Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

JOURNAL OF INFORMATION SYSTEM AND TECHNOLOGY MANAGEMENT (JISTM)
www.jistm.com

INTERNET TV NAVIGATION MODEL FOR THE ELDERLY BASED ON PERSUASIVE DESIGN TECHNOLOGY

Kalaivani Vadivalu[1], Dalbir Singh[2*]

[1] Center for Software Technology and Management, Faculty of Information Science & Technology, Universiti Kebangsaan Malaysia, Malaysia
Email: p112628@siswa.ukm.edu.my
[2] Center for Software Technology and Management, Faculty of Information Science & Technology, Universiti Kebangsaan Malaysia, Malaysia
Email: dalbir@ukm.edu.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 08.02.2023
Revised date: 10.04.2023
Accepted date: 30.05.2023
Published date: 06.06.2023

To cite this document:

Vadivalu, K., & Singh, D. (2023). Internet Tv Navigation Model For The Elderly Based On Persuasive Design Technology. *Journal of Information System and Technology Management, 8* (31), 95-112.

DOI: 10.35631/JISTM.831007

Abstract:

In today's technological era, the design and navigation process is the focal point of every conversation surrounding the development of any application. Furthermore, the rapid evolution of television is consistent with the notion that humans may see and hear at any time and place, leading to Internet TV's emergence. However, the current interface design may not be compatible with the physical and cognitive abilities of the elderly. Consequently, even though the features and functions of Internet TV are relatively straightforward, its adaption for the elderly can be challenging. Therefore, the purpose of this study is to comprehend the difficulties faced by the elderly in terms of the design and navigation of Internet TV and to propose guidelines and a model using Persuasive Technology. This model strives to develop an interface with a user-friendly appearance and feel and an environment that encourages users to return frequently and use the product without feeling frightened, disturbed, or anxious. This research employs Usability Testing (UT) to conduct trials. This investigation was conducted with ten volunteers aged 60 and older. The method consists of two sections: UT1 and UT2. In UT1, users were given seven activities using Astro-On-The-Go (AOTG). These activities collect problems, challenges, and feedback to enhance the present interface. Participant feedback was used to develop a prototype with enhanced features and functions. In UT2, the newly created prototype served as the experiment's foundation. Participants are evaluated by completing specified activities. After collecting feedback, a comparison is made between UT1 and UT2 to determine the study's findings. It was discovered that the participants were more receptive to the new prototype due to its user-friendly interface and navigation, which was

Journal of Information System and Technology Management
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

reinforced with compelling elements. These findings can serve as a foundation for future recommendations and enhancements.

Keywords:

Persuasive Design, Persuasive Technology, Internet TV, Navigation Model, Usability Testing, Challenges for elderly in TV Navigation

Introduction

Technology has developed rapidly over the past 20 years (Josh, 2022). Technology development has opened many possibilities for change for all ages, making it easier for consumers to be entertained, shop, work and study. The growth of Internet TV is also seen to be quite provoking in line with the discoveries of various supporting technologies that provide its evolution. According to Wikipedia (MSN_TV, 2022), Internet TV was first announced on July 10, 1996, and launched on September 18, 1996. It was also the first time in history that a TV or consumer electronic device was connected to the Internet. It was first introduced as web TV before Internet TV was used (Technopedia, 2011). The hardware used to operate this Internet TV is a decoder box, remote control, modem, and wireless keyboard. Sony and Phillips were among the earliest brands to provide such devices. Internet TV generally includes television shows, "video on demand" (VOD), and other video content, known as video streaming. However, in Malaysia, Internet TV only started in 2011 and became popular in 2012 (Imma et al., 2016).

Nevertheless, specific factors also contribute to the issues and challenges of the elderly in navigating Internet TV. With increasing age, the cognitive and physiological ability of the elderly also decreases. Examples are hearing, the decline in eyesight, fatigue, lack of stimulation and increased reaction time. These modern technologies indirectly affect the lives of the elderly (Zhang, 2017) as acceptance of these technologies depends on the needs and adoption of these technologies by the elderly. Technology that is complicated or not suitable for the elderly makes them afraid, and they lose confidence in using it (Royakkers et al., 2018). Similar to Internet TV technology, this group is also often left behind due to functions and services that are not in line with their cognitive and physical condition.

In order to overcome the stated issues and challenges, the study will focus on how persuasive design technology (Rees, 2017) can be adapted to improve the elderly user experience. The collection of information and feedback received was analyzed to understand the design features that can influence the behaviour change of the elderly and give them the opportunity to embrace new technology. In addition, another persuasive design feature adapted for this study is designing an environment that allows them to have a positive experience. This can be seen through additional features introduced, such as Voice Commands interactive interface that includes menu buttons and larger words accompanying icons for clearer meaning. Offering such design features is to empower the elderly, especially navigation control.

The correct use of persuasive design technology can also change users' behaviour. Users need the motivation to trigger this change process (Rozenfeld, 2018). The functions and services designed to cater to these processes are tested using the usability testing method. The purpose of such a method is to identify design opportunities for improvement. Typically, in this

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007
usability testing method, the individual experimenting will ask participants to perform activities using one or more intended interfaces. When the participants follow the procedure to carry out the activity, the researcher will observe the participants' behaviour and hear feedback from the participants (Moran, 2019).

Through the results and feedback obtained, analysis can eventually be used to formulate and validate the proposed model and guidelines that aim to provide an interactive, user-friendly and persuasive interface. Thus, the elderly can not only use Internet TV more efficiently but also provide a platform for the elderly to embrace digital technologies in the future. Further explanation is provided in the subsections of the article. The article is outlined in the following structure: 1. Introduction 2. Usability Test Design 3. Result and Analysis 4. Development of Guidelines and Model 4. Conclusion and Future Works. The findings from the study would benefit various stakeholders related to Internet TV, particularly in terms of increasing the adoption level among elderly users.

