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Activities of Daily Living (ADL) Innovation towards Sustainable Quality of Life for the Elderly

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Abstract

Concerns about ageing relate not only to the size of the elderly population but also to their health, well-being, care, and living arrangements. This paper explores articles and journals to discover concepts, definitions, and issues related to activities of daily living for an ageing population in Malaysia. The content analysis will inform future in-depth interviews and demonstrative evidence to examine the Activities of Daily Living (ADL) towards the concept of Aging in Place as an independent lifestyle. The result will provide a practical solution for ADL aids that can be used by the elderly towards a better quality of life.

Keywords: Elderly, Activities of Daily Living, Quality of Life, Aging in Place

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1.0 Introduction

Population growth is a worldwide phenomenon that affects both developed and developing countries. It occurs when the age of a country's population increases and the distribution of the country's population shifts toward older generations. In Malaysia, the number of older adults is growing rapidly. Recent medical advances and improvements in hygiene and food supply have resulted in Malaysians' longer life expectancy. The ongoing shift in the population's age structure toward older people is evident in all developed countries, and this has significant health, social, economic, and epidemiological implications. According to recent estimates, the number of people over 60 worldwide will double from 756 million to 1400 million by 2030. According to the Department of Statistics Malaysia Official Portal (2020), the number of Malaysians aged 60 and older was 3.5 million in 2020, representing 10.7% of Malaysia's total population. This number will increase over time, and Malaysia is expected to reach "old country" status by 2035 when 15% of the population is 60 years and older (Tobi et al., 2017).

Investigation into the relationship between the elderly in Malaysia and their quality of life has been thoroughly discussed in recent years, focusing on the building environment issue. Hanapi et al. (2019) mainly focused on the elderly's risk of falling with related indoor-outdoor considerations, social well-being and emotional factors. Similarly, Qandeel and Jehom (2020), studying the homeless elderly in Malaysia, discovered a comparable factor relating to emotional being, which affects the perception of the quality of life. More recently, a study done to assess the impact of the COVID-19 pandemic reaffirms the three critical factors of active Aging: psychological well-being, financial planning, social support, and networking (Ooi et al., 2021).

1.1 Research Purpose

This research investigates early-stage physical problems faced by the elderly in activities of daily living (ADL), assesses the effectiveness and practicality of current aids, and proposes potential designs for improved quality of life. It is intended to investigate the various types of physical problems related to (ADL) faced by the elderly at an early stage of ageing. The initial data collected will determine the effectiveness and practicality of the design of existing activities and daily living (ADL) aids used by the elderly. Finally, the analysis and synthesis will provide a proposal for a potential practical design for activities of daily living (ADL) aids that can be used by the elderly towards a better quality of life. The inquiry is designed to uncover questions related to how the elderly's physical and mental condition is related to their Activities of Daily Living (ADL) performance and how Activities of Daily Living (ADL) aids are being used by the elderly in their daily lives. Finally, the research is intended to outline how innovative design of Activities of Daily Living (ADL) aid can be used to improve the quality of life among the elderly.

2.0 Literature Review

Countries worldwide are currently facing a general trend of an ageing population. Generally, an expected population structure worldwide sees an increase in life expectancy followed by a decrease in fertility rates. As early as 2015, a study by Yeung and Cheung (2015) showed an alarming trend of *one-person households*, of which four of the top ten list in the world come from Asia by the year 2020. Although the list is headed by countries such as China, Taiwan, Japan and South Korea, Malaysia is within the fifteen listed countries in Asia with the possible trajectory. Whereas the rise of elderly living without family can be a problem, its difficulty is well recognised, thus offering much discussion on improving the situation. Very often, the arguments posit that the elderly's quality of life in an urban setting is where both the issues and best practices lie (Van Hoof et al., 2018).

2.1 Activity of Daily Living

When the elderly suffer from chronic diseases, problems arise due to the associated health and economic burdens. As a result, healthy ageing is critical for the elderly, as is a supportive environment that promotes dignity, autonomy, functioning, and continued personal growth. Healthy ageing and a supportive environment will enable seniors to participate in the activities they enjoy with few restrictions. Managing seniors' assistance allows them to be self-sufficient without the required help. Older adults suffering from chronic diseases require special care.

In general, Activity of Daily Living (ADL) is quickly taken for granted and is considered a daily routine that most healthy young individuals can do without help. The inability to perform essential activities in everyday life can lead to unsafe conditions and poor quality of life. Health controllers and family members should be aware of the importance of ADL in patients to help identify patients who need help. This activity details daily life activities and highlights the role of inter-professional teams in evaluating the ADL to improve patient care and management.

