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A Foresight Study on the Adoption of Assistive Technology among Disabled People

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Abstract: The improvement of assistive technology has the potential to help more user especially with special need to carry out their daily activities. Though assistive technology has helped people with the impairment, most of them could not realize the benefits as they don't have the knowledge to use it. Therefore, this study aims to identify key drivers that influence disable people to adopt assistive technologies and among disabled people and to determine the future trend of assistive technologies among disabled people for disabled people Malaysia. A mixed method approach which consists of STEEPV, and quantitative study will be used in this research. Ten merged key drivers and issues had been identified. While the impact-uncertainty analysis approach had been used to identify the future trends of Assistive Technology adoption. 384 questionnaires had been distributed to the people at who are the disabled people who had registered as OKU (Orang Kurang Upaya) under Malaysian welfare department and the people who support and engage with him or her on a daily basis with response rate 14.4%. This study found that enhance user's performance and ease in movement and mobility had the highest impact and uncertainty. Four scenarios were proposed at the end of the study. The four scenarios were quality standards and quality assurance systems, expectations, and control over surroundings, promotes acquisition of literacy and frustration and anxiousness.

Keywords: Foresight, Assistive Technology, Disable, STEEPV

1. Introduction

Quality of life has become a priority for public health systems worldwide, while efforts in infrastructure, services, and treatment, as well as breakthroughs in biomedical and rehabilitation engineering, have increased life satisfaction among persons with disabilities. Assistive technology (AT) devices provide a big step forward in providing better living circumstances for individuals with disabilities by helping them to overcome obstacles and perform tasks more quickly and effectively (Khoshmanesh *et al.*, 2021). AT has helped to improve the lives of impaired individuals, and has come to be associated especially putting those disabled people in front of real-world experiences with empowerment, optimism, and encouragement (Nichol *et al.*, 2022). People with disabilities have the

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right to be independence, efficiency, and the ability to afford assistive technology that is appropriate for their instructional needs, allowing them to access information and complete tasks effectively, allowing them to achieve the highest level of independence. According to new research, AT promotes literacy acquisition and provides more equal access to information needed for academic, employment, and general functioning (Atanga *et al.*, 2020). The definition of AT defined as a piece of equipment, or product system that is used whether purchased commercially off the shelf, adapted, or customized. AT has the ability to help individuals in a variety of ways with a lot of different and encompasses a wide range of products (Smith *et al.*, 2018). Assistive technology can be any device, software, or equipment that aids individuals with impairments in learning, communicating, or working. For instance, extrinsic enablers (EE) such as powered wheelchairs, smart prostheses, and dedicated assistive robotic tools for therapy and assistance can increase their users' life autonomy (Fong *et al.*, 2020).

It is estimated that more than one billion users worldwide could benefit from AT (Cieza *et al.*, 2020). AT is frequently used to describe goods or systems that assist people with disabilities, limited mobility, or other limitations in performing tasks that would otherwise be difficult. Since the number of individuals with disabilities who may require the use of assistive technology is quickly increasing, numerous models of assistive technology adoption have been stressed to have positive impact on assistive technology adoption for people with disability within the last decade. These models include Human Activity Assistive Technology (HAAT) (Demrozi *et al.*, 2020). While assistive technologies can have a significant impact on a person's skills, they are frequently abandoned. Adoption entails a collaborative engagement between four parties, including the user and others who support and interact with him or her on a regular basis, such as family members, friends, educators, therapists, physicians, and AT professionals who are knowledgeable about a variety of technologies and can enable a collaborative decision-making process, as well as assistive technology developers. Individuals with disabilities may struggle with tasks at times, requiring others to make decisions for them (Szmukler, 2019). The complexity of tasks may interfere with their daily lives as well as their productivity. Hence, each users contributes unique qualities to the device's development, selection, learning, and integration into the daily life of the user. The Global Collaboration on Assistive Technology (GATE) of the World Health Organization emphasizes the importance of orienting AT provision on the individual, suggesting that effective AT deployment needs a customized and comprehensive knowledge of the value and meaning of AT for the individual, as well as an emphasis on the individual prior to assessing the technological aspect (Khasnabis *et al.*, 2020).

