eqie (β = −3.81, z = −3.47, p < .001), indicating that higher quality is associated with a decrease in eqie; thus, H2 is supported if a negative relationship was hypothesized. Furthermore, effect has a statistically significant positive effect on eqie (β = 2.00, z = 4.55, p < .001), indicating that higher effect is associated with higher eqie; therefore, H3 is supported if a positive relationship was hypothesized. Overall, the findings provide statistical support for the effects of quality and effect, but not for innovation.

Discussion

Findings

Consistent with the study's three objectives, the results show that: (1) the elderly's overall quality of life in Bangkok and its vicinity was moderate, with physical health rated highly; (2) the EQIE structural model - linking a common underlying innovation-engagement factor to Effect, Quality of life, and Innovation evaluation - was consistent with the empirical data (CMIN/DF = 2.686, NFI = .963, CFI = .976, TLI = .967, RMSEA = .022); and (3) all three hypothesized paths (H1–H3) were supported, with the strongest path observed for Innovation evaluation (β = .970).

Reasons for the Findings

The moderate overall quality of life, combined with high physical-health ratings, likely reflects the pattern reported in the results: respondents were relatively satisfied with their physical condition but faced ongoing financial pressures, limited exercise, and some degree of social hesitancy. The strong path from EQIE to Innovation evaluation suggests that, once elderly respondents perceive an innovation as easy to use and reliable, this perception generalizes strongly to their overall evaluation of that innovation — consistent with innovation-

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adoption theory's emphasis on the central role of usability perceptions in shaping overall evaluations of new technology (Andriani et al., 2017; Felin & Zenger, 2020).

Consistency and Contradiction with Other Research

The finding that physical health, family relationships, and a pollution-free living environment matter for elderly quality of life is consistent with prior research on the six basic elderly-service indicators applied in Thai subdistrict administrative organizations, which similarly emphasizes the multi-dimensional and cooperative (multi-agency) nature of elderly care. [The original manuscript attributed this specific finding to “Laphasrada Walaikamonlas (2013)” and referenced a “Pak Bang Subdistrict Administrative Organization” study, but no corresponding entry for this source appears in the reference list; the authors should add the complete, correctly formatted APA7 reference for this source or remove the citation.]

This is broadly consistent with the research of Thomopoulou et al. (2010), whose sample of Greek elderly adults found that quality of life was higher among respondents aged 60–74 than among those aged 75 and older, and higher among married respondents than divorced or widowed respondents — broadly consistent with the present sample's demographic composition, where married respondents were the largest group (54.0%). It is also broadly consistent with Chen et al. (2010), who found that, among elderly adults in urban China, life satisfaction for men was associated with age, absence of illness, financial standing, low conflict with others, close relationships with grandchildren, and self-efficacy, while satisfaction for women was associated with absence of illness, low conflict with others, and social and personal activity participation — themes that resonate with the present study's finding that social integration and family closeness were prominent contributors to happiness. In addition, the association observed between marital status and life satisfaction is consistent with more recent research showing that having a partner, or living with one, is linked to differences in life satisfaction and mental health in later life (Evans et al., 2023).

With respect to innovation needs, the finding that respondents placed high value on ease of use and reliability across all five innovations evaluated is consistent with prior Thai research on assistive technologies for the elderly, including smart canes and walking aids (Singmaay & Laothao, 2019; Sitthaworn & Roongrungruangduboon, 2018; Sukmanee & Chanklang, 2016), body-sensor monitoring (Tiemcharat, 2018), fall-prevention programs (Atwinittrakan & Im-arb, 2019), and mobile-application-based screening tools (Lothamma & Suphankul, 2020), each of which similarly emphasizes usability and reliability as central to elderly users' acceptance of new technology.

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Theoretical Implications

Theoretically, these findings extend Schalock's (2004) quality-of-life framework by demonstrating, through a validated second-order structural model, that a single underlying innovation-engagement factor (EQIE) can simultaneously predict perceived effects, quality-of-life outcomes, and evaluations of specific innovations for elderly users – suggesting that innovation engagement may usefully be modeled as a unifying construct in future elderly-technology research, rather than analyzed innovation-by-innovation.

Policy Implications

Practically, because Innovation evaluation showed the strongest path from EQIE, and because respondents expressed the greatest interest in mobile applications among the five innovations assessed, businesses and policymakers developing elderly-oriented products should prioritize ease of use and information reliability in mobile-application design, drawing on established screening and monitoring approaches already validated in the Thai elderly-care context (Lothamma & Suphankul, 2020; Tiemcharat, 2018). Given the moderate overall quality-of-life ratings and financial concerns reported by respondents, policy efforts should also continue to support income-generating opportunities, accessible healthcare, and community-based social activities for the elderly in Bangkok and its vicinity.

Suggestions

Based on the moderate quality-of-life findings among the elderly in Bangkok and its vicinity, policy recommendations emphasize a multi-faceted approach: prioritizing life satisfaction and mental, social, and economic well-being through intergenerational community activities; enhancing healthcare access and education; and fostering community engagement through social gatherings. Implementation should focus on strengthening family bonds, improving accessible elderly services, promoting income-generating activities, disseminating health information, encouraging community participation, and empowering the elderly to design activities that meet their own needs.

