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The Role of Modern Technology Tools in the Quality of Life of People with Special Needs

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ABSTRACT

The current study aims to evaluate the importance of the use of smart home technologies IoT among people with disability. Data were collected by the survey questionnaire from a total of 130 Saudi individuals. Descriptive statistics and MONOVA were performed. The results reported that the participants show a medium average score (M=3.20, SD=0.539). The results also showed that male participants scored higher than female in using IoT in their life than female participants. The results also showed that there was no difference in the use of IoT devices in the quality of people with disabilities of life based on their age. The results support the relevance of providing knowledge and enhancing the skills of individuals with disability to use IoT devices to perform their daily activities.

الكلمات المفتاحية:

تقنيات المنازل الذكية
إنترنت الأشياء
الأشخاص ذوو الإعاقة
جودة الحياة
أدوات التكنولوجيا الحديثة
التكنولوجيا المساندة

ملخص

تهدف الدراسة الحالية إلى تقييم أهمية استخدام تقنيات المنازل الذكية (إنترنت الأشياء) بين الأشخاص ذوي الإعاقة. وقد جُمعت البيانات باستخدام استبانة مسحية من عينة مكونة من (130) فردًا سعوديًا. تم إجراء الإحصاءات الوصفية وتحليل التباين المتعدد .(MONOVA) وأظهرت النتائج أن المشاركين حصلوا على متوسط تقدير عام متوسط بلغ (3.20) بانحراف معياري (0.539). كما بينت النتائج أن الذكور سجلوا درجات أعلى من الإناث في استخدام تقنيات إنترنت الأشياء في حياتهم اليومية .وأظهرت النتائج أيضًا أنه لا توجد فروق في استخدام أجهزة إنترنت الأشياء وتأثيرها على جودة حياة الأشخاص ذوي الإعاقة وفقًا لأعمارهم .وتدعم هذه النتائج أهمية توفير المعرفة وتعزيز مهارات الأشخاص ذوي الإعاقة في استخدام أجهزة إنترنت الأشياء لأداء أنشطتهم اليومية.

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1 Introduction

Many factors that influence people's life, particularly stemming from the objective conditions within their residences (social indicators), their subjective response to the conditions of their lives (psychological indicators), the adjustment of expectations and the needs dictated by their lifestyle (social policy) and lastly, external influences (Bakula et al., 2011). Life quality is basically a broad concept that is influenced by the physical health of the individual, his psychological state and the environment within which he lives (Vankova & Mancheva, 2015). The topic has been increasingly attracting ample attention from various fields, including public health, rehabilitation and disability (Vankova & Mancheva, 2015; Kuvalekar et al., 2015).

In relation to the above, disability, which is not merely a health problem but also characterized by numerous difficulties when interacting with society and mobility (Fellinghaure et

al., 2012), is of importance when it comes to life quality. Disabled people, their caretakers and families face numerous difficulties owing to their health problems and the distinct social stigma attached to their condition (Ghosh, 2007; Kuvalekar et al., 2015). There are many factors that prevent their participation in society coupled with their poor health conditions, low education, high rate of poverty and enhanced dependency on others (Kuvalekar et al., 2015).

In today's world, where technological advancements have permeated all life sectors (health, education, industry, economy etc. (Jamalian et al., 2022; Wambua & Oduor, 2022; Paupini, Zeeuw & Teigen, 2022; Verna et al., 2021; Lei et al., 2022), services that help people (both with and without special needs) have greatly improved. In connection to this, Internet of Things (IoT) is one of such developed technologies that links various everyday devices and systems (sensors, appliances, actuators, computers and cellular phones) for the purpose of forming a distributed intelligent system that communicates with other systems and human beings (Lee et al., 2020; Atzori, Iera, & Morabito, 2010).

More importantly, the IoT currently has a key role in establishing a better, easier and comfortable quality of life for individuals (Maswadi, Ghani, & Hamid, 2022), affecting psychological needs, particularly among special needs people (Jamalian et al., 2022; Lee et al., 2020). Past studies dedicated to the topic stressed the role of IoT in smart home technologies to help people in day-to-day activities, and promoting their independence. Moreover, the IoT smart house technologies aim to provide assistive technology to assist disabled individuals in completing their day-to-day activities. According to disability studies, IoT support has led to enhanced life quality of individuals with disabilities relating to their vision, hearing and physical abilities (Ulloa, 2021) and it has been evidenced to be a robust tool that promotes participation and independence (Domingo, 2012). Nevertheless, a clear consensus as to IoT limits and definitions is still elusive (Wilson & Hargreaves, 2017). Studies do exist on the IoT smart technologies for disabled people, but findings indicate that such technologies adoption is still at a low level. This is attributed to the lack of full understanding of the new innovative solutions and their high costs that could factor into their slow adoption (Lee et al., 2020; Lee & Coughlin, 2014).

