Customize Design Requirements as a Disability Management Regiment for Patients with Parkinson and Epilepsy

Dinga Eric
Abstract

Customizing Design Requirements as a Method for Managing disabilities in Patients with Parkinson and Epilepsy

Dinga Eric

Parkinson disease and Epilepsy are two amongst several other diseases which possess the potential to affect the ability of individuals to function normally and effectively. As such, there has always been the need for the development of ways in which these diseases could be effectively managed. In the IT world, apps are being developed daily and customized to suit the various needs of individuals. This research work attempts to incorporate the needs of Parkinson and Epileptic patients in the design process of an app that would help mitigate the impact of the diseases upon the patients and thus improve their quality of life.

Faced with so many competitions, app designers have come to realize that it is not only functionality of the design that matters but the design as well. Designing a new app has never been this difficult, especially regarding the color, layout and other subtleties which must be taken into consideration. Therefore, designers must learn to know what motivates users to use his or her app before other apps though they seem to have similar functions. Moreover, this research work seeks to provide design specifications for the application to customize itself to fit each user's needs while creating a good user experience as users differ in their degree of impairment and it is hard to find a good design for all of them.

The overall result of this research is aimed to improve the design of an interface that aids people who suffer from intellectual impairments and to keep the longevity of the design to facilitate the Epileptic and Parkinson patients in terms of app usability.
Acknowledgements

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1 INTRODUCTION

The world has drastically evolved when it comes to mobile communication. The first mobile telephone was demonstrated by Martin Cooper of the Motorola Corporation in 1973, using a handset weighing approximately 1 kg (wikipedia.org, History of mobile phones). The whole world witnessed in awe and wonderment as this new telephone paradigm actually worked. Even Martin Cooper knew there was going to be improvement in the design, communication system, and software of this application of technology in some years to come. But he did probably not expect that it was going to be achieved in such a short time. In 1983, the DynaTac 800x was made commercially available by Motorola (ibid). By 2011, the global phone network has penetrated almost 87% of the global population. Mobile communication have radically changed a lot since then, mobile phones and other portable devices such as laptops, tablets, phablets etc. and communication has never been this easy. Because these new portable devices are technically computers, the only difference is that we can now carry them in our pockets or handbags to facilitate communication, entertainment and provide a service. All thanks to mobile applications or in short “apps”. Mobile apps are no more only for business folk, students or working population as (Aziz, 2003) posited, it is a way of life. It is everybody’s toy because over 87% of the world population now use mobile apps including even those on the bottom part of the economic pyramid (ibid).

There has been previous research on designing for people with Parkinson’s disease (Nunes et al, 2015) and people with Epileptic seizures (Baker, 2015) based on design and human computer interaction research, most of which have been generalized, that is, they tend to target the design based on a generalized manner. Those that have tried to be more specific as on how design can influence the user’s emotions when using a particular interface have actually taken more tangible things other than software (ibid) as models for the design. It is for this reason that I have chosen Parkinson’s disease and Epilepsy as my main target with the expectation that the reader can better understand the scope of what I am writing about.

The diseases chosen for this research project are Epilepsy and Parkinson’s disease. This is because these are diseases where patients can be helped by the use of mobile applications to manage their disabilities. These diseases have influenced a lot of people’s lives both directly and indirectly and the research has given users the advantage to focus on wellness issues such as fitness, lifestyle, stress and diet. They have affected many users and have ruled out their lives. Parkinson’s disease is a neurodegenerative brain disorder that progresses slowly in most people. Symptoms can take years to develop and most people live for many years with the disease (National Parkinson’s Foundation 2016). It is now commonly stated that “you don’t die from Parkinson’s disease, you die with it”.

In Europe, 6 million people of all ages are affected. It affects children, adolescents and old people (60.000 people in Sweden are affected by epileptic seizures from time to-time). There are two major types of seizures, the larger ones with cramps and convulsions (grand mal), which are probably the most well-known variety, and smaller ones (petit mal), which have a less violent effect, in that the person more or less stops in mid-activity and becomes “disconnected” during the attack. Petit mal can still be dangerous, since it may, e.g., cause a person to fall from a ladder, or drop infants during the attack (WHO, 2016).

The most common problems that people with Epilepsy and Parkinson experience are their day to day challenge in coping with their impairments. The impairment problems are seizure disorders and physical impairments which affects these patients. Seizures differ from momentary loss of attention to severe spastic movement, and can be triggered in patients with
photosensitive epilepsy by rapidly flashing light caused by screen refreshes or by the flashing of different images on the screen. Physical impairments vary greatly and the problems faced by patients with physical impairments are poor muscle control, weakness and fatigue, speech problem, vision, sensing or grasping objects due to pain or weakness and difficulty manipulating devices (touch and control). To cater for the special needs of people suffering from Parkinson’s disease and Epileptic seizures, design specifications for the mobile application are developed and customized. The project focuses on users’ of all ages and the prospect of this project is to improve the design of a previously designed application: the SAFI-F app, intended as support for people in special homes, schools, daycare and parental homes. The main objective is to propose some design guidelines that will be used to improve the current version of the SAFI-F app design. The Android and IOS platforms are used to design the mobile application because they are the most widely used platforms in mobile devices. The SAFI-F app is described more closely in the next section.

1.1 The SAFI-F App

The SAFI-F app was originally developed to facilitate communication between schools, preschools and parents, regardless of any language. The SAFI-F app is available both as an app and web application, which allows users to send and receive messages. Teachers send and receive messages in Swedish and parents respond and send messages in the language of their choice. All messages in SAFI-F app are standard messages and the app also works for illiterate users. A message in the SAFI-F app is a default message that has been translated in advance by a certified translator and then recorded by professional interpreters. The app has a reading function that allows users’ to listen to all messages. SAFI-F app thus works well also for illiterate users’ who can choose to listen to the message. They can even respond to the message or send messages to the school or staffs. The app is currently used in almost one hundred schools and kindergartens in Sweden and it supports nineteen languages for the school version and thirteen languages for the preschool version. New languages are ordered continuously by the customers and are available for free to other customers who use the same version of SAFI-F app.

1.2 Company Background

The SAFI-F app application has been developed by the company Soft Solutions Partner AB (http://www.softsolutions-partner.se/om-oss/), which is a modern IT company whose main objective is to design new systems for companies and organizations. It has ten full time employees and part-time employees in Sweden and offers services like software design, web design and mobile applications. The company works in teams with business consultants and designers to create innovations for emerging companies and businesses to improve their systems. Moreover, the company business strategy is to develop products that will have impacts on people’s lives and make it easier (ibid). For me, this has been an interesting opportunity to improve my interaction design skills and learn the values of design tools that I have never used before. This thesis has helped to develop my skills as a user interface designer as well as conducting a survey and talking with individuals affected by the disorder.

1.3 Target Users

Similar apps like wellness apps and medication tracking apps exist in the app store but due to the current status of the end users, it is important to have a well-defined target group. The target users for the SAFI-F app are personnel working in special homes, schools and day care centers with parental homes as well as children in these contexts. The users in the SAFI-F app
group are within the age group of ten to twenty-five years and adults aged thirty-five to fifty years who need to use the app to plan and communicate about their daily activities.
2 GOAL OF THE PROJECT

The goal of this thesis project is to improve the design of the SAFI-F app in a version specifically for people affected with Epilepsy and Parkinson. Each user differs in their degree of illness and it is hard to find a suitable design for the entire target group. The design will be universal, that is the app will run with customized views on iOS, android and the web. The project will focus on evaluating preexisting apps and a usability test will be done to inquire users’ needs.

2.1 Scope of Project

The scope of this project is to improve the overall design of the SAFI-F app and do a research to understand the special needs of end users. This will involve users in interviews, observation and the theoretical knowledge of the design. When all information is collected, it will be analyzed and put into a more easily useable form. In this case, it would be prototypes, personas, and design guidelines to design the app for the users. The prototype will be given to users to test and see if it meets their needs.

