

The Impact of Mobile Phones on Quality of Life of the Elderly

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Abstract

The impact of mobile devices on the overall well-being of individuals is to this day relatively under-researched. This research study focuses on the assessment of the impact of mobile phones on the quality of life of the elderly. Mobile phone adoption is increasing amongst elderly populations and the potential benefit of mobile phone usage, apart from being a convenient means of communication, includes maintaining relationships with social contacts as well as a source of entertainment and mental stimulation.

We adopted a positivist approach and used a model derived from a combination of the CASP-19 quality of life framework with elements from the Kleine framework to conduct a stratified survey among elderly in the Western Cape. We found that, while no particular mobile phone usage was directly correlated with quality of life, when used in conjunction with one another they were able to explain a significant amount of the variation in quality of life amongst individuals, thus proving that a relationship existed between mobile phone usage and quality of life. Most significantly, evidence suggests that social media can help to preserve the social contacts of elderly individuals which translates to an increase in social connectedness and a decrease in feelings of social exclusion and isolation.

Keywords

Mobile technology; Impact of ICTs; Quality of Life; Elderly; South Africa.

1. Introduction

Information and communication technologies (ICTs) have the power to influence the quality of people's lives. They have been a key driver for many improvements in modern society including in health care, education, transport as well as public safety. (AzizulHaz, Ahmed & Abdullah 2012). Mobile phones in particular have experienced rapid adoption within modern society, and through constant technological advances and increased functionality, mobile technology has empowered users to achieve new levels of efficiencies and social connectedness. Phones are no longer seen as simple communication devices, but rather as a means of obtaining convenient, mobile access to diverse portfolios of services including the likes of social networking applications as well as applications for information access (Hardill & Olphert 2012).

Much research has been conducted into analyzing how technology has been leveraged to enhance aspects such as productivity, efficiency and speed (Atkinson & Castro 2008). However, some have expressed concern about the lack of research on the impact of ICT's on the population's general well-being or quality of life, especially in the case of particular age groups such as the elderly which, along with other demographic groups such as the disadvantaged (De Jager & Van Belle 2014), foreign migrants (Nyamarebvu & Van Belle 2013) or disabled (Makgopela & Van Belle 2014), have often been referred to as the groups which derive the most benefit from ICT usage (Pénard & Suire 2011; Hardill & Olphert 2012).

This paper aims to address this relative paucity of research linking mobile device usage to the overall quality of life and wellbeing of elderly individuals and obtain increased insight into how mobile phones are used amongst the elderly and the subsequent impact of this usage has on their overall well-being. These aims have led to the definition of the following research question and objectives.

The research question for this study is "*How do mobile phones impact the quality of life of the elderly?*" In order to answer this question, the study aims to determine the impact (or lack thereof) of mobile phones on quality of life. This requires a description of the quality of life factors and indicators which are affected through the use of mobile phones. Our research null hypothesis can be stated as follows:

H₀: There is no relationship between mobile phone usage and quality of life of the elderly.

In order to answer the question above, the paper will first attempt to properly define the concept of quality of life and how this relates to members of elderly society. This section hopes to discuss quality of life from the unique perspective of individuals within their twilight years, who often have their own unique needs and requirements. The paper will then move on to discussing the nature of mobile device usage amongst the elderly and specifically how these mobile devices can be leveraged in order to maximize elderly individual's quality of life. Following the literature review is a description of the research methodology and strategy employed by this study. The paper will then continue into the data analysis and findings section where the collected data will be statistically tested and any significant findings will be elaborated upon. The paper will then conclude with a

summary of the undertaken research, as well as highlighting any potential limitations and thoughts for future research.

2. Quality of Life

The concept of quality of life, while only gaining recent popularity in academic research, is not a new one. The original concept can be dated back two millennia ago when Aristotle defined the concept of *eudaimonia* which translates to an individual's happiness or welfare. Aristotle surmised that individuals were responsible for achieving their own happiness by making use of all the resources and capabilities available to them. In doing so, these individuals would be able to live a 'good life' (Diener & Suh 1997).

2.1. Philosophical Approaches

There are three distinct philosophical approaches used for determining quality of life. The first is normative in nature, whereby a person's norms or perceptions of their own quality of life are influenced or based upon their own religious and philosophical views as well as their intrinsic beliefs and principles. Using this approach, an individual could be said to have a high quality of life if they lived in such a way that conformed to their own belief system (Brock 1993). A second approach involves taking into account an individual's preference satisfaction. This involves the ability of individuals to obtain and achieve their desires with the limited resources and capabilities available to them. This method of evaluating quality of life measures an individual's ability to obtain their goals and desires and in so doing, maximize their respective happiness and well-being (Netuveli & Blane 2008). A third approach is the subjective evaluation of quality of life. This approach defines quality of life based upon the experiences and perceptions of individuals. Using this approach, a good quality of life is achieved when an individual experiences it as such. This approach is the most subjective in nature and relies almost entirely on people's perceptions of happiness, contentment and subjective well-being (Brock 1993).