The advancement of new technology has resulted in a substantial amount of literature devoted to technology adoption, acceptance, and diffusion (Lutfi *et al.*, 2022). The procedure of the adoption process entails the creation of assistive technology, as well as the evaluation of requirements, desires, and equipment, as well as training, customization, and ease of use of the device. This vital step in research related to AT is needed to determine if a device is useful for consumers as they function in their homes and communities, and if these devices actually promote independence and mobility in their daily lives (MacLachlan *et al.*, 2018). Therefore, individual with a disability should be in complete control of the assistive technology tool. They should be able to pick it out, set it up, customize it, troubleshoot it, and use it on their own. Individuals with severe impairments or young users, on the other hand, may not always be able to do so. They may require assistance throughout the selection process, as well as ongoing support and training. The support system that surrounds them in this situation. Typically, family members, teachers, therapists, and medical personnel are critical to the process.

Poorly fitted devices may result in negative consequences to physical functioning, quality of life and occupation (Barone Gibbs *et al.*, 2021). Further, majority of assistive technology is abandoned within the first year, often as a result of a lack of consumer involvement in device selection or because the gadget fails to meet consumer expectations for efficacy, dependability, durability, comfort, and simplicity of use.

Despite the fact that assistive technology has many important characteristics, it is currently relatively rare in Malaysia, and adoption is expected to increase throughout the forecast period. While AT is very useful, its implementation and accessibility has been often questioned (Karki *et al.*, 2021).

There are a variety of reasons for AT's restricted availability, including a lack of funding, lack of knowledge among experts, and the fact that a large number of solutions are unavailable in a large number of nations. Therefore, this research aims to explore the future trend of the AT among users and non-users of AT in Malaysia by evaluating the key drivers of it.

Therefore, to achieve the research objectives the key drivers of assistive technology adoption on disabled people in Malaysia are expolerd. Consequently, the future trend of assistive technology adoption in Malaysia is identified.

The purpose of this study is to determine key drives that influence the adoption of assistive technology for disabled people as well the future trends of the technology in Malaysia. Recruitment was done to the people at who are the disabled people who had registered as OKU (Orang Kurang Upaya) under Malaysian welfare department and the people who support and engage with him or her on a daily basis. The participants were chosen based on the willingness to participate in the questionnaire without disturbing their academic timetable. Questionnaires had been distributed to the advocates for the data collection analysis. This study uses a quantitative approach using questionnaire as a study instrument.

This study is significance because it shows the future of assistive technology for disabilities as well the future trends of the technology in Malaysia. It deserves further study because consumers always rely on new advanced technology for better life. Moreover, this research will provide the benefits to future researchers as this study provides evidence of the uncertainty of the assistive technology and its effect to the users, the persons around him/her who support and interact, specialist and the developer of the technology in Malaysia.

2. Literature Review

2.1 Assistive Technology

AT refers to any item, piece of equipment, software programmed, or product system that assists persons with disabilities in increasing, maintaining, or improving their functional capabilities (Zallio & Ohashi, 2022). There are a range of AT devices that exist on a continuum. No-tech or low-tech AT comprises of equipment and instruments that assist the users but do not need substantial training or a large cost, and which are frequently easily accessed and replaced (Martiniello *et al.*, 2022). Meanwhile, middle technology devices are ones that do not need substantial training and are priced accordingly. AT have a power source usually batteries but are not excessively complicated. The high tech of AT is often best suited for those who have severe impairments or have extensive functional needs (Wali & Sanfilippo, 2019). High-tech AT typically necessitates training and is often more expensive than low- or mid-tech devices. Individuals are more sophisticated demands, the technologies are designed to ensure that even persons with limited mobility or control over their body can communicate or adjust their surroundings (Dos Santos *et al.*, 2022).

2.2 Assistive Technology Laws

The Americans with Impairments Act (ADA) provides persons with disabilities with a legal right to be accommodated in public areas and the workplace (Blanck, 2020). According to the authors, accommodation consists of providing assistive technology such as gadgets or modifying the current environment to better serve persons with special needs. Under the Individuals with Disabilities Education Act (IDEA) outlined forty assistive technology rights (Taylor *et al.*, 2022). Children and teenagers aged 3 to 21 who attend the state school system or other public agencies that teach kids with disabilities must be provided with assistive technology devices and services under IDEA Part B. Education authorities must make certain that students with disabilities get the free and appropriate public education to which they are entitled under the IDEA. Because mobility and skill development have been major obstacles for persons with disabilities, work has become another domino effect. On the other hand, when it comes to essential health care services, inaccessibility plays a significant influence. The federal-state agencies intended to establish programs to notify and educate people with disabilities, as well as those who serve them, about the availability and use of assistive technology

devices in The Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Ahmed, 2018).

