

Reinvigorating older populations in the post COVID-19 pandemic era through digital inclusion strategies: A case study of Malaysia



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1. Executive Summary

This study highlights the significance of the elderly population as a knowledge-driven society through digital inclusion. Digital inclusion among the elderly in Malaysia was analysed using the Integrated Dragon Fly Model with Sociological and Behavioural Theory Models (SBTM). This model captured their digital use, benefits, strategies, and challenges from social, economic and governance perspectives. This study employed a mixed method approach using qualitative interviews, focus group discussions, and survey questionnaires with the elderly community in Malaysia, policymakers, non-governmental organisations (NGOs) and caregivers in the ageing community. Our research has shown that digital participation among the elderly community was mainly for social purposes.

Moreover, key factors influencing digital inclusion were personal preferences, digital challenges, coaching and learning. We propose the Digital Inclusion Partnership Model for public-private partnership engagement. This knowledge informs us that understanding human needs based on age, lifestyle, and social networks is imperative for the future development of technologies and digital policies and frameworks in the future. This study represents Malaysia's urban and sub-urban elderly communities using digital tools such as smartphones and computers for communication, daily tasks, and business and leisure activities.

2. Introduction

This study was conducted under the International Telecommunications Union (ITU) Connect2Recover initiative to assist countries in strengthening digital infrastructure and ecosystem post-COVID and to remain resilient during challenging times. As part of Connect2Recover, a research competition was organised to promote research to accelerate global digital inclusion during COVID-19 recovery. This study was one of the winning projects selected as part of the research competition, focused on a study of digital use among the elderly community in Malaysia. This study supports the research focus on digital resiliency and digital inclusion to improve the community with broadband. The elderly community in Malaysia provides an interesting perspective on how digital inclusion can be expanded to a wide range of digital communities in the country and as part of the world's ageing population. Malaysia was chosen as a case study because it can provide exciting insights into how digital inclusion initiatives were carried out in developing countries and non-Western contexts. Furthermore, Malaysia has achieved 77% of its urbanisation rate and is expected to become an ageing nation by 2030 (Ahmad, 2022; Department of Statistics Malaysia, 2019).

This section provides an overview of the elderly population and the digital era, the research scope, and this study's main objectives.

2.1 Research prompt: Burden to knowledge force and knowledge-driven elderly population

2.1.1 Dignity of living imperatives

Studies on older people have been on the rise in recent years. Every person, young and old, is considered highly important in all civilisations, irrespective of timeline, geography, colour and creed. As such, issues arise when individuals, groups of people, cohorts or peers cease to be active players or become less relevant in society. The more help or assistance they need, the more they are considered burdened by society. In the current era of globalisation and technological advancements, digital inclusion warrants greater attention as an integral aspect of holistic development. Holistic development refers to social, emotional, physical, mental and intellectual growth. Increasing life span raises many questions regarding the relevance and dignity of life. Internet discourse on the quality of life of the elderly population has become increasingly complex and compelling in redefining the meaning of social life (Hunsaker and Hargittai, 2018). This situation calls for the attention of policymakers, development practitioners and caregivers, and institutional players.

2.1.2 Burden to knowledge-force population considerations

In the traditional context, the elderly population are considered a ‘burden’ at the macro level—demographically, socially and economically—once the growth rate of the working-age population becomes slower than the growth rate of the total population. The share of the working-age population starts to decline, and the demographic dividend will become a demographic burden (Nicole and Joop, 2014). Thus, tremendous pressure is exerted on allocating and appropriating public policy resources and mobilising labour, including medical staff and caregivers. The elements of a burdened population are viewed from various perspectives. Demographically, as longer life expectancy occurs (Der Gaag and de Beer, 2014), society and families incur additional economic costs due to increased expenditure on pension systems and medical costs. Socially, the elderly face various problems ranging from financial instability, poverty, victimisation, isolation, dependency, lack of access to appropriate health care and inadequate housing (William and Julian, 2008). On the governance front, the civic participation of older persons in the decision-making processes was less recognised, undermining their contributions to society.

2.1.3 COVID-19 and connectivity factor

In addition to these stereotypical issues, problems and challenges, the ongoing life-threatening COVID-19 pandemic has severely restricted the liberty, rights, freedom and social mobility of the elderly, who also face higher mortality risks than other age groups. Furthermore, the COVID-19 pandemic has compelled authorities and institutions to review the efficiency and efficacy of the delivery of products and services. Thus, going beyond and eliminating erroneous thinking about the ageing process

regarding modern living and technological advancements have become imperative among nations and societies (UKEssays, 2018). As such, the study of Internet use among older adults is vital so that we can design digital solutions to cater to their needs (Hunsaker and Hargittai, 2018), formulate specific inclusive policies for older adults for their well-being (Forsman, 2018), understand elderly care (Zhao et al., 2020) and create new economic opportunities for them (Carretero, 2015).

2.1.4. Lagging behind developed nations factor

Economically advanced countries like Germany, Finland, Italy, Sweden, and Japan have at least 20% of their respective total population aged 65 years and above. These countries have been deliberating issues, problems and challenges plaguing the quality of life and dignity of life of the ageing population since the preceding industrial era. As a result, various policy strategies, programs and regulations of financial allocations and appropriations and the establishment of dedicated institutions to improve the quality of aged care have been put in place (de Croo, 2014; Der Gaag and de Beer, 2014). The main areas of concern regarding the consequences of the rapid ageing of populations include increased expenditure on health and long-term care, labour-force shortages, dissaving and potential problems with old-age income security. However, the contemporary areas of concern affecting livelihood, existence and relevance, and the continuity of living with dignity and respect, are centred on embracing and harnessing the fast-emerging borderless communications technologies and digitalisation processes. The issues, problems and challenges of the ageing population are being constantly reviewed and rectified in developed nations in the wake of the onslaught of new technologies. As such, the study of Internet use, its impact and the consequences of digitalisation among older adults have increasingly warranted the attention of policymakers. The mainstream planning agencies were recommended to design digital solutions that cater to the elderly's needs (Hunsaker and Hargittai, 2018), formulate inclusive policies for older adults' well-being (Forsman, 2018), and understand the elderly needs (Zhao et al., 2020) and create new economic opportunities for the elderly (Carretero, 2015). Designing digital engagement strategies for ageing populations in developing countries like Malaysia requires policy concern. This research has mooted the notion of invigorating the elderly population from being a 'burden population' to a 'knowledge-force' population through digital inclusion strategies, especially in the ongoing COVID-19 pandemic in Malaysia.

2.2 Research scope and coverage

2.2.1 Target respondents

This research primarily focuses on the digital experiences, behaviours and personal experiences of the elderly population in Malaysia. However, the study also focuses on other key players in the elderly community, particularly caregivers, non-governmental organisations (NGOs) and policymakers in the mainstream. Their perspectives will help to illuminate issues and contribute to the future development of a digital elderly policy in this country. For the elderly population, we focused on the elderly who are living in urban and suburban areas in Kuala Lumpur and bordering cities, such as Kajang and

Seremban. In addition, we selected elderly activity centres, retiree associations, and ministries and agencies involved with digital policies for older people in Malaysia.

2.2.2 Sampling

As a country, Malaysia has achieved a 77.2% urbanisation rate as of 2020 (Ahmad, 2022). The contemporary digital challenge continues to exist in the urban population; therefore, this study focused on urban locations. From a sampling perspective, the geographical coverage would not be a significant issue in producing valid results due to the urbanisation rate. An attempt was made to explore senior citizens' digital aspirations and behaviours through a purposive sample survey. Therefore, this study's coverage constituted not only the aged population in the upper rung of society, particularly the well-educated ones, but also included those in the lower income levels, primarily residing in low-cost apartments in the city. Data were collected using interviews, focus group discussions and survey questionnaires. About 40 participants were identified for the interviews and focus group discussions, and 300 respondents for the surveys.

2.3 Research questions and aims

Previous research notes a wide range of experiences among the elderly on digital use, such as the frustration among the elderly for not being able to properly use digital media and the Internet (Forsman, 2018); women dominated Internet use at home (Hunsaker and Hargittai, 2018; Forsman, 2018; van Deursen and Helsper, 2015); and how the elderly used the Internet to obtain information, consultancy services and educational content; moreover, they also used the Internet to participate in cultural and political activities (Carretero, 2015). However, these studies were concentrated mainly in Western countries with high Internet penetration. Therefore, this study extends the previous studies by giving an additional perspective to the Malaysian context by focusing on the elderly in urban locations. The proposed research questions are as follows:

- i. What are the perceptions among the elderly about the existing digital technology?
- ii. What are the current initiatives undertaken among policymakers, caregiving NGOs and institutions, and others involved with the elderly?
- iii. What strategies can be recommended to the relevant authorities in encouraging more digital participation from the elderly communities?

Towards realising the envisaged knowledge-force elderly population, the research was poised to attain the following objectives:

- i. To examine the perceptions among the elderly regarding the existing digital technology in Malaysia.
- ii. To evaluate current initiatives among the government, NGOs and others serving the elderly population in Malaysia.

- i. To prescribe policy strategies for digital inclusion in transforming the elderly into a knowledge-force population.

3. Literature Review

Malaysia has achieved great strides in digitalising by attaining an 89.6% Internet penetration rate in 2021 (MCMC, 2020). The high Internet adoption rate led to many digital consequences, such as 87.6% mobile smartphone usage; 86.0% usage of socio-technology tools; WhatsApp (98.7%), Facebook (89%), Instagram (75%) and YouTube (94%) which indicates that 86% of the total population in Malaysia are social media users (KKMM, 2021). Malaysia was also ranked 5th in the world for active social network penetration. The e-commerce market value of any online buying or selling in Malaysia amounted to 30.2 billion Malaysian ringgit in 2020. This value was an approximately 24.8% increase compared to 2019, when the e-commerce value was at 24.2 billion Malaysian ringgit (Statista, 2021). In terms of population, Malaysia attained an ageing society or a greying nation status in 2020 (DOSM, 2020; UN, 2019). The United Nations (UN) has predicted that by 2030, Malaysia will have 3,620 thousand people aged 65 years and over (UN, 2019). However, the recent Internet Survey Report (MCMC, 2020) indicated that 11.36 % of Malaysians were non-Internet users, and 51.8% from this category were aged 60 and above. Even though the government has introduced a National Policy and Plan of Action for Older Persons (KPWK, 2011), this policy has yet to address the digital needs of the elderly in the country. From the public policy perspective, the pertinent question remains regarding the proportion of an ageing population that is part of the fast-growing digital population, along with their usage patterns, features and characteristics. This study was intended to examine digital use among the elderly and existing initiatives among the authority in Malaysia so that further recommendations can be made to improve their quality of life through broadband.

The primary challenges have evoked a pressing need to develop policy strategies and mechanisms that can support and mainstream the participation of the elderly population in the digital society of today. To resolve this issue, we proposed a framework that can assist the government, policymakers, industry players and leaders in society in increasing digital inclusion in all walks of life, including the elderly. This development is in line with the aspirations of the Sustainable Development Goal (SDG) agenda of the UN in terms of ushering the elderly population towards healthy, productive and active ageing as an integral part of their lives.

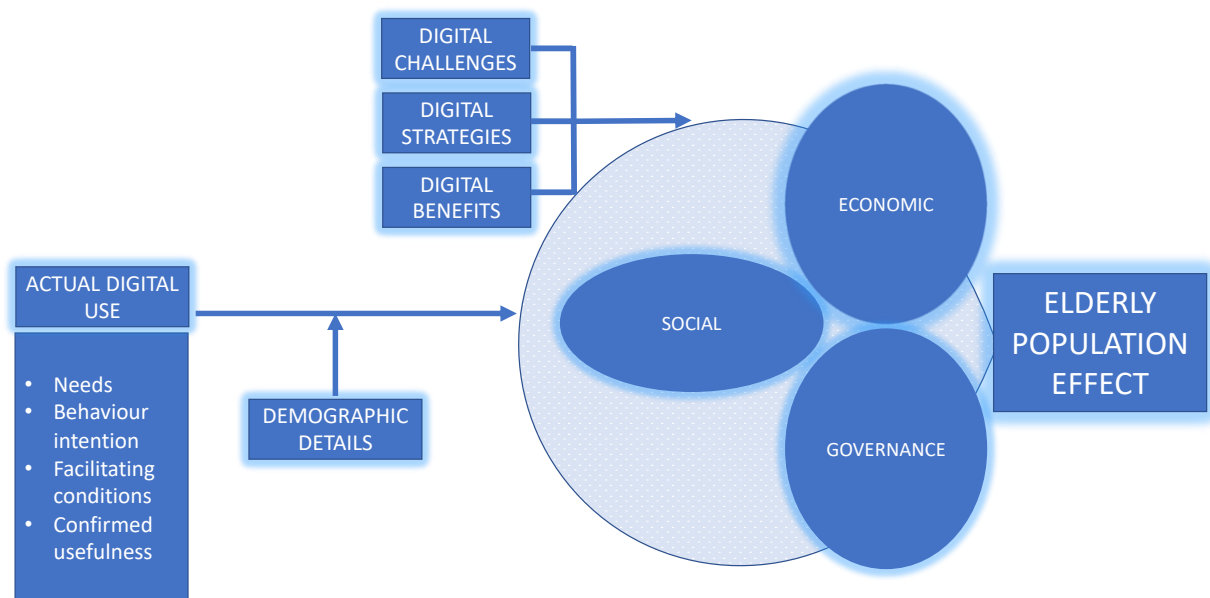
In the following section, we proposed the Integrated Dragon Fly Model with the Social, Economic and Governance Dimensions Model (SBTM) as a tool to examine digital use among the elderly. We analysed their digital participation from the social, economic and governance perspectives. This model is relevant for this study because we analysed the actual digital use through their needs, behavioural intention, facilitating conditions and confirmed usefulness. Moreover, SBTM connects digital use with the implications of digital participation in positioning them as a knowledge-based population. Relevant literature was also discussed.

3.1 Conceptual and Theoretical background

Contrary to the traditional view of a ‘burdened’ population (Nicole and Joop, 2014), this research premises upon the notion that the elderly population are a knowledge-force population, as they are endowed with years of knowledge, skills, experience and exposure during their working years. The Integrated Dragon Fly Model entails Social, Economic and Governance Dimensions, which are integrated with SBTM, as shown in Figure 1. This model offers an understanding of how the elderly population can become active members of society in social, economic, governance and digital dimensions.

Figure 1

The Integrated Dragon Fly Model



Note: The Integrated Dragon Fly Model and Sociological and Behavioural Theory Models (SBTM) for the Elderly. Source: Adapted from Park, 2017; Llorente-Barroso et al.,2015; Barnard et al., 2013; Holden and Karsch, 2010; Chan et al., 2010; Sourbati, 2009, Renauld

and Van Biljon, 2008

3.1.1 The Integrated Dragon Fly Model

The elements of the Integrated Dragon Fly Model encompass social, economic, and governance aspects. Using this model, we look into how the elderly's encounter with technology shaped their digital inclusion experience. We analysed these dimensions through digital strategies, digital benefits and digital challenges. The following section discusses several studies about the elderly role in the digital community.

i. Social aspect

Society's negative view and erroneous thinking about ageism warrant due attention (UKEssays, 2018). By and large, communities and families lack an adequate understanding of the causes and the inherent stages and processes involved in ageing phenomena, which involve nature taking its course. The problems of the elderly in society are compounded mainly by a deficiency of interaction, inactivity and loneliness. Moreover, elderly individuals are segregated and left alone in retirement institutions or nursing homes, away from friends and family members. Furthermore, they are isolated from being part of society. This scenario should not be the case if the elderly are encouraged to be active, interact with family members and friends and become integral to an inclusive society.

ii. Economic aspect

The elderly were initially seen as receivers of welfare (Ibrahim et al., 2016). However, they were also regarded as targeted consumers and included as participants due to their increasing autonomy in the economy, society and governance systems (de Croo, 2014; Terzi et al., 2012; Morairity et al., 2007). As a result, some companies have begun to recognise the endowed potential and talents of the elderly for employment on a freelance, part-time basis, or piece-rate consulting basis for a fee. In this way, employers gain a lot from maximising the potential of the elderly population at a reduced cost (Olsson et al., 2018). At the same time, companies can reduce recurring costs, such as paying for employee benefits, insurance, contribution to pension funds and medical benefits.

Moreover, when elderly employees' lives change and they become more active and economically productive, this change contributes to their healthy and dignified living (Maier and Klumb, 2005; Allen et al., 1992;). Furthermore, the elderly are a fast-growing and influential group of consumers of various services, such as tourism. However, such efforts have mostly been limited to developed countries.

iii. Governance aspect

Engagement and participation of the elderly population in a governance system are pretty limited in developing countries like Malaysia. In developed countries, the engagement and the inclusion of senior citizens in civil society and democratic institutions provide them with a greater sense of freedom and control, political efficacy

and a sense of belonging. These aspects have been key topics only in the last 20 years (OECD, 2009; EC, 2001). The social dimension covers social and family engagement, and the economic dimension covers gainful employment for healthy elderly individuals; meanwhile, the governance dimension provides the platforms and engagement for active participation (Roberto et al., 2020) in decision-making processes.