2.2. Measuring Quality of Life

Recent quality of life research has conceived two scientific approaches for the measurement of quality of life. The first approach involves measuring quality of life using objective or social indicators. This approach focuses on the observing and measuring of specific external factors believed to be associated with the concept of quality of life. These factors include an individual's standard of living, such as their environment and place of residence. Additional factors include an individual's education, income and general health status. It is assumed that there is an underlying relationship between the relative indicators and the quality of life of an individual (Netuveli & Blane 2008).

The second approach suggests that quality of life is dependent on the individual's subjective experience of their lives (Diener & Suh 1997). These subjective factors include such constructs such as perceived happiness and overall life satisfaction of individuals. This approach defines quality of life as an individual's perceptions of their current state of living in the context of the culture and value system to which they subscribe as well as in relation to their goals, expectations and standards and concerns (Netuveli & Blane 2008).

Most researchers agree that the measurement of quality of life should include both objective and subjective factors. The reason for this being that quality of life can be seen to

be an interaction between the external objective factors, which describe an individual's circumstances, with the internal subjective factors which define how the individual perceives their life to be (Browne et al. 1994). These measures normally include such factors as physical, mental and emotional health, as well as cognitive functioning, productivity, role performance and general life satisfaction. Unfortunately researchers have not decided upon a common universal definition for the quality of life construct. For our research, we adopt the definition of quality of life as the overall well-being and happiness of an individual, i.e. how content or satisfied an individual is with their current life conditions. (Schulz, Beach, Matthews, Courtney & Dabbs 2012).

2.3. Quality of Life Approaches and Techniques

Due to the complex, highly individualistic and subjective nature of quality of life, there have been numerous measurement instruments and techniques created for the assessment of quality of life in individuals. Space limits the discussion to only a few.

Traditional quality of life assessment techniques include the World Health Organisation's quality of life instrument (*WHOQoL*). The instrument is a 28-item global measure used to assess physical, functional and psychological well-being as well as general life satisfaction and the presence of social relationships. Another common measurement instrument utilised for measuring health-related quality of life in the United States is the *SF-36*; a 36 item questionnaire designed to measure quality of life domains including physical and emotional health, productivity, cognitive functioning, role performance and overall life satisfaction (Schulz, Beach, Matthews, Courtney & De Vito Dabbs 2012; Makgopela & Van Belle 2014). A new measure of quality of life known as *CASP-19* has been recently developed and consists of 19 Lickert scaled items designed to assess the four uniquely defined dimensions attributed to quality of life in elderly individuals. These domains include control, autonomy, self-realisation as well as pleasure (Netuveli & Blane 2008). We will adopt the *CASP-19* in this research.

Alternative approaches for the assessment of quality of life among individuals include Kleine's (2009) Choice Framework and Veenhoven's (2012) Happy-life-years measurement. Sen's capability approach explains that individuals have the power to choose the lives they wish to live and thus focuses on an individual's freedom of choice when living their lives. A person's "capabilities" could be defined as those sets of individual functionings (valued activities) that an individual is able to achieve given their specific surroundings and the resources available to them (Kleine 2009). Building upon Sen's capability approach, Kleine created the Choice Framework which aimed to operationalize the capability approach and provide a means with which to analyze the impact of ICTs on development and the achieving of an individual's desired outcomes and objectives. It also helps to describe the ability of an individual to make use of their respective agency factors or resources available to them while operating within a certain environment or structure (Kleine 2010).

2.4. Quality of Life with respect to the Elderly

The majority of current quality of life definitions and methodologies are not designed to cater for or explain the unique circumstances and requirements of individuals in their old age. A common perception in quality of life research with regards to the elderly is the belief that aging is perceived to have a negative impact on quality of life. However recent

research conducted into quality of life disputes this claim (Netuveli, Wiggins, Hildon, Montgomery & Blane 2006). This research showed that only after the age of 75 did age have any impact on quality of life. Additionally it was found that quality of life on average increased between the ages of 55 and 65. It was only after the age of 85 that quality of life levels showed signs of decreasing. The high levels of satisfaction and well-being experienced by the elderly despite the deterioration in objective social indicators has been identified by researchers as an interesting paradox. In their studies they concluded that the elderly complained less about their imposed limitations and made the best of what was available to them and were more effective in prioritising those tasks which maximised their individual quality of life. This led to the conclusion that elderly individuals often perceive their current quality of life to be higher than those perceived by younger individuals when making use of individual quality of life measurements. The significance of this research was that it proved that quality of life need not decline according to age alone (Netuveli et al. 2006; Netuveli & Blane 2008).