2.2 Problem Statement

Every design has its good and bad points. The thesis focuses on a specific problem which illustrates the research. At the current time, it is important to have a good insight that there are many types of problems people with disabilities have. The two most important problems of Parkinson and epilepsy diseases faced by patients are seizure disorder and physical impairment. These two diseases have variation and degree of impairment. For example, patients with a mild physical impairment may need to have the behavior of the keyboard and mouse changed slightly in order for them to be able to effectively use the application while other patients with a more severe physical impairment may need to have a special keyboard that can be operated by speech, head pointing or eye gaze. To understand these problems, more research will be done to better understand and identify the features of the preclinical phase of the diseases.

2.3 Methodology and Approach

This study is qualitative in nature and will be more of an exploratory approach to design a good user experience for the different users’ needs. In this regard, semi structured interview will use a research method for collecting qualitative data as well as eye tracking. A group of students shall be summoned to test the application and the intention will be to make the designers know how to design the app for them and avoid leaving user experience to chance, test to make sure they are satisfied with the application as outlined by (Gualtieri, et al, 2009). To proceed with this method, the following steps shall be taken into consideration: the users’ needs will be understood through interview surveys, feedbacks and then a review will be made to learn what they think or say about the preliminary design. Personas and prototypes will be developed to know the users’ real attitudes, goals and interaction with the application. At the end of this study, the users will be asked to download the app on their smart phones to test the application that will be based solely on assessing their accomplished goals, perform tasks and get to know their level of satisfaction.
2.4 Research Question
This study will seek to answer the following research question: “How can the design of a smart phone app used for communication by people with Parkinson and Epilepsy be improved to have a good user experience?”

In a quest to answer the question above, the following issues shall be highlighted:

- Who are the users? What interface requirements and improvements are needed for the application to provide a user experience? A user experience is an experience that makes the user feels familiar with the application. It includes both the practical and experimental factors as well as and the user’s perception of the system such as utility and efficiency (Roto, et al, 2011).
- What are the categories for the users’ needs? What are the users’ opinions about the application to access the support system of the application and ease of use?
- How will the app have to be designed to meet the different users’ needs and increase user’s experience?

2.5 Product Perspective
The app in itself consists of two versions, one that is downloaded and installed in the mobile phone and one that is used over the web. The mobile application is used to search for activities and view information and the web based is used for managing information about daily activities and the system as a whole.

2.6 Theory
The aim of this thesis project is to obtain an overview about neuro-physical diseases, especially Parkinson’s disease and Epileptic seizures. The various types and characteristics of these two disabilities will be examined leading up to a suggestion as to what type of application (in this case mobile applications) that will be better for people with these diseases to manage their day to day activities without any difficulties. For this reason, I will start by explaining Parkinson’s disease and then further explain Epileptic seizures because though both these diseases seem to attack the motor neuron system (Chang, et al, 2003), they are actually different from one another based on their types, duration of the illness, treatability and other factors (WHO, 2016).

Based on that information I will proceed to provide the various steps I have found that an application designer or programmer needs to take into consideration when designing an app for people with these special conditions.

2.7 Parkinson’s disease
Parkinson’s disease has been a problem in the world for a long time. Since the clues or symptoms are similar or show a close resemblance to stroke, people usually confuse it for stroke. There are many types of Parkinson disease and one of the most common is the Huntington disease (HD), also known as Huntington Chorea that has similar effects to Parkinson patients. HD is an inherited disease that results in the death of brain cells (Nance et al 2011). Though the symptoms of the disease are mostly subtle, some clues can be found to get to know the traits of the disease. Some of these clues are:

- The earliest symptoms are mostly subtle problems with mood or mental abilities (Dayalu & Albin, 2015).
• A general lack of coordination and unsteady gait often follows (Warby et al, 2014).

• Uncoordinated, jerky movements become more apparent as the disease progresses (Dayalu & Albin 2015).

Other researchers like Hoehn and Yahr (1967) brought forward physical clues based on a scale of 1-5 that has helped to classify the different levels of the disease. Stage 1 entails less extreme symptoms, like unilateral involvement with minimal or no functional disability. Stage 5 can entail the most extreme cases with symptoms such as being wheel chair bound or bed-ridden.

As the disease is being understood throughout history, other countries have taken steps to show how the disease can be classified. The British government for example used the modified schedule and British activities of daily living scale as a percentage to show how the daily lives of people in Britain can be classified to know if people suffer from Parkinson’s and what level they are into. The classification is from 100% being most active, like being able to do the day-to-day routines without any help at all, to 0% being unable to do anything at all and be very dependent upon others (Schwab and England Activities of Daily Living Scale.pdf 2014). For example, a person with a 0% classification will be bed ridden, have non-functional bowels, non-functional bladders, be unable to swallow etc. However, the four most recognized symptoms also known as the 4S are:

• Shake: Some describe it as a repetitive shake in the tip of fingers, which usually happens when the affected part of the body is at rest.

• Stiffness: A large limb like a leg may feel stiff from off the toes up to the hip joint. Similarly, tiny muscles in the face may tighten into a mask-like appearance.

• Slowness: This describes the inability of the patient to perform normal activities like dressing with typical speed at ease. It can also be described as being unable to do the things the patient used to at a normal pace, for example playing Nintendo Wii.

• Stooped posture: Here the characteristics or physical traits include as if the patient may walk using short and quick steps. Then after a time, a daily activity like walking and turning becomes difficult.

• Apart from these 4S, there are numerous invisible symptoms or impairments that may occur as result of Parkinson’s disease, including even personality changes. These lesser known effects are nevertheless also very difficult for the individuals.

Because of all the characteristics and difficulties that people with this disability have, various groups and researchers have looked for means so that they could bring forward a concise and ideal way to take care of people with Parkinson diseases.

2.8 Epilepsy

Epilepsy has been defined as a group of neurological diseases characterized by seizures (Chang, et al, 2003). The seizures can vary from brief moments of non-activity or non-responsiveness (petit mal) to a long and unpredictably long period of vigorous shaking (grand mal) (WHO, 2016). The episodes of grand mal can sometimes result in physical injuries, including broken bones and bitten tongues or damaged teeth. Chang and Lowenstein (2003) believe the seizures just tend to occur with no immediate underlying triggering cause. This means that the effective cause of most epileptic seizures is, to a large extent, unknown. Epileptic seizures seem to be a very common disorder, especially in developing countries
whereby about 80% of the disease cases occurs (WHO, 2016). The cause of the epileptic condition (not the seizures) seem to be a damage to the brain that can have several different causes.

Some people have developed the disease because of brain tumours, infections of the brain, and birth defects (WHO, 2016). In fact, some cases of the disease are so mild that they may occur only once in a while and most seizures can be at least basically controlled by medications (ibid), sometimes it can even be avoided (WHO, 2016). Unlike Parkinson’s disease not all cases of Epilepsy are lifelong and many people seem to reach the point that the treatment is no longer needed (WHO, 2016), but there are also cases of relapse after seizure less periods. Though the effects of Epilepsy are not continuously visible, as is the case with Parkinson, that doesn’t mean that having these seizures (the impairment) doesn’t have its own consequences to the person having them as well as the people being close to them. Some of the after effects are:

- Like with Parkinson, those affected by Epilepsy have psychological and social stigma affecting their general wellbeing.
- Isolation (This often occurs in developing countries, especially Africa).
- Stigmatization. The stigma can even affect the family of the person having the disorder (WHO, 2016).

For example in some countries, such as in Sweden, those with epilepsy are not allowed to drive until they are free from seizures (both petite and grand mal) for a specific length of time (Widen Cohen-Gadol 2012). Besides, it can trigger further disorders due to the presence of the epilepsy syndrome. These disorders may include depression, anxiety, obsessive-compulsive disorder, and even autism (Stefan Hermann, 2012; Levisohn, 2007).

The characteristics of both Parkinson and Epilepsy are different but at the same time also similar, and therefore I believe it is possible to design a mobile app with the same interface and functionality for both disabilities. However, since it is an app designed for people with special needs (disability), some external criteria have to be followed.