Literature Review

Internet TV

In terms of definition, Internet TV is a network of media content that can be watched on television using the Internet. It differs from Internet Protocol Television (IPTV), where IPTV uses a protocol network system and decoder as a gateway to broadcast media content on television (Wigmore, 2013). Joymali's (Joymali, 2015) study states that Internet TV uses the public domain while IPTV uses a private network. Internet TV allows users to choose any TV program from anywhere and at any time, which a conventional TV cannot do. Over the years, Internet TV has gone through a rapid evolution since its first introduction (Melanie, 2015). This was essential to meet the demands of users who seek a more personal experience (Sumner et al., 2021). However, with the increase in the elderly population, the question is how well the elderly generation perceives these changes. A study by (Zhang, 2017) shows that the elderly undergo a decline in cognitive and physiological ability parallel to the increase in age. This makes it difficult for this age group to adapt to the process of embracing the navigational process of an Internet TV.

Current State of Internet TV

The traditional TV framework is undergoing a rapid digital transformation whereby TV consumption using Internet services implies the adaptability of an online platform from everyday needs to binge-watching favourite series (Birruntha, 2021). This is supported by studies, as reported in (Howe, 2023), where internet facilities are booming extensively even in Malaysia's most rural and urban areas. It's fascinating to learn that a report by (Howe, 2023)also indicates that 96.8% of the Malaysian population of 34.14 million are connected to the internet. A good internet connectivity network is one of the infrastructure requirements to access and attain high-quality internet-distributed TV content.

The increased need of people and, at the same time, the emergence of many technologies also contribute to enhancing Internet TV features. Indirectly, it is no more just a box connected to the internet. One example is as explained by (Latiff et al., 2019), where a specific attribute of Internet TV has been explored to enhance students' learning experience. This proves that Internet TV is more than just a medium to watch internet-distributed content, and with the right mindset and strategic planning, these combos can touch many people's lives (Okoye, 2022).

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Thus, Internet TV services are preferred to traditional TV viewing due to their flexibility and content (Kennedy, 2022). Unlike traditional TV, Internet TV has more program offerings and is not restricted to a specific location. Such features ease the adaptability of the Internet TV amongst many types and generations of users, crafting paths for more integration and system enhancement to cater for their needs.

Internet TV Interface Design

Nonetheless, a good interaction design developed with users' pain point in mind may help to reduce the challenges that this elderly group is facing and allows users to achieve their objectives in the best possible way (Yu Siang, 2021). Consequently, research into user needs, limitations, and context is an impetus for designers to produce designs desired by users (Kolko, 2010). The more comfortable a person is with a design, the more they will interact with the device and, consequently, the more information the device can collect (Grinschgl et al., 2020). This is essential, especially in this era of digitalization, where the designs are usually for a general purpose that may not comply with the needs of the elderly.

Due to these shortcomings, (Staff, 2021) suggested certain features that should be present in a product or application to make the navigation process pleasant for the elderly such as voice assistant, reminder function and additional sources of support for the elderly. The navigation process for the elderly certainly requires specific modelling techniques to help them keep up with this age of technological trends. According to (Roney, 2021), several approaches can be adapted to design a navigation flow that can be enjoyed by the elderly such as paying attention to details such as font and colour selection to produce navigation links that are easy to identify. Staff's study (Staff, 2021) also suggests a settings adjustment function so that the elderly can adjust according to their tastes. This option is crucial for the elderly because the problems faced by one elderly may be different from another elderly. For example, an elderly with arthritis may find it challenging to double-click a button. In this case, the Internet TV interface can be set to allow it to respond to a click, enlarge the screen area to make the text appear larger or modify the brightness and contrast to improve the screen's visibility. Such adjustments may allow seniors to offer a better user experience.

Persuasive Design Technology in Internet TV for the Elderly

Persuasive design technology (PDT) is designed to change user attitudes or behaviour through persuasion and social influence and not necessarily through coercion (Fogg, 2003). Various technologies in the market provide a support system for the elderly so that they can use and navigate systems or products effortlessly despite their health conditions (Berdichevsky & Neuenschwander, 1999) (Cabrita et al., 2018) (Tikka & Oinas-kukkonen, 2019) (Toledo et al., 2019). Through the presentation of information from these past studies, it was found that, although different features and concepts are used, they have a common goal: to persuade users to change their behaviour towards a positive path without coercion. One of the possibilities is through the implementation of persuasive design technology. Thus, in this study persuasive features were identified to design an Internet TV prototype so that it could persuade the elderly to use the system seamlessly. Among them are the allocation of gifts and rewards, which can psychologically motivate the elderly because it shows a sign of appreciation to the consumer when they use a product (Toxboe, 2018) and the improvement of the interface by adapting animated and interactive features that cater for the needs of elderly to improve the user experience (Sid, 2020). The increase of PDT adaptation in the existing system or even in

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

constructing a new system enables the solution of various problems. It also directly or indirectly gives opportunities to research experts to continue researching how it can be innovated to use and apply PDT in other systems or applications, especially in browsing Internet TV for the elderly.

Usability Test Design

In this study, the Usability Testing (UT) method, where a test approach through the help of a moderator, is used. Looking at the vulnerability of the elderly, this approach was chosen to ensure guidance and supervision that can be rendered to them at any point in time throughout the survey. It can also create a good rapport between the person carrying out the study and the participant so that they feel comfortable clearing their doubts and uncertainties during the survey. This method comprises the first set of tests (Usability Testing 1), where the main idea is to observe and evaluate the constraints and challenges when the elderly participant is navigating through the Internet TV. This is followed by a series of analyses where the key problems and challenges from Usability Testing 1 (UT1) are thoroughly studied to develop a new prototype. This new prototype includes the proposed features and functions suggested by the participants in the survey (questionnaire), interview and observation that was conducted. Moving forward is Usability Testing 2 (UT2), which evaluates the prototype's proposed features and functions. Based on the feedback, a guideline and model of desirable Internet TV features and functions was developed. To ensure the validity and consistency of the data, the data collection process was done by using various sources such as quantitative measurements from the participant, direct observation and interviews. Figure 1 shows the overall flow of phases of the usability testing method used in this study.