This has caused researchers to propose a new interval within an individual's lifespan called the Third Age. This interval is the ever increasing period between an individual's exit from the labour market until the onset of physical dependency. This period in life is typically associated with high levels of self-rated well-being and quality of life. The ability of the elderly to maintain high levels of happiness can possibly be explained through the concept of aging well and successful aging. These terms denote the ability of elderly individuals to remain active, positive, successful and healthy during the aging process. Successful aging is defined as the ability to reduce the risk of disease and disability, while ensuring high levels of physical and mental capabilities as well as promoting an active engagement with life (Rowe 1997). However in order for the elderly to go about living happy and successful lives, they have become increasingly dependent on the support of modern technology and other ICTs. This includes an increased reliance on advances in modern health care to prolong their lifespan and improve their general physical functioning, as well as on other ICT technologies such as mobile phones in to support their daily mental, physical and social needs.

3. Mobile Phone usage amongst the Elderly

Mobile phones are an amazing form of technology with almost limitless potential for the empowerment of its users. They have changed over time from being a single-purpose device, used solely for occasional long-distance communication to a device that is intrinsic to their users' day to day activities (Hardill & Olfert 2012). Mobile phones have experienced a high rate of technology adoption rate across the globe. This can be attributed to their accessibility, usefulness and ease of use (van Biljon, van Dyk & Gelderblom 2010). According to the census results released by Statistics South Africa (2011), general mobile phone usage is also on the rise within South Africa. In 2001, cell phone devices were present in only 31.9% of South African households. This figure increased significantly in the 2007 census results with a value of 72.7%. The latest results, as of the 2011 census, show that 88.9% of households own or have access to a cellular device.

Despite the fact that mobile phones have become an essential platform used by individuals from most age groups in order to support almost all aspects of their lives, there

is a strong recurrent theme in traditional research showing that individuals over the age of 50 often find the devices to be over-complicated and difficult to use (Hardill & Olphert 2012; Renaud, Blignaut & Venter 2013). Despite this, mobile phone usage amongst individuals over 60 has been steadily increasing over the last couple of years (Plaza, Martin, Martin & Medrano 2011). Elderly individuals have incorporated a wide variety of technologies into their daily lives, including compact disk players, answering machines, microwave ovens, and more recently even the use of laptops and desktop computers (Rogers & Mynatt 2003). This demonstrates that the elderly are capable of accepting and utilising technology and ICTs as long as they perceive value in doing so (Plaza et al. 2011).

Current usage patterns suggest that elderly individuals perceive mobile devices as modern incarnations of traditional telephones, and as such limit their usage to making and receiving voice calls. Some perceive the devices only as substitutes to conventional landlines, to be used only in special circumstances and emergencies. This limited perception can possibly be attributed to a lack of understanding of the additional value that the device may offer, and the lack of support and training available to elderly individuals to allow them to make better use of their mobile phones (Hardill & Olphert 2012).

3.1 Potential Quality of Life Benefits Derived from Mobile Phone Use

Upon acceptance of the technology, many elderly individuals begin to benefit from mobile device usage. Most commonly, the elderly associate the presence of a mobile device with increased security. The device allows them to feel more secure, as they provide an effective means of requesting assistance in emergency situations. It is also possible for mobile devices to be utilised as monitoring devices, allowing care-givers to track the individual's health indicators such as heart rate through the use of specialised attachments. Mobile phones also offer the ability to track users via their internal GPS sensors and additionally also offer the ability to detect falls through the use of built-in accelerometers. Interestingly, elderly individuals seemed to prioritise feelings of safety and security over issues such as privacy. They preferred the fact that someone would be able to detect and aid them in times of distress over any loss of privacy they may incur due to the presence of the tracking technologies. These technologies allow elderly individuals to go about their lives independently while feeling secure about their safety (Wikman 2008; Plaza et al. 2011).

Additionally, mobile phone usage can also be used to support leisure activities in retirement as well as functioning as a viable source of entertainment. They offer a convenient platform to pursue hobby-related interests such as the consumption of multimedia content as well as casual gaming. This in turn is shown as being an effective means of staving off boredom and stimulating cognitive function (Plaza et al. 2011).

Mobile phones also serve as a tool for the development and maintenance of social relationships and connections between the elderly individual and the outside world. This increases the individuals perceptions of connectedness with those around them while reducing feelings of isolation and possible discontentment derived thereof (Plaza et al. 2011). An example of this is the usage of social media, such as Facebook and Twitter, as a means of staying connected with friends and family via the internet. Hardill and Olphert (2012) argue the existence of pervasive users of technologies such as social media amongst the elderly. These users are shown to derive substantial benefit from the

presence of these technologies as they allow individuals to enjoy experiences otherwise unobtainable due to physical restrictions.

With the degradation in memory and cognitive ability, mobile phones also present themselves as an effective organisational tool to assist elderly individuals with tracking their daily activities and provide reminders to complete required tasks. The devices provide the means for individuals to make use of applications such as calendars and alerts as a form of memory aid in order to assist them in remembering important appointments such as a doctor's visit or even something as trivial as a local bingo event. Additionally, they can also be used to remind patients to take their medication at their prescribed times and proper quantities. (Plaza et al. 2011).

5. Research Methodology

This study makes use of the positivism research philosophy. We used existing theoretical frameworks, namely the CASP-19 and Choice Framework (Kleine 2009; Kleine 2010), in order to formulate and structure the research process. The research strategy employed by this study was that of the survey strategy. This strategy was the appropriate choice due to the deductive and explanatory nature of the study.

