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Scenario-Based Analysis of Smart Product Acceptance for the Elderly in Home-Based Care

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Abstract. With the increasing aging population, home-based care has become a main nursing mode for the elderly. To better assist the elderly with daily activities, healthcare management and emotional support, smart technologies and products have been widely considered. However, the gap between the high requirements of smart products on users and the physical and cognitive degradation of the elderly has made it difficult for the elderly to accept new technologies. Therefore, this study aims to deeply investigate the smart product acceptance of the elderly in home-based care. For the purpose, a scenario-based analysis approach was adopted to investigate different living scenarios and analyze their smart product acceptance in different contexts. The combination of questionnaire survey and interview was employed, and 95 participants (age > 60) were involved. Statistical analysis and DEMATEL (Decision making trial and evaluation laboratory) were applied to reveal the structure and co-relations of the influencing factors. It shows that gender, age, health status, economic status, and technical proficiency have impacts on the smart product selection. Indicative and safe were identified with the most important influence on smart product acceptance in daily activities and healthcare scenarios. Trustful and efficient have moderate influence on entertainment and sports scenarios, and the influence of enjoyable and dependent factors is not that significant. Generally, this research can contribute to suggestions on the smart product design with full consideration of elderly's physical and cognitive capacity. Moreover, it provides governments and the society with insights on the further reform of more practical elderly-care policies and social support strategies.

Keywords. Transdisciplinary Engineering, technology acceptance, home-based elderly care, smart homes, scenario-based analysis

Introduction

Along with the increasing aging population, more and more research focus has been placed towards enhancing the quality of elderly's life [1]. Especially under the situation that most elderly prefer the home-based care, higher expectations are raised on their home care experience. However, the elderly encounters physical and mental declines, such as limited mobility and cognitive impairments [2], and meanwhile, smart technologies are unavoidably reshaping their lifestyles [3].How to deal with the conflict between elderly's physical degeneration and the high requirements of smart home technologies has become an important issue.

This study aims to analyze elderly's perceived acceptance of smart products in home-based care context. For the purpose, the details about how the elderly interact with their living spaces and how they select products and services to assist with their daily life

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will be collected. With the help of scenario-based analysis, the specific functional and emotional properties of smart products, which are preferred by the elderly for different living purposes, will be identified, and the general acceptance of smart products can be analyzed. Based on the analysis, potential recommendations for designing smart products that take into account their physical and cognitive abilities will be contributed.

1. Literature review

The expanding research on smart homes and technology acceptance has prompted a literature review, providing the essential foundational understanding for the study. It is important to investigate the unique needs and expectations of the elderly across various life scenarios. However, existing studies have not devoted sufficient research focus. Considering the potential of TAM theories and scenario analysis methods, this study will take use of scenario-based approach to achieve a detailed analysis of elderly's perceived acceptance of smart home products referring to TAM factors under varying scenarios.

1.1. Smart home for the elderly

Smart homes are innovatively designed to boost efficiency, improve the living experiences of the elderly, mitigate usability barriers, promote self-care, and enhance entertainment offerings [4]. Stefanov et al.'s research highlights that smart homes are specifically adapted to meet the needs of individuals requiring special attention, including the elderly, the physically disabled, and those suffering from chronic illnesses [5]. Smart homes can offer the elderly with functions, such as reminding them of medication times, automatically notifying hospitals in case of falls, and expanding entertainment options [6]. Dohr et al. have pinpointed six essential needs of the elderly: health, safety/security, peace of mind, independence, mobility, and social interaction [7]. Smart homes dedicated to the elderly should address these crucial needs and provide cost-effective services [8]. In summary, smart home synthesizes insights from diverse fields, including electronic information engineering, public administration, health care and product design [9], and has become the overarching trend and future of home care.

1.2. Smart product acceptance

Users' acceptance of products and services like smart home is crucial to determine their ability to satisfy users [10]. In this regard, the Technology Acceptance Model (TAM) is a seminal framework for identifying factors that influence technology acceptance among users, such as Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) [11, 12], and has become instrumental in understanding and predicting user behavior towards technology adoption or rejection [13]. Research indicates that these factors' impact varies among different age groups and geographic regions, with the elderly receiving particular focus due to their unique needs and challenges in technology use.