According to (Maresova et al., 2020), ADL is an everyday activity during the day, such as self-service, eating, drinking, dressing, washing, bathing, walking, and moving. Meanwhile, Instrumental Activities of Daily Living (IADL) are needed to live in a self-sufficient household in the community, which includes preparing food, making purchases, doing easy homework, making phone calls, travelling, using medicines, and managing finances.

Maurya et al. (2019) state that the ageing population and the elderly are called upon to adapt to new technologies and the demands of modern society. Technology is considered to help when it is used to assist in the functioning of activities, reducing the inability to perform activities of daily life and everyday life in various areas of everyday life. Auxiliary devices and technologies are devices whose primary purpose is to maintain or improve the functionality and freedom of the individual to facilitate participation and improve overall well-being. Examples of assistive devices and technologies include wheelchairs, prostheses, hearing aids, visual devices, specialised computer software, and hardware that enhances mobility, hearing, vision or communication capabilities.

2.2 Quality of Life for the Elderly

Addressing an issue from the Quality of Life perspective will require an in-depth investigation and discovery that will be interconnected. The solution will be interrelated to bridge social, economic and environmental sustainability. Kamath et al. (2019) studied an entire system to propose a causal loop diagram (Extended model of Barkur et al., 2019) in their study on sustainable development related to the quality of life in smart cities. The foundation of the study referenced the Sustainable Development Goal that the World Health Organization also advocate. The theme of healthy life and well-being is a persistent agenda that has resounded with efforts on a Global Action Plan commitment worldwide (WHO, 2021). The United Nations' sustainable development framework model shows that social, economic, and environmental sustainability are the needs of the future, and efforts placed in the balance between these three can impact the quality of life of residents in urban areas. Likewise, the current study realises this sense of equilibrium by focusing on a systems approach when studying human factors' solutions to identified issues.

The elderly population is defined as people aged 65 and over, and the proportion is increasing worldwide. The United Nations reported in 2019 that 9% of the population is in this category, which will increase to 16% by 2050 (Wilson et al., 2019). In Malaysia, the same trend was observed. Within a year, the senior population increased from 2.12 to 2.21 million between the third quarter of 2018 and the third quarter of 2019. The elderly population in Malaysia is expected to double, from 7.5% in 2020 to 15% in 2040 (Safian et al., 2021). Therefore, the determining factor associated with the need for personal assistance becomes essential. In addition, these are important details that need to be disclosed, especially among public health doctors, so they are prepared with more structured programs to provide the best care to this population later in life.

Changes in population structure are expected due to prolonged life expectancy and simultaneous fertility reduction. Problems arise when the elderly have chronic diseases associated with health and economic burdens. Previous studies have shown that at least one activity of daily living (ADL) and one instrumental activity of daily life (IADL), such as shopping and housekeeping, of 1 million and 2.5 million seniors, respectively, need help. Many activities typically require mental health and well-being assistance, including staying healthy, sightseeing, seeing, listening and communicating. The action is associated with quality of life, level of dependence, risk of falling, and the need for help. Further classify the need for assistance into the following four categories: no need (no need for a caregiver), minimum requirements (requires a caregiver), simple needs (requires intermittent caregivers), and maximum requirements (requires a full-time nanny). This classification system allows one to identify the level of assistance that senior individuals need and helps caregivers adjust to the needs of the elderly.

2.3 Aging in Place

The concept of Aging in Place refers to the living arrangement that allows older adults to continue living in their homes and communities as they age. The psychological benefits of allowing this living arrangement are comparable to the physical security and medical needs of the elderly (Fogel, 2019). However, another discussion often arises with such consideration centres on the need for assistive devices to perform ADL (Pani-Harreman et al., 2021). The related theme looks at the concept of independence, the need for home care, nursing facility and the support of technology (Peek et al., 2019; Wang et al., 2019). Pynoos (2019), in their discussion on home modification and repair studies for Aging in Place, has iteratively concluded that systematic analysis of such strategies still needs to be improved. Undoubtedly, these concerns are also the inevitable issue of related costs. Not all support services are covered by healthcare funding and insurance, which can cause financial problems for patients and significant others. A large portion of existing study