The participation of the elderly can benefit the well-being of seniors (Maier and Klumb, 2005; Allen et al., 1992;) thereby improving the quality, effectiveness and efficiency of public measures and boosting innovative solutions (Terzi et al., 2012; Morairity et al., 2007), especially regarding social care and pension provision (Postle et al., 2005). The patterns of senior civic participation can be in the form of adoption or consultative or co-decisional participatory approaches in policy design or policy implementation at the international, national or local level (Roberto et al., 2020).

iv. Technology use

With the commercial introduction of Internet technology in the early 90s, many countries have embarked on creating bona fide information societies, but elderly participation was less successful (Stephenso et al., 2016). Technology and computing machines like desktop computers, laptops, tablets or smartphones were considered minor activities among the elderly. Their usage is determined by other factors such as gender, age, marital status and educational background. However, technology can be an enabler for older people's better quality of life. Pertinently, technology can assist in creating a 'seamless' service that might assist the elderly socially and economically (Bernard and Phillips 2000).

3.1.2 Social and Behavioural Theory Models (SBTM)

Several sociological and behavioural theories support the Dragon Fly Model: the Self-determination Theory, the Unified Theory of Acceptance and Use of Technology, the Theory of Planned Behaviour, the Technology Acceptance Model, and the Senior Technology Acceptance Model. These theories are the guiding philosophies in developing the model for this study.

Self-determination theory (SDT) is a motivation theory built around autonomy, competence and relatedness. Founded by Deci and Ryan (2000), it explores basic human psychological needs to understand how a person can be self-determined or non-self-determined. SDT has been applied in numerous fields due to its two-pronged benefits. From the individual aspect, it increases one's well-being; from the organisational aspect, it boosts one's performance at work. This study applied SDT to understand why the elderly perceived digital tools as necessary for improving their quality of life. Another theory related to technology use is the Unified Theory of Acceptance and Use of Technology (UTAUT), a popular management and information technology theory. UTAUT helps explain the connection between intention, human behaviour and the use of technology. It combines several factors, such as performance, effort, social influence and facilitating conditions to study an individual's intention to use technology and digital devices. Niehaves and Plattfaut (2014) proposed several models based on UTAUT and MATH. The best model to reflect digital experiences among the elderly is the UTAUT model because it is easier to replicate,

more feasible for quantitative studies, yields higher explanatory power and is better with socio-demographic variables, such as is suggested for countries with diverse ethnicity.

Another theory that links motivation and human behaviour is the Theory of Planned Behaviour (TPB), which Ajzen introduced (1991) as a psychological theory that defines behaviour based on three components: attitude, subjective norms, and perceived behavioural control. It is widely used in various social sciences studies because it can explain human intention based on the surroundings. This theory is relevant in this study because we want to determine the intention behind using digital tools among the elderly community. To support these theories, we reviewed several models, such as TAM and STAM, in analysing how other factors play a role in supporting the use of technology, learning new technology and designing new technology for the elderly. This study extends Holden and Karsh's (2010) research on the features of digital products or services for the elderly and Caceres and Chaparro's (2017) work on intergenerational Internet learning in the household. It also considers the studies of Niehaves and Plattfaut (2014) and Lee et al. (2014) on socio-demographic factors and socio-economic norms. Based on these studies, while technical features are essential in promoting digital tools among the elderly, other factors and social norms are important considerations in driving digital society worldwide.

The e-Inclusion for the Elderly Model consists of digital use and the elderly inclusion effect as the main factors in this study. Digital use, the independent variable, is defined as needs, behaviour intention, facilitating condition and confirmed usefulness. The elderly inclusion effect, the dependent variable, is defined as digital strategies, digital benefits and challenges. Demographic details, such as age, literacy, gender, education and caregivers, are the moderating variables. Key operational variables are defined in Table 1.

Table 1

Key operational variables

Factors	Definition
Needs	Relates to competence, relatedness, and empowerment (Ryan and Deci, 2000)
Behaviour Intention	A user's readiness to carry out a particular behaviour (Ajzen, 1991). Behavioural intention is a factor that leads people to use the technology.
Facilitating Condition	Facilitating conditions refer to the degree to which a person believes that the existing organizational and technical infrastructure can support the use of technology (Chan et al., 2010).

Confirmed Usefulness	User confirms that using certain technologies/devices will improve or enhance their daily functioning activities (Renauld and Van Biljon, 2008).
Actual Digital use	The actual digital use is where people consume digital tools/computers/technology (Holden and Karsch, 2010).
Elderly Inclusion Effect	<p>eInclusion: Social practice supported by online technology.</p> <p>The principal actors include the elderly citizens, the government bodies promoting inclusion programs and organising digital services, various voluntary organisations such as Help the Aged, and the telecom and tech firms providing the Internet infrastructure and digital services.</p> <p>Digital inclusion activities including social media communication, tablet and smartphone use (Barnard et al., 2013), community involvement (Park, 2017), the elderly citizen's use of e-commerce entertainment (Llorente-Barroso et al., 2015) and eGovernment services (eservices) (Sourbati, 2009).</p> <p>Digital Elderly inclusion effect:</p> <ul style="list-style-type: none"> • Social and family engagement • Autonomy and empowerment • Health and well-being • Societal economic and democratic benefits, social capital •

Note: As mentioned above, the key operational variables in this study are gathered from previous literature. Source: Adapted from Park, 2017; Llorente-Barroso et al., 2015; Barnard et al., 2013; Holden and Karsch, 2010; Chan et al., 2010; Sourbati, 2009, Renauld and Van Biljon, 2008

3.2 Review of literature

3.2.1 Working definition of ageing society or nation

The UN recommendation of defining an aged nation or society as 65 years and over is presumably more suitable for advanced countries experiencing prolonged longevity since the 1970s. The youth population of fewer than 15 years have begun to show a declining trend, while the aged population consisting of individuals aged 60 years and over was showing an increasing trend (Department of Statistics Malaysia, 2020).

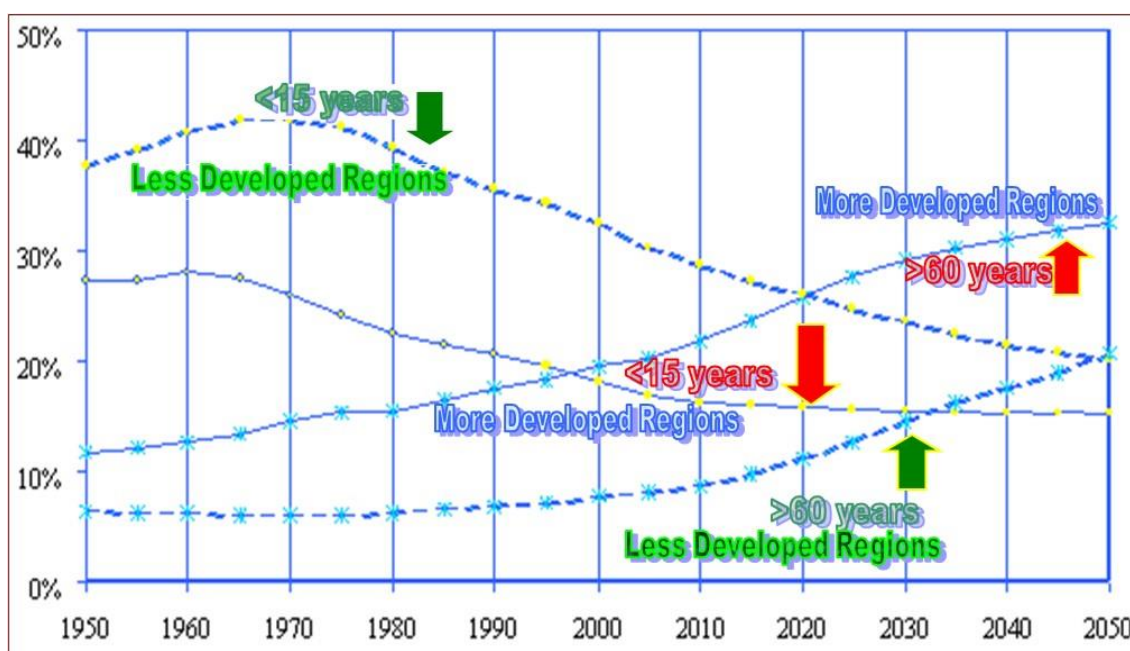
Despite having established a distinct definition, even UN agencies have used different age criteria, mainly 60+ or 65+ years, to define an ageing society according to their contextual needs. According to the United Nations World Assembly of Ageing (WOA) 1982 in Vienna, the elderly or senior citizen age is above 60 years old.

3.2.2 The global ageing phenomena

An overview of the global ageing phenomena in developed and developing countries is shown in Figure 2. Indeed, ageing has been a significant public policy concern in the past five decades, as demographic transitions towards the longevity of life have come into effect. These trends are inevitable and irreversible, as global life expectancy has increased due to decreased fertility and mortality rates and improved health and living conditions. As depicted in the diagram, most countries have a longer life expectancy, but the more developed region's rate was higher.

Figure 2

The global ageing phenomenon



Note: Proportion of Population of <15 years and >60 years by Developed and Less Developed Regions – 1950-2050, Source: Adapted from the United Nations Report, 2019

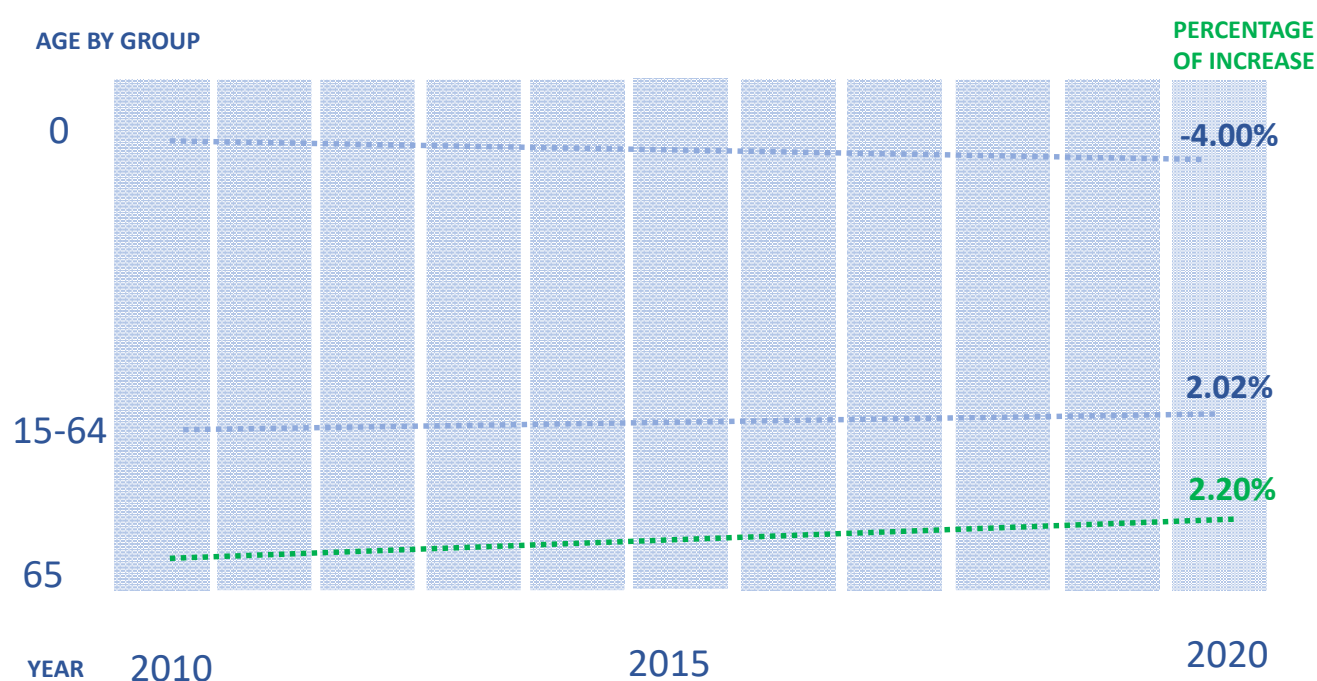
3.2.3 Malaysia as an ageing nation

Premising upon the United Nations criterion of 65+ years as the cut-off age and constituting at least 7% of the total population, the official data of the Department of

Statistics Malaysia, as shown in Figure 3, indicate that Malaysia attained an ageing society or a greying nation status in 2020. That is, the proportion of people in the age category of 65 years and above has reached the 7.18% mark, numerically constituting 2,325 thousand out of 32,370 thousand this figure stood at 6.9% in 2019. UN has predicted that by 2030, Malaysia will have 3,620 thousand people aged 65 years and over (Department of Statistics Malaysia, 2020; United Nation, 2019).

Figure 3

The increase in the ageing population in Malaysia



Note: Proportion of Malaysian Population by Broad Age Breakdown, 2010-2020, Source: Department of Statistics Malaysia, 2020

The demographic transitions that have given rise to Malaysia as an ageing society are attributed to many demographic factors. Specifically, a sharp reduction in the Malaysian total fertility rate (TFR) from 5.01 births per woman in 1970 to 1.97 in 2020 marked a significant contribution. This reduction is in tandem with the rapid economic transition from an agrarian society at the time of independence in 1957 to a newly industrialized nation by the turn of the preceding century. Subsequently, demographic and economic development factors have led to an increased urbanization rate from 33.4% in 1970 to 77.2% in 2020 and an increased female participation rate from 36.3% to 55.3% over the same period. The increase in female participation in the labour force is due to the emancipation of women from traditional and cultural inhibiting factors

accompanied by the pursuit of higher education and career advancement opportunities. In addition, improved social, education and living conditions, as well as a healthy lifestyle, have resulted in increased longevity, which was only 65 years in 1970 and rose to 76 years in 2020, as depicted in Figure 3. In tandem, the median age that divides the population into two equal parts has also increased from 17.4 to 29.9 years during the period discussed in Table 2.

The ageing trend will be a continuing trend and a challenge in the years ahead, as reflected in the Index of Ageing (IOA) trend. The IOA showed that in 1970, only 7.5 people were 65 years old and above compared with every 100 young people aged 15 years and below. However, the number has increased to 30.6 over the past five decades. Accordingly, all these demographic factors have galvanized into a dependency ratio from 6.31% in 1970 to 10.30% by 2020. In the same vein, another study revealed that the economic dependency ratio of the elderly (that is, the ratio of 65+ / <15 years) was projected to shore up from 10% in 2020 to at least 15% by 2035 (Wong et al., 2020).

Table 2:

Malaysia Demographic Evidence of Aging Population 1970-2020

Demographic Profile	1970	1980	1990	2000	2010	2020
0-14 - Population counts	4,781,079	5,448,982	6,679,765	7,736,722	7,887,279	7,589,921
65 and above – Population counts	357,410	495,395	663,617	908,066	1,392,960	2,325,071
Dependency Ratio (% working-age population)	6.31	6.31	6.21	6.24	7.36	10.36
Index of Ageing (IOA) (%): Ratio of 65+to <15 years in %	7.5	9.1	9.9	11.7	17.7	30.6
Median Age (Years)	17.4	19.6	21.9	23.6	26.2	29.9
Life Expectancy At Birth (years)	65	68	71	73	74	76
Total Fertility Rate (TFR) births per woman	5.01	4.07	3.55	2.98	2.15	1.97
Crude Death Rate / per 1000 people	7.1	5.8	4.9	4.5	4.7	5.3
Female Labour Force	36.3	44.5	47.8	47.2	46.8	55.3

Participation Rate - % of the total workforce						
Urbanization Rate – % of to the total population	33.4	42.0	49.8	67.0	70.9	77.2

Note: Key characteristics are based on factors such as IOA, fertility rate and others. Source: Department of Statistics Malaysia, 2019 and United Nations, 2019

The study also examined key ageing characteristics, particularly sex ratio (the number of males divided by the number of females) and education status of the aged population. Table 3 presents a compilation of numbers for aged populations consisting of individuals over 60 years old. In Malaysia, males outnumbered females before the 80s; in 1970, the sex ratio of elderly individuals aged 65+ was 105.4. However, by the turn of the first quarter of this century, the gender ratio indicated that females outnumbered males, as reflected in the sex ratio of 94.8 in 2020. More importantly, the proportion of the elderly with tertiary-level education increased from 0.3% in 1970 to 0.9% in 1990 and 5.9% in 2020. Indeed, these demographic trends showed that the policy strategies and programmes for the elderly should urgently consider female participation and educated old folks.