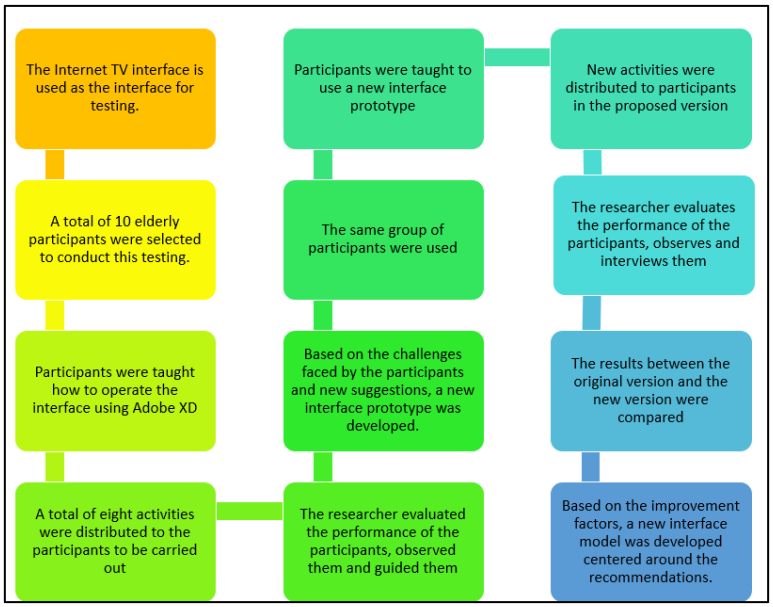

Figure 1: The Overall Flow Of Phases

Usability Testing 1 (UT1)

UT1 includes five steps. The first step is selecting an experimental Internet TV application as the platform to conduct this assessment. In the next step, ten elderly participants who are 60 years old and above are selected. In the third step, all eight tasks are taught to the participant, followed by the distribution of tasks to the participants. Finally, data collection through observation and interview.

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Experimental Internet TV Application Selection

Before this study, several Internet TV applications were explored before making a decision. The applications considered are Iflix, Disney Hotstar, Astro-On-The-Go (AOTG), YUPP TV and Viu. These Internet TV applications are among the popular choice for Malaysian. Among these applications, AOTG was chosen because it has the maximum number of subscribers, making it a popular choice among Malaysians.

Selection of Participants

Ten participants aged sixty and above were selected to perform this testing. The selection criteria are based on a similar study of (Moran, 2019) which suggested five to fifteen participants. According to (M. Six, Janet; Macefield, 2016), five to ten participants are indicated because it is the best baseline. Figure 2 compares the number of participants required in a study.

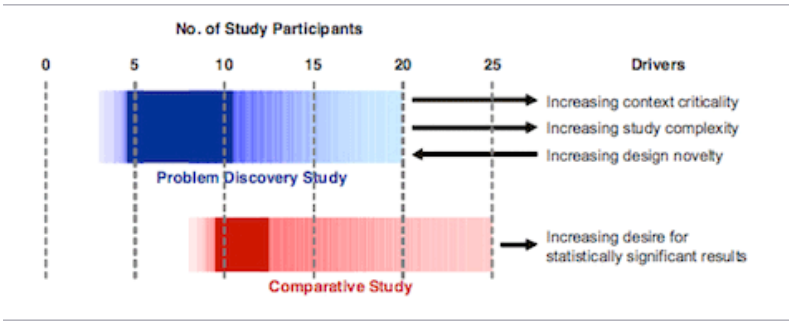

Figure 2: Number of Participants According to Types of Studies (M. Six, Janet; Macefield, 2016)

Task Distribution

Amongst the tasks that were assigned to the elderly participants to perform the usability testing on the AOTG interface are illustrated in figure 3. The participants were required to carry out the tasks as prepared to hypothetically summarize the current issues and challenges so that data and feedback were obtained to improvise the current navigation protocols.

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Figure 3: Allocated Tasks on the AOTG Interface

Data Collection

Three techniques were used to collect data from the participants. Qualitative and quantitative assessment methods were used to measure participants' performance in performing tasks. To assess their improvement, certain measurements were used to compare participants' performance in the original AOTG interface with the proposed AOTG interface. Direct observation was conducted to observe the behaviour and emotions of the participants while they were carrying out the study. Interviews were conducted to gather information about the views and challenges of the study. Data was collected using the evaluation form.

Usability Testing 2 (UT2)

UT2 is fundamentally to test the new prototype that was developed based on the feedback and information collected from participants in usability testing UT1. The main objective of UT2 is to ensure that the prototype meets the request and demands of the participants. The same group of participants was recruited again to perform this evaluation. Similar to UT1, a briefing on the task to be carried out is explained to the participants. The task for the UT2 using the new prototype was slightly different because participants were required to test additional features built into the prototype.

Experimental Internet TV Application Selection

Through the feedback obtained through observation and interviews, a prototype was designed. The selection of the application to design the prototype was made after reviewing several applications. According to (Browne, 2021), the Adobe XD application is the most popular application for designing prototypes. This application surged in popularity due to introduction of a new function that enables auto-animation, which facilitates the user's work. It is also classified as a simple application for creating wireframes, prototyping and collaboration.

