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The Personal, Technical and Environmental Barriers Affecting the Usage of Technology among Community-Dwelling Seniors in Alexandria, Egypt

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Abstract: The community modernization has led to technology evolving and information systems in everyday life. Technology has large implications for the health and well-being of older adults. Adoption of technology may improve older adults' quality of life and facilitate independent living. Yet many seniors remain largely disconnected from the digital revolution as a result of many barriers they may face in dealing with technology. The aim of this study was to identify the personal, technical and environmental barriers affecting the usage of technology among community dwelling seniors in Alexandria, Egypt. The study was carried out in two clubs namely; El-Wafaa club in MoharramBec, Al-Hayah and El-Amal club in Sidi Bishr in Alexandria. 200 older adults were recruited into this study, aged 60 years and above, able to communicate and have not any cognitive impairment or depression. Tools: Four tools were used in the present study. Mini Mental State Examination (MMSE) scale, Geriatric Depression Scale Short-Form (GDS-SF), Older Adults' Socio-Demographic and Clinical Data Structured interview schedule and Barriers Affecting the Usage of Technology among Community Dwelling Seniors developed questionnaire. Results of this study revealed that total mean scores of personal and environmental technology usage barriers were statistically significant between smart phone elderly users and feature phone elderly users. *Conclusion*: This study concluded that, there were significant correlations between personal, technical and environmental barriers that affect utilization of technology and socio-demographic variables among the studied seniors; such as age, sex, level of education, marital status and monthly income. *Recommendations*: This study recommended that, any technology serving older adults must have a clear purpose towards advancing the older adult's quality of life, safety, well being and independence, as well as appropriate learning environment must be ensured for optimal older adults' technology adoption.

Key words: Technology Usage · Seniors · Personal Barriers · Technical Barriers · Environmental Barriers

INTRODUCTION

Technology is a scientific knowledge application producing artifacts, which maintain the pragmatic goals of individual life [1]. Nowadays, technologies are broadly available it facilitate a safe, healthy and independent living. Technologies usage in older adults' life is considered as demand for their integration in community and as an antecedent or tool necessary for successful aging [2]. It helps the seniors to access health information to monitor health conditions, take appropriate health-related decisions, financial planning and connecting with friends and family [3]. There are diverse technological appliances as computers, lab tops, tablets, cell phones and smart phones. These appliances can be valuable for seniors in searching health related information through different search engines, transferring e-mails and massages, socializing via various social media [4].

Although, the feasible merits related to technology usage, seniors often dawdle in technology adoption. As well, the elders are slower to accept use of technologies than younger adults [5]. A recent survey revealed that 47% of older individuals who aged above 64 years remain did not utilize technology compared with 3% of those aged 18-29 years olds [6]. The Center for Research and Education on Aging and Technology Enhancement (CREATE) also reported that older adults aged 60-91 years were less likely than younger adults to

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utilize technology, particularly computers and the internet [5]. Yet, there is a striking gap and confusion across generations because of technologies persists to be evolving. Although, older adults may be enthusiastic to learn how to apply new technologies, they professed that they might have involvedness of learning to utilize these technological systems and they would necessitate additional time to learn than younger populations [7]. Worldwide, many of stereotypes against older adults are persistent when they believed that they are frightened, reluctant and incapable of learning how to utilize technology such as mobile phones, computers, internet and email resulting in a "digital gap" [3].

Older adults are a heterogeneous group that is varied in the socioeconomic, educational levels, cultures, health status and interests. Additionally, new technologies adoption by this heterogeneous group is a multifaceted issue. There are several common major barriers that can be attributed to non-adoption of technology among seniors which include; personal, technical and environment albarriers. The personal barriers include physiological and psychological challenges that may hinder the older adult' ability to utilize technology. Physiological challenges that may affect the older adult's ability to utilize technology are numerous such as visual impairment, hearing loss, fine motor limitations, tremors and cognitive changes. These changes make the seniors to carry out technology-based tasks more slowly than others mental and physical health influence an older adult's motivation to engage in technology. The cognitive abilities specifically decreased attention span and decreased memory capabilities were major barriers of technology use. Older adults' previous experience with or exposure to technology is another physiological variable affecting older adult engagement with technology. Many older adults now aged 50 years and older utilized computers as a part of their employment. These individuals demonstrate a level of comfort with new technology, while others without such experience do not. Moreover, many seniors convey their concerns regarding health issues that may occur directly as result of the impact of technology usage as headache, eyestrain, muscles pain and radiation effects can hinder the engagement of the older adults [3-7].