As the population ages, the imperative to create technologies that facilitate independent living and improve the elderly's quality of life becomes increasingly significant. This demographic often encounters distinct challenges in adopting new technologies. Addressing these challenges, Chen et al. introduced the Senior Technology Acceptance Model (STAM), incorporating factors such as gerontechnology self-efficacy, anxiety, facilitating conditions, self-reported health, cognitive ability, social

relationships, and physical functioning. They discovered that, for the elderly in Hong Kong, these elements hold greater predictive value than PEOU and PU [14]. Leveraging TAM and its derived models enables researchers to pinpoint both the intentions behind and obstacles to technology adoption among the elderly, thereby crafting interventions that effectively overcome these barriers and fulfill their requirements. The deployment of TAMs in studies of elderly home care emerges as a compelling method for creating user-centric smart home solutions. Especially, the related TAM factors are referential for smart product design tailored to the needs and expectations of the elderly.

1.3. Scenario-based analysis

As a decision-support tool, scenario-based analysis generates multiple scenarios by defining variables and factors, boasting a broad application spectrum in business decision-making, project management, and user experience (UX) design. In UX design, scenarios focus on individuals, their activities, and narratives [15]. Scenario construction facilitates the unveiling of users' perceptions of products and service systems, offering a potent communication that enables designers to deeply comprehend users' perspectives, which will be related to their technology acceptance. The cornerstone of scenario-based design lies in the model construction and analysis [16]. Emotions and behaviors of users, especially the elderly, vary across different scenarios [17], leading to diverse needs and expectations that ultimately influence design outcomes.

2. Research methodology

2.1. Scenario identification based on text mining

The section involves a systematic literature review to discern research trends and identify primary home-based care scenarios for the elderly. To achieve this, CiteSpace, a Java-based application designed to visually map the interconnections between scientific articles through co-citation analysis, was utilized [18]. The study commences with an exploration of existing research on domestic support for the elderly, leveraging WOS (Web of Science), the most authoritative databases internationally, to collect and analyze a comprehensive body of literature, so as to identify the current state of research and potential experimental scenarios within this domain. The search strategy was defined as follows: the query *ALL = ((elder* OR "older " OR "aging" OR "ageing") AND ("Technology acceptance" OR "Acceptance" OR "Intelligence Trust")) AND DT = (Article)* was employed, focusing on publications from 2015 to 2023. And a total of 3000 to 6649 references were identified in WOS.

2.2. Data collection via interview and questionnaire

To conduct an in-depth exploration of the living scenarios of the elderly, 7 participants, aged between 62 and 76 years, were invited for semi-structured interviews after text-mining. These interviews delved into themes such as home lifestyle, daily activities, needs in domestic life, and willingness to adopt smart home technology. The insights gained from these interviews, along with text-mining outcomes, established the foundational framework for developing a scenario-based analysis model.

Moreover, a questionnaire survey was further conducted to investigate the product acceptance of the elderly in home scenarios, alongside their attitudes and preferences. The questionnaire was organized into four principal sections:

- Item Basic Information: Gathering data on gender, age, health status, economic status, and technical proficiency, offering a summary of personal details.
- Lifestyle: probing into the significance of different activities, services, and products in various scenarios, focusing on behaviors, perceptions, and attitudes.
- Intention: employing Decision Making Trial and Evaluation Laboratory (DEMATEL) to delve deeper into decision-making processes and preferences.
- Outlook: comprehending expectations when choosing and utilizing products.

Data cleaning and pre-processing was conducted. Then the reliability and validity analysis were executed, and correlations were calculated. A strong correlation among the variables was revealed, affirming the data's appropriateness for further analysis.

