An Empirical Study on Challenges Faced by the Elderly in Care Centres

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Abstract

INTRODUCTION: The fact of our lives is that we will be reaching to elderly life stage sooner or later. Our elderly community has been left far behind of new technology updates. Technology advances just as age is catching up on us. To many who are in their twilight years, using cutting edge technologies may be a hurdle in their activities of daily living (ADLs).

OBJECTIVES: Therefore, this study aims to identify and measure the ADL challenges that the elderly encounter and improve their quality of life (QoL).

METHODS:
This research embarked on semi-structured interviews at 9 geriatric care centres in Malaysia to investigate the ADL challenges by the elderly residents. The thematic analysis approach was employed for data analysis and further discussion.

RESULTS: The research findings suggested that the QoL of the elderly is limited by the challenges of geriatric issues, poor living conditions, and technology acceptance barriers.

CONCLUSION: In conclusion, the current research provides an overview of the ADL challenges faced by the elderly with recommendations of user-centred Internet of Things (IoT) devices for elderly to use in an ambient assisted living (AAL) environment in Society 5.0.

1. Introduction

Population ageing is one of the most significant social change in today's world [1]. In 2018, 65-year-old or older population has outnumbered children for the first time in human history. In Figure 1, there is an obvious increase in the number of senior population. The United Nations reports that 9% of the world population is over age 65 in 2019, and this figure will increase up to 16% by 2050 [2]. In Malaysia, the senior population foreshadowing report indicates the senior population will reach 3.5 million, which accounts for 12% of the national population by 2020 [3].

There are many aged people suffering disabilities and illnesses. Meanwhile, with the trending concept of smart city and home, the increasing ageing population indeed demands the optimization of healthcare services. The

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improvement in Quality of Life (QoL) of them has become one of the critical challenges that affects all units in society [1].
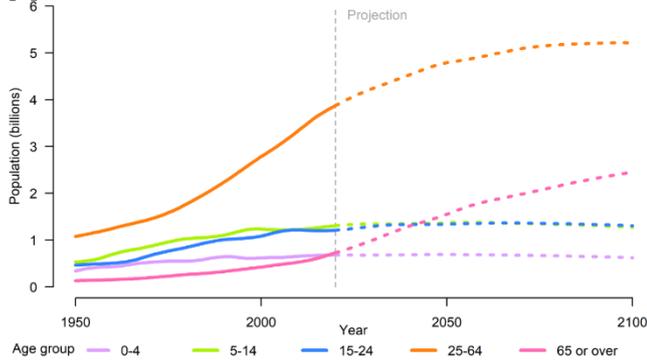

Figure 1. Estimated and projected global population by broad age group, 1950-2100 [2];

The elderly face comparatively more critical challenges of living than routine life. In particular, these issues from every single aspect of their life (i.e. ADL challenges) have negatively impacted their QoL and even threaten their wellbeing in the living environment. For this reason, a certain number of elderly prefer to stay at care centres rather than being unattended and unsupported at home. However, there is very limited number of current research works on the identification of ADL challenges for retired elderly in the care centre.

This research aims to propagandize the elderly late life to the general public. The objective of this paper is to investigate the ADL challenges faced by them at care centres with the consideration of the technology adoption in their digital-connected lifestyle. Due to the ageing issues, many elderly can hardly express themselves, but only with ambiguous responses. Thus, the researchers designed a semi-structured [4] interview for all the stakeholders involved (elderly, caregiver, and centre operator) to explore the challenges. Then the thematic analysis method was used to analyse the transcript data collected from the interview sessions. The research findings provide an overview of the challenges faced by the elderly in their daily life.

Our study contributes to the knowledge update of the current ADL challenges faced by the elderly regarding their digital-connected lifestyle from the angles of elderly, caregiver, and institution management. The research contribution highlights elderly's consideration of having technology involved in their living environment and implies the trend of technology adoption among the elderly in the future of Society 5.0.

In the following parts, Section II reviews the concerns to technology adoption, geriatric problems, and the living challenges of the elderly after their retirement. In section III, the research methodology is presented with an overview of analysis processes. Section IV and V individually discusses the results and key findings. Subsequently, the recommendation is proposed in Section VI and Section VII concludes the entire research paper followed by future study in the Section VIII.