Table 3:

Demographics of Aged 60years+ by Gender and Education Status in Malaysia 1970-2020

Demographic Variables	1970	1980	1990	2000	2010	2020
Sex Ratio aged 60 years and above: Ratio of males to females						
Gender Ratio (65+) Male/Female	105.4	101.1	93.1	92.6	95.4	94.8
Education Status of Elderly Population						
No Schooling	75.0	73.2	63.1	44.1	31.8	20.3
Primary education	22.3	23.1	31.1	34.3	38.7	45.5
Lower secondary education	1.3	1.8	2.4	4.4	5.6	15.1
Upper secondary education	1.2	1.5	2.1	3.8	4.0	13.2

Tertiary education	0.3	0.4	0.9	1.7	1.8.	5.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Department of Statistics Malaysia, 2020

3.2.4 The rise of the digital community in Malaysia

Being a newly industrialized nation, since the advent of commercial Internet technology in early 1990, Malaysia has achieved great strides in digitalizing the country by attaining an 89.6% Internet penetration rate in 2021. The high Internet adoption rate has given rise to many digital consequences, such as 87.6% mobile smartphone usage; 86.0% usage of socio-technology tools, such as WhatsApp (98.7%) and Facebook (89%), Instagram (75%) and YouTube (94%). The e-commerce market value of any online buying or selling in Malaysia amounted to 30.2 billion Malaysian ringgit in 2020. This value was approximately 24.8% compared to 2019, when the e-commerce value was 24.2 billion Malaysian ringgit. However, as expounded earlier, even in Malaysia, females outnumbered males in using new technology. Another example shown that male users constituted 47% compared with 53% of female users of Instagram (Statista, 2021). Thus, from the public policy perspective, the pertinent question remains regarding the proportion of those aged 60 years and above that are part of the fast-growing digital population, along with their usage patterns, features and characteristics. As such, the current research is poised to explore these factors.

In 2030, the United Nations Agenda for Sustainable Development aims for inclusive society as the primary goal of all Member States. It is based on the idea that a society of people from all walks of life is part of the global community. Hence, inclusion is imperative, and the goals to achieve this inclusive society are based on shared prosperity. In the era when digital technologies are redefining every sphere, the digital divide is being replaced with digital inclusion. As a result, digital inclusion has been acknowledged as a fundamental tool in advocating equality and equity among societies. However, this does not mean the digital divide no longer persists. On the contrary, it is a constant challenge for most developing countries still struggling with poverty, access to basic needs, education and infrastructure. In addition, the COVID-19 pandemic has increased the need for digital use for personal use, industry, government, and business transformation, as well as to meet societal and public expectations.

The development of digital infrastructure worldwide depends on each country's plans and initiatives. Sweden, for example, is the most connected country due to its high Internet connectivity and users (Forsman, 2018; van Deursen and Helsper, 2015). Meanwhile, Estonia is one of the leading countries in digital government transformation, and the country has proven that bureaucratic tasks can be done digitally. In addition, the UK and Australia have established research innovation centres that constantly conduct IT and digital transformation in government services. We can learn from these countries that digital inclusion is no longer about the future. But, we also noticed that smaller nations can achieve high Internet connectivity for its people, given the awareness to invest on the digital infrastructure. Digital infrastructure today is a requirement and an essential tool for policy decisions, product development and

innovation, which can reshape industries and potentially create areas for growth. Countries that increase their investments in digital infrastructures reap more significant benefits, gain higher profits and establish inclusivity among citizens.

3.2.5 The digital inclusion strategy

The digital inclusion strategy can drive social, economic and governmental dimensions efficiently and effectively. A digital inclusion strategy is much broader than the digital divide, and digital literacy was emphasized during the early stages of Internet technology. Digital inclusion policy strategies aim to empower lives and enhance the quality of life of all citizens, including seniors. Specifically, the strategies are poised to provide access to knowledge, skills, exposure and experiences regarding digital technology products and devices with elements of online connectivity and real-time interactivity, irrespective of time, geography, culture, and traditions. Digital inclusion policy strategies generally entail three essential elements such as access, affordability and ability. Firstly, access means the availability, quality, capacity and flexible packages of an Internet connection, hardware and sufficient data allowances. Secondly, the affordability of using technology and acquiring Internet access to ensure society can consume products and services digitally. Thirdly, the ability of using digital technology includes the attitudes and skills to use online technologies confidently and in diverse ways (Forsman, 2018; van Deursen and Helsper, 2015). Thus, the proposed research presumes that together with these elements, the goal of creating a more digitally inclusive society can be realized even for the elderly population. Thus, investments must be made in the elderly. By doing so, the proposed research will establish the reinvigoration of the value of the elderly population, who have an endowment of years of knowledge, skills, and experience garnered over the years. However, among younger senior citizens—those between 65 and 80 years old, the main issues are likely to be universal access to ICT and e-participation. Among older senior citizens, those over 80 years old, the main issues are mental and physical deterioration and assistive technology. An approach geared towards protecting human rights could match the different needs of senior citizens and provide concrete guidance to evaluate information technologies for them (Emilio et al., 2009).

3.2.6 The digital elderly community

Older adults were identified as 'seniors', 'elderly', and 'baby boomers'. In gerontology, an area of study about ageing people, other unique terms are used, such as 'third age'. This term refers to old-age retirement (Ahmad, 2022) and when their lives were dependent on others. However, due to digital advancements, people at this stage of life have the potential to gain economic independence, have prolonged quality of life and be active members of society (Forsman, 2018). Specific to digital studies, we also found a new term called the 'silver surfers', also known as 'super users' or 'elderly-skilled'. These individuals are affluent in digital media (Tyler et al., 2018), and this small number of people have access, motivation, and skills to use digital media (Olsson and Viscovi, 2020). Previous studies have shown that users that fail to see the benefit of digital solutions will continue to be left behind (Tyler et al., 2018). Although many studies have focused on the widespread application of digital technology, very few

have concentrated on the elderly community (Olsson and Viscovi, 2020; Forsman, 2018; Tyler et al., 2018).

Several researchers on the digital elderly have noted some frustration among the elderly for not being able to use digital media and the Internet properly (Forsman, 2018). Meanwhile, some scholars have conducted a comparative analysis of gender, such as women dominating Internet use at home (Hunsaker and Hargittai, 2018; Forsman, 2018; van Deursen and Helsper, 2015). The elderly uses the Internet to obtain information, consultancy services and educational content; moreover, they participate in cultural and political activities (Carretero, 2015), perform daily activities such as banking and shopping (Olsson and Viscovi, 2020) and use a combination of digital solutions through websites, applications, and wearable technology devices (Olsson and Viscovi, 2020). In a comparative study between different age groups in older adults, younger adults are active users, and the oldest among the elderly are the least active users; the trend is similar globally (Hunsaker and Hargittai, 2018).

Addressing digital inclusion as part of the UN SDG agenda calls for active participation in society, including providing access to the Internet and having access to it (Forsman, 2018). Political decisions and further recommendations on digitalization policies must include participation from the tech industry to produce easy-to-use digital solutions and be based on people's life circumstances (Olsson and Viscovi, 2020). For the elderly, the weakened social network entails a possibility for people to experience loneliness and social exclusion (Forsman, 2018). Several new studies include exploring 'online repertoires' (Olsson and Viscovi, 2019), which involve different devices, online content/services, patterns of use, comparative use between generations (Hunsaker and Hargittai, 2018) and types of emerging technologies for daily tasks (Olsson and Viscovi, 2020). All these studies contribute to the emerging online practices and help to understand how older adults become competent online users. In Malaysia, several studies have highlighted the need for a specific agenda for the ageing community (Khazanah Nasional, 2020; World Bank, 2020). However, these studies have generally discussed the ecosystem for the ageing population but not the elderly themselves.

Furthermore, many other works have discussed the financial and care aspects of the elderly after retirement (Tobi et al., 2017). However, very few studies have delved into the digital use of the elderly (Zaid et al., 2021; Tokiran et al., 2021; Teng and Joo, 2017). Therefore, we must develop a framework to support digital inclusion among the elderly population in Malaysia. This framework is expected to benefit the elderly directly.

3.3 Overview of relevant policies and programmes in Malaysia

3.3.1 Ageing policies and implementation

The elderly community in Malaysia are more commonly identified as senior citizens. In Malaysia, senior citizens follow WOA guidelines. Currently, policies related to seniors are under the purview of the Ministry of Women, Family and Community Development (KPWKM), and programmes and projects are coordinated and implemented by the Welfare Department (JKM). The ministry launched The Senior Citizen Policy or *Dasar Warga Emas Negara* (DWEN) in 2011, together with the National Action Plan for Senior

Citizens (KPWKM, 2011). This guiding policy was designed to meet the Vision 2020 target as a developed nation. The policy was designed based on the current needs of seniors. The philosophy of this policy is for Malaysian seniors from various backgrounds to enjoy a high quality of life and well-being, to be respected and to contribute actively to the nation's development. It supports active ageing, productive ageing and healthy ageing among seniors. The strategy includes promotion, life-long learning, safety and security, governance and shared responsibility, engagement and intergenerational relations, research and development.

Besides the policy initiatives, JKM has set up several institutions for the elderly. For instance, *Desa Bina Diri*, *Rumah Ehsan* and *Rumah Seri Kenangan* (KPWKM, 2022) were established for the residential care of the aged. Moreover, they were set up mainly to protect the elderly and poor. *Desa Bina Diri* targets homeless people, while *Rumah Ehsan* caters to the elderly poor with severe health conditions without relatives. In addition, *Rumah Seri Kenangan* is for the elderly poor without economic support. These institutions were established in various states, providing moral counselling, therapy support, training, and shelter. For active seniors who can live independently, JKM introduced *Pusat Aktiviti Warga Emas* (PAWE), the social activity centre for healthy seniors. PAWE functions as a social outreach centre for low-income families and seniors, unlike other institutions. Those interested need to register as members to attend activities in the centre for a minimum fee. PAWE is also a good partnership model because the local community drives it. Moreover, activities have been designed and delivered by NGOs and sometimes by private organizations as part of their corporate social responsibility (CSR) to the public (Ahmad, 2022; KPWKM, 2022).

3.3.2 Moving towards digital nation

Starting with the Eleventh Malaysia Plan (11MP) for 2016-2020 (EPU, 2019), the Malaysian Government focused on enhancing inclusiveness by providing equitable opportunities for all Malaysians to participate and benefit from economic growth and development irrespective of gender, ethnicity, socioeconomic status and geographical location. Indeed, this envisaged strategy is an integral part of the Shared Prosperity Vision 2030 (EPU, 2019) which supports the commitment of Malaysia to be a developed and prosperous nation with fair and equitable wealth distribution across income groups, ethnicities and supply chains. However, in the 12th Malaysia Plan for 2021-2026 (12MP), some shortfalls in achieving an inclusive and equitable society and improving well-being were reported. These shortcomings were due to lower-than-expected economic growth and weaknesses in the delivery system. Hence, the 12MP is expected to take the existing digital inclusivity agenda further to accelerate inclusive development in the country as Malaysia aims to be a regional leader in the digital economy by 2030 (EPU, 2021).

The Malaysia Digital Economy Blueprint launch in February 2021 also marked specific milestones and targets in meeting Malaysia's aspiration towards being a high-tech nation. The specifics include data as the lifeblood of the digital economy. Under this notion, using information relevant to the digital sphere aims to unlock the benefits of the digital era, such as the ability to innovate, compete and transact across borders. Secondly, the blueprint includes the goal of having the highest number of submarine cable landings in ASEAN by 2025 to enable shorter repair times for improved

connectivity, attract more global data centres to reside in Malaysia and bolster the capabilities of domestic data centres companies. Thirdly, the plan can help Malaysia realize its digital economy aspirations, as jobs in the future would increasingly require a combination of soft skills and hard technical skills, such as data analytics and coding, and soft skills, such as curiosity, innovation, and empathy and adaptability. Fourthly, the blueprint includes establishing the National Digital Economy and Fourth Industrial Revolution (4IR) Council as the highest governance authority that decides on policies, monitors the digital economy and implements 4IR strategies and initiatives. Fifthly, the COVID-19 pandemic has amplified the importance of the digital economy in resuming economic activities and ensuring uninterrupted public service delivery through expanding broadband services and connectivity for all. Sixthly, regulatory reforms ensuing from implementing the Mandatory Standard on Access Pricing (MSAP) have reduced broadband prices and increased broadband speed. Seventhly, telecommunication services are declared a public utility. This priority allows every individual access to telecommunication services, thus ensuring people and businesses have better access to the Internet and are more globally connected. Furthermore, it helps to bridge the digital divide, allowing the *rakyat* (citizens) to learn and experience new and emerging technologies and prepare the youth to be digitally ready.

In Malaysia, several papers have highlighted the need for specific agenda for an ageing community (Khazanah Nasional, 2020; World Bank, 2020). However, these papers have generally discussed the ecosystem for an ageing population but not the elderly themselves; in addition, many other papers have discussed the financial aspect and caring of the elderly after retirement (Tobi et al., 2017), and very few studies have concentrated on digital use (Zaid et al., 2021; Tokiran et al., 2021; Teng and Joo, 2017). Notably, the 12MP (2021-2026), the Shared Prosperity Vision 2030, and the Digital Blueprint 2021 do not have explicit digital agenda for older people, whose aspirations are currently overlooked by mainstream policymakers and development practitioners. An inclusive framework for an ageing community will help them to become part of the digital society in the country.

4 Research methodology

This research adopted a mixed-method design involving several stakeholders. Mixed-method design is appropriate when dealing with different data types and allows the researcher to develop a more comprehensive understanding of what is happening in the social world (Creswell, 2017). Due to several key stakeholders' involvement, this study collected both qualitative and quantitative data. The qualitative data were collected through interviews and focus group discussions, while the quantitative data were collected through survey questionnaires. The primary data sources were collected specifically for this research, which helps to increase the effectiveness of this research for policy interventions (Creswell, 2017; Mathews and Ross, 2010). As for the secondary data sources, it was mainly used for literature review.

4.1 Data collection method

Besides soliciting data and information from the literature review approach, the research methodology considered four other methods: survey, focus group and expert interviews, pilot project and industry intervention. All data collection methods and procedures were aimed at canvassing data regarding the digital experiences,

behaviours and aspirations of the elderly. Furthermore, all data collection procedures ensured ethical clearance from University of Nottingham Malaysia and Multimedia University and assurance of the confidentiality of individual data collected under Malaysian Data Protection Act 2012. The details of other methods are as follows:

4.1.1 Sample Survey

The study considered the purposive sample survey approach, covering targeted senior citizens in urban and suburban areas mainly residing in Kuala Lumpur, Putrajaya, Kajang and Seremban. A total of 418 responses from the targeted senior citizens were obtained through online and face-to-face interviews. The questionnaire was developed using the Qualtrics application and social media platforms for online data collection. WhatsApp and Facebook communication media were deployed to disseminate the questionnaire. The scope of information probed included demographic details about gender, age group, ethnicity, current working status, living arrangements, digital ownership and 40 variables on the features and characteristics of digital behaviours. SPSS Version 26 and Excel spreadsheet were used for data entry, manipulation, and analysis. The quantitative data analysis covered descriptive statistics on frequency distributions, and representative measures on mean, standard deviation, and coefficient of variation, not only at the overall level but also by critical demographic. Factor analysis was also used to determine the variables influencing aspects of digital user behaviour. Validity and reliability analyses were also undertaken to produce reliable estimates of high quality. Respondents who completed the questionnaires were given a token of appreciation.

4.1.2 Focus group / Expert interviews

The focus group/expert interviews were directed to policymakers, development practitioners, caregivers, caregiving institutions, social activists, and volunteers. This probing was qualitative. The recruitment was based on specific criteria. For example, each participant must have solid working experience in policy and programmes and be actively involved with government initiatives. We used the snowballing method in which the participants would recommend the next person based on their network to answer questions dealing with digital and senior citizen policies. In total, we interviewed government officials from several ministries, such as The Ministry of Communications and Multimedia (KKOMM), The Ministry of Women, Family and Community Development (KPWKM) and The Ministry of Science, and Technology, and Innovation (MOSTI). Some of the meetings were conducted virtually, while some were performed face to face. Apart from the policymakers, we also interviewed the Malaysian Research Institute of Ageing (MyAgeing) at the University Putra Malaysia (UPM) and volunteered at PAWE Lembah Pantai, Kuala Lumpur. As a result, we had six interview sessions with critical policymakers, caregivers and development practitioners in April and May 2022. In addition, we performed focus group discussions with the seniors to explore their digital experiences. We aimed to have 30 participants for this activity, and we managed to get 30 participants to attend the sessions in May 2022. In total, we had three focus group interview sessions in Seremban. Feedback was analysed using the qualitative coding approach via NVivo software.

4.1.3 Pilot project

The pilot project was conducted to understand senior citizens' digital experience engagement. The session comprised a digital awareness workshop, which 20

participants were expected to attend. During the facilitated workshop, they participated in the group discussion; learned how to use some basic features in smartphones for daily use, such as messaging, searching for information, and personalising their mobile phone settings; and learned about privacy and security. The aim was to instil some digital awareness among primary IT users. This session was conducted at PAWE Lembah Pantai, Kuala Lumpur, and 20 participants attended the workshop. The pre-test and post-test results were discussed in the Results section.