2.3. DEMATEL analysis

To elucidate the significance and relationships among elderly individuals' perceived technology acceptance dimensions across different scenarios, the DEMATEL was employed. Developed by the Geneva Research Centre of the Battelle Memorial Institute [19], DEMATEL has been widely recognized as an efficacious method for delineating the cause-effect relationships within intricate systems [20]. It establishes a relation matrix of system factors and identifies the correlations between these factors [21]. Through comprehensive DEMATEL analysis, the influence values among the factors were assessed. Furthermore, scenario-specific DEMATEL analysis was conducted to delineate the impact of scenarios on the multi-dimension values of model factors.

Based on the DEMATEL analysis, factor analysis was jointly considered. Especially, the "Lifestyle" and "Intention" sections utilize five-point Likert scales featuring assertive statements, and participants may provide quantitative assessments of their perceptions and experiences. Correlation analysis can be accordingly employed to uncover relationships between these variables. Moreover, stepwise regression analysis was utilized to determine the impact of these factors on scenario concerns.

3. Results analysis

3.1. Scenario identification

Upon filtering out extraneous keywords, the focus is visually represented through keyword atlases and cluster analyses as depicted in the Figure 1. Cluster analysis aggregates interrelated nodes and highlights keywords, thus enhancing the intelligibility of the figure. The effectiveness of the mapping is evaluated using Q (module value) and S (average contour value), which reflect the network structure's coherence and the clarity of clustering respectively. $Q = 0.28 < 0.3$ suggests a less significant cluster structure, whereas $S = 0.71 > 0.5$ signifies reasonable clustering. The identified keywords can be organized into four primary categories:

- Social context: Digital divide, home care, community support, etc.
- Design concept: Service design, the internet, digital integration, etc.

- Design direction: Smart home, intergenerational support, etc.
- Scenario focus: Healthcare, entertainment, safety, etc.

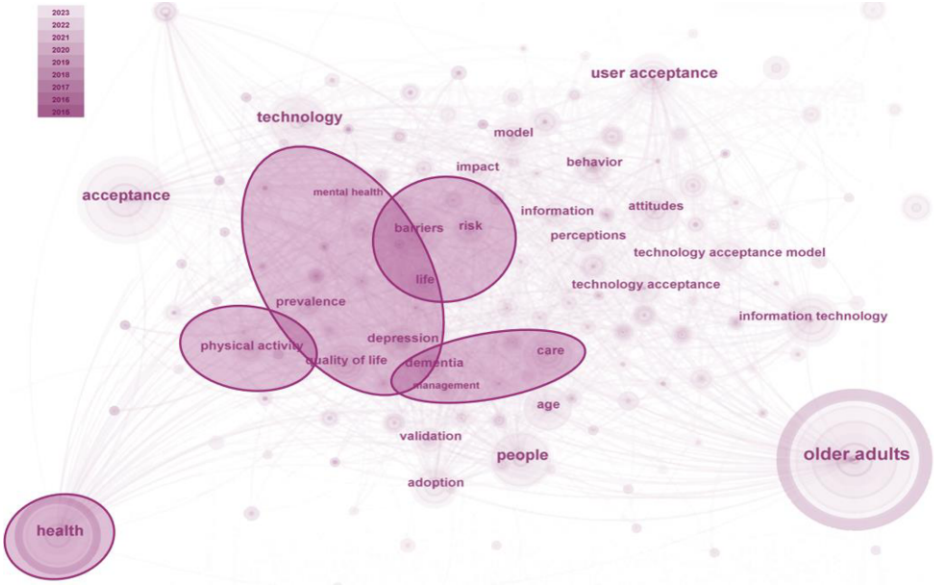

Figure 1. Keyword atlas.

Besides the text mining, semi-structured interviews show that despite most interviewees being in a generally healthy condition, concerns such as presbyopia, hearing loss, and reduced reaction times, coupled with chronic conditions like hypertension, hyperlipidemia, and gout, have significantly heightened their focus on healthcare solutions. Their primary aim is to maintain wellness. Additionally, the quest for fulfillment in retirement has led them to engage in activities like Tai Chi, square dancing, and artistic pursuits, which serve to enrich their lives. Some interviewees expressed feelings of emptiness and loneliness, stemming from the transition from work to retirement, which is challenging to adapt to and has even led to depression.