2. Literature Review

Over the past years, many research studied on the wellbeing of the elderly in different situations. Previous studies [5–7] indicate QoL can be determined by ADL challenges, which lower the measurement of QoL [8]. However, only a few studies aimed at the QoL challenges to the elderly involves the adoption of the Internet of Things (IoT) technologies [9, 10]. Moreover, the trending technologies benefit the elderly by increasing their life expectancy and healthy ageing support in their Activity of Daily Living (ADL) of late life. Meanwhile, their demand for a higher level of QoL also inspires the innovation of new technologies for solving practical problems in their living environment [11]. Technological advancement outperforms human capability for QoL [12] enhancement in many Ambient Assisted Living (AAL) scenarios [13]. Unfortunately, AAL technology has its barriers to reach out to the elderly, and real-world adoption might bring about new challenges due to the low usability, accessibility, learning, and high energy consumption during performance [14, 15].

2.1. Health Problems

As explained in Figure 2, the health condition is strongly influenced by mental and physical wellness in ADLs [16, 17]. With the high life expectancy, older adults tend to secure emotional well-being after retirement, and it is considered an important determinant of QoL. Measurement of emotional well-being determines the mental wellness in both positive and negative scales [17]. Unlike positive emotional appearance, the negative ones decrease the happiness of elders as in neuroticism and chronic fatigue, which are acknowledged as the most frequent psychological interference among older adults regarding the wellbeing [18] of them.
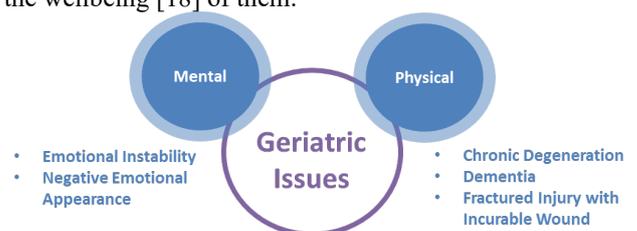

Figure 2. Geriatric issues

It is important to realize that, as the human body aged, physical function gradually degenerates with the age-related issues of muscle [19] and macular degeneration, dementia [20], and other geriatric health diseases (e.g. cardiovascular, osteoarthritis, etc.) [13]. Dementia such as Alzheimer's [20] is considered one of the degenerative challenges faced by the elderly. There will be 132 million [21] elderly people affected by Alzheimer's Dementia by 2050. Dementia significantly lowers the level of QoL [22] for the elderly in terms of labyrinth disease, auditory decay [23, 24], excess frequency and duration of nightly bathroom visit [25], and cognitive and memory impairment

[20] (e.g. identity illegibility). Age-related Macular Degeneration (AMD) is a universal geriatric disease to the elderly, and it affects many ADLs of the elderly, too [23]. As their vision fades, especially at night, the blurry vision would possibly cause unpredictable injuries due to unforeseen obstacles. Fall event [26, 27] due to muscle degeneration is a pervasive factor that results in morbidity and/or mortality [19, 27, 28]. Remarkably, most of the fall events occur indoors rather than other contextual hazards. Fractured injuries and incurable wounds due to fall event can potentially be the fatal cause for the elderly, especially, diabetes patients [28].

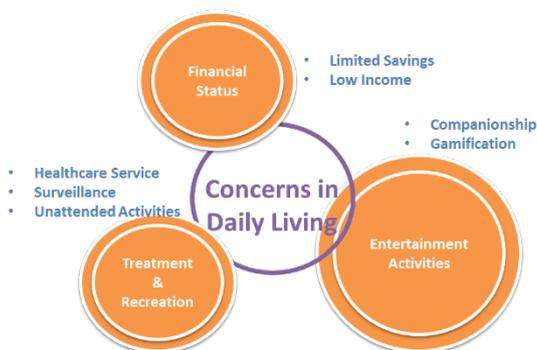## 2.2. Challenges in Living Environment

Figure 3. Elderly's concern in living conditions

The most significant concerns for elderly's daily living, as shown in Figure. 3 are the financial Status in terms of income and savings, Treatment $ Recreation Requirements for the physical wellness, and Entertainment activities for their psychological wellbeing.