On the hand, the psychological barriers are considered part of the personal barriers, such as lack of interest, a perceived lack of profit, concerns regarding information security and lack of confidentiality [8]. Older adults who experience disability due to aging are less likely to view themselves as disabled, thus may be less likely to seek, be exposed to or take advantage of adaptive technologies available [9]. In addition, shame related to using adaptive or non-standard versions of technologies, particularly those that are visible, can lead them to be rejected by older adults [10]. For some, utilizing such devices is an embarrassing admission of dependence [11]. Interestingly, older adults may be more likely to engage with technology, including electronic health records, when it helps to treat or address stigmatized illness, such as depression. Older adults may also avoid technology when they have little self-confidence about learning something new. Some older adults experience anxieties and fears that make the elders to do fatal mistakes during the usage of technology, such as inadvertently deleting a file or breaking the device, which facilitates a self-perception as being incapable of utilizing technology [12]. Alvseike and Brønnick [13] also reported that low self-efficacy, anxiety and cognitive deficits related to ageing significantly decrease subjects' capability to adopt technology. Furthermore, maintaining confidentiality and privacy is necessary for any technology users; many seniors describe technology as intrusive. Thus, seniors evade adoption of technology when it causes confidentiality violation and sometimes seniors turn their phones off because they unable to be constantly respond and contacted with others. Several studies have documented that older adults fear from both technology' impact on the society and being addicted to the phone, as they witness younger generations glued to their devices [14, 15]. Although technology progressively influences everybody, not all older-adults perceive this issue as positive [12].

Technical barriers are those related to poor design of the technological devices. Design of operating systems, websites and device applications can create additional obstacles. An absence of feedback to the users is also particularly problematic for older adults [16]. Feedback refers to when a website or application provides some indication that a button has been pushed or a task has been completed. Feedback fosters self-efficacy, which facilitates all learning. Technology is embraced and adopted by older adults when, it is perceived as easy to use or specifically designed for them. For this reason, many older adults choose models of technology that are the simplest, rather than the most contemporary [17, 18]. While, the environmental barriers are those related to the cost of a device or its services, which is greatly impact older adults' access to technology. Older adults living on fixed monthly incomes may not be able to afford to purchase any technological device. As well, social factors are considered one of the environmental barriers, which

could either facilitate or hinder an older adults' motivation to use technology. The context in which an older adult learns how to use technology has an important impact on the older adult's attitude towards technology, as well as, their self-efficacy in using it and ultimate the level of engagement with technology [5, 19].

Health care professionals need to get an understanding of why seniors have complexity in adopting technologies [5]. Gerontological and psychiatric health nurses have a great role in assisting the elders in the application of communications and information technologies. A better understanding of technology usage among seniors may aid nurses to plan and design future interventions aimed at improving older adults' well being and quality of life. Although the ubiquity and significance of technology, no studies have been conducted on technology adoption and usage among older adults living in community in Alexandria. Therefore, there is much need for scientific researches to examine older adults' technology facilitators and barriers, as well as, to identify which kind of technologies better to suit seniors and to make technology more age-friendly. In this context, this research aimed to determine the various types of barriers that affect the utilization of technologies among community-dwelling seniors in Alexandria, Egypt.

Aim of the Study: The study aimed to identify the personal, technical and environmental barriers affecting the usage of technology among community dwelling seniors in Alexandria, Egypt.

Research Question: What are the personal, technical and environmental barriers affecting the usage of technology among community dwelling seniors in Alexandria, Egypt?

Operational Definitions

Personal Barriers: Personal barriers include psychological and physiological barriers that affect the older adult's usage of technology.

Feature Phone: It is a mobile phone that incorporates features such as the ability to access the Internet and store and play music but lacks the advanced functionality of a smart phone.

MATERIALS AND METHODS

Materials

Research Design: The study followed a correlational descriptive design.

Settings: The study was carried out in three clubs namely; El-Wafaa club in Moharram Bec, Al-Hayah and El-Amal club in SidiBishr. These clubs affiliated to the Ministry of Social Solidarity in Alexandria, Egypt. The previously mentioned study settings were selected because of high registered number and attendance rate of older adults. The total number of elders who registered at El- Wafaa club is 600 older adults, with an attendance rate of 10 to 12 elders daily. The working hours of the club are from 9 am to 3 pm every day except Friday. As for Al Hayah and Al Amal club, the total registered number of older adults is 980 older adults, with an attendance rate of 10 to 15 elders every Sunday and Tuesday weekly. The working hours of the club are from 9 am to 6pm.

Subjects: The study subjects comprised of 200 community-dwelling seniors who fulfilled the following inclusion criteria; age 60 years and above, able to communicate, willing to participate in the study. In addition, they must have not any cognitive impairment or depression. The program Epi info 7 was used to estimate the sample size based on using 5% possible error and the confidence co-efficient 95%, which revealed the minimum sample size to be 200 seniors.

Tools: Four tools were used to collect the necessary data:

Tool (I): Mini Mental State Examination (MMSE) Scale: 21 The MMSE was developed by Folstein *et al*. [20]. It is a reliable measure and originally designed for assessing cognitive function of the older adults. It consists of questions that investigate the memory, orientation to time, place, attention, calculation, naming, repetition, registration and language. The scale includes 30 questions in which the older adult's response is either yes or no. The MMSE was translated into Arabic and approved to be valid and reliable by "El-husseini [21]". The Arabic version of this scale was used in this study. This tool is used for the selection of the study subjects. Scoring is based on the number of correct items, with a maximum of thirty points; possible scores are categorized in the following manner:

- 24-30: indicates normal cognitive function.
- 18-23: indicates mild cognitive impairment of the older adult.
- 0-17: indicates severe cognitive impairment of the older adult.