Table 1 illustrates the scenario-based analysis model, formed by insights from text mining and interviews. The identified scenarios were organized into five distinct clusters: healthcare, exercise and fitness, home safety, psychological support, and daily life assistance. To better describe and distinguish different scenarios, three categories were identified as scenario properties, including activities, services, and products. By employing the model, participants can express their concerns and receptivity towards specific scenarios, thereby enabling a deeper exploration of their needs and expectations.

Table 1. Scenario-based analysis model.

Scenarios	Scenario properties	Factors
Healthcare	Activity	Health monitoring (blood pressure, blood sugar, blood oxygen, heart rate, etc.)
	Service	Health care (home physical therapy, rehabilitation care, medical treatment, etc.)
	Product	Medical monitoring equipment (health management, smart pill box, health monitoring bracelet, etc.)
Exercise and fitness	Activity	Exercise (walking, square dancing, Tai Chi, table tennis, etc.)
	Product	Fitness equipment (age-appropriate fitness equipment, such as walking machines, leg press machines, etc.)
Home safety	Service	Safety services (safety guidance, emergency rescue, etc.)

	Product	Safety settings (anti-slip bathrooms, emergency calling system, anti-fall handrails, monitor alarm, etc.)
Psychological support	Activity	Socialization (community activities, group tours, etc.)
	Activity	Entertainment (mahjong, poker, chess, watching TV, listening to the radio, etc.)
	Activity	Personal interest and self-improvement (calligraphy, painting, reading, senior citizen colleges, etc.)
	Service	Spiritual companionship (keeping pets, caring visits, psychological counseling, emotional relief, etc.)
	Product	Entertainment equipment (intelligent robots, intelligent speakers including interactive entertainment, voice dialogues and daily reminders, etc.)
Daily life assistance	Service	Life service (meal cooking, indoor cleaning, hairdressing, shopping, errands, etc.)
	Service	Behavioral aid services (bathing and toileting aids, walking aids, eating aids, hearing and visual aids, communication aids, etc.)
	Product	Behavioral aid devices (crutches, wheelchairs, hearing aids, barrier-free showers, etc.)
	Product	Smart home appliances (smart floor sweeper, smart refrigerator, smart toilet, smart mattress, etc.)

3.2. Elderly data

During the questionnaire data collection phase, 95 valid responses were yielded. The participants are evenly split by gender, with the majority (82.11%) aged between 60 and 70 years. A significant portion reported being in good health (68.42%), while approximately 29.47% acknowledged the need for precautions to avoid accidents. The educational level among the participants is notably high, with most (67.37%) holding at least a bachelor's degree, followed by those with high school (15.79%) and middle school (10.53%) educations. Furthermore, a vast majority lived in urban settings (93.68%) and with their spouse (84.21%). Regarding post-retirement income, most participants reported moderate earnings of 3,001-5,000 RMB per month (76.84%), primarily derived from pension insurance, dividends or rent, and child support. The primary expenditures are food, medicine, and daily necessities.

Through post-hoc multiple comparisons of categorical factors, the findings indicate a positive influence of education level on exercise and fitness ($F=4.052$, $p=0.009$), psychological support ($F=7.860$, $p=0.000$), and daily life assistance ($F=4.911$, $p=0.003$). Urban areas exhibit a stronger preference for psychological support compared to rural regions ($F=8.168$, $p=0.005$). Additionally, the presence of disease adversely affects psychological support ($F=4.025$, $p=0.048$). Economic status, specifically income, enhances the focus on exercise and fitness ($F=4.424$, $p=0.006$), psychological support ($F=11.414$, $p=0.000$), and daily life assistance ($F=4.305$, $p=0.007$). Regarding sources of income, child support notably has a positive influence on healthcare ($F=7.995$, $p=0.006$), whereas dividends or rent enhance psychological support ($F=4.445$, $p=0.038$) and daily life assistance ($F=7.764$, $p=0.006$). Support from government or social welfare programs boosts daily life assistance ($F=10.779$, $p=0.001$), while commercial insurance enhances psychological support ($F=8.693$, $p=0.004$). Medical expenses, as a form of economic expenditure, positively influence healthcare ($F=6.021$, $p=0.016$), exercise and fitness ($F=5.717$, $p=0.019$), and psychological support ($F=8.083$, $p=0.005$). Moreover, Table 2 details the correlation analysis results of quantitative factors under different scenarios.