4.1.4 Industry intervention

Besides the data collection and the pilot project, we conducted site visits. We included the Malaysian Research Institute of Ageing (My Ageing) at the University Putra Malaysia (UPM) and PAWE Lembah Pantai, Kuala Lumpur. We did a session with Telekom Malaysia (TM), the leading national telecommunications provider in this country, to discuss digital solutions for the elderly.

4.2 Population and sample selection considerations

As mentioned earlier, senior citizens in Malaysia represented 9.2% of the total population (DOSM, 2020). Purposive sampling procedures were used by paying due attention to gender and ethnic representation sample quotas. For data collection purposes, the research used 55 years as the cut-off criterion, which the Malaysian Government typically refers to in depicting public policies and programs regarding the aged population. Although the retirement age of civil servants has been raised to 60 years, most employees in the Malaysian private sector mandatorily retire from active working life at 55 years. This research only focused on urban folks as they were exposed to new technologies and present an example of urban technological challenges in societies. Moreover, a representative study covering the probability-based approach would be costly and time-consuming. Therefore, the samples covered the aged population in the upper rung of the society, particularly the well-educated ones, but also included those in the lower levels of society which primarily reside in low-cost apartments in the city.

4.3 Preparation of survey questionnaire/study instruments

All qualitative and quantitative data collection probes were based on the theoretical framework shown in Figure 1. Specifically, the qualitative probes and the sample survey questionnaire were structured with sections about Digital Use with sub-sections on Needs, Behaviour Intentions, Facilitating Conditions and Confirmed Usefulness and Inclusion Effect, entailing sub-sections on Digital Strategies and Digital Benefits and Digital Challenges. Demographic and social variables canvassed included gender, age, race, living arrangements, education status, working status, employment status, technology ownership and digital experiences. Under qualitative assessment, specific questions targeting policy makers and caregiver associations were considered. The study instrument also considered pre-evaluation and post-evaluation elements after a short briefing session and training on Google usage using mobile phones.

4.4 Ethical considerations

Upon obtaining ethical clearance from the university, this study required the cooperation of a gatekeeper for initial access to the groups. In the participants' brief, they were informed that their participation was voluntary, meaning they had the right to withdraw without having to justify their departure. In addition, they were assured to be free from any harm to health, safety or stress when participating in the survey.

As this research was conducted in Malaysia, it adhered to The Personal Data Protection Act 2010, in which any data or information would not be presented in a form that revealed the subject. In this case, personal details, such as names, positions and ministry, were considered employment-related information, which should be protected. Sensitive data, such as health conditions, political affiliations or religious beliefs, were irrelevant to the study. Therefore, no potentially identifying characteristics were collected in this study besides their names and positions.

4.5 Data collection procedures

The fieldwork was conducted in Malaysia for three months, from March to May 2022. During the data collection process, the Malaysian Government had already lifted the Movement Control Order (MCO 2.0) and implemented the National Recovery Plan (NRP) standard operating procedures nationwide. At the same time, COVID-19 cases were still very high. Under these circumstances, we coordinated the sessions, such as the survey, focus groups and interviews, both physically and virtually. Table 4 shows a summary of the data collection phases.

Table 4:

Data collection and target respondents

Data collection phase	Target respondents	Groups	Total	Objective
Survey	Ageing population (AP) 1. Urban 2. Sub-urban	A, B, C	418	To identify the digital inclusion knowledge, skill, and experience
Focus Group	AP – 3 groups	A, B, C	39	To understand the current scenario of A, B, C of AP groups
(Semi-structured interviews)	Policymakers	3		To identify policies, programmes, and activities for AP

	Government institutions	2		To address the institutional concerns, experience, and challenges
Interview (One to one)	Private caregivers	2	2	To identify issues and challenges faced by care givers. To identify their perception on digital inclusion

Note:

Group of Respondent (aged group)

Group A – No Knowledge on Digital use

Group B – Use digital tools for day to day/social activities

Group C – Use digital tools for job/business activities

Source: The Ministry of Communications and Multimedia (KKOMM), The Ministry of Women, Family and Community Development (KPWKM) and The Ministry of Science, and Technology, and Innovation (MOSTI), the Malaysian Research Institute of Ageing (My Ageing) at the University Putra Malaysia (UPM) and PAWE Lembah Pantai, Kuala Lumpur

4.6 Data analysis procedures

The data analysis was conducted in phases. First, for the qualitative data, we performed coding analysis using NVivo. Each interview transcript was recorded and transcribed digitally. As for the quantitative data, we performed statistical analysis using SPSS Version 26.0.

5 Results

As mentioned earlier in the previous chapter, this study applied the mixed method approach. The qualitative data were gathered during the first stage through focus group discussions and interviews. We interviewed 39 participants for this purpose; 30 respondents were from the elderly group, and the rest were policymakers, caregivers, developmental practitioners and volunteers. These data were analysed using the qualitative method.

5.1 Qualitative data

1. The elderly group

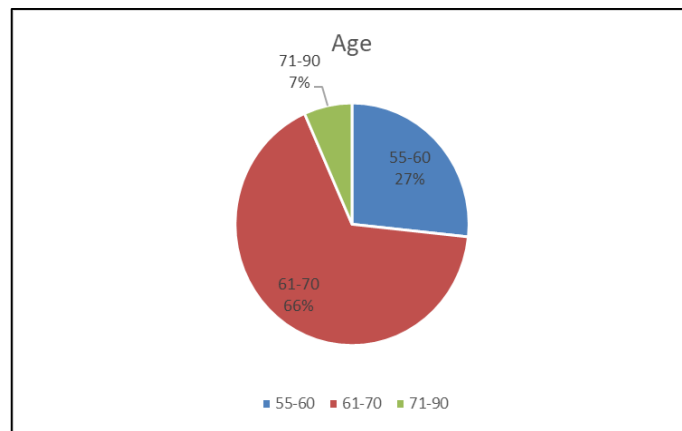
Profile of Respondents

First, we look at the demographic profile of the elderly participants whom were interviewed in this study. The total participants for the interviews and focus group

discussion were 39 participants. In Figure 4, the majority of the respondents were between 61-70 years. In Figure 5, we have more female respondents for this study representing 57% of the total participants.

Figure 4

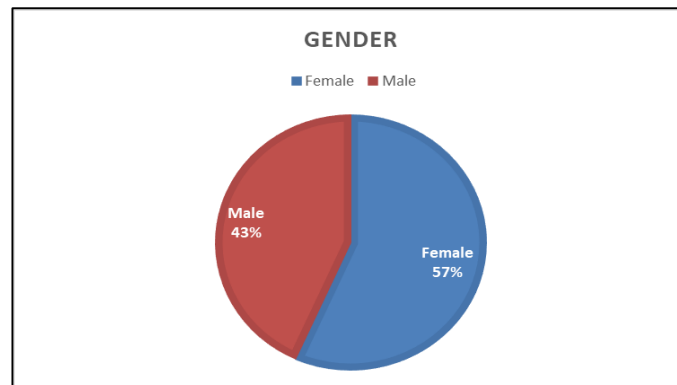
Age distribution



Note: The age range of the respondents were within 60-90 years. Source: Author(s) analysis using Nvivo.

Figure 5

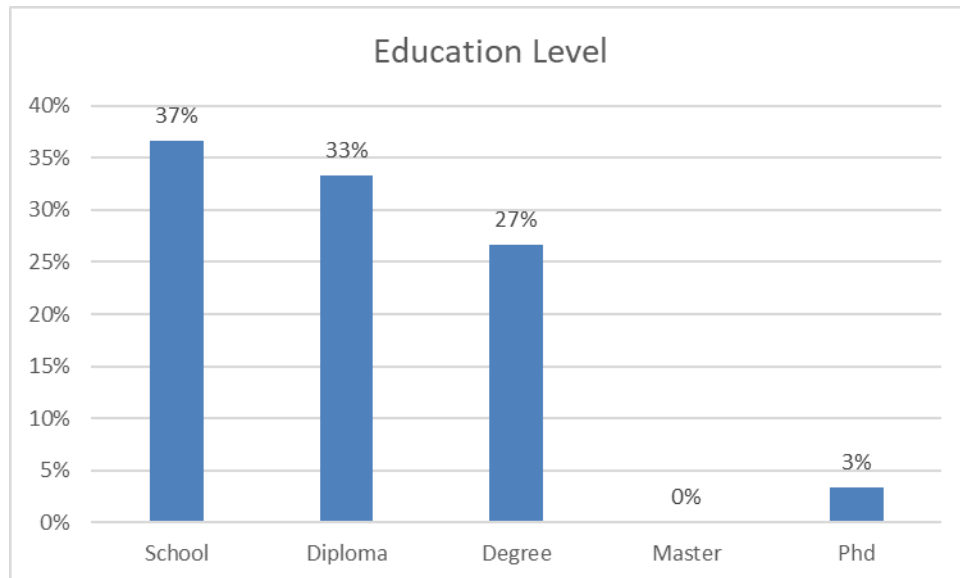
Gender distribution



Note: The gender distribution was somehow balanced with 43% male and 57% female respondents in Source: Author(s) analysis using Nvivo.

Figure 6

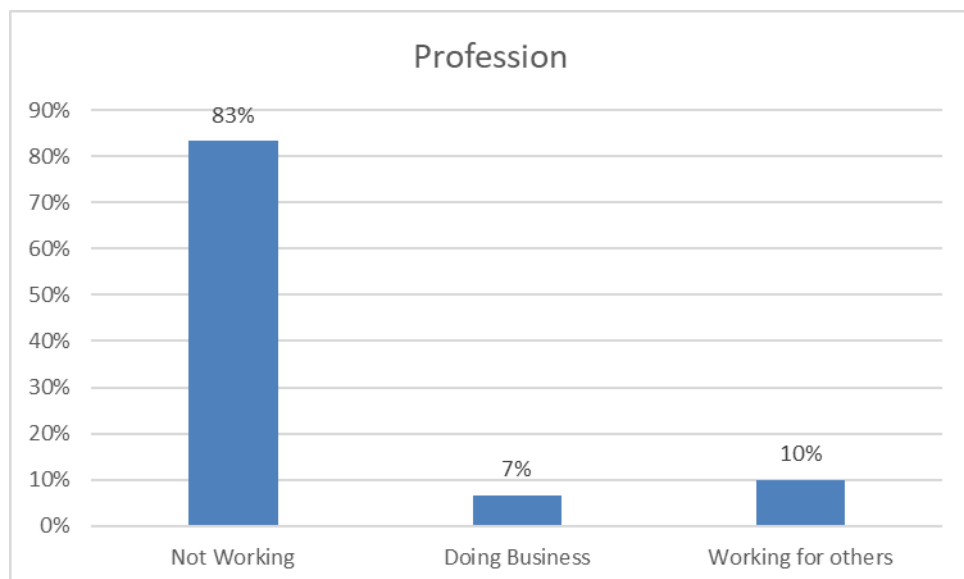
Education level



Note: In terms of education, 37% of respondents possessed secondary school level certificates, 33% had diploma level education, 27% had a degree, and 3% had PhD qualification. Source: Author(s) analysis using Nvivo.

Figure 7

Profession



Note: Most of the respondents were not working (83%), 7% were doing business, and 10% were working for others. Source: Author(s) analysis using Nvivo.

General themes

In the interview, we proposed four main themes: 1) Needs, 2) Behavioural Intention 3) Facilitating Conditions and 4) Confirmed Usefulness. Each participant was given a question and was asked to reflect on their personal experiences.

Theme 1: Needs

The following question was asked to respondents to understand their need for digital tools and services in their daily lives

Do you need any digital / computer / technology to perform certain tasks in your daily life? If no, why? If yes, how will this be helpful to you?

All respondents said YES to the need for digital tools in their daily tasks and activities. Devices mostly used were smartphones, laptops, and iPads. The participants used these devices for the following purposes:

- a. Communication – friends, family, colleagues, and old friends
- b. Online Activities – shopping, banking, taxi, social media, video calls and health
- c. Information Seeking – search for information and international news

Table 5 shows snapshot the details on the respondents' purpose in using device(s) and device(s) used.

Table 5

Summary of Respondents' Feedback

Respondents	Purpose	Device
Elderly 1	Teaching, Knowledge Sharing, Online shopping	Smartphone, laptop
Elderly 2	Zoom meeting, watch YouTube	Smartphone, laptop
Elderly 3	Connect with friends, read news	Smartphone
Elderly 4	Socialising with friends	Smartphone
Elderly 5	Socialising with friends, online shopping	Smartphone, laptop
Elderly 6	Connect with friends, read news	Smartphone, laptop
Elderly 7	Teaching, Knowledge Sharing, Online shopping	Smartphone, laptop
Elderly 8	Teaching, Knowledge Sharing, Online shopping	Smartphone, laptop
Elderly 9	Watch news	Smartphone
Elderly 10	Socialising with friends	Smartphone

Themes	Subtheme	Counts	Selected Verbatim	Inference(s)
			<i>meetings. I participated in club activities. We met online through Zoom.” Elderly 14</i>	
	online	19	<i>“I am currently using smartphone for daily use. I use it for banking. This is easy because now I can purchase things online, pay bills online. That’s very convenient for me.” Elderly 22</i>	Online activities are conveniently conducted through the digital use.
	currently	14	<i>“Yes, I think internet and phone is very essential to me. I am currently using smartphone and laptop. I use Zoom for meetings and watch videos. I use YouTube to watch international programmes, like spiritual programmes, you see. But I use smartphones more than my laptop. For my phone, I use WhatsApp the most. I like to connect with my friends, there are a lot of groups in my WhatsApp. Families, friends, ex-teachers....” Elderly 2</i>	Social media applications are accessible easily to perform current tasks and communicate with people.
	ideas	8	<i>“I am currently using smartphone for teaching my students. I also use smartphone for sharing of ideas, bring ideas to discuss with others.” Elderly 15</i>	Digital tool supports the need to share ideas.
	business	8	<i>“I use smartphone mainly to communicate with my family members and friends. At this age, using smartphone is enough for me. I</i>	Digital tool supports the need to do business.

Themes	Subtheme	Counts	Selected Verbatim	Inference(s)
			<i>think that's why people call it smartphone because it is small but can do it all. I can make appointments, read news, call friends, and do business."</i> Elderly 12	
	Information, connect	4	<i>"I'm using Facebook to network with my friends. For example, this meeting is good for all of us to network after retirement. We get some updates about the meeting and some pictures from the Facebook. Sometimes, when I want to look for some information, I can also search information from this apps. You know like information like hobbies. I love to read, so I found some Facebook group about books and booklovers, and I look for books that were discussed in the forums."</i> Elderly 13	Digital tools support the need to connect with friends after retirement. Digital tools support the need to seek information.

Source: Author(s) analysis using Nvivo

The sentiment analysis revealed that a majority of the elderly were feeling moderately positive about the need for digital tools (n=13) and very positive (n=3). Surprisingly, one elderly respondent had a moderately negative sentiment towards the need for digital tools. The following is an excerpt of the statement:

"I think internet is somehow, crazy. Like, we need more. Like we are addicted to more. I think others also feel the same. There are some disadvantages of it maybe I don't say now." Elderly 1. Based on this table, the final inferences that could be made were as follows:

- a. A smartphone is seen as an important tool to serve daily needs.
- b. Online activities are conveniently conducted through digital use.
- c. Social media applications are accessible, making it easy to perform current tasks and communicate with people.
- d. Digital tools support the need to share ideas.

- e. Digital tools support the need to do business.
- f. Digital tools support the need to connect with friends after retirement.
- g. Digital tools support the need to seek information.

We could conclude that respondents related the sub-themes of smartphones, online activities, current tasks, ideas, businesses, connections, and information. Digital tools clearly supported the needs of the elderly in fulfilling daily tasks. We confirmed that our proposition for theme 1 was supported as follows:

Proposition 1: Needs
Needs are among the main elements that influence actual use. When the need arises, elderly people will be inclined to use the digital tools.

Theme 2: Behaviour Intention

The following question was asked to respondents to understand the needs of digital tools and services for their daily life.

Describe a situation when you intend to use digital tools or apps to perform your tasks.