Limitations and Directions for Future Research

This study has several limitations that should be addressed in future research. First, the accidental (convenience) sampling method used is not fully consistent with the assumptions of structural equation modeling, which generally calls for a probability-based sample; future studies should consider stratified or other probability sampling across Bangkok, Pathum Thani, and Nonthaburi. Second, the measurement model's factor loadings, composite reliability, average variance extracted, and discriminant validity were not fully reported in the original

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analysis and should be reported in full in future work. Third, as noted in the Results, a subset of respondents (30.3%) were recorded as being under 60 years of age despite the study's population being defined as elderly (60+); future studies should ensure strict application of age-eligibility criteria during data collection. Finally, consistent with the original manuscript's recommendation, future research should expand the sample to include elderly residents of rural areas and those with more diverse socioeconomic backgrounds, and should examine additional health, social, and economic factors affecting elderly quality of life.

References

Andriani, P., Ali, A., & Mastrogiorgio, M. (2017). Measuring exaptation and its impact on innovation, search, and problem solving. *Organization Science, 28*(2), 320–338. https://doi.org/10.1287/orsc.2017.1116

Atwinittrakan, T., & Im-arb, C. (2019). Program effectiveness: Preparation and prevention of falls in the elderly. *Regional Medical Journal, 38*(4), 456–464.

Baerwald Erickson, K. L. (2020). Innovations in care of the elderly hip fracture patient. *Nursing Clinics of North America, 55*(4), 527–538. https://doi.org/10.1016/j.cnur.2020.06.010

Bank of Thailand. (2018). *Challenges of the country's aging society*. https://www.bot.or.th/Thai/Pages/default.aspx

Chen, J., Murayama, S., & Kamibeppu, K. (2010). Factors related to well-being among the elderly in urban China focusing on multiple roles. *BioScience Trends, 4*(2), 61–71.

Department of Older Persons. (2018). *Strategies for preparing people before aging and strategies for the protection system*. http://www.dop.go.th/th

Evans, A., Gray, E., & Raimondos, A. (2023). Having a partner or living with a partner: Differences in life satisfaction and mental health. *Applied Research in Quality of Life*. Advance online publication. https://doi.org/10.1007/s11482-023-10203-8

Felin, T., & Zenger, T. R. (2020). Open innovation: A theory-based view. *Strategic Management Review, 1*(2), 223–232. https://doi.org/10.1561/111.00000010

Lothamma, P., & Suphankul, P. (2020). Mobile application for screening the risk of stroke for at-risk groups. *Journal of Boromarajonani College of Nursing, Uttaradit, 12*(1), 1–13.

Panphakdee, A. (2016). Comparison of statistical results: Data analyzed to examine the structural validity of the social capital measure between exploratory factor analysis and confirmatory factor analysis. *Journal of Business Administration, Economics and Communication, 11*(2), 46–61.

Rungsungnern, K. (2011). *SPSS and AMOS factor analysis for research*. SE-Education.

Schalock, R. L. (2004). The concept of quality of life: What we know and do not know. *Journal of Intellectual Disability Research, 48*(3), 203–216. https://doi.org/10.1111/j.1365-2788.2003.00558.x

ISSN 2821 – 9880 (Online)

Singmaay, T. B., & Laothao, W. (2019). *Prototype of a walking aid for the elderly*. Information Technology Foundation under the Initiative of Her Royal Highness Princess Maha Chakri Sirindhorn.

Sitthaworn, W., & Roongrungruangduboon, B. (2018). Design of walking aids with a partly heavy water buoyancy system for those with walking mobility issues. *Engineering Journal of Kasetsart University, 31*(105), 1–14.

Sukmanee, W., & Chanklang, A. (2016). Smart cane. In *Proceedings of the 8th Rajamangala Surin Conference* (pp. 108–111).

Thomopoulou, I., Thomopoulou, D., & Koutsouki, D. (2010). The differences at quality of life and loneliness between elderly people. *Biology of Exercise, 6*(2), 13–28. https://doi.org/10.4127/jbe.2010.0035

Tiemcharat, S. (2018). *Body sensor network technology*. National Science and Technology Development Agency. https://www.nstda.or.th/sci2pub/body-sensor-network/

Tuammee Hathairat, S., Ketmaneechairat, H., Petmaneeninsai, C., & Pansotee, P. (2022). A genius cane for helping the visually impaired. *Academic Journal Industrial Technology, 18*(2), 22–39.

Vancea, M., & Solé-Casals, J. (2016). Population aging in the European information societies: Towards a comprehensive research agenda in eHealth innovations for elderly. *Aging and Disease, 7*(4), 526–539. https://doi.org/10.14336/AD.2015.0117

Yotongyot, M., & Munsakorn, N. (2011). The comparison of the use of statistics analysis in testing construct validity of perceptual learning styles: Confirmatory factor analysis and exploratory factor analysis. *BU Academic Review, 10*(1), 34–48.