Based on previous studies on the types of features and functions that may reduce the challenges for the elderly to navigate, below are the interface design principles which was applied during the development of the prototype:

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Font size 16 px and above (Polyuk, 2019).
Avoid using blue because it may appear faded in the eyes of the elderly (Polyuk, 2019).
Using icons to depict Menu buttons so that they are easy to understand (Polyuk, 2019).
Selection of important and affordable options only (Polyuk, 2019).
Interaction that does not require a long navigation process (Polyuk, 2019).
Wide and large buttons (Nunes et al., 2012).
Quickly access the main page if the wrong menu or button is selected (Nunes et al., 2012).
A simple interface that is easy to understand (Nunes et al., 2012).
Use of simple words or sentences (Nunes et al., 2012).

Selection of Participants

Participants from UT1 were selected again to conduct UT2. This is so that:

A more transparent data comparison can be made by using the same group of participants. The validity of data quality can be maintained because the prototype interface is different from the original application interface.

Task Distribution

The tasks assigned in the UT2 are as in Figure 4:

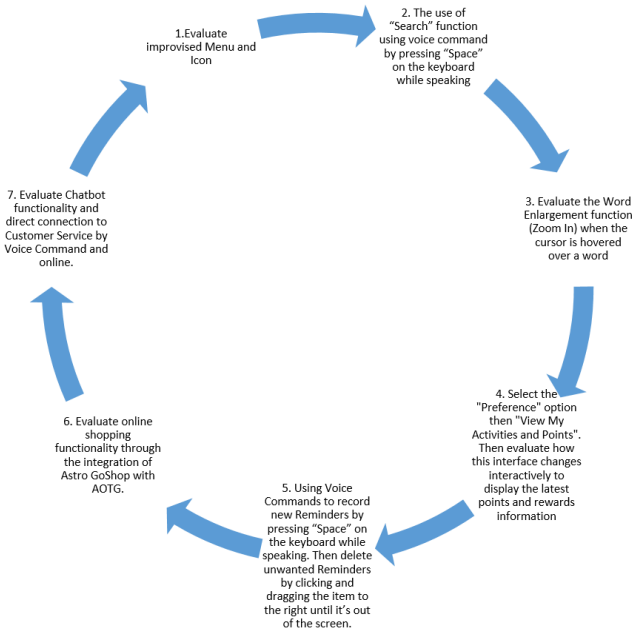

Figure 4: Allocated Tasks on The New Prototype Interface

Evaluation Criteria

Findings from both tests are collected and analyzed to understand the participants' needs. Five evaluation criteria, as elaborated (Employee, 2022), were applied to analyze the findings:

Ability and level of comfort for participants to navigate from one screen to another in both tests: UT1 uses a traditional navigation process where a click process is used to navigate from one screen to another. UT2 uses Voice Commands to navigate. This comparison is necessary to identify which technique is preferred by the participants.

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

The ability of the participants to find the desired information quickly: In UT1, menus and buttons are in standard sizes and shapes. However, in UT2, the modification was done on several features where a larger button accompanied by a larger icon for clearer attention was used. Words also have an automatic "zoom-in" technique when the cursor hovers over. Search is also included with voice commands. This comparison helps to understand which method is better desired by the user to get information through minimal clicks or navigation.

Understanding of the use of both interfaces: In UT1, there were more features and functions. Most of them did not apply to the elderly. In UT2, only relevant feature was made applicable to the elderly. This is to get participants' views on which interface is more user-friendly and easier to understand.

Reduction of the number of issues in UT2 compared to UT1: The results collected from the questionnaires, interviews and observation for UT1 as well as UT2 conclusion can be derived if the study managed to reduce or resolve the issues in UT1. This can also help to assess if the study met the intended objective.

Participant adaptation with improved interface suggestions: This is the participants' preference whether they would maintain using the interface in UT1 or move on to the enhanced interface in UT2. This is also an alternate method to evaluate the intended objective.

Result and Analysis

This section denotes how the information collected was transformed to present the participant's needs. This is required as it justifies the purpose of why the improvisation on the screen is vital for the elderly. In the first section, a comparison of UT1 and UT2 is presented. Extracted keywords follow this to develop the prototype. Finally, a summarization is furnished in section three to give high-level information on what we have achieved.

UT1 and UT2: Questionnaire

UT1 was conducted on the original AOTG interface to collect as much information as possible on the current challenges. Data was collected and studied to develop a prototype to help overcome the difficulties identified. Later on, UT2 was carried out based on the new prototype. UT2 intends to determine if the suggested feedback helped to overcome issues and challenges found in UT1. The result for UT1 and UT2 questionnaires is shown in Figure 5 A-G.

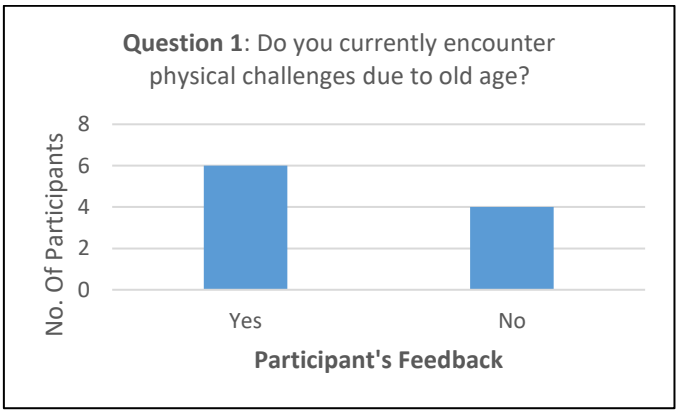

Figure 5A

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Question 5A is to understand the background of the participant. This question only applies to UT1

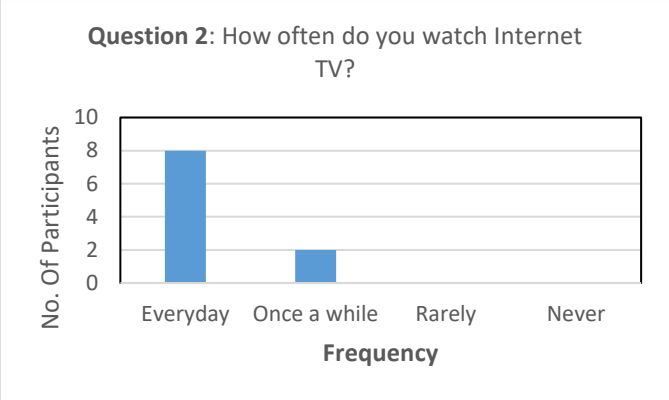

Figure 5B

Question 5B is to understand the background of the participant. This question only applies to UT1