2 Objectives of the Study

Quality life is a concept that covers a broad scope, representing the people's well-being in society (Rock, Tajudeen, & Chung, 2022), and thus, the evaluation of its specific definition and measurement involves a complex activity, albeit some authors do have an agreement on its attributes. According to past related studies (Rock et al., 2022; Djafri et al., 2020), QoL has multiple dimensions with various domains and indicators, including subjective and objective elements, and is affected by different aspects stemming from personal and environmental elements, resulting in the individual's physical, psychological and sociological state. Supporting the above, numerous studies also examined the benefits towards use-intention and rationalized the benefits of IoT use on disabled people's home life quality. This is consistent with Saudi Association for Individual with disability (2021), Marin-Diaz (2017) and Castano-Calle et al.'s (2022) models.

On the above basis, the effect of IoT use on disabled individuals' home life quality is rationalized into four facts (Jackson, 2011; Saudi Association for Individual with Disability, 2021), which are, being, belonging, becoming and daily tasks. More specifically, being refers to the key factors of physical activities practicing meeting psychological and spiritual needs, belonging refers to meeting physical, social and community belonging needs, becoming refers to meeting physical, leisure and growth needs, while daily tasks refer to the abilities towards performing day-to-day tasks individually. Overall, home life quality of disabled people will be enhanced if any of the elements stated in the model is achieved. This calls for an insight into IoT home resources effects and accordingly, this study adopts quality of home life models to examine the way different user's quality of home life can be enhanced through IoT resources usage.

IoT smart homes technologies have been evidenced to be useful for enhancing individual life activities (Lee et al., 2020), learning (Moraiti et al., 2022), and communication (Li et al., 2021). This may be evidenced by the role of IoT in assisting ADHD individuals (Anna-Maria & Drigas,

2019). Also, IoT applications can assess the individual's abilities while at the same time providing data concerning their feelings and it can relay knowledge of ADHD and promote its awareness (Anna-Maria & Drigas, 2019). This holds true for autistic individuals, where IoT was evidenced to be successful in connecting with autistic children recordable contacts and their behaviors, preferences and feelings (Anna-Maria & Drigas, 2019). In addition, IoT devices like rings, phones and speakers can enable sensory disabled people to communicate with others (Patil & Prajapat, 2017). The main success requirement of smart houses is to understand the needs of disabled people to improve their life quality. Nevertheless, research of this caliber remains scarce particularly when it comes to disabled individuals' needs and IoT smart home technology (World Population Review, 2022; Marikyan, Papagiannidis, & Alamanos, 2019; Lee et al., 2020).

3 Methodology

This study adopted a cross-sectional quantitative design, using survey as the primary instrument for data collection from participants on using IoT tools in smart homes. The study selected 130 respondents who have experienced the use of IoT devices in their homes. From the total number of participants, Male respondents constituted 78 individuals, while female respondents constituted 52 individuals, and their age from 23 to 77 years as shown in Table1.

Table 1. *Description of the Participants*

Variable	Group	Frequency	Attribution
Gneder	Male	78	60%
	Female	52	40%

3.1 Procuders

The developed questionnaire was disseminated in March to April 2023, prior to which the Pontifical Najran University's approval and collaboration was obtained. The respondents were guaranteed that their data and responses would be kept confidential and anonymous and that their participation would be voluntary. The distribution of the questionnaire was conducted through a hyperlink, ensuring that the results obtained would be used solely for research.

3.2 Measurment

The developed survey was designed based on Google form to ensure total anonymity and confidentiality of data and information. It was divided into two main sections, the first of which obtained the information of the respondents and their use of IoT to enhance their life quality. The second section contained items that measured the study variables, including quality of life, which was measured using the indicators in Jackson (2011) and Saudi Association for Individual Disability (2021), which are being, belonging, becoming and daily tasks. There were 22 measurement items that matched the study objectives, among which are, IoT resources help me engage in the home activities where I live, IoT resources help be to be very close to my family members, IoT resources help me to perform my home activities easily, IoT resources help me to practice my entertainment activities at home easily, and IoT resources help me buy my things by myself. The total measure reliability was α=0.83, which establishes the consistency of the measure – life quality of disabled and elderly individuals.

