

MODELLING GERONTECHNOLOGY ADOPTION WITHIN THE FRAMEWORK OF SOCIETY 5.0 IN MALAYSIA

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ABSTRACT

Gerontechnology is a new interdisciplinary academic and professional field combining gerontology and technology. Gerontology means the study of aging, and technology is the use of science to fulfil needs. Therefore, gerontechnology involves research and development techniques, technological products, services, and environments based on knowledge of aging processes. There are a lot of gerontechnology studies done, but the very little research focuses on exploring the influencing attributes that affect the users' acceptance of gerontechnology. Thus, the objective of this conceptual paper is to propose a new model of the behavioural intention of gerontechnology adoption. This paper is then developed into research hypotheses for further studies. This research is expected to contribute significantly to the development of a new integrative adoption of the gerontechnology model in Malaysia en route to sustainable development. The significance of this research will also contribute to gerontechnology stakeholders, including the elderly, care professionals, managers within home care or social work organizations, technology designers and suppliers, and the government as the policymaker.

Keywords: Aging population, elderly, gerontechnology, Society 5.0, technology adoption

INTRODUCTION

Malaysia is experiencing a rapid increase in the elderly population. The Department of Statistics Malaysia projected that in 2035, Malaysia will be an "aged nation" when the population of people aged 60 years old and above exceeds 15 percent of the country's total population. From the top 50 lists worldwide, Malaysia ranked 45th among countries with the largest percentage of older adults (Abdul Kadir et al., 2022). As the elderly population rate in Malaysia continues to increase every year, along with decreasing ability, there are numerous problems faced by the elderly (Aung et al., 2017). When people get older, they are exposed to the risk of events leading to sickness and disability or even death (Colnar et al., 2020). For instance, when they reach the elderly age, activities such as cooking and washing, which were once part of the manageable daily routine, have become too difficult to perform. Besides, many older people decide or prefer to live in their own homes separately. Therefore, gerontechnology has the potential to support older people in living longer, healthier lives, independently and becoming active in social activities.

Gerontechnology, defined by the Society for Gerontechnology (ISG) is the designing of technology and environments for independent living and social participation of the elderly in good health, comfort, and safety (ISG, 2021). It is an interdisciplinary field of scientific research that uses technology for the aspirations and opportunities of the elderly. The global aging population and the rapid developments in technology have encouraged the growth of technology, in which technology enables the elderly to be more independent, healthy, and safe in their later life (Zhou et al., 2018). These population trends need different ways to solve problems in healthcare, housing, transportation, education, jobs and product design. To provide solutions, technology-enabled devices and systems have been developed and introduced to the market. However, although their potential usefulness is well recognized, the adoption rates are still considerably low (Mitzner et al., 2019).

Industrial players have observed that the implementation of gerontechnology is still nascent in Malaysia. However, as the aging population is increasing, the demand for such technological solutions will increase. According to Data Bridge Market Research (2020), Malaysia's elderly care market is expected to gain market growth in the forecast period of 2020 to 2027. Based on this research, the market is growing with a compound annual growth rate (CAGR) of 5.5 percent in the forecast period of 2020 to 2027 and is expected to reach USD 3,830.59 million by 2027. Based on product type, Malaysia's elderly care market is classified into housing and assistive devices based on technology and pharmaceuticals. The housing and assistive device segments are dominating the elderly care market due to the ever-growing demand for assistive devices in the home care of elderly patients and also due to the increasing of the elderly population, especially those who are not capable of self-assistance. Based on the World Bank report titled "A Silver Lining: Productive and Inclusive Aging for Malaysia", the nation's aging population has created a significant opportunity for investment in multiple sectors. Like other Asian countries, Malaysia is experiencing a significant demographic

shift. Business sectors with high growth potential in an aging population include medical tourism, elderly care, education, transportation, healthcare devices and services, housing, and smart technology.

