USER INTERACTION EXPERIENCES ON

THE TOUCHSCREEN MOBILE DEVICE

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ABSTRACT

The touchscreen mobile phone has totally shifted the interaction experiences of the users, as the touchscreen tremendously popularized, this thesis was focused to figure out what are the general user experiences existed and what are the factors that enhanced or affected those experiences, since the information could provide valuable suggestion on the further development and the developer to create more user friendly touchscreen applications.

The general approach of the research is inductive research, in which the research gave theoretical finding base on the different raw data from the user. In-depth interview was held in order to gather the needed user feeling, while the final conclusion was summarized and organized by using coding techniques.

Key words: user interaction experiences, touchscreen

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1   INTRODUCTION

1.1   Background

The topic of user experience has been increasingly popular and widespread lately. Unlike decades ago, when people place most of their attentions on the quality and functionality, or brand of a product, at the present time, the user interaction experience and usability seems to be the vital element when people are considering and selecting a product. As life is getting easier and more plentiful, people are demanding more. They are no longer satisfied with powerful features and solid quality, the more intuitive way to use the function and more decent user impression is what they need and prefer. Furthermore, from the business point of view, enhancing the user interaction experiences of the product could bring massive success to the company, taking for example the Microsoft Windows product, a milestone creation that totally overturned the ordinary command line based user experiences on the computer, by introducing intelligent windows oriented mouse pointing user interaction. It was such an extraordinary improvement that earned great admiration and praise from the customer at that time, and gave the company significant reputation and enormous prosperity.

Along with the trend of the user experience revolution, the form of the mobile devices and mobile interaction experience has also changed almost beyond the prediction over these years. On 9th January 2007, when Apple officially launched the first generation of iPhone, the world of mobile user interaction design changed (Morris, 2011). Unlike the previous smart phone carried with the full QWERTY keyboard plus the stylus pointer, the iPhone introduced to the world an extraordinary portable touchscreen, which enables the user to simply use their finger to touch and navigate on the screen. Just one year later, Google announced the Android phone, which in many ways was the direct competitor to iPhone (Speckmann, 2008). Similar to the iPhone, the Android phone also configured with an extensive touchscreen and brand new user interaction design, but with a different operating system compared to the iPhone. In recent years, these two companies have become the greatest smart phone manufacturers and bring the

revolution of the user experience of the mobile device to the public over and over again.

The reason why iPhone and Android have received such enormous success was that the big touchscreen entirely altered the interaction experience with mobile devices and the mobile applications (Waloszek, 2008). Formerly, the main interaction approach between the device and the user was typically navigation based, meaning that the user needed to drive through the keyboard, the mouse or the other input device in order to handle the screen controls, instead of the ordinary approach, the new touchscreen smart phones offer the users with a pointing-based user experience, in which enable the users to directly manipulate the on-screen objects by their finger. (Morris, 2011) This innovation has brought an exclusively intuitive way to the mobile device users, therefore, people were willing to experience the touchscreens and accept this new technology rapidly. Likewise, the statistic was also approved the phenomenon of exceedingly acceptance to the touchscreen among the mobile device users, according to the figures collected by COMSORE (2009), the number of the touchscreen mobile users increased 59% from year 2008 to year 2009, the exponential adoption rate indicated that the touchscreen interaction required little or no learning curve for the users. COMSORE (2009) believed that the major user adoption of the touchscreen would come within time, and the touchscreen mobile device would certainly become the future of the mobile world. As Takahashi (2011) stated, the overall profit that the touchscreen could bring would increase to $13.4 billion by the end of 2011, and for the year 2017, the number would reach $23.9 billion.

Besides the skyrocket statistic and positive user feedback, the touchscreen also brought a large influence to the mobile application developers. From the development point of view, the developers needed to reform the mobile application from both the logical side and the user-interface side in order to adapt the new touch-based user experience, while at the same time, the developers were also required to enhance the usability of the mobile applications by fully express the new feature and the new possibility that touchscreen could provide, for example, the multi-touch, gesture control, finger pointing and etc.

1.2   Statement of the problem

Touchscreen was highly adopted on the mobile phones these years. However, certain people still claimed themselves to be the protester to the touchscreen adoption. Segan (2009) illustrated the reasons of why some people could not adapted to the new touchscreen user interface, as they criticized the low feedback of the tap-based onscreen objects, and they believed that the new user interface cause them with additional learning process therefore reduce the productivity of the mobile phone. Additionally, they complained that the virtual software keyboard require much more time, skills and patients to use when compared to the ordinary hard keyboard, furthermore, the soft keyboard generally occupies a large portion of the screen space hence block some important information away from the users (Segan, 2009).