4 Findings

The mean scores were analyzed against the total scores of IoT resource's role in life quality leading to medium average scores (M=3.20, SD=0.539). The authors ran an independent sample t-test to compare the use of IoT resources among disabled individuals considering their gender, and a significant difference was found in the impact of IoT use (t=5.194, p=0.000<0.05) as shown in Table 2. Specifically, male respondents' life quality was found to be more impacted by their use of IoT resources (M=3.39, SD=0.474) compared to their female counterparts (M=2.93, SD=0.516). Added to the above, a MANOVA test was carried out to compare the means of the respondents based on their ages, but no significant difference was found on the impact of IoT resources use in their life quality (MS=0.615, F=2.147, Sig. 0.121>0.05) as shown in Table 3. This indicates that notwithstanding their ages, the respondents used IoT resources for enhanced quality of life, although younger respondents used such resources more than their older counterparts. Similarly, no significant differences were found on the impact of the importance of IoT resources on the quality of life of the respondents based on their experiences used (MS=0.297, F=1.019, Sig. 0.364>0.05) as shown in Table 4.

Table 2. *Independent Sample t-test Results*

Variable	Group	Mean	SD	t-value	p.value
Gender	Male	3.39	0.474	5.194	0.000
	Female	2.93	0.516		

Table 3. *MANOVA Results Based on Age Differences*

Variable	MS	F	Sig	p.value
Age	0.615	2.147	0.121	>0.05

Table 4. *MANOVA Results based on Expereinces Used*

Variable	MS	F	Sig	p.value
Experienced used	0.297	1.019	0.364	>0.05

4 Impact of Using IoT on Quality of Life Based on Disability Types and Devices Used

Using a MANOVA test, the study compared the impact of IoT resources use on the life quality of disabled individuals based on their disability types and based on the result in Table 5 (MS=0.748, F=2.704, Sig.0.033<0.05), physically disabled individuals were more affected (M=3.45, SD=0.438) compared to any other disability (i.e., intellectual disability, M=3.35, SD=0.567; sense disability, M=3.13, SD=0.614; mental disability, M=3.12, SD=0.542; other disabilities, M=3.06, SD=0.456). As for the type of devices used, no significant difference was found in using IoT resources and their effect of life quality among the respondents (MS=0.507, F=1.783, Sig. 0.136>0.05) as shown in Table 6.

Table 5. *MANOVA Results based on Disability Types*

Variable	MS	F	Sig	p.value
Disability Types	0.748	2.704	0.033	>0.05

Table 6. *MANOVA Results based on Device Used*

Variable	MS	F	Sig	p.value
Device Used	0.507	1.783	0.136	>0.05

5 Discussion and Conclusion

In this study, a moderate level of use of IoT resources enhanced the respondents' life quality. This is consistent with previous studies (Baudier & Ammi, 2020; Schieweck et al., 2018; Sequeiros et al., 2022), which found IoT to enhance some of life qualities including health, living environment and safety at home. According to Lee et al. (2020), the percentage of IoT use among the elderly and disabled individuals remained low notwithstanding their general literacy or digital literacy. In another related study, Lau (2006) found that the rates of IoT services and devices adoption remained low among the elderly and physically disabled people (5-15%).

Upon close examination of the responses to the measurement items, some answers registered less than medium level, with negative answers. This may be attributed to the availability of IoT resources in the houses or lack thereof owing to the high cost, the requirement for techniques and infrastructures. It was notable that families were concerned about the social life of the user as using the tools may isolate them and get them addicted to technology use. Despite the studies that evidenced the benefits of technology on the quality of life of individuals, the ability to reap the benefits is dependent on the user's skills, knowledge and informed use (Van Deursen, & Mossberger, 2018). Going back to the information of the participants, the results varied based on gender and disability types but not based on age and devices used in terms of their effects on IoT resources use and life quality. The results were partially consistent with the results reported by past studies; for instance, Alexander et al. (2021) found that men possessed IoT skills and use security more than women. Finally, based on respondents' disabilities and the differences in the effect of IoT resources on life quality, the result may be attributed to the differences in abilities and skills – some individuals with cognitive and mental disabilities are more difficult to train when it comes to using IoT resources compared to those without. Different disability types also call for different tools and skills requirements.

5.1 Limitations, Recoomondation and Conclusion

Regardless of the numerous contributions of the study enumerated above, this study is not without its limitations. First, the study sample is obtained from one Saudi city and may not represent the general population and thus, future studies may include other people from another cities. Second, the study adopted a quantitative data collection method, therefore mixed method is also recommended to explore deeper into the perceptions and views of the respondents and their families concerning IoT resources use in daily activities.

The study determined the influence of using IoT tools in people life in Saudi Arabia. Data was collected from 130 participants using questionnaire survey. Based on the study findings, individual factors namely gender and disability types do affect IoT usage on the quality of life but those of age, experience and used device do not.

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