USER SATISFACTION IN MOBILE APPLICATIONS *

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ABSTRACT

Mobile applications are softwares running on mobile devices like smart phones and Personal Digital assistance (PDA). They have been developed to provide many important functionalities to people in different ways. Therefore, ensuring usability and satisfaction in mobile applications has been a major concern at this present age. This write-up focuses on usability and its attributes as they relate to mobile applications with special emphasis on satisfaction. To understand this quality attribute, several theories will be studied from psychology and consumer behaviour perspective. Reasons why users feel satisfied or dissatisfied will be explored from these theories, the major elements of satisfaction will be looked at as they relate to mobile applications, the ISO model for satisfaction, satisfaction issues in mobile applications, factors that determine user satisfaction, ensuring maximum satisfaction and consequences of satisfaction in mobile applications will be examined. Finally, ways of ensuring satisfaction in mobile applications will be proposed and its consequencies in people explored.

Categories and Subject Descriptors

D.2 [**Mobile applications**]: Satisfaction

General Terms

Satisfaction, Human factors

Keywords

satisfaction, Mobile applications, usability

1. INTRODUCTION

Mobile technology has witnessed a lot of advances in development that have allowed a widespread of applications to be developed [17]. These applications are developed by people,

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agencies owned by government, business organizations, military and educational organizations with the aim of meeting a need [7]. They can be used by people while moving. Many times, developers do not consider the fact that users want to make use of these applications anywhere they are [17]. As users are constantly depending on these applications for their communication and other important services like news and sport update, weather reports, travel information and social activities, users take along their phones everywhere. The need arises for mobile applications to be usable by people [18].

Usability is one of the software quality metrics stipulated by the ISO/IEC 25010:2011 Quality in use Standard. It defined usability as the degree to which software can be used by people to meet their needs. It is made up of effectiveness, efficiency, freedom from risk, satisfaction and context coverage[44]. This quality model will be critically examined as they relate to mobile application with special emphasis on the satisfaction attribute.

Satisfaction is a feeling of fulfillment of desires and expectations about an entity. Therefore, it is important to understand what leads to satisfaction as mobile apps are concerned. Study will be made on whether people are satisfied or dissatisfied with the services provided by mobile applications. To understand user satisfaction, different satisfaction theories will be examined from psychology and consumer behavior perspective, the reasons why users are satisfied or dissatisfied with mobile applications will be identified based on theories and elements of satisfaction and recommendations will be made to ensure maximum satisfaction in mobile applications. Finally the consequences of satisfaction will be discussed.

The work is organized as follows: section 2 talks about usability and satisfaction in mobile applications, satisfaction theories and elements of satisfaction. Section 3 presents the ISO model of satisfaction, measurement of satisfaction in mobile applications and factors affecting user satisfaction in mobile applications. Section 4 presents the major issues in mobile application´s satisfaction, ensuring satisfaction for users of mobile applications and the consequences of ensuring user satisfaction in mobile applications. Section 5 relates to conclusion and section 6 gives recommendation for future

work.

2. USABILITY IN MOBILE APPLICATIONS

Mobile applications are software systems running on devices like smartphones and PDAs (Personal Digital Assistants). They are rapidly developing and making information to be accessible to people at any location and at any time [50]. Usability in mobile applications is quite different from the usability in desktop applications because mobile applications are constrained by limited bandwidth, limited memory, small screen size, different screen resolutions, battery life, changing mobile context, e.t.c[18]. Most people think that usability relates to the appearance of an interface, but in reality, usability relates to how a software application interacts with users[12] . Even though there is confusion about the meaning of usability, its importance is widely acknowledged. Usability can be viewed in two dimensions, the product oriented and the broader human-centered dimmension [3].

Bevan, (1996) viewed usability from the product oriented approach as the degree to which a product is used with ease. It fits well with normal software engineering practice[3]. However, the major contention about this approach is that a particular product can be usable by allowing some actions to be performed, it does not mean that it is useful because the actions performed may not be what the user wanted. Therefore it will be regarded as not useful by people. Also, people have different perspectives about how a product should function when they actually use it as they have different needs.