Studies in many developed nations show that the use of gerontechnology by older people has the potential to significantly reduce aging-related problems. For example, the decline in physical and cognitive functions due to aging and sickness can be partly compensated for by assistive and health technologies. Therefore, older people can stay longer in their own homes (Verloo et al., 2020). The potential usefulness of technology to provide assistance and enrichment to older people is significant, but the elderly is not as enthusiastic about adopting new technologies as young people and are less likely to use technology for many reasons. Because of the lack of evaluation of the needs of older adults, the industry is not yet aware of the potential benefits they can reap from the large demographic community with purchasing power. To better understand and predict the technology usage behaviour of older people, it is important to identify the factors that influence their adoption of technology.

While demand for gerontechnology and assistive technology has great potential to be useful to the aging population, successful adoption of technology is dependent on the technological behaviour acceptance of the elderly. To better understand and predict the technology usage behaviour of the elderly, it is important to identify the factors that influence their technology adoption. This is equivalent to the Industrial Revolution 4.0 (IR4.0) policy embraced by Malaysia. This conceptual paper intends to address the nexus of technology anxiety (TA) and technology knowledge (TK) to the technology adoption of gerontechnology in the framework of Society 5.0 and how it shapes the individual consumption of gerontechnology. According to Grunwitz (2019), social acceptance is the pre-requisite of Society 5.0, thus this paper tries to explore the gerontechnology in the light of Society 5.0.

LITERATURE REVIEW

Aging Population

The world is experiencing an aging phenomenon. More older adults are growing older, reaching 60 years old and above. It is forecasted that by 2030, 1 in 6 people in the world will be aged 60 years or over (World Health Organization, 2021). During this period, the population with age 60 years and older will increase from 1 billion in 2020 to 1.4 billion. Over the next three decades, the number of older adults is expected to double, reaching over 2.1 billion in 2050. Globally, the share of the population aged 60 years and older is expected to increase by up to 16 percent in 2050 (United Nations, 2020).

Malaysia is not excluded from this phenomenon. The World Bank forecasted that Malaysia's aging process will occur at a much faster pace than in some European countries and Australia, but at a similar speed to that in other countries in East Asia and the Pacific, such as China, Japan, Singapore, and Thailand. According to the Department of Statistics Malaysia is well on its way to becoming an aging society by 2030 when it is projected that 15 percent of its population will be 60 years old and above.

Recent studies report that the majority of older adults or elderly wish to live in their own homes, for as long as possible. The new American Association of Retired Persons (AARP) data shows that 77 percent of older adults aged 50 and older want to stay in their homes for the long term. This has shown consistent results for more than a decade. Most older adults prefer to age in place, and supporting older adults to remain in their own homes and communities is also favoured by policymakers. This aging phenomenon is placing increasing pressure on families, governments, institutions, and organizations. Increasingly, urban and international migration have resulted in more people leaving rural areas for better job opportunities in more developed countries and cities. This leaves a large number of older adults living independently in rural areas. Besides, family structures are changing and shifting from the traditional extended family structure to a situation where older adults have to live alone. Many older adults are in danger of suffering as a consequence of age-related incapacity as a result of this drastic change in social structure. This creates a growing interest in gerontechnology.

Gerontechnology and Society 5.0

Gerontechnology combines gerontology and technology and involves the research and development of techniques, technological products, services, and environments based on knowledge of the aging processes. Gerontechnology is a technology domain that links existing and developing technologies to the aspirations and needs of elderly adults, to increase their quality of life for older adults (Joseph et al., 2018). Gerontechnology enables the sustainability of an aging society using technology that helps older adults enjoy a better quality of life.

Studies in many developed countries indicate that the use of gerontechnology has the potential to significantly reduce aging-related problems. For instance, emergency help systems, vital sign monitoring, and fall detection systems are sometimes referred to as "Smart Home Technology". Additionally, there is e-Health, which is made up of many different technologies, including online tools to support elderly adults' self-management of chronic conditions (Peek et al., 2016).