2.2.1 Low Income

The elderly are compelled to overcome life challenges in aspects of entertainment and recreation, healthcare services, and personal finance. After retirement, they become economically vulnerable, especially those who are with limited savings [29]. According to Yodmai *et al.* [29], income after retirement is from social security, family members, and personal income. In their research, they found the major sources of income among the elderly were money given by their children, followed by the pay from work. Past studies indicated that the "happy elderly" have a higher level of income [17, 30] than those "unhappy" ones do since higher income and savings reduces psychological pressure to the future concerns [31]. However, the studies on lower-income demonstrated that inadequate income is a significant problem for elders after retirement, and it would cause low self-esteem [17], depression [31], and difficulties in social participation [30]. In other words, low-income has a direct effect on the QoL of elders [17, 29].

2.2.2 Lack of Recreational Entertainment

Psychologically recreational entertainment [32] and flexibility [33, 34] is proven to be positively correlated to the Health-Related QoL [18]. Elderly individuals,

especially the ones with ailments, eager for interpersonal interaction, and in this case, game-orientated activities can reinforce the engagement of ADL activities with other people. Therefore, the concept of Gamification [35] activities enhances the positive emotion [17] in elderly groups for entertainment purposes.

2.2.3 Insufficient Healthcare Supports

Traditional healthcare service supervises vital signals on the elders (e.g. blood pressure, heart rate, body temperature, etc.) in the periodic medical check-up process and reports - any emergency issues when they happen. With the development of Ambient Assisted Living (AAL) technologies (e.g. Health Monitoring Service (HMS) [11, 13] or telemedicine [9, 36–38]), automated remote health monitoring and diagnosis, and emergency alert have benefited the elderly and any disabilities against inconvenience. By using intelligent sensing techniques, telemedicine could retrieve health data as medical references for accurately systematic analysis of older adults' constant wellbeing [39]. Hence, technologies contribute to the elderly's QoL improvement by reducing the cost while increasing the operational efficiency of traditional healthcare services [35].

Nightly activity without surveillance is dangerous for the elders when they suffer from insomnia issues. Lutze and Waldor [25] indicate unrest sleep and excess duration of toilet visits at night time are not only contributing matters to exhaustion of caregivers but also challenges the QoL of the elder [25]. Nightly bathroom visit is lethal to elders due to the likelihood of a fall accident, and 35.7% of the accidents happened in the bathroom due to slippery surface of the bathtub and floor [27]. Moreover, in an emergency system, longer queue waiting time (10 to 60 minutes) would cause severe problems of belated first aid at night [5]. A few studies have indicated emergency alert is a life-saving function, extends to healthcare stakeholders such as relatives [5], neighbours [40], ambulance centre [41] and hospital [5, 6] for timely first aid.
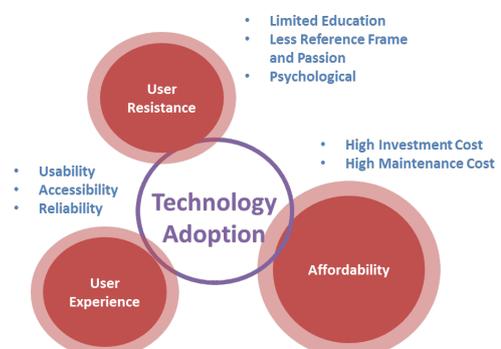
2.3. Technology Adoption

Figure 4. Technology adoption

2.3.1 Unsatisfactory Usability

As shown in Figure 4, the issues from user resistance, experiences and affordability has been thoughtfully studied in past literatures. According to Anderson and Perrin [42], although the elderly have lower rates of technology adoption than other age groups, they become increasingly close to the digital world. Technology acceptance refers to the behavioural intention to adopt a technology [43, 44] with remarkable user experience, which also helps to maintain the QoL and facilitate the elderly's independence in a digital-connected living environment [34]. However, the new technologies adoption has never been easy for the elderly [37] due to different adoption patterns [45] than young generations [46]. To be specific, the technology adoption model (TAM) explains that the most significant challenges come from perceived usefulness and ease of use [47]. The elders lack technical knowledge because of their limited reference frame and passion for learning new knowledge [48]; consequently, they become less sensitive to cutting-edge technology [43]. The resistance is due to inadvertent psychological conditions [12] and system functionality [49]. Technophobe elder users [50] fear high dependence on advanced technologies and separation of real-world with learning interest decreases due to ageing [44].