Tool (II): Geriatric Depression Scale Short-Form (GDS-SF): The Geriatric Depression Scale - short Form (GDS-SF) is a 15-item self-report tool developed by Yesavage *et al*. [22]. The scale is originally constructed to assess the incidence of elders' depression. It was translated into Arabic language and proved to be valid and reliable r= 0.70 by Elhusseini [23]. The Arabic version of this scale was used in this study to exclude any senior with depression. The older adults have chosen the answer either "Yes"or "No" based on how they have felt over the past week. A positive answer "Yes" takes (1), while the negative one "No" takes (0). The total score of GDS-SF ranges from 0 to 15, with a score ranging from 0 to 4 indicates no depression, from 5 to 8 indicates mild depression, from 9 to 11 indicates moderate depression and from 12-15 indicates severe depression.

Tool Iii: Older Adults' Socio-Demographic and Clinical Data Structured Interview Schedule: This tool was developed by the researchers based on relevant literature to collect the following data; age, gender, basic education, occupation prior retirement, current financial status and available family/social support, living arrangements, cohabitation status, as well as the presence of medical illnesses.

Tool IV: Barriers Affecting the Usage of Technology among Community Dwelling Seniors Structured Interview Schedule: It was developed by the researchers based on Chen and Chan [12] a theoretical technology model. This tool designed to assess the barriers that hinder the utilization of technology by the older adult. It included sets of three major barriers; personal, technical and environmental barriers that influence senior usage of technology. The personal barriers contain 17 questions. Partone, is the psychological barriers, which include questions to assess barriers of using technology. For example, questions about self-confidence in the technology usage, anxiety regarding occurrence of fatal technological mistakes and fears of technology addiction. Part two of personal barriers, includes questions about the physiological age related changes that may affect the older adults utilization of technology as visual impairment, decline of memory and it also include questions about previous knowledge about use of technology and unavailability of the needed skills to deal with the different technological problems as forgetting the password. Meanwhile, technical barriers composed of 10 questions, e.g. unclear fonts of labeled buttons, sensitivity of touch screens, brightness of screens and complexity of versions/models. In addition to, environmental barriers consisted of six questions, e.g. financial costs of technology and presence of expert trainers from either family, friends, or tutors. The older adult chooses the type of barrier and the type of technological device at which faced the barrier.

Method:

- An official letter was issued from the Faculty of Nursing, Alexandria University and it was forwarded to the director of the study settings to obtain their permission to carry out the study. Then, permission from the study setting responsible authorities was obtained after explaining the purpose of the study in order to gain their support and cooperation during the application of the study interventions.
- Tool III and IV were developed by the researchers after a thorough review of literature, and the content validity of the tools was tested by a jury of 7 experts in the related fields of Gerontological Nursing, Medical Surgical Nursing, Nursing Education, Community Health Nursing and Psychiatric and Mental Health Nursing. The required modifications were carried out accordingly.
- Tools III and IV were tested for internal reliability using Cronbach's alpha correlation coefficient. The results proved that the two tools were reliable with a correlational coefficient (r= 0.86 and 0.88 respectively). Arabic versions of the tools were used in the present study.
- A pilot study was carried out on 20 older adults, in order to ascertain the applicability and clarity of the study tools. The five older adults selected from El Montaza Health Insurance outpatient clinics and excluded from the study to ensure feasibility of tools and estimate the time required to complete the study tools. In the light of the pilot study findings, modifications were done accordingly.
- The researchers used to attend the selected clubs from 9.00 am to 3 pm on all working days of the week. i.e. from Saturday through Thursday to identify those fulfilling study criteria.
- Each study subject was interviewed individually in the living area of the club, in order to be more comfortable. The researchers explained the purpose of the study in order to gain the elders' cooperation and the necessary data was collected. It took nearly 20-30 minutes to complete the sheets.
- Collection of data covered a period of 3 months from the beginning of June to the end of August 2018.

Ethical Considerations: An informed written consent was obtained from each study subject included in this study after explanation of the study purpose. Study subjects' privacy and anonymity were maintained along with confidentiality of the collected data. The researchers informed the study subjects that they have the right to withdraw from the study at any time.

Statistical Analysis: The collected data were coded and analyzed using PC with the Statistical Package for Social Sciences (SPSS version 20) and tabulated frequency and percentages were calculated. Descriptive statistics as frequency, distribution, mean and standard deviation were used to describe different characteristics. The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of two or more independent groups (F Test). As well, student test is used for the quantitative data. The level of significance selected for this study was p < value equal to or less than 0.05.