The broader approach defines usability as the ability to use a product for the purpose in which it was designed for. Many times, usability is often considered as the rate at which the user interface is easy to use, this often restricts the work done on usability as it is seen as self-determining input to quality of software. By putting human factors in mind, this broader approach is synonymous to quality in use which is of the opinion that a product can be used in a real world environment [3].
However, while viewing usability in these two approaches, it is observed that a common goal is to be achieved, which is ensuring that users can effectively apply a product, either from the product perspective or the environment in which it is utilized.
According to ISO/IEC 25010:2011[19], usability quality includes the following attributes:
Effectiveness in use: This is the extent at which specified goals are reached by users in a particular context of use.
Efficiency in use: This is the rate at which users make use of suitable and minimal amounts of resources in a particular usage context.
Freedom from risk: It is the rate at which possible risks are mitigated to save human life, health and his environment. Risk refers to the possibility of occurrence of bad events. A good system/application should have provision for this.
Context coverage: It is the rate at which a system is can be used effectively, efficiently and with freedom from risk

in a specific context[19]. Context refers to any information that describes a situation in which a user finds him/herself. *Satisfaction in use*: This refers to the level at which users are glad and satisfied about a product in a defined context. It is further divided into likeability, pleasure, comfort and trust [19]. This forms the basis for this research.
Many of these usability metrics have been developed for desktop applications and they may not fit into mobile applications due to changing mobility. However, for this purpose of this research, focus will be on satisfaction attribute of usability quality.

2.1 SATISFACTION IN MOBILE APPLICATIONS

Satisfaction can be defined as the consumer´s feeling that the consumption of a product delivers results against a standard of pleasure or displeasure. This definition mirrors on one side, satisfaction´s cognitive nature, i.e. comparison between expectations and performance while on the other side, it mirrors on the affective nature which is the related pleasure feeling [32]. In order to better understand user satisfaction, it is appropriate to view it from different theories of Consumer behaviour and Psychology.

2.1.1 SATISFACTION THEORIES
Expectancy-Disconfirmation Theory: It is viewed as the most favourable framework for evaluating customer satisfaction and it was formulated by Oliver R. (1977). It states that consumers acquire goods and services with pre-purchase expectations about the products. This level of expectation becomes the point of reference in which the product is judged against [33]. When products and services are used, they are compared against what is expected from the product[29]. If there is a match between customer´s expectation and the outcome of using the product, confirmation happens. Disconfirmation happens when the difference between expectation and outcome is wide. Therefore, a customer is either satisfied or not satisfied depending on the positive or negative difference as a result of the comparison made [49]. In mobile applications, users´s expectation can be usefulness and enjoyment, fast loading, fast access to internet, e.t.c. Degree of confirmation must relate positively with these expectations. If this is not the case, disconfirmation occurs and user feels unsatisfied[6].

However, as this theory is based on expectation as the major standard for determining user´s satisfaction, it has some drawbacks in that it assumes and believes that everybody has some expectations about a particular product [49]. This signifies that without any expectation, comparison cannot be made and satisfaction cannot be determined. Having expectations may not happen all the time as we have people who may not have any expectation about a product until they see the product and feel it. There are also some products in which expectation cannot be developed for. An example is a food product that has not been tasted before by a consumer. So the theory may not hold in such cases.

In case of mobile applications, we have some applications that are totally new to the user probably because they have

never heard of it or got stumbled to it via popup ads. When this happens, it is very difficult for the user to draw up some expectations before installing and using it. Therefore, when user´s satisfaction in mobile application is based on expectation, satisfaction may not be determined if there is no expectation for a mobile application but if expectation exists for an application, satisfaction can be determined from cofirmation or discomfirmation of those expectations.

Value-Percept Theory: This theory was formulated by Locke E. (1969) and it states that satisfaction is an emotional reaction activated by a cognitive-evaluative process[28]. Comparison is made between the perceptions or beliefs about a product and the person´s values. The lesser the difference between a product´s percept and user´s values, the better the evaluation and the greater the formation of positive affect related to satisfaction and vice versa[47] . Therefore, the theory depends on product perceptions, customer´s values and conscious judgement between the perceptions and values.