The primary data source for the research took the form of an anonymous survey in the form of a paper questionnaire that was distributed to willing respondents in order to evaluate their subjective quality of life. We also incorporated several open-ended questions in the survey from which extra depth was obtained regarding the respondents thoughts and perceptions regarding mobile phones as well as how they believed mobile phones impacted their quality of life (Saunders et al. 2009).

We decided to measure the core impact of mobile phones using a quality of life construct which has been used before in elderly populations. The primary structure for this was derived from the CASP-19 quality of life measure which has been proven to be a reliable measurement of quality of life within elderly populations (Netuveli & Blane 2008). CASP-19 includes constructs for control, autonomy, self-realisation and pleasure (Netuveli & Blane 2008). However, in an attempt to obtain even greater insight, we added some additional constructs traditionally associated with quality of life in elderly individuals as identified in academic literature. These factors are an amalgamation of the agency factors of the choice framework (Kleine 2009) and other factors such as social interaction, isolation as well as safety and security identified in various quality of life frameworks pertaining to the elderly (Plaza et al. 2011).

The research instrument is therefore based primarily upon the existing CASP-19 quality of life measure. It was augmented to assess additional quality of life aspects such as isolation and social interaction. The (printed) questionnaires themselves made use of a slightly larger font size and used clear borders around respective tables in order to cater for individuals with sight impairments.

Due to limited resources, the initial sample selection process made use of convenience-based, non-probability sampling techniques in order to obtain a realistically measurable sample population. Institutions and individuals within the Western Cape area were

approached to form part of the study. A stratified sampling approach was then employed in order to further divide the aforementioned sample group into two representative subgroups, namely (1) Individuals institutionalised within old age homes, retirement villages or institutions dedicated for elderly care and (2) Individuals who live at home, either by themselves or with their families. In order to ensure a representative mix of income and education levels in the first subgroup, we selected of institutions from more affluent areas as well as from less affluent areas in the Western Cape. By doing so, the researchers aimed to cater for the diverse living conditions of individuals within the Western Cape and obtain a consensus which can be generalised to the target population. In order to establish contact with elderly individuals still residing within their own residences, the Meals on Wheels organisation was approached for their assistance in obtaining access to these individuals. This resulted in a bias towards less affluent people. In total, we distributed two hundred questionnaires to three Meals on Wheels branches and one hundred questionnaires to the two old age institutions who also consented to the study.

Participation in the survey was on a purely voluntary basis and willing participants received a detailed explanation as to the nature and purpose of the study prior to the completion of the survey. This was done in order to minimise any potential confusion and ensure that respondents were comfortable and understood what was expected of them. In addition to this, either on of the researchers or a representative from the elderly institution was always available to provide assistance and guidance where needed.

6. Data Analysis and Findings

Of the 300 questionnaires which were distributed, 89 responses were received. Unfortunately, only 69 of these were completed sufficiently enough to be deemed valid.

6.1 Respondent Demographic Analysis

Almost two-thirds (45 out of 69) of the respondents were respondents female. Although this may initially appear to indicate the presence of a potential bias, this sample demographic breakdown is in fact closely in line with the general target population breakdown as per the South African census of 2011 (Statistics South Africa 2011), which indicates the presence of a significantly greater female population in the age groups over 60 and a ratio of roughly 2:1 in the 65+ group. A Mann-Whitney U test was conducted in order to determine if the quality of life values differed between the two genders and indicated that there is no significant different between males and females for any of the quality of life constructs.

The mean age of the respondents was 73.2, with a minimum age of 60 and a maximum age of 89 and the majority of the respondents' ages between 65 to 81 years old. A Mann-Whitney U test showed that there was no significant difference in quality of life between individuals aged 60 to 74 as opposed to older individuals.

The respondents supplied information which indicated whether they lived at home within their own residence or if they were living within an institution catering for the care of the elderly. The reason that this information was requested was due to the fact that an individual's quality of life is highly dependent on the individual's living conditions and

environment (Browne et al. 1994). The response demographic was fairly evenly distributed between individuals living at home (45%) and those living within institutions (49); 4 respondents (6%) did not indicate their current residence. This means that the response rate for the questionnaires involving a third party (Meals on Wheels) was just under half of that for the directly distributed questionnaires. A Mann-Whitney U test was conducted to test for any variation in the quality of life factors between the two populations but showed no evidence of any significant differences in quality of life values between individuals living at home and those who live within retirement institutions.

Respondents were also asked as to whether or not they were single, or if they lived with a partner. The reasoning behind this was that this was also believed to be a significant factor on an individual's outlook on the respective quality of their life, as well as a significant social resource (Kleine 2011). 54% was single versus 43% being single while 2 respondents (3%) chose not to answer this question. Again, a Mann-Whitney U failed to find a significant difference in any the quality of life constructs between the two groups.