RESULTS

Table (1) illustrates that more than half of the study subjects was female (52.5%) and 59.5% of the subjects are in the age group ranging between 60 years to less than 70 years. As regards the marital status 58.0% of them were married and living with their families. 71.5% of them are living in urban areas. Concerning the level of education 33.5% of the study subjects had university education and 48.0% worked as clerk before retirement. The majority of the study subjects 84.0% had not current work and 85.0% had chronic conditions. As for the monthly income, 59.0% of them reported to have enough monthly income. According to the technology usage, 59.5% of them reported to have smart phones and 79.5% of the study subjects had net-work in their homes.

Table (2) displays the total mean scores of the three barriers; personal, technical and environmental technological barriers among the study subjects. It can be noted that the total mean score of the personal barriers among smart phone and tablet elderly users (8.07±4.5) was higher than the total mean score of feature phone elderly users (5.7±5.09) with statistically significant difference (t= 3.362, p=0.001). Furthermore, the technical barriers' total mean score was higher in smart phone and tablet elderly users (5.2±4.6) than the total mean score of feature phone elderly users (4.2±3.02) with no statistically significant difference. The total mean scores of environmental barriers also were higher among smart phones and tablets elderly users(1.9±1.3)than the total mean score of feature phone elderly users(1.4±1.5) with statistically significant difference(t= 2.436, p=0.016).

Table 3 depicts that the total mean score of personal barriers of the studied seniors using smart phone and tablet washig her statistically significant than the total mean scores of personal barriers among the studied seniors using feature phone regarding socio-demographic and clinical characteristics. As well, the total mean score of personal barriers of female study subjects using smart phone and tablet 9.0±4.4 was higher than total mean score of the studied male seniors 6.9±4.4 and using the same type of technological devices. The difference is statistically significant (P=0.001). Furthermore, the total mean score of the study subjects who aged 80 and more 11.3±4.3 and using smart phone and tablet was higher than total mean score of personal barriers of those who aged form 60 to less than 70 years and using the same type of phones is 7.0±4.6, with statistical significant difference (P<0.001). Also, the total mean score of personal barriers of the study seniors using smart phone and tablets were widow 9.2±3.9 was higher than total mean score of personal barriers of those who were married 7.5±4.7 and the difference is statistically significant (P=0.001). As for the educational level, the total mean score for the study subjects who read and write 11.3±3.0 compared with 2.6±3.11 for those who had a post graduate degrees and using smart phone and tablet. The difference is statistically significant (P<0.001). Moreover, the total mean score of personal barriers of studied older adults who reported to have enough monthly income using smart phone 7.4±5.0 was lower than total mean score of personal barriers of those who reported not having enough monthly income 9.3±2.9. The difference is statistically significant (P=0.006). Additionally, the total mean score of personal barriers for the study participants who lived alone 10.1±6.1 compared with 7.4±4.3 for those who lived with children and using smart phone and the difference is statistically significant (P=0.004). A statistically significant difference was found between total mean of personal barriers among the participants who have chronic illness and for those who did not have any disease ($P \leq 0.001$).

Table 4 shows the total mean score of technical barriers of the studied seniors using smart phone and tablet was higher statistically significant than the total mean scores of technical barriers among the studied seniors using feature phone regarding socio-demographic and clinical characteristics. It can be observed also that the total mean score of technical barriers among

Table 1: Distribution of the studied subjects according to their socio-demographic and clinical characteristics:

Socio-demographic and clinical characteristics	Frequency	%
Sex		
Male	95	47.5
Female	105	52.5
Age (Years)		
60 to less than 70	119	59.5
60 to less than 80	69	34.5
80 and more	12	6.0
Mean ± SD	68.5±6.5	
Marital status		
Single	4	2.0
Married	116	58.0
Widow	79	39.5
Divorce	1	0.5
Level of education		
Read & write	12	6.0
Primary	59	29.5
Secondary	54	27.0
University	67	33.5
Post graduate	8	4.0
Occupation pre-retirement		
Clerk	96	48.0
Worker	54	27.0
Housewives	50	25.0
Current work		
No	168	84.0
Yes	32	16.0
Monthly income		
Enough	138	69.0
Not enough	62	31.0
Place of residence		
Rural	57	28.5
Urban	143	71.5
Living with		
Alone	33	16.5
With wife / husband	116	58.0
With children	44	22.0
With relatives	7	3.5
Chronic conditions		
No	30	15.0
Yes	170	85.0
Found Net at home		
No	41	20.5
Yes	159	79.5
Type of technological device *		
Feature phone	67	33.5
Smart phone	119	59.5
Tablet \ I Pad	14	7.0

*More than one answer

Table 2: The total mean scores of personal, technical and environmental technological barriers among study subjects:

Types of Technology Barriers	Maximum allowed scores	Total mean scores of older adults using smart phones and tablets	Total mean scores of older adults using feature phones	t- test
Personal barriers	17	8.07±4.5	5.7±5.09	t = 3.362 P =0.001*
Technical barriers	10	5.2±4.6	4.2±3.02	t =1.612 P=0.1086
Environmental barriers	6	1.9±1.3	1.4±1.5	t= 2.436 P=0.016*