The respondents mostly quoted the following situations when they intended to use digital tools or apps to perform their tasks:

- a. Communication – WhatsApp, Instagram and video calls to family, old friends and relatives
- b. Social Media – Facebook, YouTube, and websites
- c. Travel – Information and Grab services
- d. Health – watch sports, health information and sensors
- e. Religious – videos, radio, and information
- f. Online Shopping – Lazada and Shopee
- g. Knowledge Sharing – with friends and reading other information

We performed a sentiment analysis for the needs, and the result is as shown below:

Table 7

Sentiment Analysis for Behavioural Intention

A: Very Negative	B: Moderately Negative	C: Moderately Positive	D: Very Positive
0	0	15	5

The sentiment analysis showed that majority of the elderly were feeling moderately positive about the intention to use digital tools (n=15) and very positive (n=5). The following are excerpts of the statements:

Sentiment	Sample Excerpts from Interview
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Moderately Positive	<i>"I use it for communication. For example, Google Meet, I find it easy to use. Meetings can be easily done via Zoom or Google Meet nowadays. Due to COVID-19 and MCO, we must change ways of working. New ways of working and communication now. I think it all went well." Elderly 8</i>
Very Positive	<i>"Smartphone is very useful especially when getting out outside home. Traveling is so much easier with technology. Inside this phone, I installed Grab. I know I can call a cab using Grab and that is very convenient for me. Now I don't have to drive or get my husband to fetch me anymore." Elderly 14</i>

Source: Author(s) analysis using Nvivo

Figure 8

Themes for Behavioural Intention

In this diagram, word frequency analysis showed the following word cloud and themes accordingly.

			<i>the forums.” Elderly 12</i>	
	communication	11	<i>“I use it for communication. I connect and chat with my friends. I say hello to my grandchildren, using the video call function. It is so much easier now. I can just dial and have a conversation with them.” Elderly 10</i>	The Elderly intends to use digital tools to communicate with family, friends, and grandchildren.
	WhatsApp	9	<i>“I use smartphone to communicate. I use WhatsApp mostly. WhatsApp is for call and videocalls and most of the time for messages too.” Elderly 23</i>	The Elderly intends to use digital tools for WhatsApp functions such as call, video call and messages.
	Video	8	<i>“When I want to look for new recipes to try, I search recipe in YouTube. What is good in YouTube you have plenty of recipes to choose from. You can select the long video, short video or any recipes that is suitable for you.” Elderly 28</i>	The Elderly intends to use digital tools to watch online videos such as cooking videos from YouTube.
	Google	6	<i>“Specific situation like looking for direction using maps. I use several applications. For example, there are times I use Google Maps and there are times I use Waze. These applications are very convenient for us especially for traveling. It saves time and energy. We can also plan to arrive at our destination” Elderly 16</i>	The Elderly’s intends to use digital use such as Google Map for travelling purposes.

Source: Author (s) analysis using Nvivo

Behavioural Intention was strongly supported by the feedback from respondents, as shown in the table above. The final inferences for the theme behavioural intentions are:

- a. The elderly intends to use Facebook to perform tasks such as seeking information, connecting to friends, and joining special interest groups.
- b. The elderly intends to use digital tools to communicate with family, friends, and grandchildren.
- c. The elderly intends to use digital tools for WhatsApp functions such as calls, video calls and messages.
- d. The elderly intends to use digital tools to watch online videos such as cooking videos from YouTube.
- e. The elderly intends to use digital tools such as Google Map for travelling purposes.

We could conclude that the respondents related the sub-themes of Facebook, communication, WhatsApp, videos, and Google to behavioural intention. The elderly had a positive intention to use digital tools for various situations in life. We confirmed that our proposition for theme 2 was supported as follows:

Proposition 2: Behavioural Intention
 Behavioural intention is one of the main elements to influence actual use. When the intention to use increases, the elderly will be inclined to use the digital tools.

Theme 3: Facilitating Condition

The following question was asked to respondents to understand the facilitative conditions to use digital tools and services for their daily lives.

Do you believe that you have access to relevant facilities to perform the tasks using digital / computer / technology tools?

The respondents mostly cited the following facilities to perform the tasks using digital tools, as they were available 24/7:

- a. Devices – Smartphone, iPad, and laptop
- b. Internet Connection – Mobile data and Wi-Fi at home

Figure 9

Themes for Facilitating Conditions

In this diagram, word frequency analysis showed the following word cloud and themes accordingly.



Source: Author(s) analysis using Nvivo

The above word cloud showed that the key themes narrated were related to facilitating conditions. The following table provides the details:

Table 10:

Facilitating Conditions Themes

Themes	Subtheme	Counts	Selected Verbatim	Inferences
Facilitating Conditions	Internet	23	<i>“Yes, I do. I have adequate internet connection at home. So far it works for me. My family all use Internet, and we find it enough.” Elderly 10</i>	Elderly has adequate facilitating conditions to use digital tools with Internet connections.
	enough	21	<i>“Yes, I believe I do have access to Internet. Enough data for me. I only install important apps in my phone. This app helps me to perform my daily task. There is so limitation to the apps, but I still use this frequently.” Elderly 1</i>	Elderly believes that there is enough facilitating conditions to use digital tools.
	smartphone	12	<i>“Yes, I bought a smartphone and data plan. These two things are enough for me. Sometimes, if I need to use more, I will use laptop to</i>	Elderly believes that the smartphone provides sufficient facilitating conditions to perform tasks.

			<i>look for information. But most of the time, smartphone is enough.” Elderly 19</i>	
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Source: Author(s) analysis using Nvivo

Facilitating conditions was strongly supported by the feedback from respondents, as shown in the table above. The final inferences for the theme facilitating conditions are:

- a. The elderly has adequate facilitating conditions to use digital tools with Internet connection.
- b. The elderly believes that facilitating conditions to use digital tools are enough.
- c. The elderly believes that a smartphone provides sufficient facilitating conditions to perform tasks.

We could conclude that respondents related the sub-themes of Internet, sufficiency, and smartphones to facilitating conditions. The elderly evidently had sufficient facilitating conditions to use digital tools for various situations in life. We confirmed that our proposition for theme 3 was supported as follows:

Proposition 3: Facilitating Conditions
 Facilitating conditions is one of the main elements that influence actual use. When the availability of facilitating conditions is sufficient, elderly people will be inclined to use digital tools.

Theme 4: Confirmed Usefulness

The following question was asked to respondents to understand confirmed usefulness in using digital tools and services in their daily lives.

Share your experiences on using certain technologies/devices.

The respondents mostly cited the confirmed usefulness of digital tools and services as follows:

- a. Communication – WhatsApp, Instagram, and video calls to family, old friends, and relatives
- b. Social Media – Facebook, YouTube, and websites
- c. Travel – Information and Grab services
- d. Health – watch sports, health information and sensors
- e. Religious – videos, radio, and information
- f. Online Shopping – Lazada and Shopee
- g. Knowledge Sharing – with friends and reading other information

Figure 10

Themes for Confirmed Usefulness

			<i>long time learning and figuring out how to use a desktop. Now it is so easy, we don't even need desktop now. Just smartphone does everything." Elderly 10</i>	
	Exercise	12	<i>"I also use apps for exercise. Sometimes I watch tips in YouTube but when I want to try to do it myself, health apps are better. It gives you notification about your health, what type of exercise you can do for your age. Some YouTube channel like Yoga is very good. You can do exercise at home while watching them from laptop as well." Elderly 14</i>	Elderly believes that the digital tools and applications such as exercise apps is useful based on their experience.
	Health	11	<i>"Smartwatch is very useful for me. Mainly I use it for health reasons. But smartwatch also helps me to track calls. I can check incoming messages and calls just by looking at my watch. Other than that, I use it as a health tracking device. I can check my blood pressure, heart rate, and monitor my body. This is important for my age."</i>	Elderly believes that the digital tools and applications such as health tools are useful based on their experience.

Source: Author (s) analysis using Nvivo

Confirmed usefulness was strongly supported by the feedback from respondents, as shown in the table above. The final inferences for the theme confirmed usefulness were:

- a. The elderly believes that the digital tools and applications such as YouTube are useful based on their experience.

Table 11:

Actual Digital Use

Respondent	Perception towards benefit of Digital tools usage			
	Less than 50%	50%-60%	70% - 80%	90%-100%
Elderly 1		x		
Elderly 2			x	
Elderly 3	x			
Elderly 4			x	
Elderly 5			x	
Elderly 6			x	
Elderly 7				x
Elderly 8				x
Elderly 9				x
Elderly 10				x
Elderly 11				x
Elderly 12			x	
Elderly 13			x	
Elderly 14				x
Elderly 15		x		
Elderly 16				
Elderly 17			x	
Elderly 18			x	
Elderly 19		x		
Elderly 20			x	
Elderly 21			x	
Elderly 22			x	
Elderly 23			x	
Elderly 24		x		
Elderly 25			x	
Elderly 26			x	
Elderly 27			x	
Elderly 28			x	
Elderly 29			x	
Elderly 30			x	
Total	1	4	19	6
Percentage	3%	13%	64%	20%

Source: Author(s) analysis using Nvivo

The plotting shows that majority of the elderly (64%) agreed that the digital tools were useful, were being used, and benefitted them in their daily lives. In addition, 20% of the elderly felt that the tools were extremely important, and 13% felt that they were somehow important and there might be some disadvantages if the elderly got addicted to them. One respondent felt that digital use had more disadvantages than benefits for the elderly. We further analysed the reason given for each of the category, as presented in Table 12.

Table 12:

Perceptions towards Digital Use

Categories	% of Respondents	Sample Excerpts
Less than 50%	3%	<p><i>“Contrary to others, I dislike technology. I might belong to the unpopular opinion but strongly think that I don’t like technology. Nevertheless, it does bring comfort to our social life and even for work. It does bring impact for most people.</i></p> <p><i>I think many ways, it is also a hassle. You need to memorise password for internet banking for example. When you have all your money in the bank and everything is online, you cannot see where your money is!</i></p> <p><i>I would say, like 35%. 35 is good and the others are not good.” Elderly 3</i></p>
50-60%	13%	<p><i>“There are advantages and disadvantages, you see. I rate 50%. Good and no good is the same. What I don’t like is that I am slowly getting addicted to it. I used to read a lot. Now I feel I am not reading enough. Reading from the internet does not gives you the same benefit as reading books. Books enriches you. Reading from the internet is just quick satisfaction. If I want to read books, I must spend less time using the phone. I must discipline myself.” Elderly 1</i></p> <p><i>“60% I must say. Internet and digital is good for senior citizens. But the truth is, our senior citizens are still backward. Situation like this requires government support. Maybe government can create more awareness, programmes for senior citizens. Programmes that can help to encourage them to learn more about becoming digital citizens.” Elderly 19</i></p>
70-80%		<p><i>“There are advantages and disadvantages, you see. I give 80%. This is because almost everybody at home need to use it. We use for leisure. In the future, digital is more important because it is already part of life, social and working.” Elderly 11</i></p>

		<p><i>“I give 70%. In the future, digital is more important because it is already part of life, social and working. But I also worried about young people using the technology. They might interpret things differently from us. For very young people, they need to be supervised. Even for old people like me, I must discipline myself too. Otherwise, I will spend the whole day playing with my phone!” Elderly 14</i></p>
<p>90-100%</p>		<p><i>“I give 90% because I am dependent on them. We need it because ageing people can find it convenient for a lot of things. Easy to use, that’s for sure. Sometimes, too easy! You end up spending more time with your phone.” Elderly 7</i></p> <p><i>“I give 90/10. I believe technology and digital is essential for all. Old people need it. Younger people also need it. They might need it more than us. But this also helps for our wellbeing. We feel less stressful because we can still find out what is going on even though we no longer work. Smartphone needs time to get used to. Not difficult, easy to use. Computer is a lot harder.” Elderly 8</i></p> <p><i>“I give 90/10. I believe technology and digital is essential for all. I agree too much make me crazy about it. That is why we need balance. Don’t use too much, use for what is most important for you.” Elderly 9</i></p>

Source: Author (s) analysis using Nvivo

We could conclude that respondents generally felt that actual digital use was extensive and provided advantage to the elderly.

b) The policy makers

During the interview session with the policymakers, we asked several questions related to digital inclusion, policy implementation challenges, specific programmes and policies on digital inclusion for the elderly and the way forward for digital inclusion in Malaysia. The ministries and agencies that participated in this interview were from The Ministry of Women, Family and Community Development, The Ministry of Science, Technology and Innovation and The Ministry of Communications and Multimedia. The important points are summarised in Table 13.

Table 13:

Interviews with the policy makers

Themes	Selected Verbatim	Inferences
Digital inclusion	<p><i>“Digital inclusion is all about inclusivity. When we deal with internet issues, it is about connection and penetration. Nowadays, we need to move forward past that. So digital inclusion is about getting everyone the same opportunity to use internet and other forms of technology so that they can use it for daily life.” Personnel 1</i></p>	<p>The policy maker believes that internet connection and society participation are basic issues for digital inclusion.</p>
	<p><i>“Everybody can be digitally literate. This covers all levels of society including the underprivileged groups and low income. The government need to play an active role in this but to ensure other parties like telecommunications provider, network provider, private sector can contribute to this part. We need to educate the society and certainly, it is not just government led but partnered with many other players as well.” Personnel 2</i></p>	<p>The policy maker believes that digital literacy is considered new skills and the development of skills is a shared responsibility.</p>
	<p><i>“We want to embrace digital inclusion but there is still a long way to go. I want to be positive about this. When I said inclusion, we need to also tackle internet connection issues in some areas. We want to move to 5G connectivity but there are a lot more places who does not have enough 4G coverage. We have to tackle the connectivity issue with the network provider first then continue to educate people about digital life, skills and competencies.” Personnel 3</i></p>	<p>The policy maker believes that while providing digital infrastructure is their responsibility, however, the people must make an effort to equip themselves with the digital skills.</p>
Digital policy challenges	<p><i>“For tech start-ups for example, we provide grants and regulations for them. We have to monitor them to ensure that those grants were utilised wisely. It is also still in the first phase of implementation; we are talking about policy that extends till 2030. I can’t comment about any success stories yet. What I can say is that we do identify talents for Science and Technology industry and certainly we support their endeavour.” Personnel 3</i></p>	<p>The policy maker believes providing support and the ecosystem in the initial stage is important.</p>
	<p><i>“We have a lot of projects with other ministries, so it includes a lot of collaboration. It is always challenging to work across ministries in a joint</i></p>	<p>The policy maker believes collaboration is required but there are issues when working with many parties.</p>

	<p><i>project and the reporting issues might come up. We do not work with the public directly so it is unfair to talk about this in detail. The bottom line is, we make policy for all and everybody is accountable for this.”</i> Personnel 4</p>	
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Source: Author (s) analysis using Nvivo

b) The caregivers and volunteers

During the interview session with the caregivers, we discussed their struggles in running the centre and creating digital programmes for the elderly. The issues are summarised in Table 13.

Table 14:

Sample excerpts for running programmes for the elderly

Issues	Category	Sample Excerpts
Lack basic digital infrastructure and financial constraints	Caregiver	<i>“I have to say the infrastructure. When I first look for the space, I could only find this building with a very bad condition. The major renovation took place was merely to provide basic infrastructure. To this day, we still did not have computers and certain peripherals like projector to support our programmes due to lack of funding. We depend a lot on donation and contributions from the community”. Caregiver 1</i>
	Volunteer	<i>“Assistance can begin with partnership. This place cannot run solely on voluntary basis. We need active players from the industry, or maybe we can set up digital centres here so that they could access digital information at a safe place even when they cannot afford to own a digital device. I think the technology must also be made affordable to the seniors, for example low-budget smartphones for low-income group” Volunteer 2</i>

Source: Author(s) analysis using Nvivo

Conclusion

The conversation with the respondents reveals that actual digital use is influenced by needs, behavioural intention, confirmed usefulness and facilitating conditions. The following are excerpts from the interview, which depict how digital tools and applications can play an important role in the elderly’s life towards making changes in their family, social interaction, economical activities and well-being.

“Technology is important. I feel technology and digital is useful. We cannot live with it. But we must know how to cope with it. Too much of it is also not good. Addiction makes people also lazy.” Elderly 1

“I love using Facebook. It helps me to connect with my friends and families but also established long lost friends. I use Facebook to see photos, wish Happy birthdays. I think the use of technology and phones brings comfort for life. It is also useful because it creates impact on someone’s life.” Elderly 2

“Like I said, it creates impact on most people’s life. You cannot live without technology. You can go crazy with technology. So, we need to create balance when it comes to digital use. You must have certain limits.” Elderly 3

“Technology helps use to move forward. Of course, a lot of changes are happening now. Older people might need to learn more from the younger ones. They usually come with instructions. There is a possibility of too much dependency, but I believe it makes life easier.” Elderly 10

“I think what is obvious was when we rely on digital tools for communication. There will be less face-to-face interactions ... it is true but that’s the reality we need to embrace. Communication will never be the same anymore, and so does how people interact with each other.” Elderly 11

In addition, the digital ecosystem can be provided collaboratively in partnerships. For example:

“Digital skills for seniors is a must, it is not a new policy that we need but programmes targeted directly to them. This could be a joint project between government, NGO and community in order to make it work. The age where government knows everything is over. Everybody should play an active role in society and community building these days.” Caregiver 2

“Collaboration with various parties is important. We need to design specific training for the elderly, it begins from basic digital literacy, intermediate and advances courses, if possible. The elderly also need to be guided, the family members teach them and the community collectively organised such programmes for them.” Volunteer 1

5.2 Quantitative Data

In parallel, as suggested earlier, quantitative data collection through sample survey questionnaire was administered for the elderly. The findings of the survey probes are as follows:

5.2.1 Survey Reliability

Before proceeding to explore the demographics and digital elements of the lifestyle of old folks, the study ensured the validity of the study using a reliability scale measured by Cronbach’s indicators, as depicted in Table 1. All the methodological procedures, namely, Alpha, Alpha Split, Parallel and Guttman indicators, revealed high-scale reliability, that is, nothing less than 0.812, thus, indicating that the respondents did not vary very much in understanding the 49 variables covered in the study.