2.3.2 Unaffordability

Affordability always plays a vital role in the acceptance of technology. Affordability is proven as a negative association with usage intention [44]. Telemedicine solutions, for example, their inhabitation sometimes become infeasible because of high implementation complexity and cost [51]. A mature commercial technology always has low cost in implementation and maintenance services. The capital charge will be increased if the technology is either in long development circle or not successfully commercialized. In consideration of long term use, the high cost of maintenance [52] also results in low acceptance level or even abandonment in the end.

2.3.3 Low User-Experience

User experience emphasizes on Human-Computer Interaction (HCI) to an application of technology [53]. The acceptance of technology can be cultivated at the early stage of the deployment [43]. At most times, a less complicated User Interface design could enhance user experience. Higher user experience always satisfies people in terms of reliability. Concerns on power consumption [44], especially for wireless sensing devices in limited battery capacity, is one of the significant challenges for IoT device adoption [54] especially the wearable ones in terms of reliability and usability. As many research studies have addressed, significant power consumption has a great impact on the willingness of the implementation of AAL devices in a house [55–57]. System framework optimization [8] and improvement on battery capacity [58] can, therefore, solve such issue significantly.

Moreover, the technology solution could also be realized from the user-centric angle regarding the actual needs from users. In a study of IoT-Based Medication Box, researchers have demonstrated a successful prototype design of medication management system powered by drone [59]. Also Jacob, et al. (2020) supports the paralyzed patients with brain energized full body Exoskeleton with IoT edge design [60]. Thus, under the proper handling of challenges of the utilization of sensors, the independent elderly would be benefited by reducing the costs in their healthcare and improvement on life quality [35].

Based on the review of past literature, elderly people are facing issues in geriatric problems and the challenges of living. The psychological and physical wellbeing of the elders has reflexivity significance in Health-Related QoL. Dementia-caused issues such as amnesia can lead to low QoL of the elderly. Memory impairment of the elders results in identity illegibility to people around them. Fall event due to chronic degeneration issues is lethal in belated first aid. In addition, the lower-income level would likely cause emotional instability [17]. The low income elders are incapable of managing investment for new technologies in their ADLs. Notwithstanding of the development of IoT technologies, technology adoption issues (e.g. accessibility, usability, and affordability) have challenged the elderly in their QoL.

3. Research Method

This study adopts qualitative [61] research methodology to identify the ADL challenges faced by the elderly residents in care centres within Malaysia. The semi-structured interview [4, 62] is usually considered as the most reliable method to evaluate answers from respondents. Nonetheless, due to ambiguous answers given by the elderly respondents, the indirect interview method was suggested by previous researchers [20, 22] to acquire answers from the third-party respondents. Therefore, we interviewed not only 24 elderly but also the institution management (i.e. 9 operators and 20 caregivers) from 9 centres in different states of Malaysia. Note-taking and voice-recording were used throughout the interview sessions, and then the audio files were translated to transcripts for further data analysis using thematic [63] method to determine the most significant challenges faced by the elderly in the context of care centre.

During process of the thematic analysis, we analysed responses from interview transcripts and categorized the content into relevant codes based on the theoretical points from the past literature reviewed, and then gauge their perception in meaningful themes as the major findings of our research. We organized our themes into two levels where the first level themes were clustered to a series of second level themes based on codes summarized. Therefore, the first level of themes became more specific and meaningful, directing to the research question.