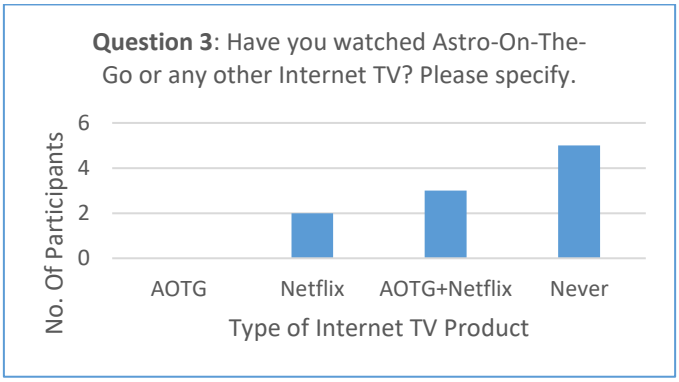

Figure 5C

Question 5C is to understand the background of the participant. This question only applies to UT1

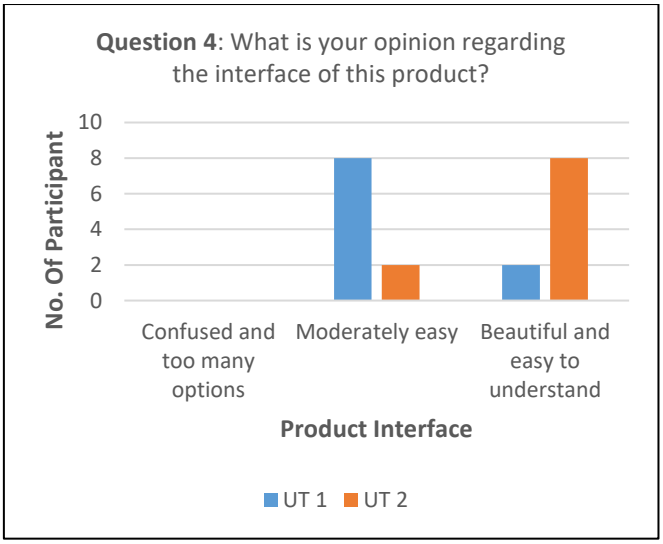

Figure 5D

A total of six participants who chose "moderately easy" in the first evaluation were found to select "beautiful and easy to understand" in the second evaluation. This shows that the proposed prototype is more user-friendly and likeable than the first interface

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

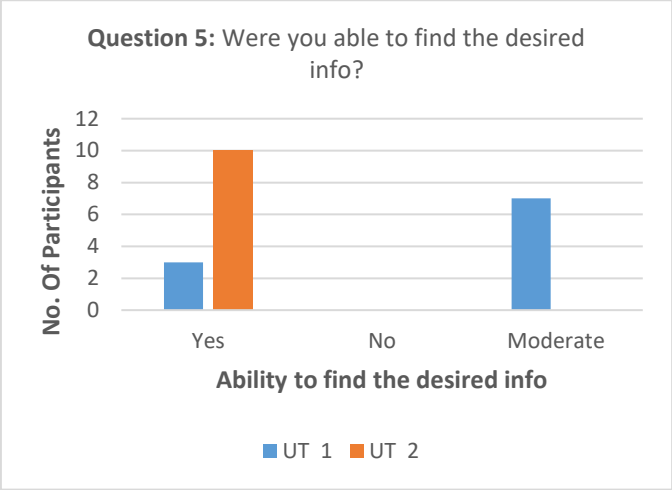

Figure 5E

This graph shows a sharp improvement, where all ten participants could find the desired information in the second assessment. In the first evaluation, only three people achieved this objective. This also shows that the proposed prototype is more robust and dynamic for use by the elderly. The elderly are more inclined to interactions that do not require active movement.

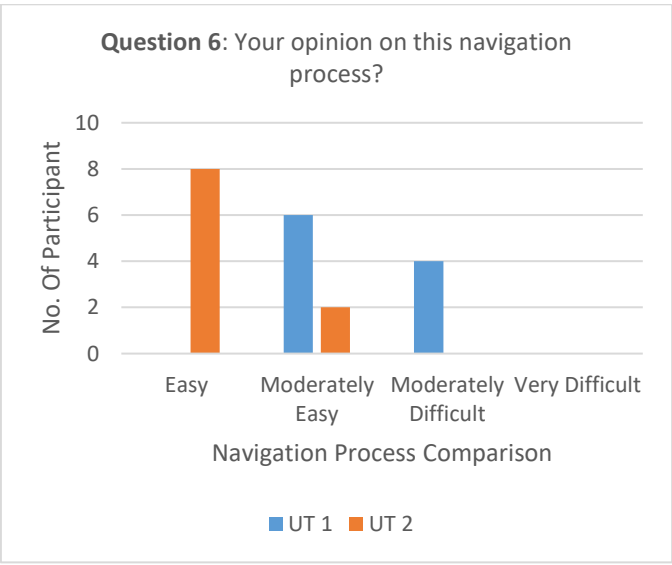

Figure 5F

Participants preferred the navigation process in the proposed prototype because it did not require much effort. Through Voice Command, they can directly activate the function they want. Searches can also be done using this technique. A total of eight participants stated that this navigation process was easier in the second evaluation. In the first assessment, the answer range is between moderately easy and moderately difficult. No participant chooses "easy".