Table 15:*Reliability Scale Measures*

Reliability Procedure	Cronbach's Alpha	Number of items	Means	Variance	Minimum	Maximum	Range	CV %
Alpha Method	0.939	49	2.301	0.157	1.287	2.872	1.585	17.2
Alpha Split Half 1	0.825	25	2.188	0.252	1.287	2.872	1.585	23.0
Alpha Split Half 2	0.945	24	2.420	0.035	2.138	2.702	0.564	7.8
Parallel Method	0.939	49	2.301	0.157	1.287	2.872	1.585	17.2
Guttman Method	0.920	25	2.188	0.252	2.138	2.702	0.564	23.8

Source: Author(s) analysis using SPSS

5.2.2 Demography characteristics

This study revealed that 62.4% were males, 80.4% were above 75 years, and 40.7% were Malays in comparison with 24.2% and 33.5% Chinese and Indians, respectively. Further probing showed that 54.1% were living with a partner, and 20.6% were with their children or relatives. Hence, many of them were not living alone, which was imperative for obtaining physical support and social support, including digital support. As anticipated, 70.8% were currently not working, which meant that they were pensionable retirees or living on their lifetime savings. In addition, a small number were inferred to be in a living arrangement that was dependent on their children or institutions. Interestingly, 60.0% of the respondents received tertiary education with at least diploma level. Among the working individuals, 15.3% were still under full-time employment and were probably young seniors; 11.2% were freelancers, thus putting their acquired skills, knowledge, experiences and exposures acquired over their past working years to good use. Moreover, 18.2% were still economically sufficient as they were doing their own businesses. Despite the on-going digital pressure, the study discovered that 35.6% of the aged population have yet to embrace basic ICT tools such as mobile phones. Conjecturally, they might be in the older senior category, who generally lacked knowledge, motivation, or adequate literacy to partake in modern lifestyle. Premising upon this conjecture, 74.2% lacked either new digital experiences or knowledge.

Besides dwelling on the basic demographic characteristics, the study also recorded representative measures of 40 variables that aimed at gauging the digital experiences, exposures and aspirations of the aged population. The detailed results by variables are shown in Table 16. A scrutiny of the results revealed that for all the variables except training and information awareness by the government, special digital package and instructions from industry service providers, community-based training and motivational or participative endeavours, the respondents reflected on positivity by agreeing or by indicating 'most likely' in the survey probes, propositions and aspirations, as per the postulated conceptual framework. The survey results signalled that so far, the digital experiences of users belonging to the aged population have their own affinity, liking or preferences and have limited motivations from government endeavours.

Table 16

Gender	Frequency	%
Male	261	62.4
Female	157	37.6
Total	418	100
Age group	Frequency	%
60-64	183	43.8
64-74	153	36.6
75-84	82	19.6
Total	418	100
Ethnicity	Frequency	%
Malay	170	40.7
Chinese	101	24.2
Indian	140	33.5
Sabahan	6	1.4
Sarawakian	1	0.2
Total	418	100
Living arrangement	Frequency	%
Living with partner	226	54.1
Living with children/relatives	86	20.6
Living in shelter home	2	0.5
Living alone	104	24.9
Total	418	100

Frequency distribution by key demography variables

Source: Author(s) analysis using SPSS

To understand the inner dynamics of the study, probes explored the representative measures in terms of key parameters as depicted in the conceptual framework. Needs, digital behaviour, facilitating conditions, perceived usefulness, digital use, digital strategies, digital benefits, digital challenges, and inclusion effects are shown, as summarised in Table 16. The table shows that all parameters except for digital strategies, digital challenges and inclusion effect secured scores well above 2.5 out of a Likert scale measurement of 3. Again, the inclusion effect elements pertaining to digital strategies and challenges scores were lower than 2. This value was attributed to the complexities of bureaucratic factors, as reflected in detailed probes by variables and some indications gathered from expert interviews and group forums. The inadequacy of public policies, information gaps and lack of faith in digital experiences can create better products and services; however, technological pressure, elements of privacy and time-consuming learning abilities are pertinent inhibiting examples, to name a few.

Table 17

Representative measures of major parameter by selected demography variables

Variables	Measure	Needs	Digital behaviour	Facilitating conditions	Perceived usefulness	Digital use	Digital strategies	Digital challenges	Inclusion effect
Male N= (260)	Mean	2.7031	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.3864	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	14.3	19.1	16.6	16.3	13.7	31.1	13.4	19.4
Female	Mean	2.6459	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099

N= (260)	SD	0.4313	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	16.3	19.1	16.6	16.3	13.7	31.1	13.4	18.9
Malay N= (260)	Mean	2.6675	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.4318	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	16.2	19.1	16.6	16.3	13.7	31.1	13.4	18.9
Chinese N= (260)	Mean	2.7465	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.2381	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	8.7	19.1	16.6	16.3	13.7	31.1	13.4	9.9
Indian N= (260)	Mean	2.6714	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.4527	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	16.9	19.1	16.6	16.3	13.7	31.1	13.4	18.1
School N= (260)	Mean	2.5713	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.4949	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	19.2	26.2	18.6	18.6	17.9	27.3	13.4	18.1
Diploma N= (260)	Mean	2.7655	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.2966	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	10.7	19.1	16.6	16.3	13.7	31.1	13.4	18.3
Degree N= (260)	Mean	2.7362	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.3801	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	13.9	13.7	16.2	20.4	13.8	21.3	32.4	13.4
Masters N= (260)	Mean	2.7640	2.5423	2.5000	2.6102	2.5865	1.9253	1.750	2.099
	SD	0.2761	0.4861	0.4139	0.4263	0.3537	0.5980	0.352	2.116
	CV (%)	10.0	10.5	17.7	15.5	9.9	31.1	16.9	11.6

Note: Representative Measures: Mean, Standard Deviations and Coefficient of Variations.
Source: Author(s) analysis using SPSS.

5.2.3 Equality of Means analysis

The coefficient measures (CV), that is, the mean divided by standard deviation expressed in terms of percentage, provided some indications of how the responses vary among gender and ethnicity parameters, as shown in Appendix II and Appendix III. Towards understanding where the response areas were, the survey participants differed significantly in the analysis of equality means for the gender, ethnicity, age group and education status. The results are shown in Appendix IV. In determining the variables, the test procedure ensured the equality of variances by Levene test, and the level of significance was ensured. The confidence level limits were within positive values. As can be seen in the results, the respondents differed in digital experiences and exposures significantly under 26 aspects of probe or variables with regard to ethnicity, followed by 12 areas under education, 8 areas under age group and 4 areas under gender. Hence, ethnicity and education status played a significant role in reinventing the elderly population in embracing the digital phenomena.

5.2.4 Factor Analysis

Factor reduction framework

Factor analysis is an interdependence technique whose primary purpose is to define and cull out the underlying structure among the interrelated variables considered in the probe or as per the conceptual framework that depicts the digital phenomena of aged population (Hair et al., 1987). Premising upon this conceptual thinking, the research exercise was poised to reduce the 40 variables pertaining to needs, digital behaviour, facilitating conditions, perceived usefulness, digital use, digital strategies, digital benefits, digital challenges, and inclusion effects into a few key determinants that can greatly help in understanding the digital experiences of an ageing population.

In other words, the reduced number of factors would provide a precise understanding of the phenomena or underlying dimensions being investigated, provided that the variables considered were comprehensively adequate, non-overlapping, interrelated, and subject to quality data collection processes and procedures. The unit of analysis considered were the variables that could give rise to a correlation matrix, which as was the basic requirement of R factor analysis. Moreover, the exercise was aimed at not only summarising the data on understanding the underlying dimensions based on a much smaller number of concepts than the original individual variables but also deriving empirical values or factor scores for each dimension. Thus, towards creating an entirely new set of variables in a much smaller number, the data summarisation procedure identified the contributions of each variable to the factors or loadings. A sample size of 418 respondents and 40 variables was deemed adequate in undertaking the factor analysis procedure, as the literature recommended 50 observations and 30 variables, as well as 5 observations per variable.

As mentioned earlier, the correlation matrix is critical for ensuring the appropriateness of factor analysis. The recommended criterion is that a significant number of correlations must be greater than 0.30, which can be determined through a visual inspection procedure. In addition, Bartlett's test of sphericity is used for assessing the statistical significance of the validity of the correlation matrix, and a sample size of 400 is considered to provide increased sensitivity. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is a statistic that indicates the proportion of variance in variables that may be caused by underlying factors. High values (close to 1.0) generally indicate that factor analysis may be useful with the data being investigated. If the value is less than 0.50, the results of the factor analysis probably will not be very useful. Bartlett's test of sphericity examines the hypothesis that the correlation matrix is an identity matrix, which will indicate that the variables are unrelated and therefore unsuitable for structure detection. Small values (less than 0.05) of the significance level indicate that factor analysis may be useful with the data.

The other criterion that warrants pertinent attention in factor analysis is the measure of common variance or communality, which provides an estimate of shared or common variance among the variables represented by the inherently derived factors. When a variable is correlated with another variable, it shares variance with the other variable, and the amount of sharing between the two variables is simply the squared correlation.

Of the two methods recommended for portioning the variance of the variable, the exercise explored component factor analysis over common factor analysis. The rationale for this consideration was the principal component analyses the total variance and derives factors that contain small proportions of unique variance or error variance. Moreover, component factor analysis is recommended when data reduction is a

primary concern. In comparison, the common factor analysis is to identify the latent dimensions or constructs. In addition, maximum likelihood methodology that iteratively improves parameter estimates to minimise a specific fit function also warranted due attention.

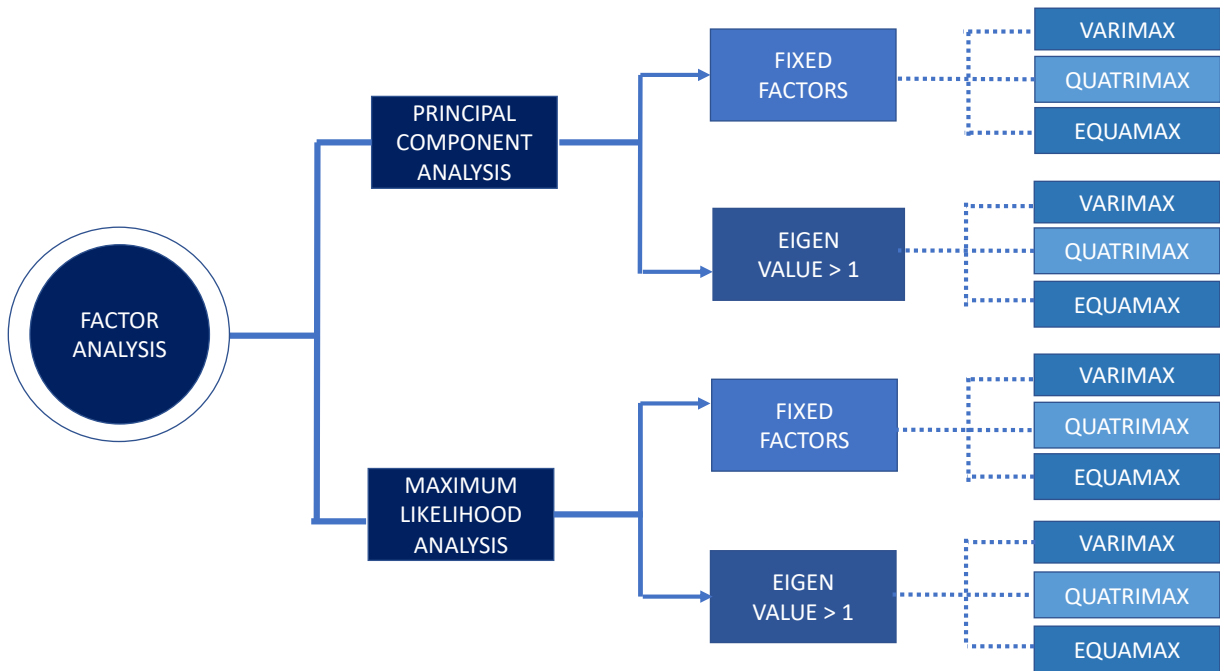
The number of factors to be selected was determined arbitrarily by fixing the number of factors or through an eigenvalue greater than 1. In this procedure, the system determines the possible number of factors. Eigenvalue is a ratio of between-group sums of squares to within-group sums of squares. Thus, a larger eigenvalue indicates that the maximum likelihood (discriminant function) of function values is more useful in distinguishing between groups or factors on the effectiveness of the factor (discriminant) analysis.

Factor rotation is a process of manipulating or adjusting the factors' axes to achieve a simpler and pragmatically more meaningful solution. Three types of factor rotation are considered in the factor analysis procedure, namely, VARIMAX, QUARTIMAX and EQUIMAX. In VARIMAX, the orthogonal rotation procedure is the method that focuses on simplifying the columns of a factor matrix. QUARTIMAX is also orthogonal rotation procedure that simplifies columns of a factor matrix but is less effective than VARIMAX. EQUIMAX is another orthogonal rotation procedure, which is a 'compromise' between VARIMAX and QUARTIMAX.

Acknowledging the various methodological concerns and procedural nuances pertaining to the study objectives of summarising data or data reduction, variable selection, study design, variance explanation, rotation procedures and factor or component criteria, this research exercise considered various options, as recommended in the SPSS package and outlined in the Factor Analysis Framework in Figure 12.

Figure 12

Factor Analysis Framework



Source: Adapted from Hair et al. (1987)

Bartlett's test of sphericity

Before proceeding with factor determination, the exercise carried out the Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett’s test of sphericity, and the analysis of variance explained the procedures. Both the Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett’s test of sphericity of 0.886 revealed that the correlation matrix had significant correlations, as depicted in Table 18 below. The statistical validity was confirmed for further analyses.

Table 18

KMO and Bartlett Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.886
Bartlett’s Test of Sphericity	Approx. Chi-Square	12116.399
	Degree of Freedom	780
	Significance level at 0.05 level	.000

Source: Adapted from Hair et al. (1987)

Table 19 and Table 20 provide the components of variance explained under Principal Component Analysis and Maximum Likelihood Analysis by considering both fixed factors and eigenvalue greater than 1 for each orthogonal rotation procedure. Close scrutiny of the results showed that the amount of variance shared among the fixed factors of 5 or eigenvalue factors of 8 VARIMAX was well distributed across the implicit latent factors.

Table 19

Principal Component Analysis Results

PRINCIPAL COMPONENT ANALYSIS						
Fixed Five Factors under Principal Component Analysis	VARIMAX		QUATRIMAX		EQUIMAX	
	Total	% of Variance	Total	% of Variance	Total	% of Variance
1	7.11	17.79	10.04	25.11	6.02	15.05
2	5.01	12.53	5.24	13.09	5.04	12.59
3	4.69	11.72	3.62	9.04	5.02	12.56
4	4.62	11.56	2.82	7.05	4.72	11.79
5	2.78	6.95	2.50	6.25	3.42	8.55

Source: Author(s) analysis using SPSS

Table 20

Maximum Likelihood Analysis Results

MAXIMUM LIKELIHOOD ANALYSIS						
Fixed Five Factors under Maximum Likelihood Analysis	VARIMAX		QUATRIMAX		EQUIMAX	
	Total	% of Variance	Total	% of Variance	Total	% of Variance
1	5.770	14.425	10.253	25.633	4.951	12.377
2	5.187	12.967	5.647	14.118	4.744	11.860
3	4.510	11.275	2.482	6.205	4.665	11.662
4	4.177	10.441	1.903	4.758	4.309	10.772
5	2.138	5.345	1.496	3.740	3.113	7.783

Source: Author(s) analysis using SPSS

Table 21

Total Variance Explained

Premising upon the variance-explained analysis, the factor determination was narrowed down to eigenvalue > 1 procedures under VARIMAX. Eight latent factors were discovered based on the correlation value equal to 0.5 and above, as shown in Table 21.