Table 2. Correlation analysis results under different scenarios.

Factors	Items	Analysis result	Healthcare	Exercise and fitness	Home safety	Psychological support	Daily life assistance
Technology proficiency	Mobile software	*r*	0.191	**0.406****	**0.337****	**0.546****	**0.379****
		p	0.064	0	0.001	0	0

Technology proficiency	Medical equipment	*r*	**0.205***	**0.291****	0.063	**0.362****	**0.437****
		p	0.046	0.004	0.545	0	0
Technology proficiency	Electric appliance	*r*	**0.476****	**0.405****	**0.439****	**0.479****	**0.497****
		p	0	0	0	0	0
Technology proficiency	Smart home	*r*	0.1	**0.418****	0.105	**0.455****	**0.435****
		p	0.336	0	0.313	0	0
Product concern	Practicality	*r*	**0.482****	0.196	**0.347****	0.17	0.19
		p	0	0.057	0.001	0.099	0.065
Product concern	Function integration	*r*	0.118	**0.353****	0.146	0.191	**0.327****
		p	0.256	0	0.157	0.064	0.001
Product concern	Ease to use	*r*	**0.410****	0.106	**0.275****	0.096	0.063
		p	0	0.304	0.007	0.356	0.543
Product concern	Portability	*r*	0.127	**0.242***	0.181	**0.242***	**0.222***
		p	0.222	0.018	0.079	0.018	0.03
Product concern	Safety	*r*	**0.444****	0.145	**0.322****	**0.248***	**0.237***
		p	0	0.162	0.001	0.016	0.021
Product concern	Comfort	*r*	**0.432****	**0.260***	**0.385****	0.192	0.193
		p	0	0.011	0	0.063	0.061
Product concern	Price	*r*	**-0.210***	-0.101	**-0.248***	**-0.275****	-0.008
		p	0.041	0.331	0.015	0.007	0.938
Product concern	Material	*r*	**0.207***	**0.301****	**0.226***	**0.362****	**0.271****
		p	0.044	0.003	0.027	0	0.008
Product concern	Color	*r*	0.119	**0.354****	0.127	**0.501****	**0.436****
		p	0.252	0	0.218	0	0
Product concern	Shape	*r*	-0.043	**0.210***	-0.026	0.167	**0.228***
		p	0.681	0.041	0.803	0.106	0.026
Product concern	After-sales service	*r*	**0.219***	**0.301****	**0.227***	0.188	0.159
		p	0.033	0.003	0.027	0.069	0.125

* $p<0.05$ ** $p<0.01$

3.3. DEMATEL analysis results

The potential influence of related factors on one another and the extent of their impact were deduced from parameterized user feedback data. Based on TAM factors and initial findings of scenario analysis, a DEMATEL model was developed:

- Function-related: Efficient, indicative, and safe.
- Emotion-related: Enjoyable, trustworthy, dependent, and common sense.

To elucidate the interrelationships among these factors, the direct relation matrix B was computed. The matrix was then normalized to generate the total relation matrix T :

$$B = \frac{x_{ij}}{\max\left(\sum_{j=1}^{n} x_{ij}\right)}, \quad T = \left(B + B^2 + \cdots + B^k\right) = \sum_{k=1}^{\infty} B^k = B\left(I - B\right)^{-1} \tag{1}$$