2.3 Benefits of using Assistive Technology

AT is defined as a variety of technologies and services connected to their usage that are targeted at assisting individuals with disabilities and special education or rehabilitation requirements to perform better within their everyday environment and attain a greater quality of life (Manzoor & Vimarlund, 2018). AT can operate as a supportive aspect of the environment, allowing a person to begin, perform, and participate in health-care-related tasks of their choosing. When the AT is chosen right, depending on the person's requirements, their surroundings, and the job at hand, it becomes a harmonizing component of the person's daily routine (Pappadà *et al.*, 2021). AT benefits people who have difficulty speaking, typing, writing, remembering, pointing, seeing, hearing, learning, walking, and many other things. One of the most significant accommodations that educational institutions must provide is AT in the classroom (Ahmed, 2018). Furthermore, Watson and Johnston suggest that high–tech computers and software can be beneficial aids for kids with moderate impairments like dyscalculia, dyslexia, or dysgraphia. One of the most important roles of teachers is to provide excellent learning experiences for all children, regardless of their impairments, and assistive technology may help instructors achieve this aim, providing their pupils a bright future. AT has several clinical advantages, such as enhancing people's mobility and capacity to do daily tasks through the use of canes and walkers (Senjam *et al.*, 2020). Mobility aids can boost people's self-esteem and sense of safety, allowing them to reach the utmost level of independence in their life. For example, a system can be built to complement the conventional white cane that visually impaired people have used for a long time. Voice messages that are sensor specific are used to notify you of any obstacles (Sahoo *et al.*, 2019).

2.4 Challenges in using Assistive Technology

Access to AT is hampered by a variety of factors, including limited to lack of training, and poor assessment. The literature listed below outlines some of the barriers that may hinder folks from gaining access to AT. According to Boot *et al.* (2018), finance for AT equipment and services has been a key obstacle to acquiring its devices and services. Further, several governmental and private sources provide money to those with disabilities in order for them to receive the necessary assistive technology; yet, obtaining assistive technology can still be challenging for families owing to the expense. Kim *et al.* (2016) conducted a study to identify the primary challenges in the evaluation and application of AT for users with multiple impairments. Several difficulties were identified by the authors, including a lack of proper teacher preparation and support, unfavorable staff attitudes, inadequate evaluation and planning processes, insufficient financial support, trouble procuring and maintaining equipment, and time limits. McNicholl *et al.* (2021) distinguish between two approaches to the influence of assistive technology on disabled people's engagement. First, disability is primarily a medical issue that should be treated as such, and second, disability is a societal problem owing to prejudice and discrimination. Users of AT may be concerned about being stigmatized for using equipment that identify them as disabled. They may also become unduly reliant on particular gadgets, making them vulnerable if they fail, or they may suffer irritation, helplessness, and fury when AT does not work as planned. Adoption, abandonment, and non-use of AT may be influenced by these negative circumstances (Petrie *et al.*, 2018). It is critical that this occurs in order to correctly assess AT users' daily lives. Furthermore, AT research must move out of laboratory settings and into the environment in which customers generally use their gadgets in order for AT to genuinely benefit the customer (Blond, 2019).

2.5 STEEPV Analysis

The issues and drivers of assistive technology (AT) were identified into Social, Technological, Economic, Environmental, Political and Values (STEEPV) analysis. Issues and drivers in this study were retrieved from various sources of secondary data such as journals, articles, books, and reports. Table 1 showed merged issues and drivers that were through STEEPV analysis.

Table 1: Table with merged issues and drivers

No.	Issues and Drivers
1.	Advanced in living standard
2.	Safety and health of users
3.	Technology advancement
4.	Addressing emotions
5.	Saves time and costs
6.	Reducing environmental impact
7.	Ease in movement and mobility
8.	Government policies
9.	Accessibility
10.	Enhance user's performance

3. Research Methodology

3.1 Research Design

Research designed can be defined as a detailed proposal that created to solve the problem of the research (Sumirattana *et al.*, 2017). Research design outlines the process for studies, directing them on how to conduct research, create instruments, perform fieldwork, gather data, and analyze the results. The study relies on quantitative research. The question in the surveys is a fixed-alternative question. The use of quantitative research was chosen since it provided more detailed information for the research. Quantitative research is those research that involves numerical measurement and analysis and is a technique used by the researcher to obtain the results from the survey without relating it to numerical measurement (Sumirattana *et al.*, 2017). The researcher developed the questionnaire by using the STEEPV analysis to determine the relevant drivers of assistive technology among blind people in Malaysia.