2.4 Product Design Solution as ADL Innovation for the Elderly's Sustainable Quality of Life

A systematic review of the past study by Wahl and Gerstorf (2018) presented a conceptual framework for studying the role of contexts for development and Aging. The review shows that when it comes to technology, studies are mostly centred on devices installed to monitor falls and the elderly's ability to interact with the tailored computer system. Meanwhile, care and service-related enquiry assess the quantity and quality of healthcare facilities and the elderly's interaction with their caregiver. Finally, another related factor of the elderly and their physical surroundings is their home's physical context, public mobility and green spaces. It is clear that a proper inquiry which focuses on product design solutions is lacking, despite acknowledgement of (a) an increasingly ageing population, (b) familiar and non-disruptive ADL, (c) the elderly's technology adoption limitation and (d) the psychological benefit of Aging in Place. These phenomena provide an explicit setting for a product design project, correspondingly: (a) trend, (b) visceral, (c) behavioural and (d) reflective perspective. Therefore, understanding such need, the current study proposed a conceptual framework with a focus on design intervention towards sustainability and quality of life within the scope of Aging in Place as represented in Fig. 1

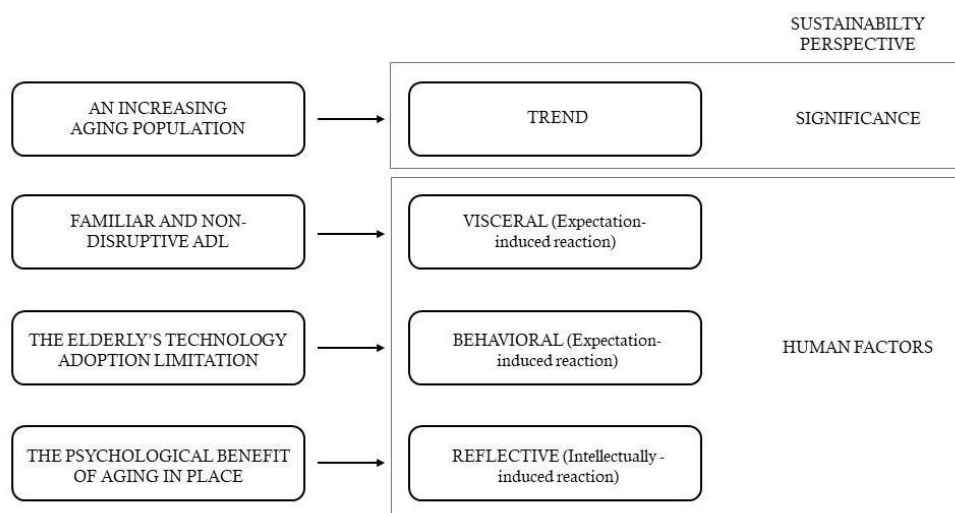


Fig. 1: Summary of a Product Design Framework for Activities of Daily Living (ADL) Innovation towards Sustainable Quality of Life for the Elderly

3.0 Methodology

As earlier outlined, the current study revealed a case for a product design intervention into the innovation of an assistive device that can allow the elderly to experience a quality of life through ADL innovation. The research method combines traditional data collection exercises with design process approaches. As an outcome, innovation focuses on output, one of which is product innovation. Meanwhile, the types of product innovation can be generalised to (1) Cost reductions, (2) Product Improvement, (3) Line extensions, (4) New markets, (5) New Uses, (6) New category entries and (7) New-to-the-world products (Kahn, 2018). The overlap between an innovation

function and the traditional New Product Development process is not coincidental. It has similar roots in corresponding fields, providing the foundation for both approaches to be applied and practised concurrently.

3.1 Research Procedure and Sampling

The research focuses on concluding criteria and characteristics of innovative design approaches of assistive devices for activities of daily living for the elderly. The current study applies qualitative data collection techniques of primary and secondary materials. Content analysis from existing literature was done with strategic keywords, particularly 'Activities of Daily Living', 'Quality of Life', 'Designing for the Elderly' and 'Aging in Place'. The insights gathered from the literature will provide considerations for the instrumentation of the semi-structured interview guide with ten respondents. Findings from the interview will be transcribed and thematically analysed. From the analysis, design considerations include appearance and utility factors that will inform the product for the elderly. Later, demonstrative evidence will be presented to the same respondent group for feedback. The following diagram (Fig. 2) illustrates the research methodology, which combines the research and design process as a complete innovation exercise.