Due to the sensitive nature of the subject, the survey question attempting to ascertain the income level of the respondent included a 'prefer not to say' option allowing the respondent to opt not to reveal their income levels. A fairly respectable spread of income levels were obtained from those respondents who chose to supply their income information as shown in Figure 1 below.

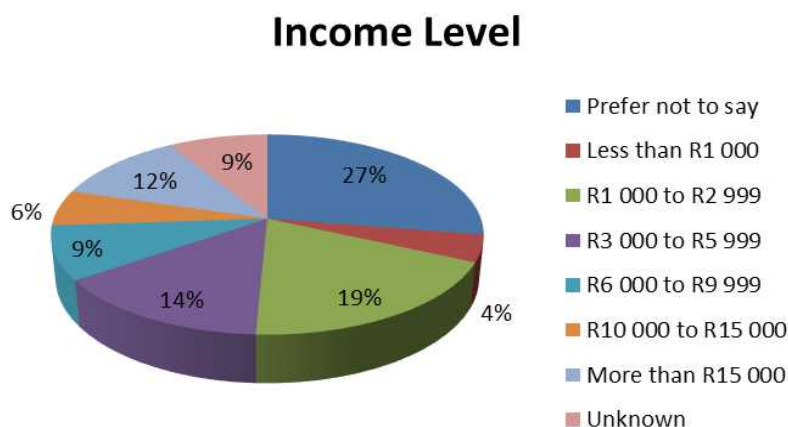


Figure 1. Income Level Breakdown

6.2 Mobile Phone Use and Type

When asked about their phone type, the majority (86%) of respondents were found to be using feature phones, while only nine respondents (13%) indicated that they were making use of smart phones devices (one respondent did not indicate what type of phone s/he was using). The low number of smart phone users may impede the ability of the researchers to assess the extent to which the improved functionality of these devices can be associated to a higher quality of life amongst their users.

Due to the prevalence and widespread adoption of mobile phones in modern society in association with the advanced year of the survey respondents, it comes as little surprise that the vast majority of the respondents have been making use of mobile phones for well

over a couple of years; almost half of the respondents have been making use of mobile phones for longer than seven years and only 13% less than one year (Figure 2).

Respondents were asked to indicate how often they made use of the various functionalities offered by modern mobile phones. Unsurprisingly, making voice calls is a primary usage for mobile phones amongst the elderly with the majority of respondents indicating that they employ their devices for voice calls more than once a day. However, text-based messaging is an almost equally commonly used function amongst respondents, with the majority of respondents using text-based communications at least once a day.

Other functionality is used less frequently, which is perhaps not surprising given the predominance of feature phones. Interestingly, organisation tools such as alarms, reminders, calendar appointments etc. are shown to be used by almost half of the respondents (and amongst both smart phone and feature phone users). By contrast, social media only receive occasional usage amongst both smart phone and feature phone users. The use of multimedia such as video and music on mobile devices was slightly higher but still low and, not surprisingly, most prevalent in smart phone device users.

The use of mobile phones as an e-reader, for reading magazines as well as newspapers is also shown to not be used extensively amongst respondents. Mobile gaming appears to be of little significance to the elderly respondents participating in this study. Internet browsing and location services are also used to a very limited extent.