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

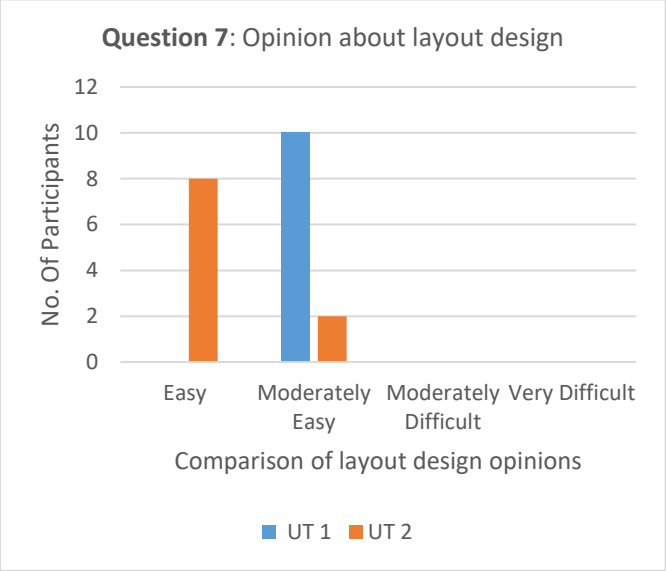

Figure 5G

Participants are more interested in the layout design in UT2. This is due to the following:
Irrelevant functionality is removed from the interface
Large font size is used
Wide buttons are used to avoid cursor or finger slippage when selecting.

UT1 and UT2: Interview

As Questions 8 to 10 are interview-based questions, the answers are open-ended and subjective. Therefore, the responses collected are compared and summarized in the table below:

Table 1: Question 8: Overall Experience During the Study - The Participants Preferred the New Interface To The Old One

UT1	UT2
Participants who have used gadgets or internet applications before do not or show minimal discomfort. 2 to 3 participants fall into this category.	The evaluation in UT2 went much more smoothly. The feedback given is also more positive than the first evaluation. The reaction and behaviour of the participants are also more satisfactory. A total of eight out of 10 participants expressed the pleasure and ease of carrying out this second study

Table 2: Question 9: What Features Do You Dislike In This Product? - No Feedback Of Disliked Features Or Features That Need Improvement

UT1	UT2
On average, all stated that these available features and functions are essential. So there is no mention of features that are not liked or features that need improvement.	There are no specified features. Participants stated that this feature was very satisfactory.

Journal of Information System and Technology Management
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Table 3: Question 10: What Features Would You Like In The Future In The Application? - Although The Reward System Is A Favourite Feature, After The Implementation Of Voice Commands, It Became Of Interest To Many Due To The Convenience Of The Navigation Process

UT1	UT2
The most voted feature is the reward system followed by voice commands. Zoom in Technique and Customer Service each got the same vote, which is 5, followed by E-Shopping.	There are no specified features. Participants stated that this feature was very satisfactory.

UT1 and UT2: Observations

Issues such as declining eyesight and cognitive and physical challenges due to old age encountered by the elderly were the motivation to design an Internet TV navigation system to help reduce these encounters. From the observations obtained, the participants seem more confident in UT2 because:

The navigation process has been simplified
The interface does not have too much information and options
Adapted design with more user-friendly features for the elderly
Adding persuasive features that make this application more relevant to the elderly attracts their interest, as they seem surprised and impressed by the improvements introduced.

Prototype Features

The prototype is an interface which was derived as a result of information collected from UT1. This prototype is to furnish a user-friendly improvised interface for the elderly to interact and navigate. The feature and functions were carefully studied based on the feedback to ensure they fulfil the participants' needs and requirements. Table 4 displays the features and functionalities that will be developed in the new prototype.

Table 4: Prototype Features and Functionalities

Persuasive Design Feature	Functionality
Display only essential menus, larger fonts and the use of the image to clearly illustrate the meaning of the menu	Provide a better customer experience
Rewards	An additional feature for senior citizens to exchange points for any AOTG product or cash
Voice Command	Avoid typing to perform a search function and more straightforward navigation
Techniques for enlarging letters and objects so that they are easier to see (zoom in)	Improve reading and focus for the elderly with poor vision
Easy connection to customer service	Enable the elderly to get connected to the customer service
Reminder	A reminder function that the elderly can set or remove will prompt them to

Journal of Information System and Technology Management
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

	remind them of something that they have set.
E-shopping	An option that will suggest the elderly incoming movies based on the type of movies that they frequently watch. They can also visit the page to view or purchase new movies.

Development Of Guidelines and Model

Based on the comparison between the two UTs and improvement factors, a guideline followed by a new Internet TV model is proposed.

The design guideline is based on the adaptation of persuasive design technology. The main idea of this research is to enable more straightforward navigation and a better user experience for the elderly. Based on this, persuasive characteristics were mapped accordingly to distinguish the needs and wants of the elderly generation. Collective information on the guidelines is summarized in Table 5:

Table 5: Design Guidelines

Reference Points for Characteristics	Persuasive Characteristics
G1	Use larger letters and words
G2	Include an image next to each menu
G3	Use only essential and meaningful menus
G4	Voice command technique
G5	Recommends products and services from AOTG that are viewing history - senior citizens can buy through digital payment or monthly bills
G6	An interface where senior citizens can continue to communicate with AOTG agents or Chatbots if they experience problems
G7	An interface where seniors can collect points if they can reach their daily targets and exchange them for any AOTG product
G8	Personal Reminder
G9	Word enlargement technique (Zoom In)

To strengthen the formulation of the guidelines, the relationship between the guideline and evaluation questions with usability feature standards from (Commission & Standardization, 2010) is analyzed. Therefore, the operationalization of accessibility can be done by assessing the extent to which the product can be used with effectiveness, efficiency, and user satisfaction (CLSI, 2013). Table 6 displays the relationships between usability guidelines (from table 5), evaluation questionnaires, and usability feature standards