The term "Society 5.0" was coined by the Japanese government, which is also defined as a "super-smart society". This concept encompasses the Industrial Revolution 4.0 (IR4.0) and promotes the Sustainable Development Goal (SDG) by the United Nations. Being defined as a super-smart society, Society 5.0 aims to solve problems via the use of technology. It is a means to resolve multiple social challenges on a day-to-day basis for every layer of society. Society will uphold the new values and services so that they can live comfortably in a sustainable way. The combination of artificial intelligence (AI), the Internet of Things (IoT), and big data enables Society 5.0 to become a reality.

Society 5.0 is an extension of the existing society. Starting from Society 1.0, where people and humans are gatherers in society. Back then, people were only hunting for food, living a life of survival and lacking basic necessities. However, as the world evolves, a new society emerges. Society 2.0 started in 13000 B.C, as the Agrarian Society. It is where human society depends on agriculture for their livelihood. Society 3.0 is the Industrial Society, where the world witnesses the human population rely heavily on industry. This phase is where the first industrial revolution in the light industry and the second revolution in the heavy and chemical industries happened. Society 4.0 is the information society, where the human population relies on digital-based life and is information-loaded. The third industrial revolution of computers and the Internet happened during this phase. Society 5.0, on the other hand, is the creative society, embracing IR4.0 where the digitalized world has already become a crucial part of human life. The existence of gerontechnology, big data, technology advancements, and innovations helps make the lives of elderly adults easier in a sustainable way.

Gerontechnology is one of the roadmaps of Society 5.0. Japan has promoted this agenda and will lead the rest of the world in achieving it. We expect gerontechnology adoption will successfully make its way into Society 5.0. Thus, the importance of adoption is urgent and needed.

Technology Anxiety (TA) and Technology Knowledge (TK)

In earlier studies, technology anxiety (TA) was often associated with computer anxiety. Although the use of computers is proven to help simplify work, some people are not comfortable using this technology. TA however, is different from computer anxiety. TA focuses on a user's state of mind about general technological tools whereas computer anxiety is related to personal computer usage (Meuter et al., 2003). Many studies have confirmed the negative relationship between technology anxiety and perceived ease of use. Giacomo et al. (2019) found that technology anxiety, or also known as technophobia, is a possible new risk factor for elderly adults as it can affect their daily lives through low adherence to digital living. People who feel intimidated by these objects are more likely to experience technology anxiety, and frequently, the non-tech savvy from the older generation face a risk of lowered quality of life and chances of inclusion. Numerous studies indicate that technology anxiety negatively affects elderly adults' perceived ease of use of certain gerontechnology (Tsai et al., 2020).

Technology knowledge (TK) can be defined as the knowledge of certain ways of thinking about and working with technology, tools, and resources. Working with technology can apply to all technological tools and resources. This includes understanding technology broadly enough to apply it productively at work and in daily life (Koehler & Mishra, 2009). TK also includes the ability required to operate particulate technologies. Past research has studied the relationship between TK and TA and has shown that TA can lead to TK due to uncertainty and unexpected errors in technology (Tsai et al., 2020). Elderly adults often lack of knowledge or are unaware of many existing technologies. (Vaportzis et al., 2017) conducted focus groups to explore the attitudes of elderly adults towards technology in general. This is to understand the elderly adults' perceptions of technology, allow them to gain knowledge and formulate an informed opinion on the benefits of using technology. Therefore, the TA and TK will be embedded as part of the independent variables in the new gerontechnology adoption model.

Conceptual Framework

Demographic variables such as gender, age, education level, and income are among the most discussed variables in technology adoption. According to the Department of Statistics Malaysia, in the second quarter of 2021, the number of people aged 65 years and above has increased from 2.29 million to 2.40 million. This trend is in line with other developed countries which are heading towards an aging population (Department of Statistics Malaysia, 2021).

