Adult First-Time User of Handheld Computing Systems: Assessing Ux

Guy Toko, Ernest Mnkandla

Abstract—The advent of computing systems has changed many aspects of our daily lives and routines; including the way we communicate, entertain, navigate, travel, study, generate knowledge, seek medical help, and relax. Initially, computer systems development was restricted to computer scientists. Computers have now become working instruments available to whoever has the means to acquire and use them, irrespective of social status, disability, geographical location, education level, and gender. Lately, there has been a significant re-valorisation and adaptation of computing devices, whether physically, electronically, or logically, which resulted in more user-friendly and innovative computing systems and interactive systems. This research project primarily intends to explore and examine user-experience (UX) dynamics regarding the relationship between humans and handheld computing systems, and, most importantly, concerning adult first-time users.

Keywords—Adult first-time user, handheld-computing-systems, user-experience, user-evaluation.

I. INTRODUCTION

The field of interactive design, just as any other applicable science field, comes with its own set of internal norms, guidelines, and principles, and anyone who engages with it must abide by these in order to bring into line the new design with an existing set of preconceived design principles which are meant to alleviate the burden on all users. These designs principles affect the set of built-in features, physical size, form factors, and usability that all form part of the overall capability of the systems. Since computing systems may not all fulfil the same purpose, this set of capabilities would differ from one device to another (Bellino 2015:231).
One aspect which is significant here is the fact that all these principles are to some extent thoroughly researched and implemented from a developer's perspective before being implemented (Bellino 2015:231). Others may argue that the source of developers' inventions or innovations is the desire to develop computing systems that are as unique as possible, extraordinary, and never seen before.In most cases, they are challenged by the current market offering and their inner ambition to overcome the challenge of competitors (Erazo, Pino & Antunes 2015:442).

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As in many free markets, the first and the best "takes all" (Aregbeshola et al 2013:14). Most, if not all, developers are well aware of these rules and in most cases research into new products and the development team are continuously gearing their efforts to unleash the best regarding these endeavours (Erazo et al. 2015:552). In pursuing these absolute computing interactivity tasks and goals, some outcomes, which are the final product outcome, may set users' usability skills on the back foot (Erazo et al. 2015:553). What makes any product unique are the types of features offered; however, users may sometimes become overwhelmed and fail to recall the basics (Erazo et al. 2015:553). In some cases, we do not only refer to the overall features, as seen in most product advertisements depicting their importance, but rather to the impact that these built-in features may impose on interaction and later on the user (Zhang et al. 2015:570). The transition may not be as simple as one may think, but it is important to note that, the more features any handheld computing system has, the more complex it becomes (Zhang et al. 2015:570)

II. LITERATURE REVIEW

Not so long ago, being literate meant being able to read and write in one's mother tongue, a foreign language, or sign language (Hsu 2010:535). Today, with the proliferation of computer systems and complementary accessories, society, driven by its current technological ambition, has coined the term "computer literacy". Although close to the original meaning, being computer literate refers to one's ability to use, comprehend, and control a computing system, regardless of the core function.
This research project therefore postulates that physical access to any computing device, whether handheld, desktop, or any other type, may not automatically translate into "effective and efficient" usage, unless an educative initiative is taken prior to the experiment. In other words, simply providing physical computing devices to any potential user may not lead to systems adoption; unless those who are on the receiving end can effectively and efficiently use the acquired systems (Garrett 2010:52). No matter how proactive, meticulous, and efficient the interactive design team of any electronic gadget, household appliance, or computing system is, it is not always possible to predict all human behaviour and instincts at the time of development and it is also difficult to predict social aspects pertaining to the conditions the end users will be exposed to, in most cases designer strived to improve UX.

1) User experience (UX)

The UX, which is coupled with system memorability, enjoyability, learnability, and performance, is a set of individual characteristics that any system should provide its users in order to remain relevant and useful (Gelderblom 2008:97). Any interactive team should not take this aspect lightly, as it will determine the success. Measuring the degree of UX is one of the most important aspects of system evaluation; it gives the user an overview of the system and how the user or potential user will interact with it (Rogers et al. 2013:13).

2) Challenges for adult first-time tablet users

From a computing usability approach or perspective, the most difficult aspect that needs attention is how to teach an adult first-time user (a person over the age of 35 or older who never used the system) to manipulate a device without causing any form of frustration or anxiety (Nielsen & Budiu 2001:31). An example is the challenges experienced by many left-handed users, since in many instances pre-installed applications system are mostly meant for right-handed users (Coleman-Martin et al. 2005:82).