3.2 Population and Sampling

Research population is a big group of individuals or people who are primarily interested in a scientific question (Boeschoten *et al.*, 2020). The population is a list of all the attributes that make up the population from which the sample is drawn. It is also known as a well-defined group of people or things that have similar qualities. In this study, the target respondents are the disabled people who had registered as OKU (Orang Kurang Upaya) under Malaysian welfare department and the people who support and engage with him or her on a daily basis or the people who actually saw how disabled people used the technology. The participants for this study should be from different gender, race, ages, and religion. This research used a cluster sampling method, then cluster samples are randomly selected from the population. Based on the Krejcie and Morgan (1970) sampling table, 384 respondents expected to be involved in this study.

3.3 Research Instrument

In this research, both qualitative and quantitative approaches were used to analyze and interpret data. Quantitative research methods highlighted objective measurement and statistical, mathematical, or numerical analysis of collected data (Basias & Pollalis, 2018). The main instrument that has been used in this research is questionnaire. To develop a successful questionnaire is very important to make question easy to read and understand by respondents in order to complete it in a given time (Lenzner *et al.*, 2010). The questionnaire consisted of four parts which are Section A, Section B, Section C, and Section D.

3.4 Data Collection

The accuracy of the data obtained will have an influence on the outcomes in the end. Both primary and secondary data were used in the research to investigate the foresight study on adoption of assistive

technology among disabled people in Malaysia. Data collection is used to collect primary data. Questionnaire is the research instrument that was employed in this study. The core data for this study was gathered via a questionnaire based on the STEEPV analysis results. The survey method through primary data was carried out in the form of questionnaires distributed to the related respondents. While most of the secondary data obtained from the online database are manually obtained from Tunku Tun Aminah Library, University of Tun Hussein Onn Malaysia, and many other websites such as Science Direct, Google scholar, Emerald Management e-Journal Collection and so on. Secondary data is to support data and understand more detailed studies conducted.

3.5 Data Analysis

(a) Impact-uncertainty analysis

A descriptive result was used to conduct an impact-uncertainty analysis. This study looks on the uncertainty around the goal of using assistive technology among disabled people in Malaysian. The STEEPV analysis yielded a list of variables. The elements having the greatest impact and uncertainty are the major drivers for the impact-uncertainty study.

(b) Future scenario analysis

The purpose of creating a scenario is to outline possible outcomes such as future issues, trends, events, strategy, and future-related development. This strategy is commonly employed during the Impact-Uncertainty Analysis stage's brainstorming. The uncertainty analysis is used to define the range of prospective outcomes and future uncertainties. This is when conceptual thinking come into the picture.

4. Results and Discussion

4.1 Response Rate

The selected respondents are registered disabled people (OKU) under Malaysian welfare department in 2021 consist of 605,746 individuals. A total number of 384 of the sample sizes for the targeted respondent were selected for this study. The questionnaire had been distributed through social media such as WhatsApp. According to Table 1, 54 out of 384 valid questionnaires had been collected. The response rate is 14.4%.

Table 1: Questionnaire response rate

Sample size	Returned (Valid) Questionnaires	Response Rate (%)
384	54	14.4%

4.2 Reliability Analysis

A reliability test was done in the real study to verifying the reliability of this research. Reliability was defined as the extent to which outcomes are steady and exact over various repeated trials (Morris & DeShon, 2002). Thus, perform a pilot test is critical to establish the reliability of the instruments. Cronbach's alpha was employed to evaluate the internal consistency of the instruments (Bonett, 2003). The Cronbach's Alpha coefficient was used to test the reliability of all questionnaire parts and to assess the internal consistency of each scale item for each primary construct. Table 2 indicates the rule of thumb for measuring Cronbach's Alpha value and assessing reliability.