Recent years have seen a rise in literature focusing on exercises and exercise based games for clinical rehabilitation aimed at people with disability (Parkinson, see, e.g., Scholfield et al, 2015). Other studies in particular have focused on exergames targeting stroke rehabilitation (Alankus, et al, 2012; Balaam et al, 2013; Burke et al, 2009).

Scholfield and his co-researchers (ibid), for example, proposed what they thought that every video game designer or application designer needs to take into consideration when designing an application or a game for people with Parkinson’s disease. Although these guidelines were based on their research of people with Parkinson, I here propose that the guidelines will also be ideal for people with the Epilepsy syndrome. These guidelines were:

- The designer has to be self-conscious about emotional and physical difficulties that arise when a person encounters this disease. That is, they have to be able to translate the design in a way that take the patients physical and emotional traits into consideration.
- The game or application has to be grounded in a real life world situation. The games for example have to be able to relate to the daily life or routines that they now miss or are unable to perform.
• Show consideration for Parkinson’s symptoms. The application or game have to take into consideration the kind of feedbacks people with Parkinson need to have as compared to people without the disease. For example, if it is a mobile application, the app has to be patient with their typing or texting speed since generally people with Parkinson will be slower to text or type compared with standard behaviour. The size of the text must be large and visible for the patient to type and the keyboard should have enough spacing in-between the text to facilitate typing. This will probably be for the reason that their hands may be shaking involuntarily or that the hand may be stiff so that the patient has to type with one hand instead of typing with two hands. Like Parkinson’s myoclonic seizures (a type of Epileptic seizure) involves spasms of the muscles in all of the body or just a few areas, especially the hands (Schacter, Holmes and kasteleijn 2008).

However, little has been done to follow up this research about Parkinson’s disease (Schofield et al., 2015), which has made it difficult to develop an application that can be better used for their needs. However, as Schofield and his co-researchers pointed out, maybe it will become easier if people and developers better understand the disease, its symptoms and the feelings or difficulties of the people who have Parkinson’s disease. If this is the case, it will be possible for the developers to create an application that will be optimal for people with the disease.

2.9 User Experience (UX)

In this section, I will define the concept of user experience and then elaborate on why user experience is important for the SAFI-F app for patients that will use the app with great expectations when they interact with the mobile application.

There are many definitions of user’ experience (UX), however, my focus here will be on digital user experience of mobile and web applications. The ergonomics of human-system-interaction (ISO 9241-210) defines user experience as a person’s perception and responses that result from the use or anticipated use of a product, system or service. This definition still has so many interpretations. To design a user experience, it entails a combination of art and science with many rules that are design guide lines based on user behavior and usability.

We can also contrast this with the definition of usability. Usability is the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (Ergonomics of human-system interaction, ISO 9241-2010). The notion of usability is that any system designed for people should be easy to learn (and remember); useful in the sense that it contains functions that people really need in their work and is easy and pleasant to use (Nielsen, 2012). It is important for an application to differentiate itself from others by providing a better user experience so that users will be willing to purchase the application and recommend the company behind the app.

2.10 The Case of SAFI-F App

Many companies are expanding their products into the global market to capture users because they want an experience that is valuable, easy to use, aesthetically pleasing, and emotionally satisfying for everyone. (Gualtieri, 2009) points out three important benefits that companies would receive when providing a good user experience:
• Many customers will be willing to purchase your product if the company provides an excellent user experience.

• Many customers will resist doing business with competitors, compared with companies that offer a poor user experience.

• Many customers will recommend you. Companies with the highest user experience scores have 16.8% more customers who are likely to recommend their product or services compared with their lowest rivals.

Therefore, the app has to be more subjective, it should not be just some fanciful piece of software; it should be able to perform its aims and objectives. By its aims I mean that before the developer wants to design the app he must be able to answer the questions as to why, how and what the app should do. Firstly, the designer needs to have an inherent reason for why he designs the application. This is because other designs could not follow or understand how users feel or connect to that particular design. To answer this, the developer or designer must become one with its design to better understand the users, in line with the saying: “We shape our tools and our tools shape us” (McLuhan, 2013). Secondly, why design in the first place? Is it because we use one design and get disgruntled by the weaknesses of the design; its functionality? Thirdly, the ‘what scenario’ how can we better target our objectives? How can we better make our design different from others? Who are our target users?

2.11 Special Users Needs and Tasks

In this section, I will list down the special needs of patients and give examples of how the need can help to accomplish their day-to-day activities. In this case of the SAFI-F app, some users need medicine at regular intervals and possibly also other help as they go about their day-to-day activities. As I observed during the interview, some users with sight problems need to use special apps, tablets and computers to read. Those with hearing or speech problems need hearing aid to hear and speech therapy as it is difficult to say words correctly when you cannot hear them very well.

These patients have special needs because they might need medicine, therapy or extra help in school whereas other patients don’t necessary need it or only need it once in a while. For example people who need a wheel chair or use braces when they walk, these people have special needs. They need this equipment to help them get around but they might need to have ramps or elevators available. They might also need a special transport to and from school and a special device that lifts them up into the bus so that they don’t have to use the steps.

A good insight of user needs is necessary to design an excellent user interface. Kraft pointed out three different types of user’s needs; immediate user needs, perceived user needs and latent user needs (Kraft, 2012). He defined them as follows:

**Immediate User Needs:** They are the needs that users have here and now that enables them to imagine or express the needs. A specific need provides information about what the user wants. For example, I want an application that has GPS to monitor my daily activities or I want an application to improve my health safety (Kraft, 2012).

**Perceived User Needs:** These are superficial needs that users expect a product to solve and they have a false belief in the product that the product is unable to fulfill. They are created through marketing campaigns to entice customers to purchase the product because they have a need for the product. Kraft further explains that users should be careful as they may get disappointed with these needs when they have high expectations for the product (Kraft, 2012).
Latent User Needs: They are needs that users already have but cannot imagine or articulate, and also needs that users are not aware of or do not have. These needs can be identified by a person through observation in interviews and observers may discover new things that users want or are not aware of and then suggest solutions to upgrade the product to have a good user experience. Kraft argued that these latent needs can make it possible for a designer to get a competitive edge over others (Kraft, 2012).

Some special user needs for patients who have illnesses like Parkinson’s disease and Epilepsy can be listed as follows:

- Need to track daily activities such as diet, exercise, homework, medication and socializing that distracts and may alleviate pain.
- Need to include environmental factors such as weather that may affect level of pain.
- Identify pain whether is part of the user disease or not and whether the user needs to seek more help.
- Provides information about pain and how it can be alleviated for different medical conditions.
- Allows users to network with a support group that can help them.
- Need for the care giver to help in crisis situations.
- Need to make choices and remind the user what to do and when, for example take breakfast, lunch, drink enough water, take medications watch movies and play games.
- Communicate with the parents and teachers of the patient.

This list only provides some examples of the needs for this user group. To provide a complete list is beyond the scope of this thesis.
3 DESIGN REQUIREMENTS

For the application design, I have assembled a set of design requirements, that will capture the most important needs placed on the application.

3.1 Requirement Specification

These are requirements, functionalities and features that the whole system should have. First of all, it is important to specify the product backlog for this project to ensure that it is transparent and clear to all users. As the company is the product owner, the product backlog should have the latest status of all requested functionality the stakeholders want. The initiative for the product backlog was brought up by the research owner and the supervisor. Table 1 shows product backlog that represents the functionality of the system requirements.