4. Results

Results are discussed in the emerged themes shown in Table 1. The analysis revealed that Geriatric Problem (T1), Poor Living Condition (T2), and Technology Acceptance Barrier (T3) are identified with their subthemes for further explanation in this section. In order to keep the anonymous status of the respondents, the care centre is indicated by a "C", Operator by an "O", Caregiver by a "G", and elderly by an "E". Followed by a number, the indicator (e.g. C1O1) can thus point to a particular identity of a respondent at the centre.

Table 1. Summary of themes

Theme	Subthemes
Geriatric Problems T1	Dementia
	Emotional Instability
	Chronic Degeneration
Poor Living Conditions T2	Low Income
	Lack of Social Engagement (Entertainment)
	Insufficient Healthcare Support
Technology Acceptance Barriers T3	Unsatisfactory Usability and Accessibility
	Lack of Instructions and Knowledge (Technology Unfamiliarity)
	Unaffordability

4.1. Geriatric Problems (T1)

Respondents from different elderly centres indicated that the geriatric problems in ADL challenged the elderly in their living environment. The findings in the aspects of geriatric challenges can be classified into Dementia, Emotional Instability, and Chronic Degeneration. Importantly, both challenges of Dementia and Emotional Instability issues were reported by the operators and caregivers rather than the elderly themselves.
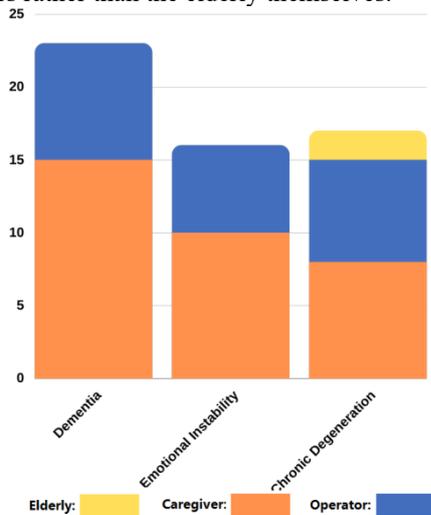

Figure 5. Geriatric problem

4.1.1 Dementia

In our interview session, there were 15 caregivers and 8 centre operators reported they dealt with dementia elderly in their workplace. *"The problem is due to dementia, some elders act like children"* (C1G1). Both C5O1 and C9O1 mentioned about demented elders and the inconvenience brought about by dementia [22]. *"Dementia case can be psychiatric patient"* and *"They don't know the way come back."* (C9O1). Social and environmental variations have a manifest influence on dementia's QoL [21]. Meanwhile, *World Alzheimer's Report 2015* [21] has clearly defined the levels of deterioration in cognition vary in dementia progression. C5O1 added *"Due to the dementia issue, some time they cannot remember and tend to be very suspicious"* meaning that memory decay caused by dementia inevitably affects mental wellness and lowers QoL of the elderly. C5O1 still observed the identity recognition issue due to dementia. He indicated that *"If they don't know how to respect you, they won't be listening to you when you conduct activities"*, and added, *"So, I always tell myself you have to tell the others you are the nurses that 'I am here to help you (the elderly)'"* to clarify their authorized identity to the elders at the centre. He added, *"We send them for training which is about how to taking care of elders"*. Once a confirmed dementia case is diagnosed at an early stage, its symptom appears to be increasing as the disease progresses [21]. In this case, family involvement and building a dementia-friendly environment is highly suggested [20].

4.1.2 Emotional Instability

Notably, 10 caregivers and 6 operators declared the emotional instability is one of the significant challenges in their workplace. *"Elderly person has his own personality"* (C3O1), but *"the elderly's bad temper makes them look like kids"* (C3G1) and *"90% of them act in a childish way"* (C1G1). Aggressive arguing and bullying behaviours to institution staff are also observed. According to Lee [17], anger is recognized as one of the negative emotional appearances, which significantly differentiates happy elders from unhappy ones. *"Sometimes when the eldest start (to be) aggressive and irritated, they usually tend to bully dentist staff ... they have that kind of (bullying) mind-set"* (C9O1). Other studies have indicated that neuroticism is a critical personality trait that significantly affects emotional well-being [17, 18]. C5O1 continued, *"Bigger challenge is when the elders (start to) quarrel... They are fighting for one chair."* These statements are evidence that anger-management is not easy for neurotic elders due to emotional instability [32]. In order to handle such emotional issues, *"we need to separate and coax them and take advantage of their temper at the moment"* (C3O1).