In the use of technology, these demographic factors affect and influence the adoption behaviour and adoption rate. Many studies have been done on gerontechnology adoption in Malaysia. A study by Teh et al. (2017) used the Technology Acceptance Model (TAM) and the Gerontechnology Usage and Acceptance Model (GUAM). However, the studies are limited to certain ethnic groups in Malaysia, the application is limited to certain technology, and UTAUT is not applied in the research.

This paper proposes to make use of UTAUT as it is unanimously agreed by researchers that it synchronized the theories in technology adoption. UTAUT is the combination of several theories in technology acceptance and adoption, such as TRA, TPB, TAM, IDT, and social cognitive theory (SCT). In studying the adoption of gerontechnology using UTAUT, every variable needs to be studied thoroughly to look at the compatibility of the theory with innovation and technology. Performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) are the main variables in the original UTAUT model. The conceptual framework can be seen in the diagram below:

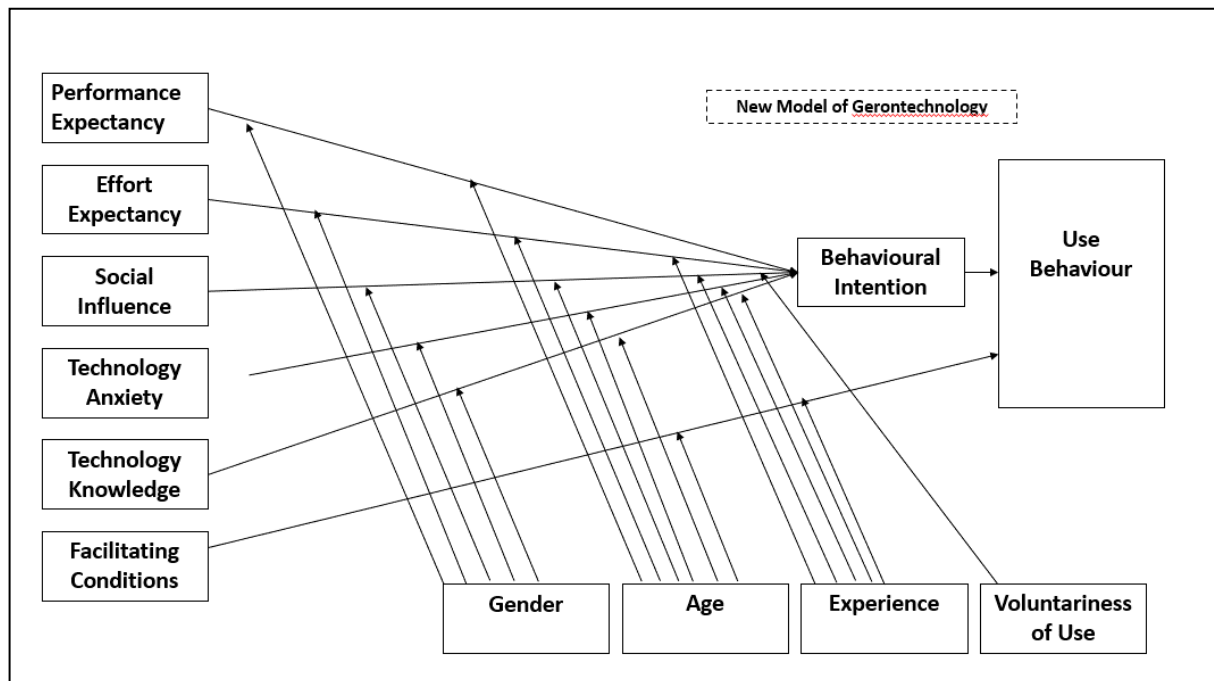


Figure 1: Conceptual Framework

From the proposed framework, the following hypotheses were developed:

- H1 - Performance expectancy provides a significant effect on the behavioural intention to adopt gerontechnology.
- H2 - Effort expectancy provides a significant effect on the behavioural intention to adopt gerontechnology.
- H3 - Social influence provides a significant effect on the behavioural intention to adopt gerontechnology.
- H4 - Facilitating conditions provides a significant effect on the behavioural intention to adopt gerontechnology.
- H5 - Technology anxiety has a significant effect on the behavioural intention to adopt gerontechnology.
- H6 - Technology knowledge has a significant effect on the behavioural intention to adopt gerontechnology.
- H7 - Behavioral intention of gerontechnology adoption has a positive relationship with gerontechnology adoption.
- H8 - Gender moderates the relationship between performance expectancy and behavioural intention of gerontechnology.
- H9 - Gender moderates the relationship between effort expectancy and behavioural intention of gerontechnology.
- H10 - Gender moderates the relationship between social influence and behavioural intention of gerontechnology.
- H11 - Gender moderates the relationship between technology anxiety and the adoption of gerontechnology.
- H12 - Gender moderates the relationship between technology knowledge and adoption of gerontechnology.
- H13 - Income moderates the relationship between performance expectancy and behavioural intention of gerontechnology.
- H14 - Income moderates the relationship between effort expectancy and behavioural intention of gerontechnology.
- H15 - Income moderates the relationship between social influence and behavioural intention of gerontechnology.
- H16 - Income moderates the relationship between technology anxiety and behavioural intention of gerontechnology.
- H17 - Income moderates the relationship between technology knowledge and behavioural intention of gerontechnology.

H18 - Education background moderate the relationship between performance expectancy and behavioural intention of gerontechnology.

H19 - Education background moderate the relationship between effort expectancy and behavioural intention of gerontechnology.

H20 - Education background moderate the relationship between social influence and behavioural intention of gerontechnology.

H21 - Education background moderate the relationship between technology anxiety and behavioural intention of gerontechnology.

H22 - Education background moderate the relationship between technology knowledge and behavioural intention of gerontechnology.

CONCLUSION AND FUTURE RESEARCH

Previous researchers have highlighted the importance of technology adoption factors among elderly adults. This paper attempts to provide insights into its facets, thus providing useful input on the adoption of gerontechnology. It is predicted that many of these factors will be significant.

The significance of this research contributes to some gerontechnology stakeholders, including elderly adults, care professionals, managers within home care or social work organizations, technology designers and suppliers, and policymakers. This study aims to investigate the technology adoption among consumers (elderly) in gerontechnology. Thus, this study enables those especially technopreneur to start business and to know the demand pattern of the consumer in gerontechnology.

Furthermore, businesses can also can infer consumer behaviour gerontechnology. Thus, it will encourage and motivate the business start-up to come out with the latest innovation in gerontechnology. Additionally, this study will motivate the current gerontechnology businesses to gain wider potential consumers in adopting gerontechnology. Businesses are also able to get an overview of how elderly adults respond and react to technological changes in gerontechnology. Therefore, businesses can always frame their strategies to capture market share in gerontechnology.

Businesses also can improve their services to be more age-friendly. Lastly, this study also contributes to the existing knowledge of gerontechnology. This is because Malaysia is well on its way to becoming an aging society by 2030 when it is projected that 15 per cent of its population will be 60 years old and above. This indirectly extends the theoretical framework of technology adoption to gerontechnology. This means it confirms the technology adoption theory for the gerontechnology setting in Malaysia.

Furthermore, this study will be filling up the knowledge gap in gerontechnology, technology adoption, technology anxiety and technology knowledge. This study also may stimulate the cooperation of the academic line and industry to gear up the innovation with the gerontechnology inventions through the improvement of the adoption rate and service policy of gerontechnology.

CONFLICT OF INTEREST

The authors declare there was no conflict on interest involved in this study.

ACKNOWLEDEMENT

The authors would like to thanks Universiti Teknikal Malaysia Melaka (UTeM) and Ministry of Higher Education under the Fundamental Research Grant Scheme (FRGS) number: FRGS/1/FPTT/F00487 for funding this project.

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