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Importance</th>
<th>Estimates</th>
<th>Empower Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Login</td>
<td>50</td>
<td>30</td>
<td>Must be easy to enter data</td>
</tr>
<tr>
<td>2</td>
<td>Medicine Reminder</td>
<td>80</td>
<td>40</td>
<td>Don’t pause until registration is completed</td>
</tr>
<tr>
<td>3</td>
<td>Connects with contact persons</td>
<td>40</td>
<td>20</td>
<td>Contact others and compare experiences</td>
</tr>
<tr>
<td>4</td>
<td>Monitor daily activities</td>
<td>65</td>
<td>35</td>
<td>Continually monitoring patient’s outcome measures</td>
</tr>
<tr>
<td>5</td>
<td>Activity schedule</td>
<td>27</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Calendar for important events</td>
<td>19</td>
<td>8</td>
<td>-</td>
</tr>
</tbody>
</table>

*Table 1 Product backlog showing the functionality of the system requirements*
3.2 Supplementary Requirements

In addition to functional requirements the application also has supplementary requirements that have to be taken into account in the design process. Eeles, (2004) outlined the rational unified process approach used to specify the supplementary requirements that are relevant for the design. In this case, the requirements should be classified as functional and non-functional because it gives a good understanding of what sort of things the designer needs or wants from the users’. According to Eeles, (ibid.), the FURPS+ model is used in the design process as one way to classify all the collected requirements from the users. The FURPS+ model is basically a short hand for functionality, usability, reliability, performance and supportability and it also means the other requirements such as design constraints, implementation requirements, interface requirements and physical requirements. Basically the FURPS+ is a method for dividing the requirements into functional and non-functional requirements (DG Energy and Transport, 21 February 2003).

The functional requirement is a set of supplementary requirements that has to be considered in the design process. It defines what actions and functions the system can execute. For example, this means how the system works, what it does and what happens when end users use the application.

Moreover, there are requirements that defines how the system behaves with the input that it gets from the users or from the external systems and the output that it produces (Eeles, 2004). The non-functional requirements are in many cases more important for the success of the product than the functional requirements. The non-functional requirements are everything that sets some demand on the application.

Functional requirements
- Usability
- Reliability
- Performance
- Supportability

Non-Functional requirements
- Design Constraints
- Implementation requirements
- Interface requirements
- Physical requirements

3.2.1 Usability

The notion of usability is to design apps for users that should be easy to learn and remember. Usability are the things that relate to human attributes (Nielsen, 2012). The system must contain some useful functions that users really need in their work and be easy and pleasant to use (ibid). In this case, the application design for the user interface should be esthetic,
consistent and accessible and the human documentation should support the system (Eeles, 2004). The components of usability were identified by Nielsen (2012) and were tested and expressed in the following ways; regarding these terms:

- **Learnability**: The time and effort required to reach a specified level of users’ performance (ease of learning). It controls how much instruction is given to test participants or carefully recruit users with different levels of domain knowledge and experience.

- **Throughput**: The tasks accomplished by experienced users, the speed of task execution and errors made (also described as ease of use). Time or count clicks on page view, with realistic tasks.

- **Flexibility**: The extent to which the system can accommodate changes to the tasks and environments beyond those first specified. Evaluate tasks for how accurately they were completed and how often they produce errors.

- **Attitude**: The positive attitude endangered in users by the system. User satisfaction survey or qualitative interviews can gauge users’ acceptance and attitude towards the software.

### 3.2.2 Reliability

Reliability requirements may be related to frequency or severity of failure, recoverability, predictability, and accuracy, mean time to failure and software criticality. Reliability is another important issue that should be considered in the application and must have functional icons like alarms and auto detect functions. The function should be used in critical situations especially when a seizure occurs and it should be available at all times. If the app fails to perform this function, the user must receive a message notification so that he or she can have an alternative way to alert related users.

### 3.2.3 Performance

The only way systems can meet their performance target is for them to be identified clearly and unambiguously. It is a simple truth that if performance is not stated in the system requirements, then the system developers will definitely not consider performance issues. Performance requirements can be directly related to functions or they can be more general. Similarly, with performance, the system must be efficient and fast in order to achieve functionality, use resources and respond quickly. If something fails, the system should be fast and be able to recover from an error situation. Finally, the application must provide a fast response to users’ actions.

### 3.2.4 Supportability

Supportability means more or less how much money we have to spent, keeping the system operational, how easy it is to maintain and adapt, how easy it is to test or localize on a new platform and how easy it is to install the new system. Supportability includes the following:

- Testability, extensibility, adaptability, maintainability, configurability, serviceability, the ability to install software and localization. Basically, the application should have a pathway for future upgrades for the design to adapt to new operating systems.

Finally, designers have come to realize that functionality alone doesn’t matter because they have to understand that “Emotions are an integral part of decision making” (Valiselina et al 2012). Emotions transcends our level of learning, our perception of things based on the world around us as well as other cognitive functions. No doubt, every app designer’s aim is first to
target the users’ experience. But then again targeting experience alone cannot make users rely on apps. However, designers have come to realize that with the trend of things and events in the modern era, usability as well as functionality are important too. Therefore, in order for the application to survive, it has to have the possibility of adapting and move forward with the recent changes that users see on apps every day. Every app seems to change and new colors, emoticons and other new functions are added, that can affect the emotions of their users. And in this, SAFI-F-app is not exempted. However SAFI-F app also has this idea or this foreknowledge. Simplicity and originality are of great significance too.

Users all love development and progression, but too much change is not really good. After all: “Why change a recipe that has been used for over a hundred years?” (Morais, 2011). Therefore, in this research, the main objective is to try to improve the design and use criteria that needs to be followed out to influence users’ experience such as: design, color and functionality. Though there seems to be an increase of users as time goes by, the changes have been as positive as before, for example in the first three years since its inception. This means that the changes really have been positive (more users are using SAFI-F app every year). This change in trend is occurring with users who have great understanding of the functionality and objectivity of the design. This change includes mostly adults and students. By functionality, I mean how a particular design is able to follow and understand the main objectives of its users.
4  METHOD

The methods that were used for this project are described below in the following sections.

4.1 Interviews

For this project, a user interview to get a good insight about how to design the system to fit user’s needs was conducted. The interview was planned to be in person as it was not necessary to know the user but to dive deeper to understand the user’s motivations, mentality and behavior. Carolyne and Boyce, (2006) claim that individual interviews are important for understanding users’ perspectives and ideas on a particular thought they have concerning their experiences and expectations related to a specific application. In this case, it was advantageous because it provided more detailed information than collecting data through survey methods, and in that term helped to minimize errors in the design process.

It was decided to use interviews to gather information from the SAFI-F app and end users. Only one interview was conducted due to time limitation. The interview was conducted in a school for disabled people in order to get a good insight with the tutor that understands the user’s needs. The interview lasted for one hour and was held in the office environment and in person to make the tutor more open to positive experience about app design. However, due to time constraint, the interview was audio recorded to support outline the design of the SAFI-F app. A friendly and relaxed atmosphere was used to make the interview lively. The interview questions are available in the appendix of this thesis.

4.2 Contextual Interviews

According to literature, “Contextual Design”, contextual interview “is a method used to obtain information where users are first asked a set of standard questions with observation of their duty in the working environment” (Beyer and Holtzblatt, 2005). This means that at the early beginning of the design process, it is important that the designer visits the physical working environment of the users to get detailed information about their working behavior, technical skills and tools to know what they are currently doing. Carolyne and Palena, (2006) pointed out that this method is good because it provides a good atmosphere for collecting information and users feel free and more relaxed, having a conversation about their experience with other applications, as opposed to filling out a survey form.

4.3 Personas

Personas are a description of archetypal users that guide the designer to make decisions about the design and functionality of the system (Uzelac, Conaway and Palmer, 2008). Each persona represents a given set of behaviors and values. Therefore, you can identify users and essentially "bring them to life" by providing their needs (ibid). A persona helps in design and identification of a product and can also enlighten a designer to perceive users’ needs after conducting a survey.
4.4 Prototyping

I sketched and looked at some SAFI-F mock-ups showing how the design should look and operate before it goes into development. After producing the initial sketches, a persona was developed as the representation of the design to be evaluated with users. Having observed the personas, a design idea to improve the app was proposed. (Please find the results of this phase in the appendix of this thesis in the sketching section). A paper-and-pencil form was used at the early stages to communicate design ideas (visual brainstorming, Verplank, 2009) and to explore alternative designs. Having proposed ideas, the prototypes were categorized according to how they should function based on design, usability and efficiency. The good thing about doing it this way is that it gives valuable insight into how to improve the SAFI-F app design. A prototype is the process of building a model of a system like the SAFI-F app which will help designers to be able to create an information system that is intuitive and easy to end users (Fidel, 2010). That means it actually works or if it is not an idea or a drawing, it should have a general life time. At one end of a spectrum prototype, it may be discarded immediately after use, and at the other end, it will eventually evolve into a final system. I used a pencil and paper to sketch a prototype of my design ideas. Please find the results of this phase in the design section of this thesis.