PRINCIPAL COMPONENT ANALYSIS						
Eigenvalue >1 under Principal Component Analysis	Rotation Sums of Squared Loading					
	VARIMAX		QUATRIMAX		EQUIMAX	
	Total	% of Variance	Total	% of Variance	Total	% of Variance
1	5.31	13.28	5.31	13.28	4.24	10.61
2	4.71	11.78	4.71	11.78	3.81	9.53
3	4.51	11.27	4.51	11.27	3.80	9.49
4	3.39	8.47	3.39	8.47	3.56	8.90
5	2.82	7.06	2.82	7.06	3.40	8.49
6	2.54	6.35	2.54	6.35	3.20	8.01
7	2.48	6.19	2.48	6.19	3.10	7.75
8	2.42	6.06	2.42	6.06	3.07	7.67

Note: Total Variance Explained: Eigen Value >1 . Source: Author(s) analysis using SPSS

Based on the procedure, the eight latent factors were discovered such as, the digital experiences, behaviours and aspiration were simplified as 1) Personal preference/Affinity, 2) Digital challenge, 3) Digital training, coaching and learning, 4) Digital relevance and imperatives, 5) Social relevance and imperatives, 6) Digital usage aspirations, 7) Peer pressure and digital savvy, and 8) Public policy concerns. These factors were illustrated in Figure 13.

Figure 13

8 Factors That Shaped Elderly Digital Participation



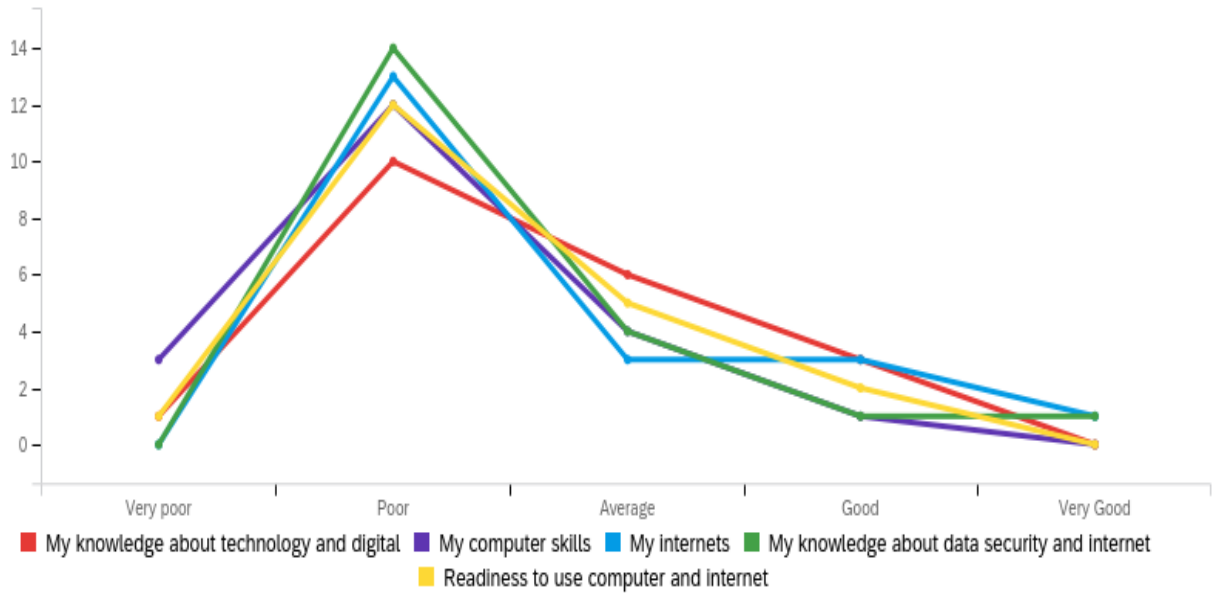
Note: Eight factors were categorised into the digital experiences, behaviours and aspiration.
 Source: Adapted from SPSS results

5.3 Pilot project

After collecting both qualitative and quantitative data, we organised a pilot project at PAWE Lembah Pantai, Kuala Lumpur. This session was conducted as an intervention approach to see how the elderly with little or very basic digital skills would react to technology. The session was led by a facilitator, and it began with a session about digital awareness, how to use features in mobile applications and group activities. A total of 15 participants attended the session. The pre-test results are shown in Figure 14.

Figure 14

Participants self-assessment before digital training session

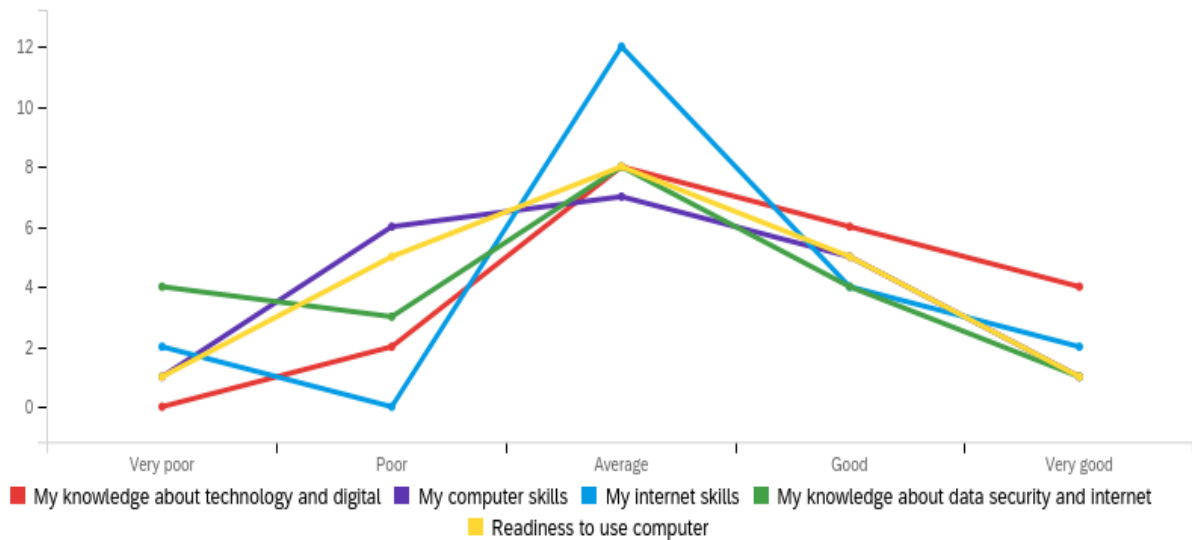


Source: Author(s) analysis using Qualtrics

Based on the graph shown, most participants rated their digital skills as low before the session. The questions examined their self-evaluation about digital and technology, computer skills, Internet skills and readiness to use the Internet. Subsequently, they were asked to rate themselves after the training was completed. The result is shown in Figure 15. In this graph, the participants rated themselves slightly higher, thus demonstrating that they were excited to learn new skills and would be interested to know more about digital skills.

Figure 15

Participants self-assessment after digital training session



Source: Author(s) analysis using Qualtrics

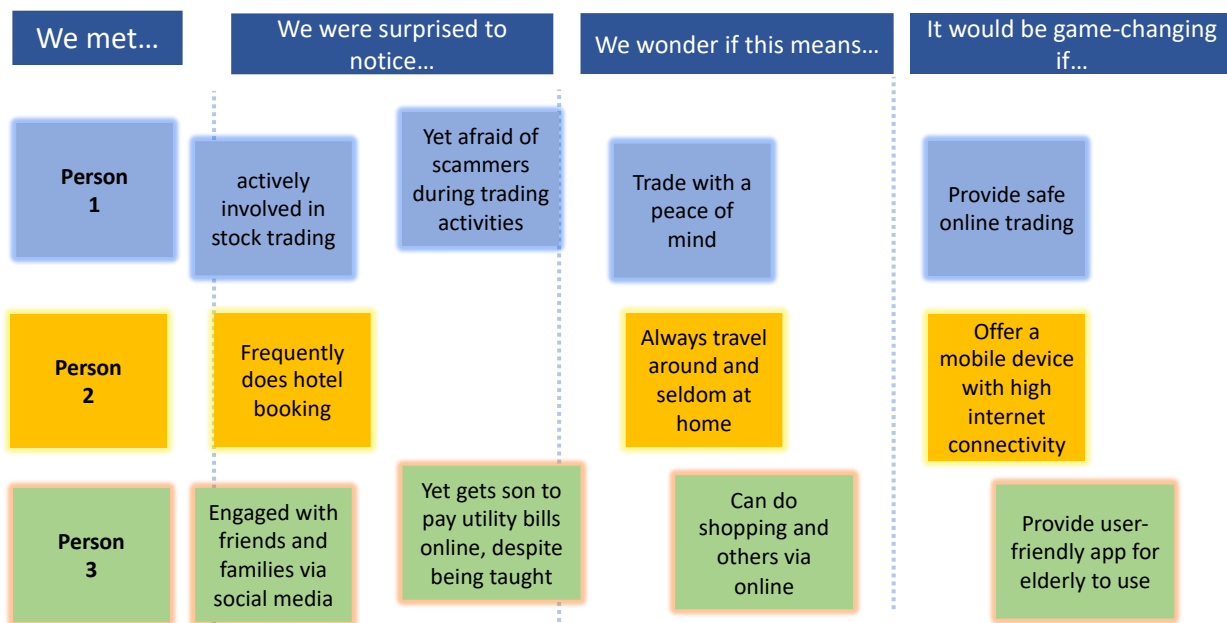
Based on this intervention, the elderly requires an environment that supports and promotes digital skills learning. More programmes should be designed for them in the future to help them become a knowledge-force population. On another note, this undertaking also promotes intergenerational learning in which the younger generation can teach seniors how to learn to use technology more effectively.

5.4 Industry intervention

In June 2022, a workshop was held with 10 telecommunication (Telco) industry experts to identify possible solutions for Making Elderly Independent and Connected (MEIC) via a Design Thinking process that proposed several possible initiatives. The full report can be read in Appendix VI. The Design Thinking process involved five stages: Empathy, Define, Ideate, Prototype and Test. The workshop, which consisted of Telco industry experts, aimed to obtain insights and ideas to leverage the infrastructure that was readily available to implement the proposed solution. They interviewed 10 elderly individuals to collect information about their challenges, pain points, surprising facts and tensions. Feedback was captured in a Jamboard, as presented in Figure 16.

Figure 16

Discovery about challenges, facts and tensions about digital participation among elderly



Source: Author (s) analysis using Jamboard

Based on the discussion, some of the options from the Telco experts are described here in three categories:

i. Social

- a. Create an applications hub that has already validated its security/authenticity
- b. Online community forum and motivation sessions for elderly with common interests
- c. Embedded tool in a website or application so that they can engage with anyone they trust to get things done
- d. Create an online senior smart hub that offers integrated IoT development through other developer partnerships for add-ons and expanded features: Translation, Healthcare, Shopping, Social and Open for developers. Both web and app based: web – for online features; app – online and offline features
- e. Companion robot that is driven by artificial intelligence (AI) and provides healthcare monitoring, emotional support, and safety monitoring, which is enabled through smart home and 5G connectivity: Companion inside and outside, capable of going outdoors and seamless integration with government and public services, i.e., public transportation, hospitals. Push notifications to alert users through voice assistance on medications, travel routes, weather, safety, real-time translation, and facial recognition. Driving assistance with autonomous driving capabilities
- f. Smart wearables/smart watches designed for the elderly and connected through 5G: Enables healthcare monitoring 24/7, panic button and AI to enable daily life assistance and reminders to senior citizens.
- g. Customised apps and user interface for portable wheelchair

ii. Economic

- a. Become an influencer –share tips, knowledge, and experience over social media such as TikTok

- b. Online seller – sell based on capability
 - c. Online Consultant – for Small Medium Enterprise (SME), such as ‘Dr. Online’
 - d. Create knowledge-bank portal with YouTube tutorials
 - e. Integrated platform – WhatsApp, online banking, forum, and tutorial
 - f. Artificial intelligent bot that can guide the elderly to perform banking transactions, purchasing, and trading
 - a. Confinement Lady Service – marketing through online platforms
 - b. Cheaper broadband package with high bandwidth for a clear video conference experience
- iii. Governmental
- a. Apps on financial advisory terms

6 Discussion

6.1 Overview

Previous chapters discussed elderly participation in various digital and technology tools in Malaysia. We learned from previous studies and better understood how digital initiatives were promoted in this country. Even though the IR4.0 Policy was just recently launched in Malaysia, Malaysia is serious about preparing the country to become a digital society. However, we also observed that more effort is required to support digital engagement among senior citizens to ensure that they are not left behind and that they can enjoy a better quality of life.

One of the critical questions in this research was about the contemporary issues and challenges among the elderly population in the context of digital inclusion. From the analysis, we learned about IT-savvy seniors and non-IT-savvy seniors. Each category has its issues and challenges depending on its digital literacy level. Thus, solutions must be based on their needs and preferences. While this study supports previous studies on personalising technology for elderly use (Olsson and Viscovi, 2020; Olsson and Viscovi, 2019), it also suggests other factors that must be considered when designing digital solutions. For example, when we performed the factor analysis using quantitative data, we found eight latent factors influencing digital experiences, behaviours, and aspirations. These factors have been simplified as 1) Personal preference/Affinity, 2) Digital challenge, 3) Digital training, coaching, and learning, 4) Digital relevance and imperatives, 5) Social relevance and imperatives, 6) Digital usage aspirations, 7) Peer pressure and digital savvy, and 8) Public policy concerns.

Next, when we analysed the current initiatives undertaken among various stakeholders to promote digital inclusion for the elderly population, we found that the community rather than the government drives most activities. The digital policy is still in its infancy stage, which explains why the government is focusing on building digital infrastructure, establishing a network, and investing in emerging technologies as the priority. Allowing the community to support skills development is good. Still, the government also needs continuous support, such as allocating a budget to promote an active lifestyle among the rapidly ageing population in Malaysia. Our findings support Gong (2020), who

demonstrated that people feel that some parts of the country are still facing Internet connectivity issues, especially in rural areas.

Furthermore, the Dragon Fly Model analysed critical factors of social, economic, governmental, and digital inclusion aspects of the elderly's lives. We observed that socially, the elderly use digital tools for communication, socialising, and networking with others. This observation supports previous studies, which found that the elderly use digital solutions, such as mobile and web-based applications, to participate in social spaces (Olsson and Viscovi, 2020). However, we did not find enough evidence to support that the elderly use technology for economy and governance (Carretero, 2015), which means that most spend rather than earn. Nevertheless, if they can learn advanced skills in banking, online selling, and marketing, they may have the opportunity to earn extra income to support the economy. In addition, from the governance perspective, the elderly can participate in online voting, have their voices heard online and have a say in public decision-making. This participation can be made possible through adequate Internet connectivity, appropriate digital and mobile technology skills and an ecosystem that promotes learning.

In support of Forsman's (2018) recommendation that understanding elderly needs are an essential criterion for designing policies that are related to their well-being, this study highlights potential mechanisms to improve the existing senior citizens' policy (DWEN) and introduce a digital dimension to the policy which will be explained further in the next section.

6.2 Study Recommendations

6.2.1 Strengthening of policies for the elderly

The existing policies on senior citizens were designed with the best intention to suit the population at a particular time. A policy comes with an action plan that requires coordination and collaboration with other ministries to ensure community development, which is a shared responsibility. Besides driving social plans for the elderly, the ministry has partnered with other ministries to prepare strategies for health and research and development in gerontology. However, globalisation and the rise of digital society mean that seniors may be left behind and stand the risk of being a burden population. Under this scenario, the Senior Citizen National Policy or *Dasar Warga Emas Negara* needs to be re-evaluated to include the digital component to the existing policy as part of strategic efforts to protect the well-being of the elderly.

6.2.2 The Digital Inclusion Partnership Model

The main findings from the study pertain to the evidence of the disparity between IT-savvy and non-IT-savvy individuals among seniors. We should manage this disparity between the two categories by bridging the gap through policies, such as continuous digital infrastructure development, accessible training and coaching for digital skills. The concept of 'the government knows everything is no longer effective in providing

sustainable solutions to the public. Moreover, people need to be empowered and well-informed. Therefore, based on the Dragon Fly model, we suggest a mechanism like the public-private partnership that can be adapted to solve social problems. The findings and recommendations are summarised in the following table.