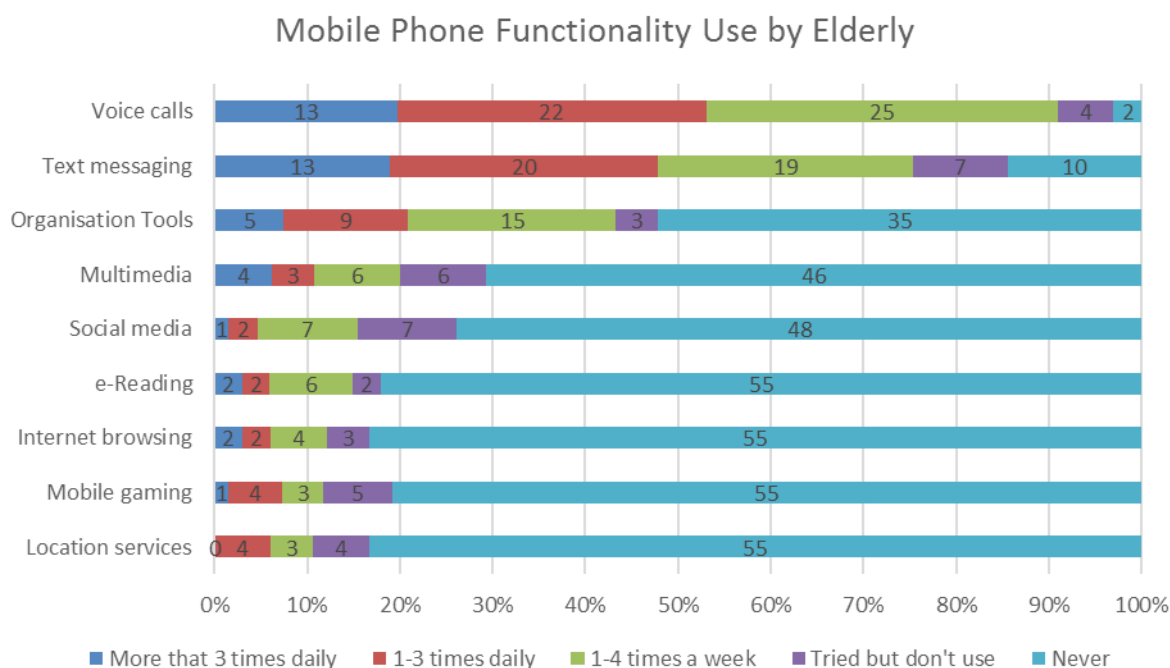


Figure 1: Mobile Phone Functionality Use

6.3 Reliability and Validity

The survey was based primarily upon the previously established CASP-19 framework and instrument, which has been validated quite extensively in European studies (Netuveli et al. 2006). However, because it has not been applied within a South African context before, tests for reliability and validity were done.

Item analysis tests were performed on the CASP-19 measure (“Quality of Life”) as a whole, as well as on its constituent constructs, namely Control, Autonomy, Self-Realisation and Pleasure (Table 1). As can be seen from the Cronbach Alpha values, the reliability is generally fine, although the value for Autonomy is marginal. Given that Autonomy is actually a formative construct measuring various disperse factors of autonomy such as physical health, family responsibilities and financial security, and that this is a relatively small sample, we considered the reliability to be satisfactory.

Construct	Questions	Cronbach Alpha
CASP-19	1-19	0.883
Control	1-4	0.736
Autonomy	5-9	0.615
Pleasure	10-14	0.869
Self-Realisation	15-19	0.772

Table 1: Item Analysis – Cronbach Alpha

Factor analysis was employed in order to assess the validity of the quality of life constructs (Table 2).

Factor Loadings (Varimax normalized) Extraction: Principal components (Marked loadings are >.5000)

	Pleasure	Control	Self-Realisation	Autonomy
Q1	0.1931	0.7895	0.0952	0.1606
Q2	0.1380	0.8100	0.1007	0.1053
Q3	0.4701	0.1543	-0.0504	-0.3153
Q4	-0.0132	0.8220	0.0953	0.2148
Q5	-0.0144	0.5677	0.2863	-0.3563
Q6	-0.1614	0.1923	0.0874	0.7392
Q7	0.4561	0.4230	0.2122	0.2046
Q8	0.2522	0.6985	0.1648	0.3980
Q9	0.1735	0.3394	0.0666	0.7202
Q10	0.9172	0.1446	0.1661	0.0239
Q11	0.9001	0.1914	0.1481	-0.0743
Q12	0.9305	0.1840	0.0861	-0.0689
Q13	0.2095	0.2897	0.4070	-0.3764
Q14	0.8173	-0.0638	0.1116	0.1772
Q15	0.3412	0.5718	0.1125	-0.1860
Q16	0.5356	0.2842	0.4267	-0.2761
Q17	0.1392	0.0925	0.9023	0.1167
Q18	0.1374	0.0227	0.9230	0.0616
Q19	0.1034	0.4011	0.8383	0.0393
Expl.Variance	4.2866	3.8772	2.9956	1.8885
%	35.4%	14.7%	10.6%	8.0%
Cumulative %	35.4%	50.0%	60.7%	68.7%
Eigenvalue	0.2256	0.2041	0.1577	0.0994

Table 2: Factor Analysis – Principal Component Analysis

As can be seen from the table above, the majority of the questions loaded onto the correct factors as indicated by the highlighted values. However there is an indication of a potential overlap between the Control and Autonomy constructs as demonstrated by questions five and eight loading onto the control construct instead of autonomy. This further supports the findings of the reliability analysis on the autonomy construct, indicating the potential presence of formative factors within the construct. The four CASP-19 constructs explain 68.7% of the variance.

The additional set of constructs added to the CASP-19 measure were found not to be valid, with many of the proposed questions loading to the CASP-19 *control* construct. We thus decided to exclude the data collected from these questions in any subsequent data analysis.

6.4 Multiple Regression Analysis and Hypothesis Testing

Multiple regression analysis was performed in order to test our null hypothesis that there is no relationship between mobile phone usage as well as other independent variables as stipulated in the literature, and quality of life of the elderly (operationalized here as the non-weighted sum of the values for the CASP-19 constructs of Control, Autonomy, Self-Realisation and Pleasure).

The independent factors include the demographic factors identified within the literature review as being potentially related towards quality of life in individuals: age, gender as well as education and income levels (Browne et al. 1994). In addition to this, mobile usage behaviours have also been included as independent variables in order to test whether their use has any impact on the quality of life of an individual. However, the resultant model has a relatively large number of independent variables (12) in relation to the relative small number of responses, which makes it almost over-specified and the relative significance of any independent variable varies quite markedly for small changes in the data set. When all variables are included, the model has an R^2 of 0.756 but the adjusted R^2 is only 0.338 and the overall statistical significance was $p=0.220$ i.e. not significant despite the high unadjusted R^2 .