4.5 Testing

After developing the initial prototype, it was necessary to do a usability test to get to know how the design functions. According to Rubin and Chisnell, (2008) usability lab testing is a method that takes place in a lab divided into two parts by a two-way mirror where participants of the study are in one part of the lab and observers in the second part. During the lab session, the respondent’s desktop and facial expressions are recorded. This method of testing is important because it is used to discover functional features of the product. Usually, it is followed by an in-depth interview which takes place after completion of each task (ibid). As usability testing consumes a lot of time and because of the fact that my own time is limited, I created a testing schedule for the app owners to test the design at a later date.

4.6 Interesting findings from Interview

After collecting data from the interview and after reflecting on my audio records, I discovered some important things that the tutor said. Pictorial communication is mostly what was used by some of the children and at times it was a little bit hard or too difficult to use. The users have difficulties with pictorial communication because they are not able to express their thoughts and feelings and are not able to understand what others say.
5 THE DESIGN PROCESS

5.1 Design Decision

The modern world is difficult to appease; new apps tend to be developed every day with new designs as well as new ideas. It seems when a new app is designed, it tries to bring into focus or target those areas they find their predecessors failed to take into consideration, neglected or didn’t do enough about. So how does an old design survive in order to compete with the new ones? The designer therefore has to be ready to face challenges by making design decisions or make the design of the interface flexible so that their users can experience the same awe or the same emotions they had when they first saw the design, even as time passes by. For a design to succeed it has to follow the simple role of functionality and usability. In order for it to be usable, it has to be “easy to learn, easy to use and easy to remember” (Walter, 2012). In other words, it has to be polyvalent, that is the design interface should have many varied functions that are easy for the user to comprehend. If possible it has to integrate with different design interfaces or applications that can best bring out the emotions of its users or make them stay loyal to the particular app. The designers seem to have this ability to make it flexible so that it can adapt to the demands of users based on time changes as well as the trend of its users change of taste. The users can bring out their experiences using different designs that are integrated with the SAFI-F app.

So far, after having an overview about what Parkinson’s disease and Epilepsy syndrome are and the various characteristics or hindrances when it comes to targeting day to day activities like manual handling amongst others, I now have to look at what is important when designing an application for people having these disorders. (Nilsson, 2008) gives a general guideline on what one has to consider when designing a mobile application. Some of these guidelines are going to be based on what a designer needs to do when designing a mobile application for people with Parkinson’s disease as well as Epilepsy.

The first thing to consider is the type of user interface. Here Nilsson (ibid), provides three choices that a developer needs to use when designing a mobile application, be it on a smart phone or a PDA (Nilsson, 2008), namely:

- Web-based user interface (WUI).
- Graphical user interface.
- Terminal user interface.

All these interfaces have their advantages and disadvantages. For example, a web-based interface, though it has the advantage of being modest and easy to use, have the disadvantage that it always requires the device to be online. For a Parkinson patient, this kind of application will not be an optimal application. They will need a flexible application, that is an application that both works online and offline. If they have an emergency to use the application, for example call the doctor or for help or don’t have the online connection, they can at least even receive some information, at least the most important one. The Oxford Dictionary developed by the Livio Group is the best example (https://livio.io/, 2017).

A person can be able to look for words, their meanings, synonyms, antonyms and even versions of the word in other languages as a little historical background about the word or the app. And yet, there is a further link to connect it online if one requires more details concerning the word online (in this case, the words are linked to Wikipedia). With the
Epileptic syndrome the application will help mostly after the applicant calls for help any time they encounter seizures. Larner and Andrew (2010) observed that even though the syndrome can last from one to two days, there are times that it lasts just for a couple of minutes or even seconds.

In essence, the best connection server that both patients will need will be a stand-alone connection or server-based solution so that they can work or sort out things even offline in case of an emergency, perhaps call a taxi or call for help.

The developer has to make it easy for patients to easily retrieve information both offline and online. However, Nilsson (2008) highlighted that this will be difficult to achieve.

When it comes to texting, it is better to use an auto complete mechanism. This is a mechanism that tries to guess what the user is about to write and suggests this by filling-in the suggested text ahead of the writing user (most mobile phones and tablets have this application now). However, the user must actively decide to choose the suggested texts or not, in order to avoid the application writing suggestions automatically, which may confuse or even insult the receiver. The application should be adaptive, which means the application will be able to store information based on words often used by the user. This can help people with Parkinson’s disease and epileptic syndrome to easily type the words when texting in case they want to send an urgent message or text. It will cause them less stress when texting since they may not be able to text as fast as a normal person can.

Another consideration the designer has to take when designing the application for both disabilities is that the application should have a multiple model interaction. For Parkinson patients, the best idea will be for the application or interface to have a voice control mechanism so that in case of an emergency or if the patient is having difficulties texting, typing, or finding something they can just dictate what they want and the application will do the rest for them. That is, the application can act both as a search engine and as a typing aid. The two best examples will be the Cortana in Microsoft Windows and Siri in Apples. This is also true with Epileptic patients given that after the syndrome, the after effects may include abnormal behaviour and even difficulty to speak (Larner, 2010).

Finally, the log on/log off mechanism has to be automatic or least have simple backup for Parkinson’s patients as well as Epileptic patients. The best solution is to have a saver-based mechanism so that they can easily login anytime they want to, without necessary input of their emails or passwords all the time. Almost all modern applications have this sort of backup login/off mechanism.

5.2 Mockup

After collecting data from the interviews, I proceeded to the description of the design because it was time to build something that would be more appropriate to show users that can act as a more detail description for future work. In the early stages of my design, I tried to create the application to be as simple as a series of paper sketches showing the interface with steps and users tasks. Furthermore, the design was prototyped using a system called Invision apps.com. It was also possible

to build the prototype using google docs which could be the foundation of the final product. Figure 1 shows the first three screens of the prototype as illustrated below.
5.3 Discussion

I developed many concept ideas to improve the design that I discovered with SAFI-F application. Because of the time constraint, just a few of them were implemented. I am grateful about the results that were generated because one was the improved design guide lines and the other is what was implemented. I believe a good approach to design for different users’ needs is to first compile ideas from different research and then do a complete iteration and incorporate other designs, in order to have a good user experience.

5.3.1 Recommendations

My recommendation is to improve the design and make the interface more user friendly to have a good user experience for all users and stakeholders. The recommendations are outlined and explained in the following way:

*Design the Interface for Everyone:* from the data collected from the interview I perceived that it was important to design the interface for the users affected with Parkinson and Epilepsy as users often have some difficulties of using most system software because of poor catastrophic design. Users face problems, for example being unable to click a button in order to return to the menu when they get lost in the application. It is important to create a responsive design for the teachers to be able to see all the students and the schema. Without the support of the teachers to allow the students to use the application, they should have one button to press on the application, and it should take the user back to the first page. For parents it is important that they all see their children on the first page and for teachers it is important that they see all the children in the groups and all relevant information of the children. For some reasons that are important to design for everyone is that the interface should be responsive to fit the user’s needs and they get a push notification when they send or receive a message. Due to time constraint, not everything was discussed but the mockups will help improve the design.

*Figure 1: The first three screens of the SAFI prototype. After click on the "ok", it takes the user to the next screen "Groups"*
Also, user’s needs should influence the design like language needs and also the interface. The start page should make it easy to start the app. Signs and symbols should be in the design to help the user navigate the app. It is important that the app should function well on Android, the web and IOS, so that all users can get access to it. Moreover, teachers, children and parents should be connected all the time. The app should motivate teachers and parents to see what the children are doing school. The users are students and for the app it will be students in day care and adults who live in homes from three to sixty years. But the app is used by the school for disabled kids because they mostly used it for communication. Apps that have a lot of options will be difficult to use especially when they are being used by the students in schools because it will take a lot time to study the application. Also, they may sometimes feel bored using the application. Regarding the expectation for the app, it will be useful for all the students. Though it is impossible to design an app that can fulfill all the users’ needs, it should be updated from time to time. Lastly, the app should be easy and simple to use, having no unnecessary design, no tunes or distractions, the color should be easy to understand and the font size should be easily readable, the color design should be light and simple and the design should be user friendly.