Westbrook and Reilly, (1983) made a comparison between expectation-confirmation model and the value percept model. They stated that values, in contrast to expectations determine satisfaction. They found that disconfirmation of expectation has a higher effect on satisfaction than differences between value and perception and recommended both models for explaining customer satisfaction because neither expectation nor value-percept model was adequate independently[47].

The value percept model focuses on differences between customer´s personal values and product values that they perceive. In mobile applications, user´s personal values can be bright colors, and beautiful interfaces. If the user does not percieve the mobile application´s to have these features, then there will be no formation of positive affect. Therefore, the user is dissatisfied.

However, it is so clear that this theory pays no attention to how these expected personal values are formed before they relate them to products. Likewise, some direct evaluations may be against customers´or user´s values, the theory has no attention to this. In mobile apps, some applications may not have specific users as they are developed for the masses, it is difficult to have a picture of each user´s personal values before comparing them to the values of services provided by applications as each individual has his own distinct personal values.

Attribution Theory: Weiner B.(1985) postulated the attribution theory and it states that individuals involve in unprompted thinking about the cause of product failures in order to get a better understanding of the failure and to have control over their environment [46] . There are attributions about the cause of both positive and negative situations in products and services. Attribution does not relate to failures only, but also to recovery. Negative attributions may be caused by failure, but recovery decreases the effect of negative attributions and produce positive results like satisfaction [8] . Therefore, satisfaction can differ depending on the type of attributions made by a user of mobile applications. If a mobile application fails its user in a specific functionality, users may make negative attributions for the reasons of such failure to get the causes of failures. This reduces satisfaction. They have communicative and direct effects on judgment of satisfaction[38] .

The attribution theory can be viewed as a way of extending the Expectancy-Disconfirmation theory since attribution in mobile application is caused by negative disconfirmation of what users are expecting from applications. For example, user´s expectation can be that a mobile app functions without any interruption or breakdown. When this failure happens, users may give reasons for such failure. Therefore, it still lies on the fact many users may not have expectations for some applications in which they have not seen, felt or used before and getting attributions for failures from such may not be visible and may not be a good judgement for satisfaction. Also, not every user knows the technical details of mobile applications. Not everybody is a computer literate. So it may be difficult for users to give reasons for the failure of mobile apps since they do not know the internal technical details and workings.

Performance Expectancy: It refers to the level at which an individual opines that a product will assist him or her in getting better job performance. Davis F. (1986), related it to constructs like perceived usefulness and relative advantage [42],[11]. Perceived usefulness relates to continual use of a product which is caused by the benefits to be derived. In mobile applications, a user may have some beliefs that using an application can give him/her better job performance. When this happens after using an app, his level of satisfaction increases, but when this does not happen, user´s satisfaction level lowers [21]. This will be discussed in detail later as factors affecting user satisfaction

It is however important to note that a specific mobile application may be developed for different purposes or functionality as it may not be generic in nature. Therefore, its performance will be different with respect to the difference in context in which it is used. Some users may have wrong performance expectations for mobile applications as they may not fit into their context of use. When this happens, no satisfaction will be derived. A typical example of this is when an individual is trying to design a graphic document using a word/text processor mobile application.

Theory of Cognitive Dissonance: Festinger L. (1962) formulated Cognitive dissonance theory and stated that it is the discomfort experienced by an individual having two or more conflicting ideas and beliefs and that there may be non-fitting relationship among cognitive elements. When dissonance happens, there is pressure to minimise dissonance and avoid its increase [13]. Manifestation of pressure includes cognition and behavioural change [37].

In mobile applications, when many functional designs are used, cognitive dissonance occurs among users as there are two or more valuable offer contest and users have the feeling of misfit between various features of the design. This leads to a dissonance, negative attitude to mobile apps and reduction in satisfaction [31].