*significance at p value ≤ 0.05

Table 3: The correlation between personal barriers and socio-demographic and clinical characteristics among the studied smart phone and feature phone elderly users

Seniors' socio-demographic and clinical characteristics	Personal Barriers among smart phone Users	Test of significance	Personal Barriers among feature phone Users	Test of significance
Sex				
Male	6.9±4.4	F:11.698	5.2±4.4	F:0.199
Female	9.0±4.4	P:0.001*	6.1±5.5	P:0.002*
Age (Years)				
60 to less than 70	7.0±4.6	F: 9.271	5.2±4.6	F:1.499
60 to less than 80	9.2±3.9	P: <0.001*	5.5±6.8	P:0.001*
80 and more	11.3±4.3		6.5±5.4	
Marital status				
Single	2.5±1.2	F:5.283	1.7±0.9	F:5.776
Married	7.5±4.7	P: <0.001*	4.7±4.7	P:0.001*
Widow	9.2±3.9		7.4±5.2	
Divorce	2.0±0.0		0.0±0.0	
Level of education				
Read & write	11.3±3.0	F:22.796	7.6±6.1	F:4.0.97
Primary	10.9±4.0	P: <0.001*	5.4±4.3	P:0.003*
Secondary	7.4±4.3		5.0±4.2	
University	5.8±4.0		3.5±4.1	
Post graduate	2.6±3.1		2.8±4.8	
Occupation pre-retirement				
Clerk	5.7±4.2	F:30.431	4.9±4.3	F:5.549
Skilled Worker	10.4±3.6	P:<0.001*	7.6±5.4	P:0.005*
Housewives	9.9±3.9		5.1±5.6	
Current work				
No	8.8±4.3	F:36.563	6.1±5.2	F:6.549
Yes	3.9±3.2	P:<0.001*	3.6±3.5	P:0.011*
Monthly income				
Enough	7.4±5.0	F:7.698	4.9±4.9	F:11.274
Not enough	9.3±2.9	P:0.006*	7.5±5.0	P:0.001*
Place of residence				
Rural	1.8±3.6	F:34.145	7.1±5.7	F:6.502
Urban	6.9±4.4	P:<0.001	5.1±4.7	P:0.012*
Living with				
Alone	10.1±6.1	F:3.285	8.2±5.2	F:4.602
With wife / husband	9.7±3.4	P:0.023*	6.03±5.1	P:0.004*
With children	7.4±4.3		3.7±5.7	
With relatives	7.5±4.7		4.9±4.7	
Chronic condition				
No	4.2±3.5	F:28.782	4.2±3.9	F:3.261
Yes	8.7±4.3	P:<0.001*	6.0±5.2	P:0.072

F: ANOVA test P: P value of ANOVA test *significance at p value ≤ .05

NB: Maximum allowed scores for personal barriers: 17

female study seniors using smart phone 4.7±3.1 was statistically higher than those male seniors 3.6±2.8 who using the same technological devices (P=0.002). As well, a statistical significant relation was found between total mean score of technical barriers of seniors who have aged 80 years and older and those who aged 60 years to less than 70 years among smart and feature phone users (p=0.003), and (p= 0.004) respectively. Regarding the marital status, teetotal mean score of technical barriers among the studied widow seniors 4.7±3.0 was higher than total mean score of technical barriers among the studied married seniors 3.9±2.9 who using smart phones, with statistically significant difference (P< 0.001). While, the total mean score of technical barriers among study seniors using smart phones and tablet and have a post graduate education degree 1.8±1.6 was statistically lower than total mean scores of technical barriers among those who can read and write 5.3±2.6 with statistically significant difference (P= 0.002). Moreover, the total mean score of technical barriers among study older adults who

Table 4: The correlation between technical barriers and socio-demographic and clinical characteristics among the studied smart phone and feature phone elderly users