Table 2: Cronbach's Alpha classification

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good

$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Table 3: Result of reliability in real study

	Cronbach's Alpha	Number of items	Number of Respondent
Pilot test	0.977	52	15
Real Study	0.960	52	54

Based on Table 2 and Table 3, the Cronbach's Alpha value for the pilot test is 0.977. The number of respondents is 15. From the value of Cronbach's Alpha indicates in Table 3, it is excellent because the value had exceeded 0.9, therefore the study was reliable and could be continue. The Cronbach's Alpha value for real study is 0.960 with total 54 respondents. Hence, this study illustrates an excellent and high reliability of the variable.

4.3 Respondent's Demographic Information

Table 4: Demographic analysis

		Frequency	Percentage (%)
Gender	Male	25	53.7
	Female	29	46.3
Age	Below 20	2	3.7
	21-25	34	63.0
	26-30	7	13.0
	31-35	6	11.1
	36-40	4	7.4
	41 and above	2	3.7
Race	Malay	46	85.2
	Chinee	7	13.0
	Others	1	1.9
Heard about Assistive Technology?	9 years	26	14.4
	Yes	35	65
	No	19	35
Status of respondent	I am an Assistive Technology user myself	11	20.4
	I am a family member of an AT user	7	13
	I am an educator of AT users	4	7.4
	I see how disabled use the AT	14	25.9
	I never heard of Assistive Technology	18	33.3
Living Option of Respondent	I live by myself (alone)	3	5.7
	I live with family members	39	73.6
	I live with roommates	7	13.2
	I live in a group home	3	5.7
	I live in a nursing facility	1	1.9
Living situation changed after Assistive Technology?	Yes	44	81
	No	10	19

The demographic analysis was conducted to describe the tabulation of the respondents. It consists of gender, age, race, education level, status, and the knowledge about Assistive Technology. Table 4 shows that majority of the respondent are female (53.7%), age between 21-25 years old (63.0%), and

Malay (85.2%). Most of the respondent (65.0%) have heard about Assistive Technology. 81.0% of the respondent agreed that Assistive Technology changed the living situation.

4.4 Impact-Uncertainty Analysis

Impact-uncertainty analysis is conducted to identify the top two drivers with high impact and high uncertainty values. These two drivers will then be used to develop the scenario analysis.

Table 5: Mean of the drivers on level of impact and uncertainty

No	Statement	Impact	Uncertainty
1	Using Assistive Technology can make people with disabilities be more independent in the community.	4.46	4.30
2	Using Assistive Technology provides technology advancement as it meets the special needs of the user.	4.44	4.26
3	Using Assistive technology is helpful for telecommunication and information.	4.35	4.20
4	Using Assistive Technology provides better access to health security.	4.39	4.22
5	Using Assistive Technology provides an effective way to display information (i.e., including speech, music, graphics, text, and animation).	4.33	4.28
6	Using Assistive Technology saves time and costs.	4.35	4.11
7	Using Assistive Technology enhances users' performance.	4.46	4.35
8	Using Assistive Technology improves efficiency in completing tasks as it uses control mode of AT devices.	4.35	4.13
9	Using Assistive Technology improves user motivation.	4.43	4.26
10	Using Assistive Technology gives the capability to move and carry goods more easily.	4.52	4.30
11	In my opinion, government initiatives and policies encourage AT users to share their experience in handling the device.	4.33	4.24
12	Using Assistive Technology requires frequent maintenance in order for the device to last beyond its expected life.	4.41	4.22
13	Using Assistive Technology requires training to handle the device.	4.35	4.31
14	Using Assistive Technology could not cause pain or discomfort.	4.09	3.98
15	Using Assistive technology could not embarrass some users by certain aspects of the device (e.g., physical appearance or unusual sounds).	4.11	3.96