4.1.3 Chronic Degeneration

Another challenge faced by elder residents is the Chronic Degeneration issues. This particular issue was observed and recorded by 2 elderly, 8 caregivers, and 7 operators in the elderly centre during the interview session. AMD significantly lowers QoL by impacting mobility,

It has been suggested by the respondents that cutting-edge technologies brings great advantages in elderly care. It was put forth by C4O1 that *"Technology (IoT) in elder care industry is very important"*. The interview respondents also pointed out that there is resistance from the elderly while implementing technology in their centres.
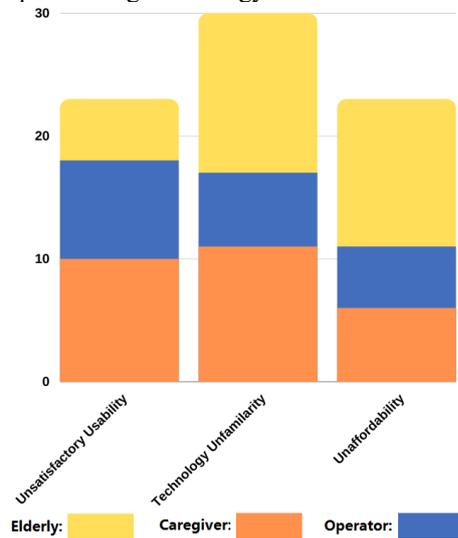

Figure 7. Technology acceptance barrier

The managers of C5O1, C6O1, and C9O1 in the interview agreed that technology implementation assists them to overcome difficulties for the enhancement of the QoL among the elderly community. The elderly respondents agreed that the TV (C2E2, C2E3) and smartphone (C2E1; C2E4; C3E1; C3E2) are the most tangible technology in their living. Based on the statistics, there were 59% of 65 to 69-year-olds own smartphones in 2017 [42]. Entertainment equipment is needed by C5O1 for optimizing activity engagement of centre elders. According to C9O1, physiotherapy machines improve "healing effect" and lifting one can be used to *"carry a heavy patient"*. However, *"we are still doing manual system"* reported by C6O1 and *"So, here we do a manual system on the stock records"* (C7O1) indicated that there are some difficulties in technology adoption in the real user case.

4.3.1 Unsatisfactory Usability

A great user experience always satisfies the users in their particular needs. However, the elderly are slower than young generation in learning new technology [34]. According to the result from the interview, there were 10 caregivers, 8 managers, and 5 elderly residents addressed their concerns on the unsatisfactory usability of the emerging technologies in the context of elderly centre. *"When we started we actually used ice cream bell. That was worst ... because in the morning when one ring, everybody wakes up. And then ring together. So, we change it to a wireless device"* (C4O1). The manager also appreciated the implementation of one of his current IoT implementation at centre. *"So, this helps a lot, because these were sent a signal to nursing station. Then our nurse manager will then distribute the task to the caregiver on*

the ground."(C4O1). The user experience should be able to satisfy the users' particular needs when using certain technologies. However, the elderly may take more time in learning a new technology [34].

The existing technology infrastructure was not properly used in many centres in the current investigation. As C5O1 mentioned *"Even the CCTV is there I seldom to use it unless I want to find, to trace back something"*, he continued, *"We have CCTV, (but) no access"*. Also, respondent C7O1 added that, *"We do not use any except CCTV"*. Accessibility is considered important in technology adoption [15]. Speaking to one of the elderly regarding technology equipment, he expressed that he has the fundamental technologies for home-use purposes, such as *"the thermometer, temperature checking, and sugar level checking"*. C9O1 insisted that they currently used machines are automated, *"But still need a human to look up"*.

Usability is about the interaction between human beings and machines [36]. When C5O1 was asked about the usability of technology in HCI, *"It (Inter-person communication) is a human-to-human understanding"*, he answered, *"IT is smart, but I think IT got the chips; human got the heart"*. He had a negative perception of intelligence development in emotional care. *"Machine still machines. I don't see (HCI) in the very near future technology can provide love and care to the elderly"* as firmly indicated by C9O1.