These untapped user communities of the African continent can be young or very young, but some of them may be people who have never had an opportunity to access or use a computing device in their lives, for reasons such as their geographical location, advanced age, poor school grade, or low literacy level (Vatavu, Anthony & Brown 2015:1). This group, referred to in this study as *adult first-time users* are people who may have realised the importance of computing systems at a later age and are willing to fully explore them in order to become more accustomed to new ICT innovations.

3) Adult first-time user

The primary target of this study is people perceived as the missing middle. These are people who are over the age of 35 and have no or little educational background. They are mostly employed in the informal sector and, even though they have no previous computing skills, they want to know how computing systems work. They live in the rural areas of South Africa.

Having stated the above and knowing the importance of having better computer skills, this study targeted this segment of the population because, in many other studies, researchers seem to be the targeted population (Lee et al. 2015:607). The researcher explored and assessed the needs of the missing middle using a new form of computing system that has since become more popular than other types of computing systems and is therefore more approachable but may not be as user friendly as traditional types of computing systems (Winckler et al. 2015:211).

At first glance, given the number of people one may see on the street using handheld devices, and also given the number of these devices sold across the country, a number South Africanadults are currently using handheld computing systems but their numbers are still fewer compared to non-users.

4) Handheld user challenges

Regarding handheld computing devices, users, especially adult first-time users, must first deal with the challenges of having to physically control the device with one hand and having the other hand operate it, while moving around or standing still (Lee et al. 2015:607). Whether the user is left- or right-handed, the challenge is the same; only one hand is freely available (Lee & Kim 2015:203).

The other challenge that any user faces is the actual interaction; whether using the stylus or the finger to tap, the user needs to think very carefully about how the systems might react. At times the link may not be as visible as the user may expect, or their adult fingers are too big for the contact point where one needs to tap, which results in selecting and accessing undesired targets (Liang et al. 2011:607).

Navigation is one of the most difficult aspects to control for most adult first-time users. Some may have had basic traditional computing experience and may want to navigate in the same way as when using their desktop computing system, but they will still be confronted with unexpected mobility problems (Marquardt 2015:644). Controlling tabs for some may be as hard as any other navigation problem; they may want to return to the main screen without using an external button (Marquardt 2015:644).

III. Research Question

How to evaluate UX when it comes to the adult first-time user?

IV. Study Population and Sample

For the purpose of this study, we approached and selected adult first-time user from a province called Limpopo, a South African northern region, and a municipality called Bela-Bela. The location was randomly selected. There the researcher contacted around 250 senior citizens with no knowledge of computing systems and very little education background. The researcher selected both genders equally and invited them to our experiment sites.

V. Research Methodology

Our methodology during this study was primarily based on experimentation, having access to UX benchmarks ahead of the experiment, which literally consisted of key usability details that frequent and regular user should have, such as the speed of task selection, ease of navigation, ease of reaching some target, ease of moving from one location to the next and reaching some set target. The team had this planned and invited participants to execute some of these tasks. The process was monitored and filmed with the consent of the participants. After completing the interaction with the computing systems, a survey was conducted to gather data, which was later analysed.

VI. Study Set Up

The location was well chosen; the researchers selected a local primary school, with the permission of the school governing body, as the location where the experiment was to take place. They provided tablet computers with a set of applications pre-installed. The time was also setup and participants were well informed of their being recorded. They had a series of mounted cameras recording the action of the participants, as well as their facial expressions. On the other end, they could visualise all the action the participant was having.

They had series of questions for each one, for example: open the word processing application. They recorded all their actions, such as the number of hesitations, mistakes, errors, and the time it took them to get to the set aim.

VII. STUDY LIMITATION AND DATA COLLECTION APPROACH

This study is primarily intended at the evaluation UX of the first-time user of handheld computing systems, or people who for some reason were never exposed to any form of computing system and are now older and would like to explore some of the latest technology. The computing devices used here are tablet systems, using the Android operating system.

The data they are about to explore here were collected as part of a bigger research project, which had various component. The experiment section was about providing handheld systems to first time-user and asking them to perform a series of tasks and activities, which were recorded on camera. The same task and activities were performed by all participants.

VIII. DATA ANALYSIS

Interpretation

Table 1 shows the age group of the participants. The researcher wanted to know whether or not the participants were indeed the people he was expecting. It is important to note that this study specifically and explicitly targeted a particular group of people, i.e. adult first-time users, and here the researcher noticed that a considerable number of participants were within the target age group, which makes this study more reliable. As indicated in the table, 82.3% of the participants were over the age of 18 years. It is also important to note that, during the fieldwork, the researcher made it very clear to all the participants that the study was limited to adult first-time users and adults who have never experienced any form of computing in their life, with the exception of those who had used cell phones before. By combining the number of all those who came forward and who were 18 years and older, the researcher had a good number of people who met the requirements.