Table 22

Future recommendations

Research questions	Findings	Recommendations
What are the perceptions among the elderly about the existing digital technology?	<ul style="list-style-type: none"> Needs influence the actual digital use, behavioural intention, confirmed usefulness and facilitating conditions. Eight factors that influence digital experiences, behaviours and aspirations were 1) Personal preference/Affinity, 2) Digital challenge, 3) Digital training, coaching, and learning, 4) Digital relevance and imperatives, 5) Social relevance and imperatives, 6) Digital usage aspirations, 7) Peer pressure and digital savvy, and 8) Public policy concerns. 	<ul style="list-style-type: none"> Telco to design digital solutions for the elderly. The community can be empowered to provide digital training for the elderly. Make features in the digital products accessible and secure for the elderly.
What are the current initiatives undertaken among policymakers, caregiving NGOs and institutions, and others involved with the elderly population?	<ul style="list-style-type: none"> The existing senior citizens' policy does not cover the digital participation of the elderly. Similarly, the digital policy is still in its infancy stage and does not give focus on the elderly. However, there are a few research efforts and community-driven participation in getting the elderly to be digitally engaged. 	<ul style="list-style-type: none"> Include digital components that are designed for the elderly in elderly-related policies Include public-private participation for digital engagement Support continuous research and development for the ageing community
What strategies can be recommended to the relevant authorities in encouraging more digital participation	<ul style="list-style-type: none"> No specific strategies were targeted directly to the elderly, but assistance was given to researchers, caregivers, and volunteers in the form of grants, small budget allocations and allowances. 	<ul style="list-style-type: none"> Empower communities to assist the elderly in increasing their digital literacy Promote NGOs and other parties to teach digital

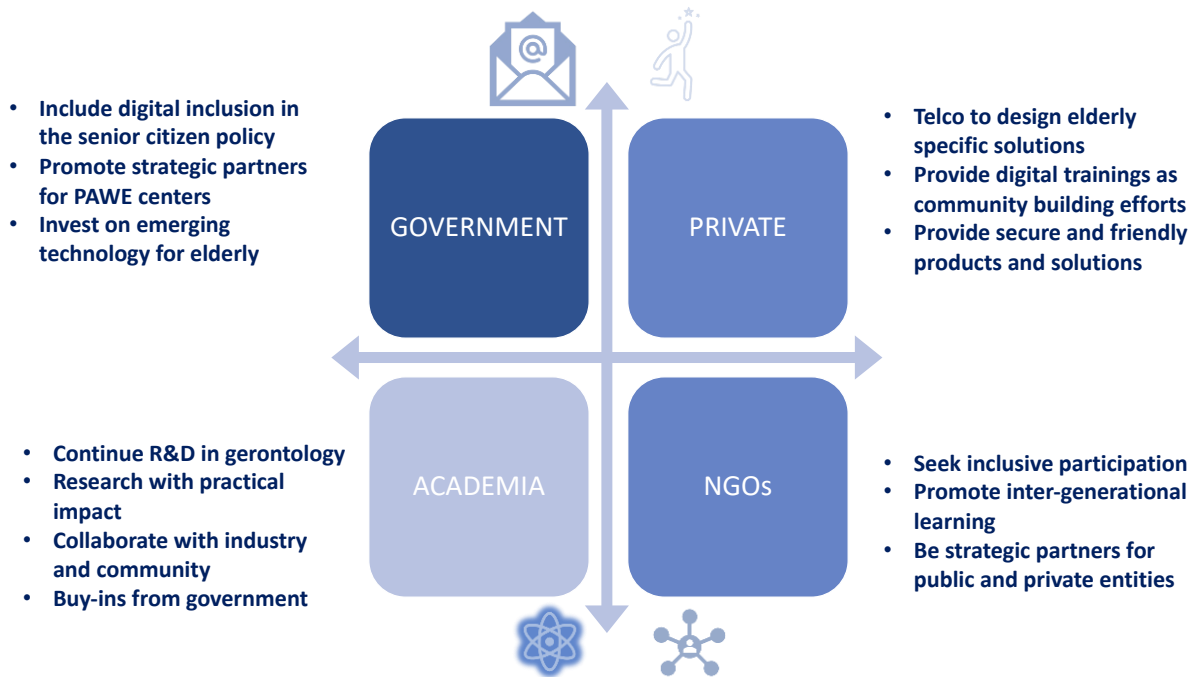
<p>from the elderly communities?</p>		<p>skills through intergenerational learning</p> <ul style="list-style-type: none"> • Create more digital awareness programmes for the elderly community
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Source: Author(s) analysis using multiple resources

Our recommendation includes ideas from several stakeholders we interacted with earlier in our study. These possible solutions form the Digital Inclusion Partnership Model (DIPM), in which each party can consider designing solutions based on their role and responsibilities. The proposed model is summarised in Figure 17.

Figure 17

Digital Inclusion Partnership Model (DIPM)



Source: Author (s) analysis using multiple resources

Based on this model, we have categorised four main stakeholders in promoting digital inclusion for the elderly: the government, the private sector, NGOs, and academia. Malaysia has set up initial efforts to build the ecosystem for an ageing nation in various aspects. However, it can be improved by bringing digital inclusion into the picture. This inclusion not only accelerates growth in the country's digital technology advancement but will also benefit the people and future digital users. As we can observe from the study, seniors are excited to learn digital skills as this acquisition is important and meaningful for them. Still, they need assistance in terms of training, awareness and assurance when acquiring digital skills and knowledge.

With the recent introduction of digital policy in the country, we find that some strategies are directed towards organisations, industries, and people. However, no specific strategies have been made for the elderly. On the one hand, caregivers and volunteers struggle with obtaining financial support to sustain the activities and programmes at elderly centres, either privately or government owned. On the other hand, the elderly requires more significant government support in instilling their awareness to be part of the digital society. This call for support is considered one of the significant challenges when dealing with the elderly community. Therefore, to address this issue, collaboration through a public-private partnership can bridge the gap and accelerate the learning transition for the elderly.

6.2.3 Programme review and realignment

The study reveals that Malaysia has joined the ranks of aged nations. Accordingly, all social, economic, demographic, and technological policy strategies warrant a review and realignment of programmes and actions at the grassroots' level towards enhancing

the quality of life and the dignity of the aged population. Specifically, emphases for an ageing society must be mainstreamed into the inclusive society initiatives promulgated in the 12MP (2021-2026) so that no one is left behind. In doing so, digital talents will be created in the Malaysia Digital Economy Blueprint in February 2021. In addition, the roles and incentives will be incorporated for active and healthy aged population involvement in the 4IR, which the government aspires to achieve.

6.2.4 Diversity in approach

As reflected in the qualitative findings, some senior citizens are currently active users of socio-technology tools, such as Messenger, WhatsApp, Facebook, Instagram, TikTok etc. Besides voice communication, they are also soliciting various types of information and knowledge sharing about health, travel, religion, online shopping etc. However, the numbers of active seniors are meagre and are mainly confined to the educated, the professionals, and those in the upper rung of society. Thus, the study recommends a motivational approach and adequate people-centric and participatory societal, intuitional and policy support to close the usage gap among senior citizens. Moreover, this study suggests providing incentives for web-based content development relating to endowed knowledge, skills and experiences and private sector incentives, such as free Internet, subscriptions, and free training for aged users above 60 years, besides focusing on the provision of ubiquitous, pervasive, and quality connectivity and infrastructure.

6.2.5 Emerging factors of digital inclusion

As highlighted in the quantitative findings, due attention must be paid to factors such as having personal affinity and preferences, instituting capability initiatives that entail training, learning, coaching, and mentoring, and creating a conducive environment that addresses aspects of digital relevance, socio-economic relevance, and digital usage activities.

6.2.6 Demographic profile sensitivity

As reflected in the demographic profiles, policy strategies and program formulation activities need to be sensitive to gender, education and ethnicity considerations, significantly where females outnumber male counterparts, the increasing level of secondary and tertiary education, and the priorities of most of the population.

6.2.7 Integrated Dragon Fly Model

This study conducted a pilot project in urban areas. The pilot project is poised to entail three sub-projects. The first focuses on the social dimension entailing social, leisure, entertainment, and health-related activities. The second project focuses solely on the economic dimension, providing employment opportunities and linking the supply and demand of services. The third one is on the governance dimension, which can provide

virtual platforms and civic participation for deliberating issues, problems and challenges plaguing societal well-being and the dignity of living and their *raison d'être*. Governance deliberations can focus on the local level (e.g., waste disposal), national level (e.g., rising prices) and global level (e.g., climate change) and prepare policy and research papers for the attention of mainstream planners, development practitioners and private-sector telecommunication players, for 5G roll-out media and academia. The pilot projects warrant ministerial support and allocation and the involvement of the private sector and NGOs. Succinctly put, a tri-sectoral partnership can be established.

6.3 Suggestions for future research

We have proposed the Dragon Fly Model as the theoretical framework for this study based on several established theories, such as SDT, TPB and UTAUT. While this framework allows us to define digital inclusion and understand digital benefits, challenges and strategies, further research on how actual digital use can provide a better quality of life is warranted. We have explored several perspectives, such as social, economic, and governmental aspects, in this study. We found evidence that digital use assists the elderly in having an active social life in the digital domain. However, more studies can further explore other aspects so that the elderly can be a knowledge-force population empowered economically and play an active role in digital society. In addition, other studies in social gerontology and gerontechnology would transform the ageing community into an inclusive society in the future.

7 Conclusion

While this study supports the previous study on personalising technology for elderly use (Olsson and Viscovi, 2020; Olsson and Viscovi, 2019), it also suggests essential factors that influence digital experiences, such as 1) Personal preference/Affinity, 2) Digital challenge, 3) Digital training, coaching, and learning, 4) Digital relevance and imperatives, 5) Social relevance and imperatives, 6) Digital usage aspirations, 7) Peer pressure and digital savvy, and 8) Public policy concerns. These findings helped develop further programmes and digital solutions for the elderly.

The emergence of COVID-19 has undoubtedly changed the ways of working, doing, and socialising in different fabrics of society. It has informed us that while digital use is essential and meaningful for people, different age groups have different needs, preferences, and even learning styles. From this study, we understand several factors that affect the use and preferences of using technology among the elderly community in Malaysia. By focusing on the urban and sub-urban areas of the population, we learn to understand the elderly's struggles and to design better solutions for them. Our finding is not unique to Malaysia and is part of a global trend of managing elderly participation in digital tools and technology.

By applying the Integrated Dragon Fly Model for our research, we proposed an action plan through the Digital Inclusion Partnership Model, which consists of people, private entities, public entities, and partnerships. We recommend that the government champion this initiative at the policy level by reinforcing digital skills for the elderly,

supporting the budget for training and activities for the elderly, investing in the digital infrastructure in public buildings, and supporting and strengthening elderly activity centres. In addition, the local government can play the bridging role between the community and private sector so that these centres can become a crowdsourcing avenue for people.

Finally, a mindset for change is essential. Senior citizens are the drivers themselves when it comes to digital learning and empowerment. They must realise that they need to step forward so that the community, family members, friends and community leaders can provide the moral support they need.

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Appendices

Information for Research Participants

Thank you for agreeing to participate in the research project. Your participation in this research is voluntary, and you may change your mind about being involved in the research at any time, and without giving a reason..

What is the research project called?

Reinvigorating Elderly Population in Post-COVID 19 Pandemic Era through Digital Inclusion Strategies: A Malaysian Case Study

Who is carrying out the research?

This research will be carried out by a group of researchers from University of Nottingham Malaysia and University Multimedia as part of a research project

funded by International Telecommunications Union (ITU) under the United Nations (UN).

What is the research about?

This research proposal aims to invigorate the elderly population who are aged 55 and above from “burden-population” to “knowledge-force” population.

What groups of people have been asked to take part, and why?

The elderly people aged between 55 and above are selected to understand the digital issues face among the elderly and the digital strategies that they have used for daily functioning post pandemic.

What will research participants be asked to do?

Survey: The respondents will need to participate in a 20-minute survey

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REINVIGORATING ELDERLY POPULATION IN POST COVID-19 PANDEMIC ERA THROUGH DIGITAL INCLUSION STRATEGIES: A MALAYSIAN CASE STUDY

Dear Respondent,

A research entitled as ” **Reinvigorating Elderly Population in Post Covid-19 Pandemic Era through Digital Inclusion Strategies: A Malaysian Case Study**” is being conducted by University of Nottingham Malaysia. The objective of the study is to probe knowledge, attitude, and perception of aged population 55 years and above regarding digital inclusion strategy in Malaysia. We invite you to participate in this survey. Upon completion, we will send you GULA cards as a token of appreciation.

Part 1 : Personal details

Please answer the questions below by placing a check mark (√) in the appropriate boxes.

1. Gender

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>

2. Age

55-64	<input type="checkbox"/>
65-74	<input type="checkbox"/>
75-84	<input type="checkbox"/>
85 year and above	<input type="checkbox"/>

3. Race

Malay	<input type="checkbox"/>
Chinese	<input type="checkbox"/>
Indian	<input type="checkbox"/>
Bumiputera Sabah	<input type="checkbox"/>
Bumiputera Sarawak	<input type="checkbox"/>
Orang Asli	<input type="checkbox"/>
Others	<input type="checkbox"/>

4. Who are you currently living with?
working?

With a partner	<input type="checkbox"/>
With my children/ relatives	<input type="checkbox"/>
With a caregiver	<input type="checkbox"/>
In a shelter	<input type="checkbox"/>
Alone	<input type="checkbox"/>
Others (please specify)	<input type="checkbox"/>

6. Are you still

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

7. What type of working arrangement do you belong to?

Fulltime employment	<input type="checkbox"/>
Part time/ Freelancing	<input type="checkbox"/>
Own business	<input type="checkbox"/>

5. Highest Academic Qualification

School	
Diploma	
Bachelor degree	
Masters	
Ph.D	

8. What type of technology devices do you currently own? (Tick all that apply)

Mobile phone	
Smartphone	
Tablet/Ipad	
Laptop	
Desktop	

9. Which of these following activities reflect your digital experience? (Tick all that apply)

Communicating via mobile phone	
Communicating via smartphone	
Accessing information via (Facebook/ Youtube/ Google)	
Sharing information via social networking platforms (Facebook/ Youtube/ Whatsapp)	
Online shopping (ordering food, groceries)	
Online banking (money transfer/bill payment)	
Online learning (course, seminar, lecture)	
Online games	

Part 2 Digital Use

Please answer the following.

DIGITAL USE	
Scale guide	Strongly disagree ---Strongly agree

No	Statements	1 <i>Strongly disagree</i>	2 <i>Disagree</i>	3 <i>Neutral</i>	4 <i>Agree</i>	5 <i>Strongly agree</i>
1	N1: Digital products such as smartphones and computers support my needs as part of the society.					
2	N2: Digital products such as smartphones and computers are important for my daily activities.					
3	N3: Service providers like banks provide mobile applications for me to use (online banking).					
4	N4: Digital products gives me some sense of control when I learn how to use it.					
5	N5: Digital products gives me some sense of personalised service when I learn how to use it.					
6	BI1: I intend to continue using digital products in the next 3 months.					
7	BI2: I predict I will continue using digital solutions in the next 3 months.					
8	BI3: I plan to use more digital products in the next 3 months.					
9	FC1: People who influenced me think I should be digital savvy.					
10	FC2: People who are important to me think I should be digital savvy.					
11	FC3: My peers are using digital devices; therefore, I should be digital savvy.					
12	FC4: Digital products nowadays are easy to use.					
13	FC5: Digital products nowadays are fun to use.					
14	FC6: Digital products nowadays make my life easier.					
15	FC7: I enjoyed using the digital products and solutions.					
16	FC8: I am having fun using the digital products and solutions.					

17	PU1: I find digital products has tools for personal productivity.					
18	PU2: I find digital products support household activities.					
19	PU3: I find digital products support activities outside the house.					
20	PU4: I felt that I only needed to learn a few steps to master online applications or digital products.					

Part 3: Elderly Inclusion Effect

Please answer the following.

ELDERLY INCLUSION EFFECT						
Scale guide		Never -----Always				
No	Statements	1 <i>Never</i>	2 <i>Occasion ally</i>	3 <i>Many Times</i>	4 <i>Often</i>	5 <i>Always</i>
Digital Strategies						
1	DS1: The government provides facilities and infrastructure for me to use digital services.					
2	DS2: The government provides information and awareness for me to use digital services.					
3	DS3: The government provides opportunity for skills training for me to use digital services.					
4	DS4: The digital providers provide special package for me (discounts etc) when I use digital services online.					
5	DS5: The digital providers provide instructions when I use digital services online.					
6	DS5: The community supports me to use digital services through training.					
7	DS6: The community encourages me to participate in daily activities online.					
Digital Benefits						
Scale guide		Very dissatisfied-----Very satisfied				
No	Statements	1 <i>Very dissatisfie d</i>	2 <i>Dissatisfie d</i>	3 <i>Neutral</i>	4 <i>Satisfied</i>	5 <i>Very satisfied</i>

8	DB1: Digital communication improves my opportunity to do business with others.					
9	DB2: Digital experience enhances my knowledge and allowed me to gain more useful information.					
10	DB3: Digital experience allows me to participate in the society.					
11	DB4: Digital experience allows me to reduce personal expenses.					
12	DB5: Digital experience allows me to protect my health.					
13	DB6: Digital experience allows me to make new friends and relationships.					
Digital Challenges						
Scale guide		Strongly disagree ----Strongly agree				
	Statements	1 <i>Strongly disagree</i>	2 <i>Disagree</i>	3 <i>Neutral</i>	4 <i>Agree</i>	5 <i>Strongly agree</i>
14	DC1: Digital experiences creates knowledge, skills, and information gap among elderly.					
15	DC2: Digital experiences creates pressure to keep up with the technology.					
16	DC3: Digital experiences creates lack of privacy.					
17	DC4: We have inadequate digital awareness programmes for the elderly.					
18	DC5: We have inadequate policies to support digital use among the elderly.					
19	DC6: Digital experiences creates better option to get products and services.					
20	DC7: Digital experiences takes time to learn and gain mastery.					