We therefore reduced the model size by omitting the five variables from the model which had a very low t-value (i.e. a p-value above 0.50). The multiple regression test was executed again and the resultant output is shown in Table 3 below.

Regression Summary for Dependent Variable: QOL						
R= .85623528 R ² = .73313886 Adjusted R ² = .57746986						
F(7,12)=4.7096 p<.00944 Std.Error of estimate: 6.2116						
N=20	b*	Std.Err. of b*	b	Std.Err. of b	t(12)	p-value
Intercept			46.4959	6.714933	6.92425	0.000016
Term	0.59429	0.184551	5.8024	1.801904	3.22017	0.007352
SocialMedia	0.98682	0.270312	9.6350	2.639240	3.65067	0.003322
Location	-1.59152	0.541291	-15.3918	5.234905	-2.94023	0.012367
Gaming	-0.90080	0.256723	-7.5043	2.138671	-3.50886	0.004311
Multimedia	1.46485	0.500528	12.7784	4.366275	2.92660	0.012684
Education	-0.36877	0.196943	-3.5285	1.884454	-1.87245	0.085706
Income	0.49179	0.210768	3.0285	1.297955	2.33330	0.037843

Table 3: Regression analysis for QoL (reduced model)

Despite the reduced number of variables, the refined model still explains 73.3% of the total variation in the quality of life variable but the adjusted R² has almost doubled to 0.577, which is statistically highly significant (p < 1%). The regression model indicates that the factors for phone term or duration, social media, location services, mobile gaming, multimedia and income levels are significant in predicting the value of quality of life in elderly individuals. This is especially true for all the aforementioned variables excluding education which is the only independent variable not proving to be statistically significant with a p value greater than 0.05.

The null hypothesis can thus be rejected and we conclude that there is in fact a relationship between mobile phone usage and quality of life amongst the elderly. Although the individual factors lack any strong correlation to quality of life, in conjunction they are able to predict changes in quality of life, implying the presence of a causal relationship.

Additional multiple regression tests were also performed on the individual CASP-19 constructs with each construct utilised as the dependent variable in the analysis. In a similar fashion to the overall quality of life analysis, the initial regression model included all of the independent variables and the model was then refined until only the most significant factors remained while striving to maximize the explained variance of the regression model. A summary of the significant findings include a fairly moderate negative correlation between age and text messaging to the quality of life factor of self-realisation. Another statistically significant relationship was identified between text messaging and the quality of life construct of pleasure, however with the low fit of the model this may require further validation. Social media is also seen to have a positive relationship with the control and autonomy constructs. Additionally it is of little surprise that income is indicated as being significant in relation to an individual's autonomy. What is surprising is the indication of a negative relationship between the use of location services and control, as well as between mobile gaming and autonomy.

6.5 Implication of findings

A relationship exists between the usage of mobile phones and an individual's well-being and happiness. This section will detail the specific impacts of mobile phone use and the respective impact this usage has on quality of life.

6.5.1 Phone term / duration

The duration that an elderly individual has been making use of mobile phones was found to have a significant, albeit small impact on the overall quality of life of elderly individuals. The obvious implication being that as referenced in the literature review, the longer the user has made use of a technology, the more comfortable they are with its usage. Those individuals who have become comfortable with the usage of a technology are often proven to continue its usage even until their late years of retirement (Plaza et al. 2011). This in turn has shown to have a positive impact on these individuals overall well-being.

6.5.2 Voice calls and Text-based messaging

An interesting finding of this study is the relative lack of significance voice calls and text-based messaging have on quality of life. Although proven to be the dominant usage factor amongst the elderly respondents, its relative impact on quality of life and its constituent factors has been insufficient enough to have been included within the majority of the regression models. This is substantiated with qualitative evidence received from respondents indicating that although they enjoyed the convenience and increased control associated with owning the device, they often found that it was intrusive and resulted in the disruption of their daily routine. Six respondents complained of being disturbed by unsolicited phone calls and text-based message advertisements during all hours of the day. What can be taken away from this is a reaffirmation of Wikman's (2008) findings, that in order for ICT adoption to have a positive impact on the well-being of the elderly, they need to be adaptive and less intrusive as well as being smarter 'human-like' solutions.

6.5.3 Social Media

Possibly the most interesting finding is the fact that the use of social media has a consistent positive impact on overall quality of life as well as the majority of its constituent constructs. Although the correlation analysis indicated only a weak correlation between social media use and one of the factors associated with autonomy, there is still a clear indication that its usage in conjunction with the other mobile phone usage factors has a clear impact on the quality of life of individuals. This is indicative of the notion that social media is capable of enhancing an individual's social connectedness with the world around them. The presence of social media allows elderly individuals to continue participating and being exposed to social events in their community as well as giving them the means to effectively plan and co-ordinate their activities with events sourced from social media sources such as Facebook and Twitter. This supports Foley's (2011) assumptions that internet connectedness can be utilised to combat social exclusion.