Table 1: Q1 – Please indicate your age group

	Frequency		**%**	**Valid %**	**Cumulative %**
	Age Range	Results			
Valid	5-10	3	0.8	0.8	0.8
	11-13	17	4.5	4.6	5.4
	14-17	39	10.3	10.6	16.0
	18-24	237	62.9	64.2	80.2
	25-34	42	11.1	11.4	91.6
	35-44	21	5.6	5.7	97.3
	45-55	4	1.1	1.1	98.4
	Over 55	6	1.6	1.6	100.0
	Total	**369**	**97.9**	**100.0**	
Missing	System	8	2.1		
Total	**-**	**377**	**100.0**		

Interpretation

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Interpretation

Based on the number of people who indicated in Table 2 that they had had prior contact with a tablet system, the researcher wanted to know more about the possible level of frustration they may or may not have experienced while operating one. Did they feel frustrated because some actions could not be completed, or were there other issues? Table 2 shows that 45.1% said *yes*, they felt frustrated; 46.2% said *no*, and 8.8% did not respond to this question. These responses can be used for further analysis as computing usability and frustration are often interlinked.

Interpretation

This question touches on the essence of this research study. It indicates how users felt when they operated a tablet system for the first time. Only 24.4% of the respondents indicated that they felt confident when using a tablet for the first time, and 68.2% said they were not confident at all.

The negative output of 68.2% here is very problematic because some users may opt out after such a negative experience, while it may also lead to other forms of reclusion. It is important to note at this stage that these preliminary questions were asked before the training session and therefore users responded to these questions after interacting with the device for the first time.

Interpretation

Table 4 shows the limited knowledge participants may have had about computing systems. The researcher wanted to know if participants found the tablet's usability complex. Most (87.9%) indicated that they found it complex, while 12.1% indicated that they found it easy.

This may indicate that not much is being done to address the level of complexity of some handheld computing systems, which may cause some major problems in future, as this figure is very high and needs to be explored in order to address it. The more complex a device is, the more frustrating it is for users.

Interpretation

Very often, when people are experiencing difficulties, they tend to ask for assistance. With this question, the researcher wanted to know whether participants felt they were unable to complete the tasks unless they sought any form of assistance, even though they were not supposed to do so. A total of 52% indicated that they asked for assistance during testing and 47% said they did not. It is a matter of concern that the majority of the respondents indicated that they found themselves in a situation in which they had to seek external help to complete basic tasks. This shows that the respondents needed help when interacting with a tablet system, and that they were stuck and needed help to overcome the difficulties.

Interpretation

This question seeks to explore one of the main areas that was widely analysed in this study, especially in the observation section of the study. The researcher wanted to determine if the system the participants were using was to some extent effective and efficient. Only 26.4% said *yes*, while 73.5% said *no*. These figures support the output of the previous question. One may stipulate that the response is open for any form of interpretation, since one may need to clearly define what we understand as "effective" and "efficient".

In this study, under "effective", the researcher wanted to know if participants believed that the system enabled them to do what it was meant to do, and under "efficient", the researcher wanted to know if it enabled them to speedily complete the tasks they were meant to complete.

Still in the same line as the output from the previous question, many believed that the system they were tested on was not as good, as they expected it would be, which is also problematic, at least at this stage.

Interpretation

As with the previous question, the researcher wanted to know if the participants, based on the limited contact they had with tablet systems, thought that it could easily be learned in terms of usability. Only 15.2% indicated that it was easy to learn, and 84.7% indicated that it was not. This is a clear sign that most were of the view that learning to use or control these devices needed either more time or that it was not at all possible.

The learnability of any system is what makes it worthwhile investing in because, when first-time users do not find it easy to use, it can easily be interpreted as not being user friendly.

Interpretation

With this question, the researcher wanted to determine if the participants felt any sense of satisfaction after completing the experiment. Only 6.0% said that they felt satisfied, while 76.8% indicated that they did not, which is a very high percentage. This high percentage comes as no surprise after observing the results of the preceding questions, which were clear signs of dissatisfaction, and an indication that something needs to be done to address this dissatisfaction.

Interpretation

This question is a follow-up from the previous question. The researcher wanted to determine how often the participants made a mistake or errors, as a way of classification of those mistakes.

Table 9 supports the outcomes of the previous table and indicates the number of mistakes the participants may have committed, which is quite concerning. The researcher provided a set of groups under which to classify the mistakes and it seems that those who made five or fewer errors per activity were in the majority. It also needs to be specified that each activity consisted of five tasks, and if the majority indicated that they made approximately the same number of mistakes as there were tasks, then it means that at least one mistake per task was made, which is very high. It also means that no tasks were completed without mistakes.