As we have seen that cognitive dissonance has indicated that there may be misfits between different features of a product which lead to negative attitude; it has not fully and directly explained how people get dissatisfied. Though there may be some features in mobile apps that can lead to dissonance, for example, there can be two or three diffferent attractive user-interface elements. People have different ways of viewing application features as the way people think are different. What will create likeness in an individual may cause hatred and irritation for another person because we have some people who will love to see a lot of flashy interface elements, while others will not. Therefore, the theory has not specifically stated what arouses dissatisfaction in people.

2.1.2 ELEMENTS OF SATISFACTION
The following are the major elements of satisfaction.
Cognitive-Affective Element:
Cognition is the process of obtaining knowledge and understanding via experiences and thoughts. Affect refers to how people feel about things around them[4]. Cognitive-affect has been seen as major element of satisfaction. Satisfaction is said to be a cognitive process when a user thinks and decides whether a product meets his/her need while on the other hand, it is an affective process when a user has some feelings about a product. Van Dolen W. (2004) pointed out that the cognitive system does the advanced mental processes of evaluating, planning and understanding while the affective system is basically concerned with emotions and feelings which can either be positive or negative [40]. When there are positive affects, satisfaction is positively affected while the presence of negative affects increases dissatisfaction [41].

In mobile applications, user´s enthusiasm to get deep into the cognitive state involves a mindful decision concerning the purpose for using an application which may be ease of use or functional delivery of service while the affective system relates to personal feelings like enjoyment about an application which can be positive or negative feelings. They are seen as either encouraging or discouraging[20] . Engagement has been seen to encourage a lot of functional, hedonic experiences depending on the context of the use. Frequent engagement can lead to cognitive and affective (emotional) use and attachment to an application. The conscious decision to use or engage with an application is cognitive in nature. This includes functional motives which may have effect on the affective state because engagement with excitement and fun increases users emotional and affective experiences. This leads to getting a higher value with lower effort. If users continue to use an application, more value is delivered than initial usage. This has a tendency of saving time, giving more pleasurable experiences, increasing satisfaction and driving further engagement [20] .

Most times, mobile applications with initial high cognitive value may not lead to high affections as users discover that a particular app requires a very high cognition i.e. high mental processing for proper usage. This will lead to increase in negative affections, smaller frequency of use and dissatisfaction.

However, there are some mobile applications with initially low cognition requirement but have not led to high affection for users. This might be due to some reasons like personal interest. People may not just be interested in using a mobile application because of their state of mind or maybe they are not planning to give it a trial. Therefore, to such kind of user, a mobile application may be perceived as less satisfactory.

Behavioural element of satisfaction
Users´ behaviour and acceptance of mobile applications and their services is determined by the success of mobile applications. This success factor depends on users´ continued usage of mobile apps. From the Expectancy-Confirmation theory postulated by Oliver R. (1977), confirmation is the rate at which the performance of a product exceeds or matches users´ expectations [33]. This can be positive (confirmation), zero or negative (disconfirmation)[33] . A user´s reuse behaviour is preceded by satisfaction, i.e satisfaction must have occurred before deciding or intending to use an app again. On the other hand, user´s satisfaction is also determined by disconfirmation which occurs when user´s expectation is not matched by the performance of an application [23].

Conversely, it is also important to state that user´s willingness as related to capacity to indicate interested behaviour can also determine user´s intention to continue with usage of mobile application. Users may not feel like making their intention for continued usage known. This recent issue is not well grounded in the Expectancy confirmation theory for users´ behaviour towards mobile applications[23]. Also, some users´ expectation may be ambiguous and might not fit into the actual mobile application functionality and performance.

Moreso, habits are relevant to people, if people repeat a previous habit, and are satisfied with the results, they will repeat the same habit again and this becomes a continued behaviour [43]. In the context of mobile applications, when an individual uses an app for the first time and discovers that the solution to problem offered by the app is satisfactory, the next time he encounters the same problem again will make him/her to use the app again. This forms continued usage behaviour of an application due to previous satisfaction derived[24]. But there are situations in which an app usage can be discontinued due to certain factors like connectivity on movement, moving towards network restricted areas and loss of mobile phones. These can limit the continued use of a mobile application. Therefore, the behavioral element has no provision for this.