6.5.4 Multimedia

The use of mobile multimedia content such as videos and music has shown to have a statistically significant positive impact on overall quality of life and well-being. This effect can be explained through the use of Kleine's (2009 2010) choice framework, whereby the elderly individuals are shown to be making use of the material resources available to them in terms of the multimedia content and the mobile phone and through their choice to make use of this content they are able to achieve the desired outcome of increased satisfaction and happiness. This positive correlation also supports the findings of Plaza et al. (2011) whereby mobile phone usage, especially in the context of multimedia usage can be efficiently leveraged in order to support leisure activities and function as a source of

enjoyment.

6.5.5 Organisational Tools

The use of organisational tools as a means to increase elderly individuals control over their lives through the use of alarms, reminders and scheduling appointments was expected to be a factor in predicting the variance in the quality of life construct for control. However the factor's influence was not statistically significant in our survey. Further research is indicated.

6.5.6 Location Services, mobile gaming, internet browsing and reading

The use of location services and mobile gaming was shown to not be used to any great extent by the sample population. This indicates that these sets of functionalities are not highly valued amongst elderly individuals, especially within the South African context. Several qualitative responses received from respondents indicated that the individuals often experienced difficulties reading the small text on their mobile devices. Twelve respondents indicated that they wished for a larger font and two respondents also indicated that they perceived their devices as not being loud enough and the sound quality to also be lacking. This points to an issue with how the devices are designed and a places increased emphasis on the need to rethink how devices can be designed in such a way as to provide maximum benefit to unique population groups such as the elderly (Wikman 2008).

7. Conclusion

The justification for this research has arisen from the increasing importance of the elderly demographic. With the technological and medical advances brought about by modern society, the average individuals are able to live longer, more productive lives (Plaza et al. 2011). The ramifications of this is that the elderly demographic is slowly increasing with respect to the rest of the population, emphasising the need for ICTs to adapt in order to best satisfy their needs and requirements without hampering or intruding upon their daily activities (Wikman 2008). It is for this reason that this paper's main objective was to assess the prevalence of mobile phone usage amongst the elderly and with this information assess the impact of this subsequent usage on the overall well-being or quality of life of elderly individuals.

The primary research question was assessing the potential impact of mobile phone usage upon the quality of life of the elderly. In order to determine this, the paper first outlined the meaning of quality of life as being the measurement of the objective and subjective well-being and happiness of individuals and their perceptions of happiness and satisfaction.

7.1 Summary of Findings

The findings of this paper indicated the presence of an identifiable relationship between the combination of the constituent mobile phone usage factors and an individual's quality of life and well-being. Of particular significance was the indication that social media and multimedia usage had a positive, albeit weak, contribution towards the quality of life as experienced by elderly individuals. Through their usage, elderly individuals are able to maintain and expand their social connections, thus increasing their available social capital. The usage was also shown to combat the factors of social exclusion and isolation through

the ability preserve the external connections with the outside world.

However not all mobile phone usages were shown to have a positive contribution to quality of life. It was shown that perceptions around the use of location services and mobile gaming resulted in a decrease in perceived overall-wellbeing. Feedback from respondents indicated that this negative impact could be explained through inadequacies of the mobile phones themselves, with the design specifications of the phones specifically catering for usage amongst elderly users.

It is for this reason, and in conjunction with the ever increasing importance of the elderly demographic, that the need arises for mobile phone device manufacturers to pay heed to the needs and limitations of the elderly in order to ensure that the devices are able to satisfy the unique needs of the elderly. In so doing, they will also increase the potential contribution of mobile phones to their quality of life (Wikman 2008).

7.2 Limitations & Future Research

Due to resource constraints, a non-probability sampling approach was used and the sampling frame was relatively small. This resulted in a relatively small and possibly biased but still usable data set. The resultant small sample size may potentially have some impact on the generalizability of the findings. Another potential limitation of this study is the pioneering usage of the CASP-19 framework within a South African context. For the most part, the model was proven to be both relatively reliable and valid through the usage of factor and item analysis. However some factors of the autonomy construct did not load correctly within the construct, which may have skewed the ability to assess the impact of mobile phone usage on autonomy. Additional constructs from the Kleine framework were thought to be useful and relevant but failed to pass the validity tests.

Hopefully the approach used and promise of interesting findings in this study will lead to future research to validate or extend our findings using a larger and perhaps more rigorous sample. This would be invaluable in proving the reliability and effectiveness of the CASP-19 measure within non-European countries although we still feel that additional constructs are called for. Another promising research avenue is a long-term longitudinal study focussing on the impact of mobile phone factors on quality of life in individuals over time. This study would be able to validate the assumptions of Plaza et al. (2011), whereby individuals exposed to a technology at younger ages will become comfortable with the usage of the technology and continue its usage into old age. The significance of this would be that future generations of elderly individuals may no longer be as adverse to the usage of technologies and this would increase their impact on their well-being.

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