Easy Access to the Menu Page: When a user gets confused or lost within the application, he or she should be able to click a button to go back to the menu page. The application should clash with the user’s mental model to let the user know what the menu button means. That is when the user presses the menu button he should expect order icons to pop-up on the menu screen. For the teachers, it is most important they could see all the students and the schema as visible in figure 2.

![Figure 2](image-url)

*Figure 2: The menu screen and the scheme screen display details of activities and schedules. The activities are meant to enlighten users to help them in their condition.*
Make the Interface Clear and Concise: The users should be able to understand how the interface works because if they have little knowledge about the interface design they get bored and frustrated. Also, clarity should be an important tool for the interface to ease user’s communication. It is also important that things should be clear and concise, and be careful not to add too many explanations as users will spend more time reading through them than when you can label an item with a word instead of two. This saves valuable time for the users by keeping things concise.

Make the Interface Intuitive and Responsive: It was important to make the users to be familiar with the interface like something they have experience before. With familiarity, users are able to know how the interface behaves and what to expect. The interface should be designed such that it can identify elements and integrate things like calendar, chat, files and tasks that are familiar to users. Users’ can figure out that clicking on a tab can navigate him or her to the next section and the rest of the tab can remain there for further navigation.

Make the Interface Consistent and Attractive: Consistency should be maintained throughout the interface and it should allow users to develop patterns they want to learn and realize what they do in different contexts. Perhaps, users should learn to click buttons, tabs, icons and other elements that they can easily recognized. From interview, I learned that if I can go that extra mile to develop the interface and make it attractive, the experience of using the interface will be truly satisfying.

Make the Interface Efficient and Forgiving: A user interface is a system that people (users’) interact with the computer (Tim Capes, 2011). It can be both hardware and software components. A user interface can navigate the user to places and the places are the different functions of the system application. An interface should allow users to perform functions faster with less effort. When all the functions are combined on the list, the interface will end up to be efficient. Almost, but not quite; to make an interface efficient, it is necessary to figure out what exactly the user is trying to achieve and let them to do exactly that without any remedy. Users need to identify how the application should work, the functions needed and the goals to be achieved. I think it is important to implement an interface for everyone to easily accomplish what they want rather than implementing access to many features. No human is perfect and everyone is bound to make errors. How well you can handle errors can be an important indicator of your system application quality. The interface should be designed such that users should not strain in interacting with the interface and it should be a forgiving interface to fuss things that may arise. A forgiving interface is one that can avoid users from making silly errors (Mandel, 1997). For example, if a user deletes information, he can easily retrieve it or undo the action.

5.4 Design

In this section, I discussed the design that I came up with and the design decisions that was made to create the design. What I thought was that each design should have its own screen and features that a user can navigate to see different options. The design is for everyone that is affected with Parkinson and Epilepsy mostly children and adults from three to sixty years old. Therefore, the idea of the design is that users should be satisfied with the layout. I did research about how to improve the design of the two diseases and the how the colors, text, buttons and font size should be arranged for the users. For example, some Parkinson patients want the keyboard button to be large that can facilitate easy navigation.
5.4.1 **Design Decision**

The design concept I choose was to use some design guide lines, and Shneiderman (2013) defines eight golden rules of interface design, user centered design and usability guide lines. Some examples of these guide lines illustrate a productive usable interface and frustration free user interfaces. I used some previous research on Parkinson and Epilepsy to incorporate my design for the SAFI-F application. These guidelines will help to take a holistic approach to design for the different users who use the SAFI-F application. From previous research and following all of the design guide lines, it will give me an insight to create a better user experience for users using the SAFI-F app. As this project is not about design guide lines, I will not explain these guide-lines in detail but it is necessary to follow them as research has shown that they work better to design good user interfaces (Shneiderman, 2013).

5.4.2 **Menu Screen**

My suggestion is to design the menu screen for all users and it is important to design an aesthetically pleasing screen that will lure users. The screens must be fined tuned designed and visible in figure 3.

![Figure 3](image)

Figure 3: Reading and replying messages. A green tick indicates that an activity has been carried out or completed. This keeps track of the already completed activities and still to do, it stores any activity that was skipped or uncompleted. This keeps the patient active and discipline.
5.5  Analysis

As seen in the previous discussions, Parkinson’s disease and Epilepsy seem to have some important similar characteristics, for example, both share a common trend in causes of head trauma, the blank stare and freezing movement is the same for both patients. Both conditions may also be environmentally triggered, their depression symptoms are almost similar, in that, both patients rarely report or discussed the occurrence of the seizures with their doctors. It is a little hard to know if they do it willingly or they just forget to report, in this case dementia. Their dietary needs as well as nutritional as supplements are almost the same in that they both need food rich in vitamin A and the E complex.

Though their causes as well as diagnosis maybe different, for example, Epileptic patients are more photosensitive and therefore will more easily have seizures with videos showing fast moving colors; though the patients may both feel pain, pain is more severe and more serious to Parkinson patients than Epileptic patients. Their special needs seem to be the same. Therefore, when developing an application that needs to be used by these patients, the developer has to consider the following:

- Need to track daily activities such as diet, exercise, homework, medication and socializing that distracts and may alleviate pain
- Need to include environmental factors such as weather that may affect level of pain
- Identify pain whether is part of the user disease or not and whether the user need to seek more help
- Provides information about pain and how it can be alleviated for different medical conditions
- Allows users to network with support group that can help them
- Need for the care giver to help in crisis situations
- Need to make choices and remind the user what to do and when for example take breakfast, launch, drink enough water, take medications watch movies and play games.
- Communicate with parents and teachers of the patient.

Many applications have been developed to cater for people with Epilepsy and Parkinson diseases, for example Nathan et al, (2016) recently developed an iOS app that detects seizures of patients. However, the app fails in accessibility since only apple users can use it. Though it monitors seizures, it should be noted that it gives no clue on what to do when a patient has one or how to give the patient signals when the seizure is going to take place.

So, is it easy to develop an app that takes these things into consideration? According to Bonnie (1999) before developing an app, developers have to know and also understand the needs of the users. Therefore, in order to analyze and see whether the prototype adheres to or falls short of the needs of the users, I will use visuals from the prototypes and see how the usage design and the design interface adheres to the needs of these patients.

According to the above, the app has to consider the dietary needs of the patient, their daily routines as well as try to minimize anything or situation that may alleviate the pain of the patient. I think in this case this application should try to look for means to solve these problems. It gives the patient a clue on what they need to eat, taking their health needs into
consideration but also giving them the choice and what decisions to make. This makes the application flexible and user friendly. It also brings out the various activities that the patient needs to do in order to minimize their pain. The developer has to consider other factors that may cause pain such as environmental factors, identifies if these pains are part of the patient’s disease and at the same time provide aids and guidelines or how to alleviate the pains and when to call for help when in pain. In using the app, each user has a specific goal to achieve. From the very early beginning the app has been equipped with rich features. The app design is good for the purpose of letting users understand what they need to do in order to manage their disabilities. The layout tries to display the aesthetic of the design, its appearance, color, text and font size for good adaptability of the users. Because the application is used by Epileptic and Parkinson’s patients, I suggest that the design should have one screen with same features for users to achieve their goals. The photo screen is designed such that users see each other and there is direct communication that enables parents to follow the activities of their kids at school. The first screen on the SAFI-F app design is the login page where the user requires just one touch on the ‘OK’ button as ID and password is saved to appear automatically. After the ok button, it takes the user to the next screen ‘Groups’ as it can be seen on the figure below.