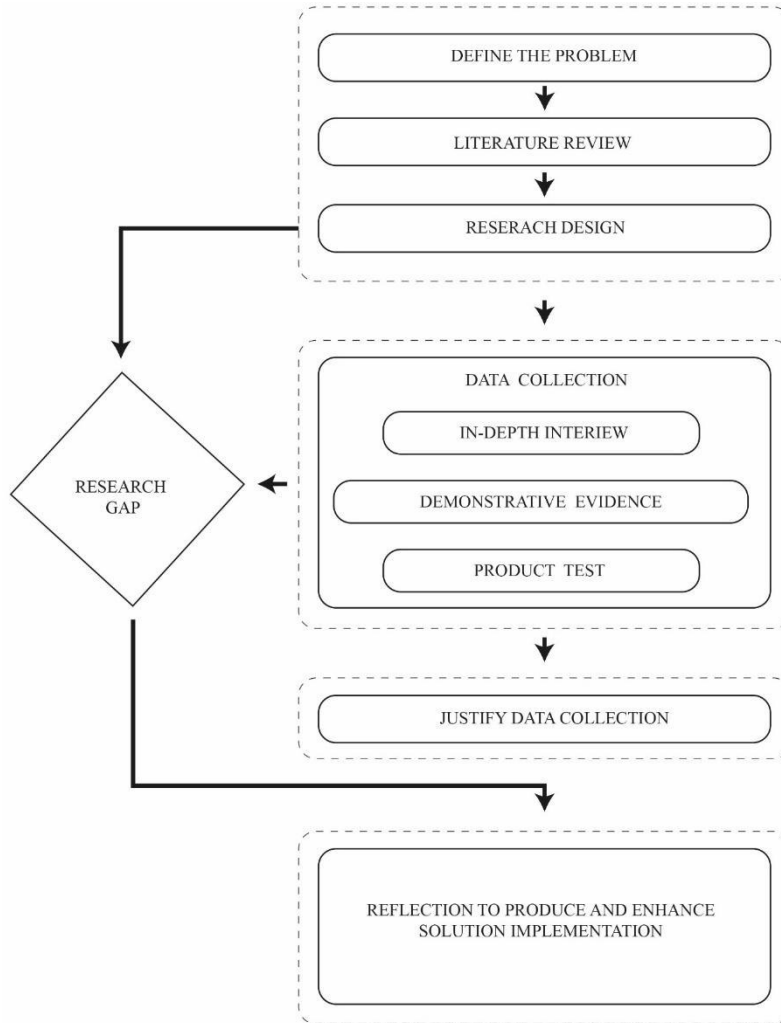


Fig. 2: Research and Design Process Activities of Daily Living (ADL) Innovation towards Sustainable Quality of Life for the Elderly

The sampling decision references the definition of elderly, which is 65 and above, described early, as well as the specific definition in the study by Safian et al. (2021). The age group was divided into three categories: young elderly, mid elderly and late elderly. Since most respondents were of Malay ethnicity, ethnicity was divided into two groups, either Malay or non-Malay.

The effectiveness of demonstrative technological evidence from the legal profession has inspired this design inquiry. It features a demonstrative evidence approach. The demonstrative evidence used in a courtroom display is meant to assist the deliberation of the court and jury (Johnson, 2022), showing how reliable it is as a judgment tool. In the present study, The process will gather data using Virtual lab Animation and 3d Characters. Instead of intrusive product testing, the respondent will be provided with video characters with instructions showing the user conducting daily living activities (ADL), including walking, feeding, dressing, personal hygiene, continuity, and toileting. The animation and 3D characters serve as discussion user feedback (Fig. 3). The respondent will provide their perception

of their ADL without becoming the subject of intrusive observations. Later, design consideration will inform the making of low and high fidelity that will be returned to the respondent for feedback and design improvement.



Fig. 3: Demonstrative Evidence / Virtual Lab: Animation and 3D Character video screenshot for ADL Research on Elderly's Quality of Life.

4.0 Findings

This study proposes a dual-method approach. The method includes social science and contemporary design process as presented in Fig.4. The research design uses demonstrative evidence with the latest technology, using virtual labs with the help of 3D characters and animation to emulate the condition of the elderly in their daily activities. In representing the data about the elderly using a virtual lab, the researcher examines every action related to daily living activities by relating visceral, behavioural, and reflective factors to find the gaps in the form of design consideration. Likewise, with contemporary design, researchers use product tests using high-fidelity and low-fidelity prototypes to unravel the product's suitability for the elderly and examine the product's suitability with daily living activities to combine the two methods to obtain an accurate conclusion. Prototypes as demonstrative evidence can *facilitate learning and material promises of a realisable future* (Dickel, 2022). The following diagram (Fig. 4) conceptualises a framework for the design of the dual-data-gathering approach of the current study.