$$B = \begin{bmatrix} 0 & 0.157 & 0.161 & 0.168 & 0.165 & 0.159 & 0.161 \\ 0.169 & 0 & 0.161 & 0.167 & 0.174 & 0.165 & 0.163 \\ 0.163 & 0.164 & 0 & 0.163 & 0.173 & 0.159 & 0.159 \\ 0.161 & 0.165 & 0.150 & 0 & 0.164 & 0.158 & 0.159 \\ 0.165 & 0.159 & 0.161 & 0.170 & 0 & 0.163 & 0.160 \\ 0.161 & 0.161 & 0.157 & 0.163 & 0.167 & 0 & 0.156 \\ 0.161 & 0.165 & 0.153 & 0.160 & 0.162 & 0.139 & 0 \end{bmatrix} \quad T = \begin{bmatrix} 4.637 & 4.731 & 4.621 & 4.824 & 4.877 & 4.622 & 4.683 \\ 4.901 & 4.714 & 4.737 & 4.945 & 5.007 & 4.743 & 4.803 \\ 4.823 & 4.781 & 4.527 & 4.867 & 4.930 & 4.667 & 4.727 \\ 4.725 & 4.686 & 4.564 & 4.629 & 4.825 & 4.572 & 4.633 \\ 4.807 & 4.760 & 4.648 & 4.854 & 4.764 & 4.652 & 4.710 \\ 4.752 & 4.710 & 4.594 & 4.796 & 4.854 & 4.462 & 4.656 \\ 4.651 & 4.612 & 4.494 & 4.692 & 4.748 & 4.486 & 4.422 \end{bmatrix}$$

The row sums (D_i, $i=1,2,\ldots n$) and column sums (C_i, $i=1,2,\ldots n$) of the matrix T , indicating the level of influence and the extent of relationships respectively [21], were employed to compute the prominence values M and the relation values R. A higher value

of M signifies the greater importance of a factor, whereas a higher R value indicates a stronger influence of a factor on others. Specifically, $R > 0$ denotes a stronger influence on other factors, while $R < 0$ suggests a higher susceptibility to influence from other factors. The two values are crucial for the construction of the causal diagram [22]:

$$M_i = D_i + C_i, \quad R_i = D_i - C_i \tag{2}$$

Table 3. DEMATEL analysis of factors.

Factor	Efficient	Indicative	Safe	Enjoyable	Trustful	Dependent	Common sense
D	32.995	33.849	33.323	32.635	33.195	32.824	32.106
C	33.297	32.994	32.185	33.607	34.006	32.203	32.635
M	66.292	66.843	65.508	66.242	67.201	65.027	64.741
R	-0.302	0.855	1.138	-0.972	-0.811	0.621	-0.529

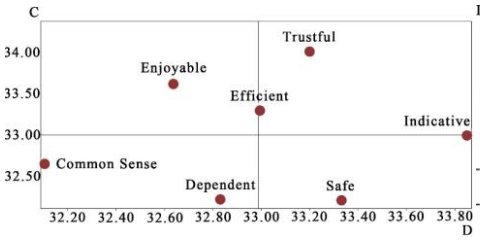

Figure 2. Causal diagram presenting influence and relationship values.

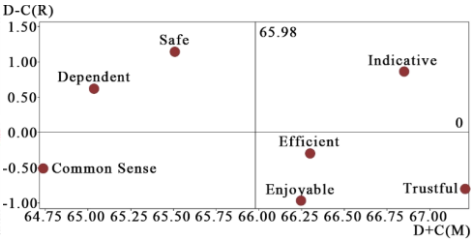

Figure 3. Causal diagram presenting prominence and relation values.

The analysis confirms that all factors incorporated into the model yield positive outcomes. A detailed examination reveals the following results:

- Indicative: Highly influential and moderately susceptible.
- Trustful: Moderately influential and highly susceptible.
- Safe: Highly influential and minimally susceptible.
- Efficient: Moderately influential and highly susceptible.
- Enjoyable: Minimally influential and highly susceptible.
- Dependent: Minimally influential and minimally susceptible.
- Common Sense: Minimally influential and minimally susceptible.