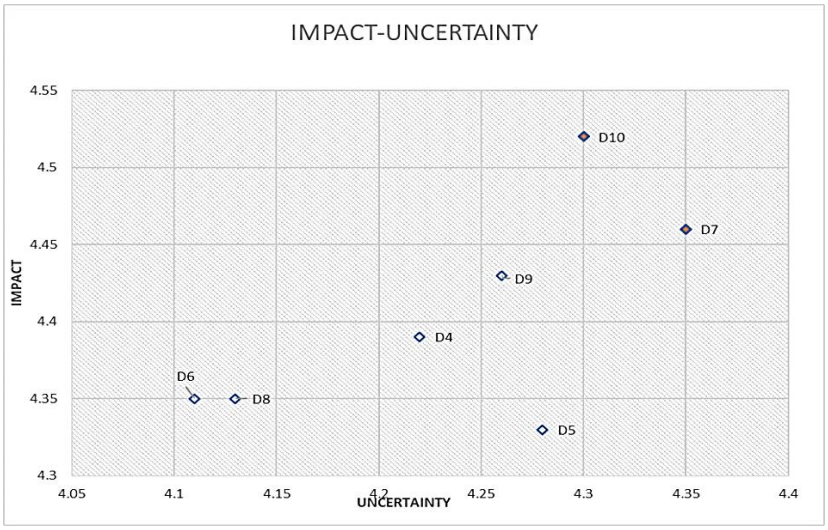

Figure 1: Impact-uncertainty analysis

Figure 1 shown the top two coordinates with high impact and uncertainty were chosen which is D7 (4.35, 4.46) and D10 (4.30, 4.52). D8 has the highest level of impact and D9 has the highest level of uncertainty while for the future of assistive technology among disabled people in Malaysia. These two drivers represent the following question which are *"Using Assistive Technology enhances users' performance"* and *"Using Assistive Technology gives the capability to move and carry goods more easily".* From the result, this study had selected drivers that related with advanced in living standard and enhance performance as the top drivers that lead to the adoption of assistive technology among disabled people in Malaysia.

5. Result and Discussion

5.1 Discussion Based on the First Research Objectives

The objective of scenario building was to determine the expected outcome with the top two drivers in order to investigate the future potential of assistive technology adoption among disabled people in Malaysia over the next 5 to 10 years. The impact-uncertainty analysis and scenario analysis have been proven to be closely related, with the top two drivers contributing the most impact and uncertainty, which will be utilized to construct scenario analysis based on four scenarios.

5.2 Discussion based on the Second Research Objectives

The second objective of this study is to identify the future trend assistive technology adoption among disabled people in Malaysia. The trend is achieved by generating scenario analysis based on the top two impact-uncertainty drivers identified from the impact-uncertainty analysis. The next section discusses the top two drivers who were chosen. It is stated how unclear the future development is and what influence it will have on the future use of assistive technology among disabled people in Malaysia. The four possible scenarios have been analyzed and show in Figure 2.

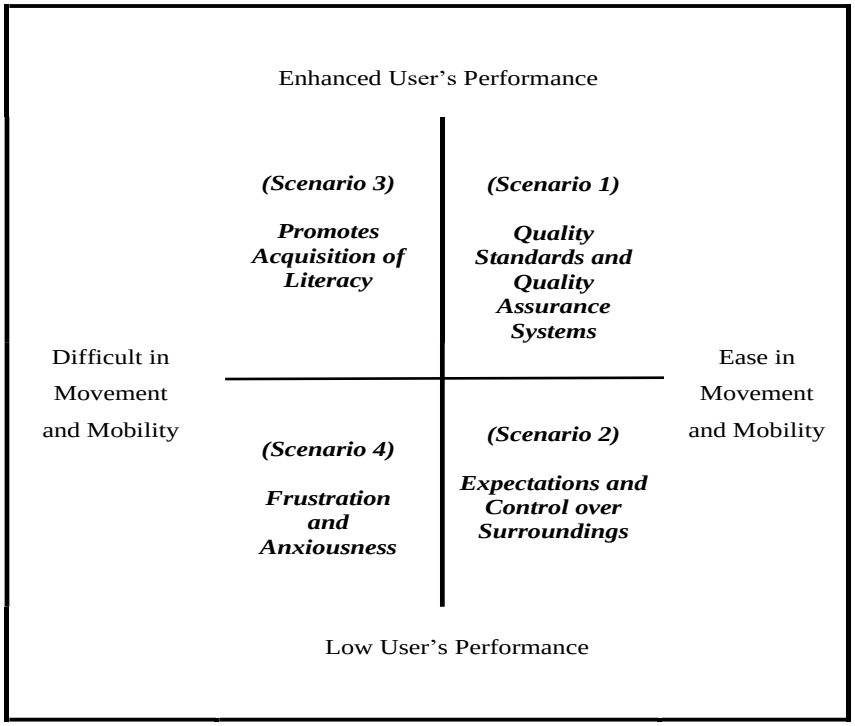

Figure 2: Four alternative scenario

(a) Scenario 1 (Quality standards and quality assurance systems)

Aside from clear guidelines for the service delivery process, a quality standard is essential. The Association for the Advancement of AT in Europe (AAATE) has produced a series of quality standards for Assistive Technology service delivery, and a proposal for a quality framework was given at the Gang Resistance Education and Training (GReAT) summit. The latter is intended to be a tool for systematically analyzing and discussing the quality of Assistive Technology service delivery at various levels (national, service provider, individual). The framework is based on seven quality criteria: access, competence, coordination, efficiency, flexibility, user-centeredness, and infrastructure.