Another view to user´s behaviour towards mobile application usage is through the Technology Acceptance Model (TAM) which captures some important opinions about information systems´ usage context in terms of perceived usefulness and perceived ease of use. Davis, (1989) defined Perceived usefulness as the level at which an individual opines that using a system will enhance his/her job performance while perceived ease-of-use is the level at which an individual hopes that using a system will be free from spending effort [9] . These two factors can be seen as perceived value and in mobile applications, it determines a user´s intention of use and attitude towards an app [25] .

However, in certain applications like mobile commerce and game apps, usefulness or ease of use may not be able to describe user´s behaviour for accepting and using an app because some intrinsic motivations like enjoyment and playfulness determine user´s continued usage behaviour. Even if an application delivers the required functionality, if these intrinsic motivations are not there, users may feel dissatisfied. These two components will be discussed in under subsection 2.5 as factors of satisfaction to see how they determine satisfaction.

3.   ISO MODEL FOR SATISFACTION

The International Organization for Standard (ISO/IEC 25010:2011) defined satisfaction as the rate at which a user is satisfied and happy about a product in a specific context [19]. Satisfaction was further split into the following attributes:

*Likeability:*It is the rate at which a user is contented with how a easy to use a system is, the accomplishment of goals and results gotten from using the system.

Pleasure: It is the rate at which a user is satisfied with the achievement of hedonic needs and initiation of affective responses by a system.

Comfort: It the rate at which a user percieves that a system provides some level of physical comfort

Trust: It is the level at which a user feels satisfied that a system will act as intended and with satisfactory perceived usage consequences [19].

3.1   MEASUREMENT OF SATISFACTION

An approach was used by Bayraktar et al., (2012), for measuring user satisfaction in mobile phones. It is called Data Envelopment Analysis (DEA). It is based on linear programming model and used for assessing the performance of many types of objects in different contexts. It measures object attributes by using a scale between 0 to 1 or 0 to 100. For mobile phones, it takes various factors of satisfaction like perceived usefulness, perceived ease of use, perceived values and others as inputs and generates user satisfaction and loyalty as output. Since it is a quantitative measurement for satisfaction, it can be adapted to mobile applications as well[2] .

Despite the fact that DEA takes various attributes as inputs to generate an output, it poses serious problems especially when interpreting each variable independently. For example, different individuals will have different perception of usefulness and ease of use, objective determination of satisfaction may be quite difficult.

Also, O´Malley et al., (2014) proposed an approach for measuring user satisfaction. It called Software Usability Measurement Inventory (SUMI). User satisfaction is further split into five factors which are:

Efficiency: The degree to which a software/application enables a user to complete a task.

Affect: this is the extent of user´s emotional feelings to a software/app

Helpfulness: This is user´s perception about how the software offers helpful communication

Controllability: Rate at which the software/app responds to user´s input in a consistent manner.

Learnability: The degree to which a software/app is straightforward to use[34]

This approach has been seen to be efficient as it closely relates specifically to mobile applications. It was used to measure the satisfaction of an obesity app called Reactive app. SUMI is a consistent and and approved standard for measuring satisfaction. It uses a questionnaire which states responses in form of 3-point linkert agreement scale with options "agree", "undecided" and "disagree". SUMI indicated a glogbal satisfaction score of 64.40 and for the other satisfaction attributes, it indicated 60.60 for efficiency, 67.00 for affect, 60.80 for helpfulness, 60.30 for controllability and 60.80 for learnability [34]. The results showed that users were satisfied with the app.

3.2   FACTORS AFFECTING USER SATISFACTION IN MOBILE APPLICATIONS

The European Customer Satisfaction Index (ECSI) is a popular model that stated the major factors affecting customer satisfaction. They are:

Perceived ease of use: This is a major concept for assessing the acceptance and usage intention of a technology. It was introduced by Davis F. (1989). It refers to how users perceive whether using a particular technology or information system will require much or less mental effort for performing a task while using the system or application. This can be influenced by complexity of a mobile application[9] [35]. In mobile applications, perceived ease of use determines user´s satisfaction as people prefer to use an application that will require minimum mental effort. If cognitive requirement is too high, users will prefer to switch to an application that only requires small cognitive processing.