A sub-scenario analysis was further employed to focus on scenarios of paramount concern to participants. In the healthcare scenario, the "Indicative" and "Safe" factors are paramount in influencing smart product acceptance. For exercise and fitness, "Trustful" and "Indicative" factors are crucial; in home safety, "Safe" and "Trustful" are key. "Indicative" and "Common Sense" factors are essential in psychological support, while "Indicative" and "Enjoyable" are essential in daily life assistance.

Table 4. Weights of factors in sub-scenario analysis.

Factor	Healthcare	Exercise and fitness	Home safety	Psychological support	Daily life assistance
Efficient	18.37%	14.29%	10.20%	6.12%	14.29%
Indicative	**26.53%***	**26.53%***	14.29%	**26.53%***	**26.53%***
Safe	**22.45%***	18.37%	**26.53%***	2.04%	18.37%
Enjoyable	2.04%	2.04%	2.04%	14.29%	**22.45%***
Trustful	10.20%	**22.45%***	**22.45%***	18.37%	10.20%
Dependent	6.12%	10.20%	18.37%	10.20%	2.04%
Common sense	14.29%	6.12%	6.12%	**22.45%***	6.12%

4. Discussion

Based on the analysis above, the survey reveals that factors such as users' demographic information, technical proficiency, and intentions towards smart products notably affect their concerns across various scenarios. It should be noted that the most participants in this work have relatively high education level. They have stable economic status and better chance to practically use smart products. Therefore, their interest and attitudes towards smart products are generally positive, and their preferences on products, functional and emotional properties are clear and more specific.

The DEMATEL model, encompassing dimensions like efficiency, indication, safety, enjoyability, trustworthiness, dependency, and common sense, demonstrates positive outcomes, indicating an effective integration of related factors. Moreover, the influence of these factors to different scenarios can be identified, which could provide importance reference for the evaluation of perceived acceptance of smart products and services in different contexts. Based on the findings, smart product design for the elderly should prioritize user-friendly interfaces, accessibility features, and health monitoring capabilities. Products should integrate emergency response systems and offer customization options to cater to individual needs. Additionally, incorporating features that provide emotional and social support will enhance user experience and acceptance, addressing the physical, cognitive, and emotional requirements of elderly users. Accordingly, recommendations can be offered in reforming pension systems and developing diverse welfare programs to address the core needs of the elderly for governments and societal institutions.

5. Conclusion and future works

In the study, the perceived acceptance of smart products of the elderly was investigated via a scenario-based approach. For the purpose, text mining of existing studies, interviews and questionnaire among elderly were conducted. Referring to TAM factors, DEMATEL was employed to reveal the specific influence of different factors to varying scenarios, which can further assist the evaluation of elderly’s acceptance of smart products in different living contexts. The main contributions of this work may lie in: i) a scenario-based analysis model for smart homes catering to the elderly, ii) recommendations for designing smart products that consider the elderly's functional and emotional preferences, and iii) insights to enhance elderly care policies and social support mechanisms.

Nevertheless, there are still some limitations of this study. For example, the sample size is limited, and cannot fully represent the whole population. In future work, more participants with different demographic characteristics will be included, and filed experiments will be considered to test the acceptance of specific smart products.

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References

[1] J. Powell and S. Chen, *The Global Dynamics of Aging*. Nova Publishers, New York, 2012.

[2] J. Jie Kai Yan and A. Siew Hoong Lee, A Conceptual Model on Integration of Technology Acceptance Model on Smart Home Healthcare System among Elderly,. In: *2022 4th International Conference on Advances in Computer Technology, Information Science and Communications (CTISC)*. 2022, pp. 1–5

[3] A. Leeraphong, B. Papasratorn, and V. Chongsuphajaisiddhi, A Study on Factors Influencing Elderly Intention to Use Smart Home in Thailand : A Pilot Study, *The 10th International Conference on e-Business (iNCEB2015)*, November 23rd - 24th 2015.

[4] L. Dogruel, S. Joeckel, and N.D. Bowman, The use and acceptance of new media entertainment technology by elderly users: development of an expanded technology acceptance model, *Behaviour & Information Technology*, Vol. 34, 2015, pp. 1052–1063.