![SAFI-F app design](image)

**Figure 4: Interaction mechanism screens**

A click on group immediately goes to the next screen which shows the users’ pictures. At this stage, it is easy for the user to see him or her photo. The next screen appears when the user touches the next photo, the menu screen of a particular user. On the menu screen, the user can find the calendar icon where he or she can setup dates. For example, when to take his medications, take a bath, breakfast, do physical exercise and homework. Message icon is available in case of any new messages; it is indicated by a red signal.
Figure 5: The menu screen and scheme screen display details of activities and time schedule.

Figure 3 shows the menu screen and the schema screen with details of activities and time schedule. For example, On Monday at 8-9am, Jacob has to take breakfast and from 9:05-9:15am, brush his teeth. On this screen, he can control his daily routines. Bright colors and pictures are used to better describe the activities. The color that is used for the design is good as it is meant to give a relaxed and happy feeling to the patient. Though sometimes, images gives a positive atmosphere and uplifting the mood of the patient. Parkinson patients are known to have the tritan color deficiency (Piro et al, 2014). For example, the blue and sometimes yellow colors are not seen as brightly as shown, therefore using colors like red and green is more appropriate.

Figure 6: Illustrates the various activities of the day
In the figure above, the second interface tries to minimize stress by providing different activities to do during the various seasons and weather condition of the day. Pictures are also provided so that the user can easily understand and know how to utilize the application. The pictures help users to easily remember than texts or notes given that they seem to forget an event that occurs in their lives as the diseases gets serious. The app needs to be able to remind the user when to do various daily activities as well give them the choice on how and when to make these choices, which means the app has to be flexible.

![Figure 7: Display the different activities to do during the day](image)

From both interfaces, it can be seen that there are different menus as well different activities to do during the day in order to reduce the patient’s stress and pains, but it also gives the users the chance to follow the schedule. However, a reminder is given which enable the users to know if an activity has been done before or not. This gives the users the chance to do what has not been done the next time and hence keeps the user on track.

Though the application has all the above advantages, it still has some shortcomings. (See limitations)

Aesthetic is an important part of the design. It may of course lure users to buy the app because they like the design and the way the design is made and not because they think they are good but then again they will like the design to be able to perform the goals and objectives that they trust they can perform. However, if this design is difficult to trust for the user, then it is lacking. The designers must understand that designing for emotion implies knowledge about relationships between users’ emotional reactions, needs, values and goals. (Valiselina, et al. 2012)

Designers, should have in mind that different genders, cultures and even people with different philosophical preferences can decide not to use the app just base on our design alone. Color is a common differentiator of culture and connotes different meanings. A color or visual design that may be considered appealing and aesthetic by one culture can be interpreted differently
by another user (Cyr. Dianne 2010). For example, the color white that is considered a color for purity and virtue in Western Europe and the United States, is considered the color of death and mourning in Japan. So now begs the question, if the app user in Japan is sad or mournful, what can he or she do to change that color on the background? It is that lack of flexibility that has made the amount of users of different apps to dwindle over time.

In another words, we are entering the jungle of an international or global digital age where only the strongest survives. But this is not the jungle based on functionality and usability; all the factors that influence users experience have to be taken into consideration.

### 5.6 Limitation

The limitations of the design are basically due the use of a paper prototype for the reason being that when it is designed on a graphic platform, the result will be different from the one obtained on the paper platform. The transition of the paper prototype to graphic design will be somehow difficult to obtain the real results, if both paper and graphic design will be the same when it is incorporated to fit users’ needs. Moreover, it was possible to integrate the graphic design into different platforms, which allows the prototype to be tested on iOS, android and the web and that will produce the same results in contrast to the paper prototype that will have different results.

- Though the original app looks simplistic and user friendly, it is too cumbersome to use for the targeted users in this case Parkinson and Epileptic patients. The purpose of the app is to act as a reminder for the user to monitor their daily activities in order to reduce their stress, pains and aide them when need be. But the cumbersome nature of the app can instead increase the user stress levels.

- Though the app is supposed to be user friendly, since it requests the user to enter their user name and password, and given the fact that the users of the app are prone to forgetting things and dementia, this is not a good idea.

- Besides, it also neglects the fact that the majority worry of Epileptic patients is the inability to know when the seizures take control of them. The app should have an icon to monitor and hence detects when the patient can possibly have a seizure hence can take necessary precautions.

However, it is a good application in the sense that it has taken the first step to see how the daily problems of Parkinson’s and Epileptic patients can be monitored and hence ameliorated.

### 5.7 Results

From the overall process, from Methodology, the design process to the analysis, two important points were derived. The first one is how to improve the interface design and interaction mechanism and the second point is how to keep the longevity of the design to facilitate the Epileptic and Parkinson patients in terms of app usability. The app is designed to improve socialization skills for users and has helped users to learn to read moods remember faces and express themselves with facial expression and poses. Also, it will help children and adults who benefit from visual support and those of developmental disabilities like autism and learning disabilities. Finally, users can also be able to create their own visual guides by using their photos where necessary to make sense of their daily routines and make it more pleasant to them. This will help to increase their level of independence and flexibility.
5.8 Application Design

A statistic conducted in February 2016 revealed that android is the world’s most widely used smart phone operating system with 80.7 percent market share while iOS recorded 17.7 percent market share (Rossignol, 2016). Though the number of users has been increasing over the past years, the android system has become more famous especially in the mobile market. Users tend to follow the current market trend in combination with the total amount of applications that are available on the platforms (ibid). Smart phones platforms have changed the definition of mobile phones and they have differences in the development of their application models. Android is an open source and some of the development tools are free that enables many applications to be generated. It has inspired many users to use the android system. Moreover, the platform is convenient for a developer which makes them spend less time to realize their ideas and go to further development. Android and iOS has differences in their application program interface for the user interface and application life cycle.

It is for the reason why the android and iOS design was chosen for the SAFI- F app. The application design will be use by a large number of users that are not restricted to any type of smart phone that is needed for the smooth functioning of the application.

Figure 8: Mobile App Architecture Overview.
6 DISCUSSION

This research will hopefully help developers to look things into a personal level when developing or designing an interface bearing in mind that though functionality matters, designs also matter. If the app can be flexible such that it can best target users’ experience based on their mood, their gender and even a particular situation, great rewards will be achieved. To be successful therefore, one has to understand the goals, aims as well as the emotions of users. Pinpointing the weaknesses that different apps have both in design and function (to better bring out the emotions of its users’ through its interface, future designers and app developers) will be able to blend the differences and weaknesses and make an app design that can best suits everyone. Designers should also make the app to be flexible so that there should be room for further improvement and improvisation.

Finally, new apps such as diabetic and healthy living apps have seen these weaknesses and seem to correct them by making their apps not only usable and functional but flexible so that users can use different profiles to portray how they feel at one time or another. However, I have to admit that this research points out the limitations of SAFI-F app vis-a-vis other design interfaces with similar objectives. SAFI-F app seems to have more users every day. Besides, the research is qualitative which means it doesn’t provide enough data to show these changes. But what is important to note about this research is that little has been done in this field of research before. The research is to improve the design of the app based on users’ experience and to customize it to fit users’ needs with different design interfaces based on usability and functionality. So no matter the limitations, I hope this research will help as a corner stone for future researchers.
7 CONCLUSION

The purpose of this project has been to improve the design of the SAFI-F app. For example, Norman believes that when designing an app, to get the appeal of users’ aestheticism must be considered (Norman, 2002). Functionality is good but what is the use of functionality without the beauty of the work? In a world were there seems to be more than one application with similar functions, most users have tend to consider the aesthetic function of the design first before anything else. For example take two different communication apps; they both perform similar functions namely chatting with friends, sharing files such as pictures, videos and music. If they seem to perform similar functions, why border to have both of them when we only need one?. So therefore we need an app that is able to satisfy its users both aesthetically and functionally.

If I take rationality to be one of the users' best traits everything being equal, I will say I will have to take the one that suits action best at the time. But it’s the nature of user to be rational. So most users will choose the one they think it has the best aesthetic value but still performs its functions (Norman, 2002).