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Table 6: Relationships between Usability Guidelines, Evaluation Questions and Usability Features

Guidelines	Evaluation Questions	Usability Feature Standards (CLSI, 2013)
G1, G4, G9	Use larger letters and words	
G7	Include an image next to each menu	
G5, G6, G7, G8, G9	Use only essential and meaningful menus	
G1, G2, G3	Voice command technique	appropriateness recognizability, learnability
G4	Can you find the information you are looking for?	operability, learnability, accessibility
G4, G9	Your opinion about this navigation process	aesthetic, operability
G1, G2, G3	Your opinion about layout design	aesthetic, operability
G1, G2, G3, G4, G5, G6, G7, G8, G9	How would you describe the overall experience of this product?	operability
G3	What features do you dislike in this product?	appropriateness recognizability
G1, G2, G3, G4, G5, G6, G7, G8, G9	What features would you like in the future in this app?	aesthetic, operability

A model is proposed based on the usability guidelines emphasizing persuasive design, as illustrated in figure 6. The proposed model focuses on Primary Task Support, Dialogue Support, Credibility System and Social Support for Internet TV elderly users.

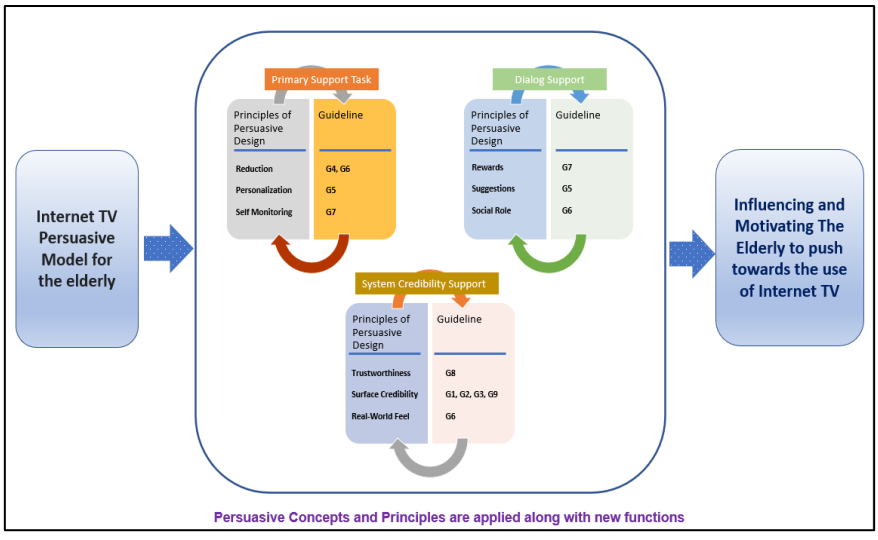

Figure 6: Proposed Model for New Internet TV

Conclusion and Future Works

The study has outlined contributions in terms of elderly users, the Internet TV industry and researchers. For the Internet TV industry, the study has outlined guidelines and a model that could be applied to design future Internet TV applications, especially for elderly users.

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Eventually, the study could increase the adoption level of Internet TV among elderly users. The study's contribution could open up new frontiers for researchers in application development for elderly users.

As for future works, the study can be further improved. Firstly, the study could employ Artificial Intelligence techniques to provide a personalized user experience. Secondly, the study could use a larger group of users from diverse backgrounds for the UT. Thirdly, the study could also employ an Automated Usability Assessment that enables researchers to get information more quickly and accurately. The use of an automated approach can also reduce the range of errors.

Acknowledgement
This research has been funded by Universiti Kebangsaan Malaysia Internal Funding: GP-2021-K018530

References

Berdichevsky, D., & Neuenschwander, E. (1999). *Toward an Ethics of Persuasive Technology*. *42*(5), 51–58.

Birruntha, S. (2021). 064945a06405933cbe4775e43be5e6cbf4007b3c @ themalaysianreserve.com. *Themalaysianreserve*. https://themalaysianreserve.com/2021/01/05/top-5-streaming-platforms-in-malaysia/

Browne, C. (2021). *11 Best Free Wireframe Tools for UX Designers in 2022 @ careerfoundry.com*. Careerfoundry. https://careerfoundry.com/en/blog/ux-design/free-wireframing-tools/

Cabrita, M., op den Akker, H., Tabak, M., Hermens, H. J., & Vollenbroek-Hutten, M. M. R. (2018). Persuasive technology to support active and healthy ageing: An exploration of past, present, and future. *Journal of Biomedical Informatics*, *84*(April 2017), 17–30. https://doi.org/10.1016/j.jbi.2018.06.010

CLSI. (2013). *ISO/TS 20282-2:2013 @ Www.Iso.Org*. https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en

Commission, I. E., & Standardization, I. O. for. (2010). *Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - System and software quality models*. *2010*, 44. papers2://publication/uuid/4E7AB6E6-6F61-4D11-A7BA-9644832A7308

Employee, H. (2022). *usability-testing/questions/ @ www.hotjar.com*. Hotjar. https://www.hotjar.com/usability-testing/questions/

Fogg, B. J. (2003). *Introduction Persuasion in the DigitalAge*.

Grinschgl, S., Meyerhoff, H. S., & Papenmeier, F. (2020). Interface and interaction design: How mobile touch devices foster cognitive offloading. *Computers in Human Behavior*, *108*(February), 106317. https://doi.org/10.1016/j.chb.2020.106317

Howe, S. (2023). social-media-statistics-malaysia @ www.meltwater.com. *Meltwater*. https://www.meltwater.com/en/blog/social-media-statistics-malaysia

Imma, D., Latiff, A., Ridzuan, A. R., Mohideen, R. S., Kamilah, N., Anuar, K., Alyani, N., & Shukri, M. (2016). a Study of Usage Patterns and Tv Shows Analysis on Internet Tv. *Journal of Education and Social Sciences*, *3*(2012), 111–117.