It is important to note that at times, what users perceive about a mobile application in terms of mental requirements may not actually be the major determining factor for user´s satisfaction as there may be other things to consider. An application may require least mental effort to use and yet may still pose difficult for the user. This means that there are still some inherent factors leading to disatisfaction of such apps like not using a mobile app in the context in which it was designed for. Users may be engaged in other activities different from the context of the application. For example, driving while sending a text message and incorrectly selecting a wrong recipient or misspelling some words and expecting an application to automatically correct these mistakes. in cases like that, users may not be satisfied.

Perceived Usefulness: It was also introduced by Davis F. (1989). It is the rate at which an individual believes that using a particular system will enhance his/her performance on job [9]. This factor enhances user´s usage intention for any technology. Mobile devices allow people to have access to lots of applications. If users discover that they can make use of an application at any time when required and that it is reliable, they will perceive such application as been useful. It also determines trust for mobile applications [16].

People have different perceptions about usefulness. This is based on each individual´s personal reasons as peoples´ needs are different. Therefore, perceived usefulness for an application by a single individual cannot be generalised for everybody. Personal reasons and wants need to be considered. People use mobile applications not only for their jobs but also for other purposes like entertainment and commerce. So needs of people are different and their perception for usefulness will be different too . Therefore, it should not be related to job performance only.

User´s expectation: Rotondaro G. (2002) related this to user´s previous knowledge and involvement with a particular service or product. User´s expectation must be positively related to satisfaction. i.e. satisfaction is strongly dependent on expectation[36], [2]. In mobile applications, people will prefer to makes use of an application that will meet their expectations rather than managing an application that has nothing to do with their expectation[7]. Such expectation may be fast processing and loading, simplicity of functionality, linear design, limited number of choices, e.t.c.

In situations where users have expectation for a mobile application, this can be a major determinant for satisfaction. However, not all users have expectations for mobile applications; such expectations may come when they see a mobile application working or when they use it for the first time. Also, when an application is totally new, there cannot be any expectation for it. Therefore, it may not be effective or sufficient to depend only on user´s expectation for satisfaction determination in mobile applications.

Perceived value: This relates to the price paid by a customer for a product. It has been seen to have an impact on a customer´s satisfaction[15][2]. It has its source from equity theory which relates customer´s assessment to either fair, right or deserved for an offer. It is the ratio of user´s output to input. Perceived value is made up of monetary and non-monetary inputs like time, energy and stress went through by users. most times, customers may feel rightly treated if they compare their input/output ratio to be equal with the input/output ratio of services provided by other products or company services [48]. Therefore, if users perceived to be fairly treated, satisfaction increases.

In mobile applications, users often make comparisons for applications that offer almost the same service but from different developers. They do this by comparing what they are expending on a particular app with what other people are expending on similar apps in terms of of money and cognitive processes to what they are having as return.If there is little or no difference, users feel fairly treated and satisfied by developers [39].

Several mobile applications may be offering the same service but this does not mean that they are developed using the same technology. There may be extra cost of technology on developer´s side which may affect overall cost on users too. Therefore, making comparisons between similar mobile applications in terms of input/output ratio may not gurantee user´s judgement of fair treatment most especially when users are aware of the technology used in producing an application. If their input is greater than what they are recieving in return, they feel rightly treated based on the knowledge of application development. On the other hand, if they are not aware of how an application was developed, they can feel cheated.
We also have users who expend a lot in mobile applications to get a little output from it. Even if the application offered a single functionality, if that functionality is what they actually desired, they will feel satisfied regardless of what they have spent. Therefore, comparison among several mobile applications in terms of input/output ratio may not be a major determinant of satisfaction in mobile applications always.