Also, it took decades to get comfortable using mobile apps as users’ do. Nobody ever knew that there would be this drastically improvement. Mobile applications have become an integrated part of us because all users love the awe-inspiring world of the app design. Users stored even the most important details in them such as their bank account details, their memoirs their meeting memos.

The change has not only been on the design and layout but the functionality and usability has also increased the class of users using it these days. Before, mobile applications were for the elites, now it is for everybody. Maybe we forget how important it is because it is so common these days giving that at least eight in ten users in the world now have a communication app installed on their mobile devices. But the fact remain that it has helped to improve the quality of life of Parkinson and Epileptic patients and has changed their perceptions of the world in many ways and make life much easier. It makes one to wonder how people who lived before the mobile app age even survived. One seems not to miss friends and families as one travels to distant lands knowing that it will be very easy to communicate with them when one reaches the required destination. To me, this is the greatest achievement of the application design network.

Lastly, the accomplishment of this thesis has been to improve the design of a good user interface for users of different age groups who used the SAFI-F app with focus on Parkinson and Epileptic patients. It was difficult than expected despite the fact that it was focused on two different diseases due to the large field of study. My objective was to do a usability test and improve the design but it turned out that functionality and usefulness consumed a lot of time. The users and groups have different diseases and this is because the design needs to be improved to have a good user experience. Implementing the design on iOS, Android and the web was challenging and interesting because it gave me an insight about the framework of the design. It was possible to do design choices on the different platforms and then iterate back and forth made the design interesting. Also, it was interesting to cooperate with a team of designers although I could not benefit much from the project at the beginning because they had already started with the design process.
My recommendation is that it is important to understand different diseases and to have experiences with it before you start designing. I also believe that it is important to apply different research methods for the different diseases, in order to know the users’ needs. This more flexible approach will help you design a good user interface for special users such as those with Epilepsy and Parkinson’s disease that will be in line with their mental model to have a good user experience.
8 FUTURE WORK

There is still much work that has to be done with the app design for Epilepsy and Parkinson’s disease. With many design features that has to be approved by stakeholders, I think there have been a lot of upgrades in app designs and enthusiasm for various users. Subtle as these upgrades may be, it is a call for concern that it should not be minimized as time goes by. I hope that if these upgrades are shown and reasons for them are portrayed, future designers will learn to think about the aims and goals of their users first before they decide to develop or design an app that is universally acclaim-able. I also think that for future developers or designers of the SAFI –F app especially for Epileptic and Parkinson patients, they must design the app so that it must be as flexible to meet the demand of future users. Though it was hard to see any better updates in the app design, I believe that there is still much better room for improvement and that in ten or twenty years to come we are going to see more advancement of communication apps more than anywhere in the field of scientific and technological research combined. If this improvement is put into use, adding software that can alert users when he or she is in trouble or when he or she needs to take his medications like the Parkinson patient or when the user is going to have a seizure like in Epileptic patients, it would be more useful than just to have some updates about videos or photo-shopping or games.
9 REFERENCES


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Interview email
Hello,

My name is Dinga Eric Gwanyebit. I am a student at Uppsala University and currently doing a research project for customizing design requirements as a method for managing disabilities in patients with Parkinson and Epilepsy. I wish to inquire if the design will specifically meet the needs of the end users by conducting a survey. I wish to ask users some questions to know their special needs for using the smart phone app comfortably. Your feedbacks will give me an insight of how to do further research and help in making the design to have utility and usability. Moreover, your identity to this survey will be kept confidential and anonymous.

The survey will be an interview with end users and will last for one hour. Questions will be asked to end users regarding their experiences with different app designs designed to facilitate people with Epilepsy and Parkinson and their opinions about how to customize an app that should be easy to learn, and pleasant to use. I would like to videotape and record the interview for the security of the hard copy, but however, if you object to this method, then it is perfectly fine for me. A meeting with the tutor has been booked but if you are not interested in participating or if the time isn’t ok for you, feel free to decline or choose another time that suits you. After the survey, all the interviewed participants’ materials will be discarded. Your feedbacks will be highly appreciated.

Regards
Dinga Eric

Interview Guide

- Background (age, gender, origins, education)
- Experience with apps (specific applications or software, length of time, depth of knowledge)
- Job responsibilities (managerial roles, motivation, influence)
- Reasons for not using the interface (inadequate services, too complex, too slow)
- Familiarity with features (printing, shortcuts, tutorials)
- Feelings after using the interface (confused or clear, frustrated or in control, bored or excited)

- Introduction: Name
- Record: As I have already stated, the recording for the survey is personally for me and will be deleted.
- Introduction of Survey: I am doing a research to improve the design of smart phone app in patients with Parkinson and Epilepsy and I wish to ask users some questions about how the app should be design and other general questions of different Parkinson and Epileptic apps.
Regular use of other apps

Interview Questions: The goal of this interview is to know the needs of users and get a good insight of how the SAFI app can be design and then implement it on real life app to have a good user experience.

Stakeholders: SAFI designers and support end users.

What is your gender?

Male:
Female:

Date of birth:

Origin:

What is the level of education you have achieved?

Elementary School
Secondary School
University (Bachelor/Master’s degree)

General Questions

➢ What makes a good user experience?

➢ What do you think is important for the users who will use the SAFI app?
➢ Who are the users and which age group?
➢ Have you experience system messages or error messages easy to use in other apps?
➢ Do you feel competent with the knowledge about the system messages or error messages in other apps?
➢ When you noticed an error message in other apps, do you find it helpful in identifying the problem?
➢ Do you think there are too many options and special cases in different apps?
➢ Do you have problems in remembering options and have to consult the manual frequently?
➢ When problem arises, do you ask for assistance from someone who knows the system?
➢ What are your expectations for the SAFI?
➢ What problems do you face when you use other apps?
➢ Do you think your needs will influence the design?
➢ Do you need any specific mobile requirement?
➢ Are other applications that you use user-friendly (responsive design)?
➢ How do you want the style of the application should look?
➢ Do you need a printer friendly option?
➢ Do you have any idea that you need to match with the design?
➢ What kind of information should always be visible?
➢ Do you have any other information or need specific information that has not been addressed?
Personas

According to the user centered design method, in order to build a good design, it was important to focus on end users. To facilitate the design process, two personas were created.

Jeff Anderson

Age: 18

Occupation: Student

Frequency of Use: Often

Jeff is an epileptic patient in a gymnasium who likes to often use the SAFI-F app to manage his disability. He is very extrovert and wants to spend most of his time in school with friends. He likes to learn new things with the app and when he is at home, he wants to communicate with his friends and teachers about assignments and school activities for the next day. When he perceives that he will have seizure, he then presses the seizure information icon on the app that will determine the length of time the seizure can last. He needs a system that is easy to use.

Needs:

- To see all seizures information like date, length, type, triggers and notes.
- Call the ambulance or emergency contact
- Call contact person
- Warning signs
- Consciousness.

Anna Karlsson
Age: 10

Occupation: Student

Frequency of Use: Regular

Anna is a Parkinson patient in an elementary school. She is a regular user of the SAFI-F app and always wants to know what is happening to her in school and at home. She likes to interact with the app and always want to communicate with her parents and teachers when she is at home or at school. She is a class prefect and the app helps her in her special duties. She enjoys interaction with the app.

Needs:

- Smart system and easy to use
- Able to track activities
- Medications
- Reminders
- Book appointments
- Calendar options
Iterative Prototyping

The app design is for Parkinson and Epileptic patients. It helps users to organise their daily activities and provide functionalities like reminders for taking medicine, register mood and call contact persons.

An iterative process of prototyping was followed. Feedback was incorporated after each iteration. For example, users can call contact persons to tell them their location in emergency situations.
Like information that emergency always ask for, users can easily say the information without necessarily sending a message. Users location, emergency contact, and medication can be accessed and shared within the keyboard.

When I started this project, the scope was quite broad. The objective was to improve the design of the previously designed SAPI-App. This project has given me an insight to brainstorm ideas and learn the value of design tools.