However, people may have a different perspective on successfulness of technology adoption. "*As a company, we always look forward to you know ... invest in new technologies.*" (C4O1). C4O1 continued *"We have already got a platform, the apps and everything. So, now we are actually incorporating a lot of hardware which is the IoT devices into the system (*Smart Assistant System*)"*. The system's usability can also be extended to its inter-operability outside of the system [66, 67]. According to C4O1, he has the resolution to promote his idea and implement such a cooperative healthcare system among care centres in Malaysia. C4O1 believes that, *"SAS model means other nursing homes who want to use our system they can"*, and he continued, "*I have plans to make it nationwide. Yes, A solution for actually all the nursing homes*".

4.3.2 Technology Unfamiliarity

Technology advances precipitously and cutting-edge technology may be unfamiliar and arduous to learn how to use them for many elderly. There were 11 caregivers, 6 managers, and 13 elderly residents reported the fact that they are not familiar with the new technologies. Respondent C4O1 mentioned that "*Elderly here they are from a generation not too tech-savvy*" (C4O1). According to C5O1, *"They (the elderly) do not know how (to use technology), and they do not even know how to use the TV"*. One of the significant reasons that contribute to the elderly's unfamiliarity to technology such as not knowing how to use the digital TV is *"it takes time to know a new knowledge"* (C8O1). The centre elders are proven to be not

sensitive to technologies and their usage. This may be because the seniors generally have a lesser frame of reference to enable them to absorb new knowledge [48]. Additionally, only *"a few of them know how to use the hand-phone"* as mentioned by C5O1. Also, *"They do not even know how to look the phone book"* in their mobile phone which may cause some future inconvenience. The administration of both centres admitted that overall, the elders at their centres are *"not really good in technology"*. However, C8O1 also pointed out that, *"Caretakers must love to upgrade (themselves with regard to technology)"*. It is crucial that "*The staff should know the technology so that (they) can support the elderly*" (C8O1).

4.3.3 Unaffordability

The unaffordability observed can be explained from two angles: high purchasing price and lower-income level. The unaffordability of the new technology application was concerned by both care institutions (6 caregivers and 5 managers) and elderly residents (n = 12). C8O1 was asked about his willingness of IT technology implementation, he answered: "*No, because of the high cost so I prefer manual*". C5O1 indicated, "*We have (television), we do not have Astro (local cable TV)*". Nevertheless, C3O1 also indicated that, *"If we are in good economic condition and technology is affordable, we would like to invest"*. It was also highlighted that, *"Technology is not cheap,"* (C9O1), *"the centre cannot afford the technology"*. A similar response was echoed that, *"It costs too much"* (C1O1). Hence, it is important to consider that the affordability of technology is essential to its adoption [48]. People would like to invest in technologies to improve their living conditions; however, the costs to obtain and maintain its usage may not be for everyone as shared by C1E1, C1E2, and C3E2 "*I do not have money*". The price of technology implementation may not be affordable for a charitable organization. C9O1 provided the insight that, "*There is an IT solution company, but they are selling to Europe and Australia*". Locally commercialized technology products can reduce procurement and maintenance cost since the low affordability are negatively associated with usage intention for elderly users [44].

5. Key Findings

In order for the improvement on elderly-centred IoT adoption in Society 5.0, our findings provide extensive information to researchers based on the challenges faced by the elderly. Geriatric issues including dementia, emotional instability, and chronic degeneration issue threaten the wellbeing of elders, and they are facing medical challenges brought by these issues. Care centres use different kinds of technologies to overcome the issues from the healthcare concerns. Moreover, many elderly at centres are limited by the low-income problems and existing constraints in healthcare services and social engagement may be some of the significant concerns that need to be appropriately addressed and resolved at geriatric care centres.

Technology could improve the QoL of the elderly in the care centres. Unfortunately, the elderly residents have resistance to technology adoption because of technology unfamiliarity, unsatisfactory usability, and unaffordability caused by high procurement and maintenance cost.