Screen size: This has been seen as a major factor that affects a user´s satisfaction in mobile applications. The screen size of a common mobile phone is around 1.65 inches in diagonal in comparison to that of a laptop which is around 12 inches. It is a major factor because visual perception and attention in humans restricts the amount of details that can be seen. This has effects on attentiveness of people [5] and causes users to zoom images and objects in apps while viewing, thereby ensuring that the user keeps all information about images and objects in their head leading to more cognitive activity. This activity can be constrained by the span of human attention as we have people with high and low cognitive abilities [30] . To reduce the negative effect of screen size, Findlater and McGrenere, (2008) proposed the use of adaptive graphical user interfaces for mobile devices. This allows shorter search path for regularly accessed items by spontaneously tailoring a functionality presentation to fit a person´s task, abilities and patterns[14].

Battery life: This also has some effects on the overall satisfaction derived from applications. When a mobile application consumes a lot of battery resources of a mobile phone, users get frustrated and feel less satisfied as they go every where with their chargers. Mobile application developers must put this into consideration by ensuring that while users are less active on an application, the app should automatically switch to sleep mode in order to minimize battery consumption.

4. SATISFACTION ISSUES IN MOBILE APPLICATIONS

The following are the major issues that relate with user´s satisfaction in mobile applications.

Context: Context refers to the situation or environment in which an inidividual is using a mobile application. It includes user´s location and involvement in other activities while using a mobile application. [17]. The context in which a mobile application is used is very important and it can determine satisfaction derived from it [7]. In order to ensure real satisfaction, developers should put this into consideration by determining proper level of context information through the display of only the required information to ensure that users have total control of the application because if an application malfunctions unexpectedly, the user´s perception of control will be weakened.

Interruption: An application can be interrupted by other unintended events like phone calls or reminders. From interaction perspective, being mobile entails more cognitive requirement as users may lose focus of what they are doing before the interruption happened. Interruptions affect task completion time of mobile application as they delay task processes.

To avoid the negative effects of interruptions, users can be assisted to recapture their contexts again by maintaining the state of the context while going back to the interrupted application. For example repeating the last few interactions on the user interface/screen automatically so that users can have an idea of what was going on before the interruption happened[22].

Also, developers must ensure that unnecessary interruptions are avoided and the visibility of the system based on the action currently been performed must be enough for the user to know what an app is doing [10].

Privacy: It is the ability of a user to know how his/her personal information will be taken, used, shared and also how control will be exercised over it. This is very important in mobile applications as we have a lot of people using mobile apps for various reasons. Mobile applications downloaded must give detailed information on the kind of personal data that will be taken and the manner in which it will be used. This will give consumers an opportunity to review the privacy policy of an application before downloading[7] . Also, in case of mobile applications that are connected to social networks, user´s permission must be gotten before broadcasting user´s private data to any social networks. This can also be done through the use of privacy settings and profiles to enable users to select their preferred level of personal data to be made public [26].

Wireless connectivity: This issue is affects the performance of mobile application as they depend heavily on wireless networks for their operations. Wireless networks are characterised by frequent disconnection as users are moving, low bandwidth and high error rates. Therefore, mobile devices must be designed to switch among different wireless networks as users constantly change their location[27]. This will enable mobile applications in phones to operate without any network interruption. With this, users can make use of applications anywhere they are thereby giving them enough satisfaction.

4.1 ENSURING SATISFACTION IN MOBILE APPLICATIONS

In order to get maximum user satisfaction from mobile applications, the following are recommended:

i. Ensuring that user´s expectations are met: as mobile application users are increasing, expectations are also increasing, users are expecting fast access to mobile applications and sites, and fast downloads. To meet this expectation, developers must have an understanding of how individuals are using an application in each interaction. This will allow them to build applications that will meet user´s expectation at a point in time it is been used[1].

ii. Developers must ensure that a mobile application requires minimum cognitive processing for users to be able to operate a mobile application [17]. When a mobile application can only be operated with high mental processing by thinking for several minutes or hours, user´s satisfaction will be reduced as it will impact the affect stage of usage. Users will not have any perceived affections for such an application. Therefore, design must be kept as simple as possible to ensure that user do not put in much mental inputs to mobile application useage.

iii. The various limitations of mobile devices, like limited screen size and battery life should be considered while designing mobile applications as they also affect satisfaction. The display of objects and images should be made clear with respect to screen size especially for visually impaired users. Also, mobile applications should be developed in such a way that it will not consume much battery resources. This can increase user´s mobile application engagement.

iv. Developers must ensure that standard design guidelines are followed while developing mobile applications.