Seniors' socio-demographic and clinical characteristics	Technical Barriers among smart phone Users	Test of significance	Technical barriers among feature phone Users	Test of significance
Sex				
Male	3.6±2.8	F:7.187	3.4±4.7	F:0.216
Female	4.7±3.1	P:0.002*	5.0±4.5	P:0.008*
Age (Years)				
60 to less than 70	2.0±3.1	F:0.888	3.9±4.3	F:2.391
60 to less than 80	4.5±2.8	P:0.003*	4.0±4.9	P: 0.004*
80 and more	6.5±4.9		7.4±4.6	
Marital status				
Single	2.0±1.4	F:7.732	2.5±2.6	F:2.403
Married	3.9±2.9	P: <0.001*	4.1±4.3	P:0.001*
Widow	4.7±3.0		7.0±4.5	
Divorce	1.0±0.0		0.0±0.0	
Level of education				
Read & write	5.3±2.6	F:2.919	5.7±4.5	F:3.761
Primary	4.0±2.0	P:0.002*	5.5±4.6	P:0.006*
Secondary	3.8±2.7		5.4±4.7	
University	3.9±3.4		2.5±2.9	
Post graduate	1.8±1.6		1.6±2.7	
Occupation pre-retirement				
Clerk	3.6±3.3	F:6.107	5.0±4.5	F:4.786
Workers	5.4±2.7	P:0.003*	6.6±4.9	P:0.009*
Housewives	4.0±2.0		3.9±4.0	
Current work				
No	4.5±3.0	F:9.604	5.4±4.7	F:1.338
Yes	2.7±2.1	P:0.002*	4.3±4.0	P:0.008*
Monthly income				
Enough	4.0±3.1	F:2.232	4.2±4.1	F:2.162
Not enough	4.7±2.6	P:0.001*	7.5±4.8	P:0.001*
Place of residence				
Rural	5.1±2.7	F:6.809	5.6±4.6	F:0.512
Urban	3.8±3.0	P:0.01*	5.0±4.6	P:0.001*
Living with				
Alone	4.9±3.2	F:1.220	7.7±4.7	F:8.633
With wife / husband	4.2±2.9	P:0.004*	6.2±4.2	P: <0.001*
With children	3.9±2.9		2.0±3.1	
With relatives	4.1±2.6		4.2±4.3	
Chronic condition				
No	2.8±2.8	F:8.255	4.0±4.2	F:2.425
Yes	4.4±2.9	P:0.005*	5.4±4.6	P:0.002*

F: ANOVA test P: P value of ANOVA test *significance at p value ≤ 0.05

NB: Maximum allowed scores for technical barriers:10

were workers before retirement and using smart phones 5.4±2.7 was lower than total mean score of technical barriers among pre- retirement clerks 3.6±3.3 with statistically significant difference (P= 0.002). Furthermore, the total mean score of technical barriers among the studied seniors reported having not enough income 4.7±2.6 was higher than total mean score of technical barriers among the studied seniors reported having enough income 4.0±3.1 with statistically significant difference (P=0.001). A statistically significant difference was found between total mean of technical barriers of the participants who have chronic illness and those who did not in smart phone and feature phone users (P= 0.005) and (P= 0.002) respectively.

Table 4 The correlation between technical barriers and socio-demographic and clinical characteristics among the studied smart phone and feature phone elderly users using smart phones with a total mean score 2.1±1.1, while total mean score of male study subjects using the same technological devices is 1.8±1.4 and a statistical

Table 5: The correlation between socio-demographic, clinical characteristics and environmental barriers and among the studied smart phone and feature phone elderly users

Seniors' socio-demographic and clinical characteristics	Environmental barriers among smart phone and tablet Users	Test of significance	Environmental barriers among feature phone Users	Test of significance
Sex				
Male	1.8±1.4	F:2.308	1.3±1.3	F:1.587
Female	2.1±1.1	P:0.001*	1.6±1.7	P:001*
Age (Years)				
60 to less than 70	1.8±1.4	F:1.959	1.4±1.5	F:2.201
60 to less than 80	1.9±1.1	P:0.004*	1.6±1.7	P:0.003*
80 and more	2.2±1.0		2.5±1.0	
Marital status				
Single	2.0±2.8	F:7.205	1.7±2.8	F:3.763
Married	1.6±1.2	P:<0.001*	1.1±1.3	P:0.012*
Widow	2.4±1.1		1.9±1.7	
Divorce	0.0±0.0		0.0±0.0	
Level of education				
Read & write	2.3±0.8	F:4.702	1.8±1.6	F:3.059
Primary	2.0±1.6	P:0.003*	1.5±1.3	P:0.018*
Secondary	1.7±1.2		1.2±1.8	
University	1.3±0.7		0.7±1.4	
Post graduate	0.6±1.4		0.5±0.9	
Occupation pre-retirement				
Clerk	1.7±1.6	F:2.617	1.5±1.5	F:0.718
Worker	2.2±0.8	P:0.076	1.6±1.8	P:0.489
Housewives	2.1±0.8		1.2±1.2	
Current work				
No	2.1±1.1	F:9.239	1.5±1.6	F:1.527
Yes	1.3±1.7	P:0.003*	1.1±1.5	P:0.001*
Monthly income				
Enough	1.7±1.4	F:12.141	1.2±1.4	F:9.546
Not enough	2.4±0.7	P:0.001*	1.9±1.7	P:0.002*
Place of residence				
Rural	2.1±1.0	F:1.455	1.3±1.1	F:0.248
Urban	1.9±1.4	P:0.229	1.5±1.7	P:0.619
Living with				
Alone	2.5±1.5	F:6.546	2.0±1.9	F:5.473
With wife / husband	1.6±1.2	P:<0.001*	0.2±0.7	P:0.001*
With children	2.4±0.9		1.2±1.4	
With relatives	1.5±1.1		1.8±1.5	
Chronic condition				
No	2.1±1.8	F:0.291	1.6±1.8	F:0.347
Yes	1.9±1.2	P:0.590	1.4±1.5	P:0.557