The first two steps in developing an AT provision model are to establish a legislative foundation and to establish Assistive Technology centers. The legislative foundation is required to provide people with the rights to obtain appropriate AT solutions, as well as to establish quality standards, eligibility criteria, and reimbursement rights, among other things. AT centers are an excellent way to not only provide access to AT solutions for everyone who may benefit from them, but also to play an active role in awareness raising and information provision, to deliver training and support to health and social care professionals, teachers, and others who support people with disabilities, and to participate in research and innovation.

Thus, a network of centers allows for the sharing of expertise, techniques, and tools, as well as the development of specialties on top of a general function for each center. When a solid legal basis is in place and a network of centers is in place, high-quality AT services can be ensured, and new features may be added.

(b) Scenario 2 (Expectations and control over surroundings)

Actions are driven by a desire to get the greatest possible results by exerting control over our environment, and this is true even for persons who are completely incapacitated. Berry and Parasuraman (1997) also observed that when the two user groups' expectations from technology were questioned, the novice users were irritated and gave up, but the expert users attempted to navigate through the

obstacles to achieve outcomes. In the case of blind users, high adoption and continuing use of AT might be encouraged if the users had a good attitude toward the device. If, on the other hand, users had a neutral or negative attitude toward the role of AT, they might resist adoption and continued use. This attitude demonstrates some resistance to new technology, which raises an essential question: Are blind people typically fearful of new technology? Could they be afraid of adoption because of the high learning curve? It appears that blind individuals have a tough time transitioning to new technologies, but when the technology works, the transfer to a better AT is welcomed.

(c) Scenario 3 (Promotes acquisition of literacy)

Newer technologies include capabilities that allow a user to have greater access to and control the information delivered through voice, braille, text, and audio. The claim is made in what is known as audio supported reading (ASR) that the combination of refreshable (paperless) braille or screen magnification and text-to-speech will further augment the speed with which a reader can acquire information. With these information and communication technologies, the task of reading and comprehending text can occur with greater efficiency, thus opening up learning opportunities that will support students in maximizing their educational opportunities (Prensky, 2005). Evans *et al.* (2020) describes technology that may be used to educate individuals with learning impairments is roughly classified into three categories including audio technologies, visual technologies, and audio-visual technologies. According to him, audio technology refers to information and communication technology that exclusively appeals to the sense of hearing of visually impaired people, whereas visual technology refers to information and communication technology that appeals to a hearing-impaired person's sense of sight.

(d) Scenario 4 (Frustration and anxiousness)

Frustration and anxiety can result from a lack of faith in technology, failure when expectations are high, and negative social conditioning. Personal characteristics such as a lack of patience or understanding, as well as a lack of commitment that restricts time spent using AT, can all have an impact on AT use. Multiple examples of irritation and anxiety associated with the usage of AT demonstrate the difficulties in user-behaviors toward AT. Despite the fact that most users are constantly challenged by a lack of consistency, availability, and accessibility in AT, they continue to rely on it for everyday functioning. Frustration and anxiety have given birth to inventiveness in some circumstances. This behavior definitely inhibits AT adoption and should be researched further to see if its impacts can be lessened by training, especially in the case of heavy users of AT. The participants' perseverance and ingenuity came out as particularly noteworthy in this study.

5.3 Conclusion

In conclusion, this study provides the description of future AT by identifying the current trend of AT among disabled people in Malaysia. It is found that two key drivers which shaping the future AT are advanced in living standard and enhance performance. Future work will focus on expanding each these elements to provide a resource to academics and AT providers. Besides, this study will also bring the knowledge and information as well as perception of the respondents on adoption of AT among disabled people in Malaysia. The top two drivers which identify from impact-uncertainty analysis has been used to build scenario building analysis. Four scenarios analysis are built to determine the proposed future trend AT adoption among disabled people. Every new technology will face some challenges and limitations. Therefore, the public and private sector should give support to help develop this new technology in future in Malaysia.

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