4.2 CONSEQUENCES OF SATISFACTION IN MOBILE APPLICATION

Ensuring satisfaction for users of mobile application has been seen as a good idea as it allows users enjoy an application, makes life easier, decide to reuse the application again and also prompts them to refer satisfying applications to other people. On the other hand, if users have this excessive feeling of satisfaction for mobile applications, the following consequences results.

Addiction: In mobile applications, when satisfaction is ensured for users, it makes them to be addicted to them as people get more used to them due to the value they get from them. Addiction occurs when an individual´s basic beliefs in some things get initiated by acute occurrence of events which results into cravings. These frequent cravings lead to addiction [45]. In mobile applications, when satisfaction is ensured for users, they can get used to it and even

get busy with these applications regardless of where they are or what they are currently doing. This can lead to a state in which users will not be able to sustain their life without their mobile phones or mobile apps.This can be avoided by ensuring balance between what an application will offer users and what users have to do on their own by making users to do some simple tasks by themselves. Detailed work has not been done in this area.

Laziness: When satisfaction is ensured in mobile applications, people tend to have a sense of dependency on them totally for most of their tasks. This decreases users´ activity rate thereby making them to be lazy. When there is lazy attitude in users, it degrades their cognitive/mental activity which is not an healthy idea. Developers can minimize laziness by ensuring that not all tasks are done for the user by an application. Users should be allowed to carry out some tasks themselves.

5. CONCLUSION

In this work, usability attributes have been viewed and in detail, satisfaction has been studied from psychology and consumer behaviour perspectives. Satisfaction theories have helped in the understanding of how people get or feel satisfied or dissatisfied even though there are are variations in the applications of these theories.

In mobile applications, user´s satisfaction is determined by what users perceive about an application, product expectations, expected performance, and match between personal values and app values. It has been discovered that in a situation where users have expectations for a mobile application, then satisfaction will depend on the confirmation of their expectations, otherwise, satisfaction cannot be determined based on that. Also, the more the negative attribution for the failure of an app, the lesser people get satisfied. These are the reasons why users feel satisfied or unsatisfied. Also, cognitive/affective and behavioural elements show the processes involved in how users judge whether they are satisfied or unsatisfied as they relate to mental requirements for using an app and their intention to continue to use an app because of the benefits they have derived. Issues like context, privacy and interruption has been seen as having effects on users´ satisfaction.

Ensuring user´s satisfaction is possible if developers understand how humans view things around them, strictly following development standards,avoiding unnecessary interruption during usage, making sure that users can recover their current context after interruption and that only the required context information is made visible to give users sense of control.

Also satisfaction has some negative effects like addiction and laziness. This can be solved by making sure that there is a balance between what is enjoyed from mobile applications and what users must do on their own.

6. RECOMMENDATIONS FOR FUTURE WORK

This write-up has explored mobile application satisfaction from psychology and consumer behaviour perspectives. However, in most literatures studied, little work has been done on ensuring maximum satisfaction and at the same time, minimizing the negative effects of satisfaction in mobile applications. This is quite important because users need some sort of balancing between services enjoyed and their own personal inputs. There is need for more research work on minimizing negative effects like addiction and laziness which arise as result of feeling satisfied with mobile applications.

It has also been discovered that developers design applications without the knowledge of how people perceive things around them or react to events. More research work is needed to be done in the aspect of human psychological reasoning and thinking so as to know how people get satisfied or dissatisfied.

Also, there are a lot of mobile applications in the market in which users will pay some price to get them, but at the end of the day, no satisfaction is derived by the user. This is due to lack of standards. Even though in recent literatures, there have been standards laid down to develop mobile apps, but developers are not well grounded on how to apply these standards into development. More practical work should be carried out to help developers in this aspect.

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