Josh. (2022). *Technology for Older People@ www.lifeline24.co.uk*. Lifeline24. https://www.lifeline24.co.uk/technology-for-older-people/

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Joymali. (2015). *https://www.smartdatacollective.com/internet-tv-vs-internet-protocol-television-iptv-which-one-should-consider@ www.smartdatacollective.com*. Smartdatacollective. https://www.smartdatacollective.com/internet-tv-vs-internet-protocol-television-iptv-which-one-should-consider/#:~:text=Internet TV and IPTV have,are not willing to pay.

Kennedy, I. (2022). internet-television-definition-impact @ study.com. *STUDY*. https://study.com/academy/lesson/internet-television-definition-impact.html

Kolko, J. (2010). *interaction-design*. https://www.interaction-design.org/literature/topics/interaction-design#:~:text=Interaction Design (IxD) is the,output to suit precise demands.

Latiff, D. I. A., Yasin, M. A. I., … S. N. F. A.-F. K., & 2019, U. (2019). Unique attributes of internet TV in enhancing students' learning experience. *Ir.Uitm.Edu.My*, *14*(2), 1–19. https://ir.uitm.edu.my/id/eprint/48456/

M. Six, Janet; Macefield, R. (2016). *how-to-determine-the-right-number-of-participants-for-usability-studies @ www.uxmatters.com*. https://www.uxmatters.com/mt/archives/2016/01/how-to-determine-the-right-number-of-participants-for-usability-studies.php#:~:text=In summary%2C research suggests that,when testing more novel designs.

Melanie. (2015). *Internet TV @ www.privatestage.tv*. Privatestage.Tv. http://www.privatestage.tv/tag/internet-tv/

Moran, K. (2019). *Usability Testing 101 @ www.nngroup.com*. 2019. https://www.nngroup.com/articles/usability-testing-101/

MSN_TV, W. (2022). MSN_TV @ en.wikipedia.org. In *Wikipedia*. https://en.wikipedia.org/wiki/MSN_TV

Nunes, F., Allen, R. A., Kerwin, M., Allen, R. A., Silva, P. A., & Allen, R. A. (2012). *Design Recommendations for TV User Interfaces for Older Adults : Findings from the eCAALYX Project*. 41–48.

Okoye, J. (2022). 29509 @ www.techopedia.com. *Technopedia*. https://www.techopedia.com/7-ways-technology-has-changed-television/2/29509

Polyuk, S. (2019). Ui-Design-for-Older-Adults @ Www.Toptal.Com. In *Toptal*. https://www.toptal.com/designers/ui/ui-design-for-older-adults

Rees, B. (2017). *persuasive-design-using-psychology @ www.toptal.com*. TopTal. https://www.toptal.com/designers/ux/persuasive-design-using-psychology#:~:text=Persuasive design can improve user,of users and engages them.

Roney, M. (2021). *five-ways-to-help-older-adults-navigate-technology-more-easily @ guide.peacefully.com*. Peacefully. https://guide.peacefully.com/resources/five-ways-to-help-older-adults-navigate-technology-more-easily

Royakkers, L., Timmer, J., Kool, L., & van Est, R. (2018). Societal and ethical issues of digitization. *Ethics and Information Technology*, *20*(2), 127–142. https://doi.org/10.1007/s10676-018-9452-x

Rozenfeld, M. (2018). how-persuasive-technology-can-change-your-habits @ spectrum.ieee.org. *IEEESpectrum*. https://spectrum.ieee.org/how-persuasive-technology-can-change-your-habits#toggle-gdpr

Sid. (2020). *5 persuasive design principles to enhance your product experience @ uxdesign.cc*. Uxdesign. https://uxdesign.cc/5-persuasive-design-principles-to-enhance-your-product-experience-bf4c9a8cb93

Journal of Information System and Technology Management
JISTM
EISSN: 0128-1666
Volume 8 Issue 31 (June 2023) PP. 95-112
DOI: 10.35631/JISTM.831007

Staff, P. (2021). *A Senior's Guide to Navigating Tech Issues in 2021 @ www.pandasecurity.com*. Panda Security. https://www.pandasecurity.com/en/mediacenter/tips/seniors-tech-guide/

Sumner, J., Chong, L. S., Bundele, A., & Wei Lim, Y. (2021). Co-Designing Technology for Aging in Place: A Systematic Review. *Gerontologist*, *61*(7), E395–E409. https://doi.org/10.1093/geront/gnaa064

Technopedia. (2011). internet-television-internet-tv @ www.techopedia.com. In *Technopedia*. https://www.techopedia.com/definition/13523/internet-television-internet-tv#:~:text=Internet TV makes it possible,also known as Web television.

Tikka, P., & Oinas-kukkonen, H. (2019). *Tailoring Persuasive Technology : A Systematic Review of Literature of Self-schema Theory and Transformative Learning Theory in Persuasive Technology Context*. *13*.

Toledo, F. P. De, Devincenzi, S., Kwecko, V., Mota, F. P., & Botelho, S. S. D. C. (2019). A framework for modeling Persuasive Technologies based on the Fogg Behavior Model. *Proceedings - Frontiers in Education Conference, FIE*, *2018-Octob*(October). https://doi.org/10.1109/FIE.2018.8659195

Toxboe, A. (2018). *The Power and Danger of Persuasive Design @ www.uxbooth.com*. Uxbooth. https://www.uxbooth.com/articles/the-power-and-danger-of-persuasive-design/

Wigmore, I. (2013). *Internet-TV @ www.techtarget.com*. TechTarget. https://www.techtarget.com/whatis/definition/Internet-TV

Yu Siang, T. (2021). *what-is-interaction-design @ www.interaction-design.org*. InteractionDesignFoundation. https://www.interaction-design.org/literature/article/what-is-interaction-design

Zhang, R. (2017). *User Research and Design for Live TV UX in China*. 9–14.