Interpretation

Based on the results of previous questions, the researcher wanted to determine if respondents, after all the difficulties they had faced, still felt like they achieved something positive; in other words, if they found the experiment enjoyable. This is one way of assessing whether participants liked the whole interactive journey. Only 11.4% indicated that they found it enjoyable; 81.2% indicated that they did not; and 7.4% did not respond to this question. The results are not too surprising and they are very much in line with the results from previous questions. Considering that, as indicated in previous questions, the majority of the respondents indicated that they were not guided by the interface, that it did not provide any form of consistency, that they made some errors, and that they were not able to locate key features and functions, it is not surprising that they did not enjoy the experiment.

IX. CONCLUSION

The exploration of data collected and the interpretation that followed clearly shows a co-relationship between adult first-time user and poor UX. The literature review stipulated a constant sense of innovation from system developers, with the aim of gaining more attractiveness and market share, but data collected also indicate that many senior users are simply unable to meet their demand and are left behind. From the data, Table 2 indicates that 49% of participants felt frustrated because some of the tasks they were requested to completed could not be executed, while around 73% were not confident that they would complete the task they were given, that is Table 3. The issue of usability is addressed in Table 4, where 87% indicated that they found the whole process complex, or at their level at least and wanted help. Table 5 indicates that 52% acknowledged requesting external assistance when they were not supposed to. Table 6 clearly shows that respondents feel that the handheld systems they were using were not efficient nor effective at all, that is the response of 73%. Learnability, which is one of the key principles of human computer interaction is tested here, and respondents who are senior citizen are indicating that it was not easy to learn, that is an overwhelming 84%. Poor user satisfaction is displayed here, with 76% indicating their lack of satisfaction, that is shown in Table 8, while Table 9 indicates that 57% of participants made at least five mistakes. With these, we can conclude that some work is to be done to also include the needs of the senior citizen in the development of handheld computing systems in order to satisfy their needs.

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Appendix

Table 2: Q2 – Did you feel frustrated because some actions could not be completed?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	170	45.1	49.4	49.4
	No	174	46.2	50.6	100.0
	Total	**344**	**91.2**	**100.0**	
Missing	System	33	8.8		
Total	**-**	**377**	**100.0**		

Table 3: Q3 – Did you feel confident when using the tablet system for the very first time?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	92	24.4	26.4	26.4
	No	257	68.2	73.6	100.0
	Total	**349**	**92.6**	**100.0**	
Missing	System	28	7.4		
Total	**-**	**377**	**100.0**		

Table 4: Q4 – Was the tablet's usability complex?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	211	56.0	87.9	87.9
	No	29	7.7	12.1	100.0
	Total	**240**	**63.7**	**100.0**	
Missing	System	137	36.3		
Total	**-**	**377**	**100.0**		

Table 5: Q5 – Did you ask for help while doing the task?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	163	43.2	52.2	52.2
	No	149	39.5	47.8	100.0
	Total	**312**	**82.8**	100.0	
Missing	System	65	17.2		
Total	**-**	**377**	**100.0**		

Table 6: Q6 – Was the system effective and efficient?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	90	23.8	26.4	26.4
	No	250	66.3	73.5	100.0
	Total	**340**	**90.1**	**100.0**	
Missing	System	30	9.8		
Total	**-**	**370**	**100.0**		

Table 7: Q7 – Was the system easy to learn?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	50	13.2	15.2	15.2
	No	277	73.4	84.7	100.0
	Total	**327**	**86.6**	**100.0**	
Missing	System	40	13.4		
Total	**-**	**367**	**100.0**		

Table 8: Q8 – Were you satisfied with the tablet system's operation?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	80	21.2	23.2	6.0
	No	265	70.2	76.8	100.0
	Total	**345**	**91.4**	**100.0**	
Missing	System	32	8.6		
Total	**-**	**377**	**100.0**		

Table 9: Q9 – How many mistakes did you make?

	Variant	Frequency	%	Valid %	Cumulative %
Valid	Less than 5	139	36.9	57.4	57.4
	Less than 10	49	13.0	20.2	77.7
	less than 15	32	8.5	13.2	90.9
	Less than 20	7	1.9	2.9	93.8
	Less than 25	15	4.0	6.2	100.0
	Total	**242**	**64.2**	**100.0**	
Missing	System	135	35.8		
Total	**-**	**377**	**100.0**		

Table 10: Q10 – Was your experience enjoyable?

	Frequency		%	Valid %	Cumulative %
Valid	Yes	43	11.4	12.3	12.3
	No	306	81.2	87.7	100.0
	Total	**349**	**92.6**	**100.0**	
Missing	System	28	7.4		
Total	**-**	**377**	**100.0**		