F: ANOVA test P: P value of ANOVA test *significance at p value ≤ 0.05
NB: Maximum allowed scores for environmental barriers:6.

significant difference was found (P = 0.001). As regards the age of the study subjects, a statistically significant difference was found between total mean of score environmental barriers of the participants who aged 80 years and older and the other two age groups in smart phone users and feature phone users(P=0.004), (P=0.003) respectively. Concerning the marital status of the study subjects, a statistically significant difference was found between total mean score of environmental barriers of the studied participants who were widow and other marital categories in smart phone users and feature phone users (P= 0.001), (P=0.012) respectively. As for the educational level of the study subjects, a statistically significant difference was found between total mean score of environmental barriers of the studied participants who were widow and married in smart phone users and feature phone users (P=0.003), (P=0.018) respectively. Moreover, a statistically significant difference was found between total mean score of environmental barriers among the studied participants who have not enough income and

those who have enough income in smart phone users and feature phone users (P=0.001), (P=0.002) respectively. As well, a statistically significant difference was found between total mean score of environmental barriers of the studied participants who lived alone and those who lived with others either children or relatives in smart phone users and feature phone users (P= 0.001) and (P=0.001) respectively.

DISCUSSION

The information technology usage has expanded dramatically in the ageing society. Technology becomes inevitable in human life particularly for the seniors. Older adults have comprised the fastest growing population adopting the internet and technology over the past decade. It plays an increasingly serious role in maintaining their independence and improving their quality of life. Adoption of technology by older adults is a complex issue that is influenced by a number of barriers which rarely been examined [24]. Therefore, this study aimed to identify the barriers affecting the usage of technology among community dwelling older adults.

The most notable findings of this study, is that the studied Seniors encountered various barriers while utilizing the technology and its devices particularly, the smart phones, feature phones and tablets. Surprisingly, total mean scores of personal, technical and environmental barriers were higher among smart phone and tablet users than feature phone users. However, statistically significant differences were found between smart phone and feature phone study users in terms of personal and environmental barriers. These findings of the present study may be attributed to age- related physiological changes such as the visual acuity, color perception and contrast sensitivity which all diminish with ageing impeding an older adults' ability to read webpages, mobile apps and mobile phone screens that use complex fonts, too many visual elements, or colors that are not sharply contrasted. Also, the design of operating systems, websites and device applications can create additional obstacles. Tools, such as a click-and-drag operation or "predictive text", where words are input into a text message, search field, or email on a smart phone with just the typing of a few letters, can hinder an older adult's capability to easily utilize these advanced features. These findings are in consistence with Bergstrom *et al*. [25] who revealed that websites or applications that are dynamic continually change images or headlines are also not suited to older adults who are more prone to "change blindness". As well, these conclusions are in agreement with a study done by Chevalier *et al*. [26] which revealed that touch screens are often incorrectly calibrated to an older adults' level of motor function and can be too sensitive to the touch.

Gender differences is significant variable exist in technology adoption and withdrawal among older adults. The findings of this study confirmed that fact and revealed that the female study seniors reported to have higher significant personal, technical and environmental barriers among both smart phone and feature phone elderly users than the studied male subjects. These results could be explained by women tend to have low self-efficacy and self-confidence in using of technology than males. Older females usually have lower perceived ease of use of technology because they were having higher levels of technology anxiety as compared to their male counterparts. As a result, low expectations of female competence have the potential to create barriers in the structure of opportunity for women in information technology. These results are in accordance with Penard *et al*. [27], Gorard [28], Gell*et al.* [29] and Czaja *et al.* [5] who found that older women used fewer types of technology, were more anxious and had less positive general attitudes regarding technological devices relative to older men. Similarly, Margolis and Fisher [30] who reported that many older females initially become enthusiastic in learning the technology, but their self-efficacy and interest are substantially diminished by repeated exposure to biased environments, negative poor pedagogy and loss of confidence. However, Hashmi [31] and Buse [32] who revealed that no differences across genders in adoption of technology.

The natural decline in physical and cognitive changes as individual's age, which is considered a common barrier to successful technology use [5]. This research proved that fact and depicts that a statistically significant difference was found between total mean score of personal, technical and environmental barriers of the study participants who aged 80 years and older and those with other two age categories among smart phone users and feature phone users. These findings are in agreement with Anderson and Perrin, [33] who documented in his report about the American seniors use of technology that, seniors ages 65 to 69 are about twice as likely as those ages 80 and older to say they ever go online and use of technology (82%) versus (44%) respectively. Moreover, those who have broadband at home (66% vs 28%) and they are roughly four times as likely to say, they own smart phones (59% vs. 17%) respectively.

Additionally, Gell*et al*. [29] and Gorard [28] revealed that 59.6% of those ages 65-69 used these technologies on most days compared with less than 45% of those 85 years.