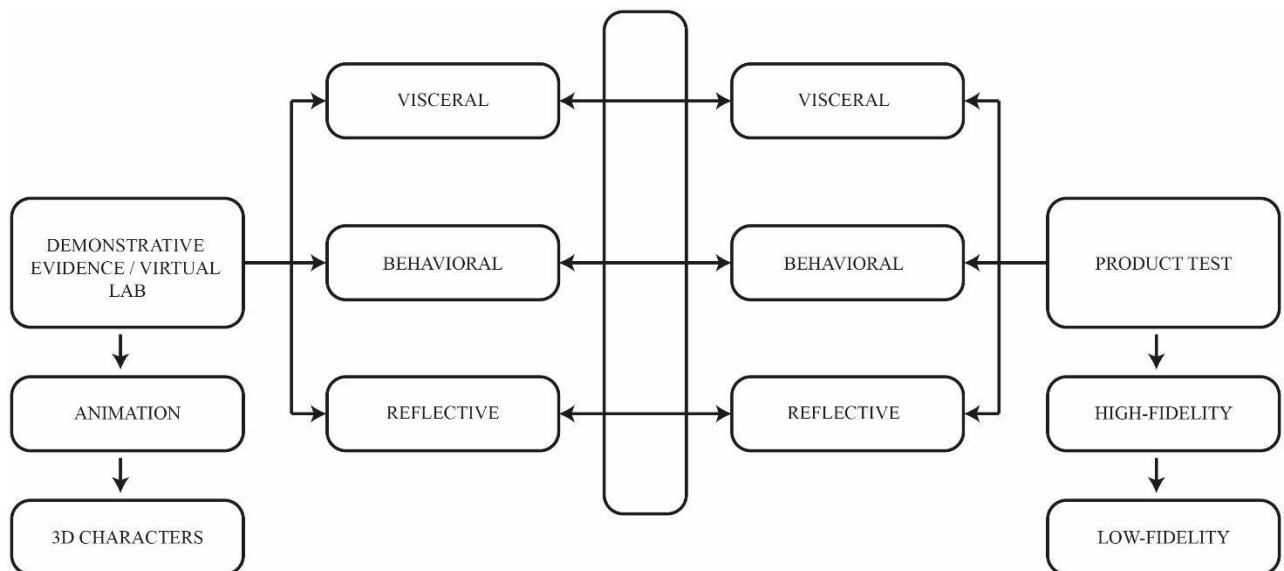


Fig. 4: Conceptual Framework for Design Inquiry into Activities of Daily Living (ADL) Innovation towards Sustainable Quality of Life for the Elderly

5.0 Discussion

This research focuses on the method of designing dressing aids for the elderly, identifying physical problems faced by them in their early stages of aging. The study involved collecting feedback from elderly individuals aged 60-80 years and analysing existing products. The design incorporated comfort, durability, and ease of use, making them suitable for the elderly to perform daily activities independently. The effectiveness and practicality of existing dressing aids were determined, with light, strong materials being preferred for durability and ease of use. Comfort was also emphasised, with complete dressing aids making it easier to dress up. Practicality was also considered, with dressing aids designed to be comfortable and easy to use. The study proposed a potential practical design for activities daily living (ADL) aids, resulting in the development of 5 in 1 dressing aids. The findings show that the 5 in 1 dressing aids are effective

and practical, but weaknesses in the manufacturing process need to be addressed in future batches. Overall, the research aims to improve the quality of life for the elderly in Kuala Langat, Banting, Selangor, Malaysia.

6.0 Conclusion and Recommendation

The study suggests that 5 in 1 dressing aids are a versatile option suitable for the elderly who perform independent dressing activities. These aids include shirts, pants, buttons, socks, and shoes, making it easier for the elderly to do their daily activities independently. However, there are still weaknesses to address, such as the manufacturing process and functionality of the aids. The manufacturing process should be improved, and the features should be tested and developed to improve the product. User surveys should be conducted to gather feedback from seniors using dressing aids in Malaysia. This feedback can identify areas for improvement and refine the aids to better meet the needs of seniors and provide a better experience. Overall, 5 in 1 dressing aids are recommended as a suitable choice for seniors seeking complete and practical dressing aids. From a method application point of view, the findings from this research propose a dual data collection framework in a qualitative design research approach. Further inquiry can be done to provide a more objective conclusion to this framework where the two means of data collection can be quantitatively analysed for its correlational relationship and causal relationship. The extension of the study will provide insights into the strength of the variables independently and as a cluster, providing the needed validation for its application in design practices.

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Paper Contribution to Related Field of Study

The findings from the research contribute to the research design field where an option for a dual-mode data collection method for design inquiry is proposed and tested. The data collection allows researchers to reach a design conclusion by allowing data comparison. At the same time, applying demonstrative evidence or virtual lab in the form on 3D character and animation helps to enhance in-depth interview session where sensitivity of time spent with respondents is of ethical importance. Instead of subjecting respondents to unnecessary stress by testing, respondents can provide feedback on the product concept with minimal intrusive activities.

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