This study is of high relevance in addressing ADL challenges faced by the elderly, and supports technology implementation (e.g. telemedicine) by considering the most challenging difficulties faced by the elders. Geriatric issues inevitably trouble the elderly in their late life. These issues can be further explained in mental (i.e. Emotional Instability) and physical (Chronic Degeneration & Dementia) ways where technologies can assist. Another concern that was addressed is that the centre elders need love and care through social engagement, and this is the reason why the elderly, especially those with health issues, are longing for interpersonal communication and companionship.

The poor living condition in the elderly centres was also noticed in this research. The most significant issue in the healthcare management limitations resulted from the high employee turnover rate in Malaysia. These issues potentially harm the caregiving condition of the elderly. Another cause to the poor living condition may be cause by low-income rate. According to Lee [17], the lower-income elderly are less happy than the ones in higher income level. Entertainment activities can enhance the elder's QoL in the living environment; however, some entertainment may come with a cost. So far, their entertainment experience is still constrained with manual-based activities. With the help of technologies, gamification activities [35] can be realized to improve interpersonal communication among the elderly group in the care centres for psychological recreation purposes.

With the implementation of technologies, game-orientated activities can reinforce the engagement of ADL with other people. It is suggested that an affordable and easy-to-use technology solution can assist elders to improve their QoL and maintain the physical and psychological wellbeing in their late life. With the development of IoT technologies, there is no doubt that the AAL solutions would improve the elders' QoL in their living environment. In this research, one of the findings indicates that technology resistance exists among elderly respondents due to their limited income and savings.

Another substantial finding explains the importance of technology adoption and its barrier in the real implementation. The unaffordable procurement and maintenance cost with the low income elderly people and insufficient budget has limited the technology adoption in care centres. Elderly residents are not technology-adherent, but they are eager to touch technologies. Nevertheless, they are still concerned about technology usability whether the invested technology has satisfactory user experience for day-to-day uses.

6. Recommendation

The recommendations are made based on the findings in this research to propose solutions for the elderly centre to support the ambient living for the elderly residents. First and foremost, regarding the geriatric problem, the most urgent demand for the elderly is the telemedicine technology and innovation to support the elderly in their daily-basis treatment, medication, and recreation.

From our findings, we have identified the low income after retirement which further leads to their unaffordability of technologies to improve their QoL in both independent and institutional living contexts. In this case, new technology solutions should thoughtfully consider the affordability of target population whilst designing and development a solution. Similarly, to the elderly users, the usefulness and ease-of-use must be considered in terms of the improvement of HCI usability and user experience.

Besides, the high employee (caregiver) turnover rate has been observed in many elderly centres. This problem challenges not only the centre management but also the wellbeing and QoL of elderly residents. In this case, the design and development of automated healthcare innovations is recommended for the sake of elderly individuals especially during the pandemic time.

7. Conclusion

This study investigates the challenges faced by the elderly in care centres within Malaysia. From the takeaways of the empirical results, in summary, we noticed that the geriatric issues, limited living conditions, and technology adoption barriers significantly challenge the QoL of the elders in their living environment. Regarding the technology adoption in the elderly care institutions, the ADL challenges may change over time, so the current study updated the knowledge of the challenges faced by them in care centres with the consideration of a technology-connected lifestyle. In today's world, technology has become a part of our life and affected those in the late years of their lives. The elderly from care centres need a support system in their ADLs from today's technology development. Our explanation on the in-depth reasons for such social problem provides more support to improve the telemedicine and other advanced technologies adopted in the elderly community to assist them in their living environment. This paper has few limitations. First of all, the researchers only focused on the elderly residents from the care centres in Malaysia. Moreover, this paper focuses to identify the challenges faced by elderly's rather than care institutions.

8. Future Work

In the future, researchers can conduct field studies depending on different demographic and geographic segments. Based on the recommendations given in this research, the researchers will design an easy-to-use medicine management system to regulate the medication

service for the elderly centres. Because of the limited income and savings, financial constraints may be a crucial barrier to technology adoption. Therefore, affordability becomes a practical consideration in the development of the IoT technology in the context of care centres.

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