With regard to the marital status, the present study showed that a statistically significant difference was found between total mean score of persona, technical and environmental barriers of the studied participants who were widow and other marital categories among smart phone users and feature phone users. These results might be attributed to, the fact that reported lack of spouse can affect the presence of supportive environment for acquiring technological information. In particular, widow female older adults who affected by the cost of technological devices due to the decrease of their monthly income. In addition to that, widowhood can extremely affect the older adult motivation to learn new technology skills. These results are in agreement with Gorard [28] who reported technology-using older adults are more likely to be married than single. As well, this study revealed that, a statistically significant difference was found between total mean score of personal, technical and environmental barriers of the studied participants who lived alone and those who lived with others either children or spouse among smart phone users and feature phone users These findings could be related to the fact that the younger regenerations are knowledgeable and expert about different types of technology, who can help the seniors to be able to deal effectively with the technical problems that arise from using the various technological devices. These findings are in accordance with Gorard [28] who concluded that technology users are more likely to be older adults who live with long-term partners or children who help them in any technological problem. Other studies [11, 15] contradict the present study findings and revealed that, many older adults avoid asking their family or friends for help, because they do not want to reveal their lack of knowledge. This could be problematic in certain cultures where hierarchy between children and parents is life-long.

Education level independently predicted technology adoption behavior. the current study proved that fact and revealed that when the level of education of the studied participants increased, the personal, technical and environmental barriers was significantly decreased among both smart phone and feature users. The seconclusions could be explained by adoption of new technology typically requires new learning and learning is influenced by individual differences in cognitive abilities such as memory, concentration, attention span, as well as individuals' experience and educational background. These findings are in agreement with Anderson and Perrin [33], Gell*et al*. [29], Gorard [28] who reported that the use of technology such as computers and the internet is less frequent among those who are older and less educated and large increases in smart phone ownership were among older adults who are affluent and well educated.

The most important finding of the current study declared that the study seniors who reported not to have enough monthly income exhibited significant higher personal, technical and environmental barriers than the participants who reported having enough monthly income in the utilization of both types' technological devices. These study results could be related to the expense of technology will continue to be an important consideration because many older adults are on a fixed monthly income. These conclusions are supported with Mitzer *et al*. [35] and Roger [36] who identified that cost is the significant reason for poor technology acceptance among older adults. Because of the cost of technological devices, seniors are less likely to adopt new technologies unless they view clear benefits of using them. However, Melenhorst *et al.* [37] contradicts these findings and reported that, the cost of technology may be a secondary factor in terms of acceptance with perceived usefulness, while, ease of use continuing to be of primary importance. As well, when older adults saw the advantages and benefits of using technology, they outweighed the concerns related to cost.

Concerning the occupation before retirement, the current study revealed that those who were clerks reported to have significant lower personal and technical barriers in using both types of technological devices than those who were skilled workers such as carpenter, taxi driver and blacksmith or those who were housewives. These findings could be related to the fact that older adults might exposed to different technological skills during their jobs as using of computers. These older individuals demonstrated a level of comfort with new technology, while others without such experience do not. For those without previous experience, utilizing new technologies may be foreign and daunting. These results are in agreement with Zhou *et al*. [14] who revealed that previous experience with or exposure to technology is the most important factor affecting older adult engagement with technology. Many adults now 50 and older utilized computers as a part of their employment.

Therefore, gerontological and psychiatric health nurses as one of health care professionals should make much effort for decreasing the number of barriers affecting the usage of technology among older adults.

CONCLUSIONS

In the light of the study findings, it can be concluded that older adults face many barriers when dealing with technology. This study revealed that the total mean scores of the personal and environmental technological barriers were statistically significant between smart phone elderly users and feature phone elderly users. As well, the personal, technical, and environmental barriers were statistically significantly affected the studied smart phone and tablet elderly users who aged 80 years and older, female sex, had lower level of education, single and living alone and have insufficient income more than those of the studied feature phones users. Furthermore, a statistically significant difference was found between total mean of personal and technical technological usage barriers among the participants who have chronic illness and for those who did not have any disease in smart phone elderly users and feature phone elderly users.

Recommendations:

- Health care providers must be familiar with ways to help elderly individuals to overcome these barriers and share its benefits and impact on their health.
- Education should alternate between lessons and exercise, including complete instruction for each task, providing step-by-step assistance and adapting the complexity to the user's experience.
- Experts in technical advice and training need to be available for older adults in order to increases their familiarity and usage.
- Face-to-face direction, guidance and training to resolve any technological problem that may interfere the usage of technology
- Specific smart phone and tablet design features should be considered to enable the seniors to cope with the age-related physical and cognitive changes that commonly occur as a part of aging
- Find a mobile phone with a user-friendly design that is able to compensate for their deficits or difficulties in navigation.
- The encouragement and support from tutors, families and friends are needed for ongoing engagement of older adult with technology.
- Educate the seniors to use a magnifier, high contrast features and optimal visual display features in order to help them to use the technological devices with more ease.
- Older adults must be given time to examine, explore, and experiment with a device at their own pace.
- Occupational therapy has a role with older adults and technology based on the barriers that were identified.

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