[5] M. Chan, E. Campo, D. Estève, and J.-Y. Fourniols, Smart homes — Current features and future perspectives, *Maturitas*, Vol. 64, 2009, pp. 90–97.

[6] R.J. Robles and T. Kim, Applications, Systems and Methods in Smart Home Technology: A Review, *International Journal of Advanced Science and Technology*, Vol. 15, 2010, pp 37-48.

[7] A. Dohr, R. Modre-Opsrian, M. Drobics, D. Hayn, and G. Schreier, The Internet of Things for Ambient Assisted Living,. *2010 Seventh International Conference on Information Technology: New Generations*. 2010, pp. 804–809.

[8] A. Peine, I. Rollwagen, and L. Neven, The rise of the "innosumer"—Rethinking older technology users, *Technological Forecasting and Social Change*, Vol. 82, 2014, pp. 199–214.

[9] X. Liu, K.-Y. Chau, X. Liu, and Y. Wan, The Progress of Smart Elderly Care Research: A Scientometric Analysis Based on CNKI and WOS, *INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH*, Vol. 20, 2023, p. 1086.

[10] E. Park, Y. Cho, J. Han, and S.J. Kwon, Comprehensive Approaches to User Acceptance of Internet of Things in a Smart Home Environment, *IEEE Internet of Things Journal*, Vol. 4, 2017, pp. 2342–2350.

[11] P. Legris, J. Ingham, and P. Collerette, Why do people use information technology? A critical review of the technology acceptance model, *Information & Management*, Vol. 40, 2003, pp. 191–204.

[12] F.D. Davis, Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology, *MIS Quarterly*, Vol. 13, 1989, pp. 319–340.

[13] N. Marangunić and A. Granić, Technology acceptance model: a literature review from 1986 to 2013, *Universal Access in the Information Society*, Vol. 14, 2015, pp. 81–95.

[14] K. Chen and A.H.S. Chan, Gerontechnology acceptance by elderly Hong Kong Chinese: a senior technology acceptance model (STAM), *Ergonomics*, Vol. 57, 2014, pp. 635–652.

[15] B.A. Nardi, The use of scenarios in design, *ACM SIGCHI Bulletin*, Vol. 24, 1992, pp. 13–14.

[16] B. Ouyang and Y. He, Scenario-Based User Experience Research in Automobile Interior Lighting Innovation,. In: T.Z. Ahram and C. Falcão, (eds.) *Advances in Usability, User Experience and Assistive Technology*. pp. 706–714. *Springer International Publishing*, Cham 2019.

[17] J.M. Carroll, Scenario-Based Design,. In: *Making Use: Scenario-Based Design of Human-Computer Interactions*. MIT Press, Cambridge, 2003, pp. 45–70.

[18] J. Zheng, M. Hou, L. Liu, and X. Wang, Knowledge Structure and Emerging Trends of Telerehabilitation in Recent 20 Years: A Bibliometric Analysis via CiteSpace, *Frontiers in Public Health*, Vol. 10, 2022, p. 904855.

[19] A. Gabus and E. Fontela, World Problems, *An Invitation to Further Thought within the Framework of DEMATEL*, Battelle Geneva Research Centre, Geneva, 1972.

[20] S.-L. Si, X.-Y. You, H.-C. Liu, and P. Zhang, DEMATEL Technique: A Systematic Review of the State-of-the-Art Literature on Methodologies and Applications, *Mathematical Problems in Engineering*, Vol. 2018, 2018, pp. 1–33.

[21] S.M. Seyed-Hosseini, N. Safaei, and M.J. Asgharpour, Reprioritization of failures in a system failure mode and effects analysis by decision making trial and evaluation laboratory technique, *Reliability Engineering & System Safety*, Vol. 91, 2006, pp. 872–881.

[22] C. Putthiwanit, V. Vevere, O. Akova, and A. Raisiene, Exploring the Impact of Organizational Culture on Women Workforce Perception in International Hotel Industry, *XVIII International May Conference on Strategic Management – IMCSM22*, May 28, 2022, Bor, Serbia, 2022.