Even some touchscreen supporter also considered that the touchscreen user experience could be improved further. They indicated that the touchscreen was an extraordinary innovation, and the modernization from normal screen display to the touchscreen is irresistible. However, the user interface of the touchscreen at this moment was the main problem that impeded the user feeling and the interaction experience. Since the user interface was the main intermediary between the user and the touchscreen, (Weiss, 2002) therefore, the user interface on touchscreen device is a double-edged sword, at one hand, it could help the touchscreen fully express the powerful side to the user, alternatively, it might also confuse the user and left them with some serious impressions.

1.3   Purpose of the study

Strong evidences have shown that the touchscreen would turn into the mainstream configuration for the mobile phone in the future. Therefore, it was worth to study and research the related knowledge of the touchscreen. This thesis was focused on the user interaction experience analysis of the touchscreen mobile device, so that at one hand to find out what were the general user experiences existed among the touchscreen mobile users, on the other hand, base on the user feelings, trying to dig out the factors that might affect or enhance the user interaction experiences on the touchscreen. Furthermore, the research would provide some suggestion on

how to improve the touchscreen user interface according to the corresponding factors.

1.4   Structure of the thesis

The thesis was started by introducing some background knowledge of the user experiences and the touchscreen mobile interaction, it is aimed to indicating that, as the demands on the touch-based mobile phones and applications increased, the importance of the user **interaction experiences design and development had become more and more significant**. Hence, the study on finding what were the general user experiences and the affecting factors behind the user experiences was fairly essential, since the outcome could provide valuable suggestion for the developer to create more user friendly touchscreen mobile application.

Further, the thesis went through several literature studies, searched for information about the general user feeling towards the touchscreen and possible factors that might enhance or affect the user experiences. With the basic literatures data in hand, a interview based data collection was conducted, aimed to collect user story and user feedback from the interviewees, who were sampled and selected according to their practical experiences on touchscreen mobile phone. Then, the raw interview data were categorized and analyzed with data coding techniques. Finally, base on the analysis result, the research produced the theoretical conclusions.

2 RESEARCH METHODOLOGY

"A systematized effort to gain new knowledge" is the definition that Redman and Mory (1934) gave to research, the main purpose of the research is to unveil the answers to the question through a serial of scientific procedures, (Goddard & Melville, 2004) those procedures could be referred as, firstly state the research problem, and then according to the problem withdrawn the research question, after that, base on the research question choose the suitable research philosophy, following by research design and the implementation, finally, the research went to data analysis and obtain the conclusion corresponding to the research question.

2.1 Research problem

Base on the truth that touchscreen adoption rate was increasing tremendously, as well as the fact that the new evolutional user interaction design received a fervent controversy over the mobile phone users, this research was conducted and focused on answering the main research questions:

What are the general user experiences towards to touchscreen-based mobile devices, and what are the factors that affect or enhance the user experiences?

2.2 Research approach

Inductive approach was the key research approach that guided the thesis proceeds. The approach was mainly utilized with the interview research method, while the conclusion of the research was abstracted and accomplished base on the collected data. Generally, the research approach involved with gather user experiences related data from the in-depth interview, then inductively coded and analyzed the raw data to extract the general user experiences on touchscreen, as well as formed up the theoretical outcome concerning the factors that affect or enhance the user feeling.

2.3   Research method

Qualitative research method as one of the main research methods was primarily about exploring issues, understanding phenomena, and answering questions, it is an approach to knowing the subject via investigating the perspectives, opinion and behaviour of the people in the certain situation and context (Kaplan & Maxwell, 1994). Compare to the quantitative research method mostly dealing with numbers and figure, the qualitative way is more concentrate on the words and attitudes. Therefore, throughout the research, it was more wisely to use the qualitative research method to discover the right answer to the question, since the focus of the research was concentrate on the user experiences on the touch-based mobile phone. Mostly, the data collected during the research were sentence-based user story or user affection, to those linguistic data, the most efficient way of absorbing knowledge is to analyse them with comprehending and summarize, rather than involving calculation and quantification. Thus, the qualitative research method was the suitable research technique for the research, and it did contribute to the stage of data collection and data analysis.

The In-depth interview was the main data collection method that applied during the research. Kaplan and Maxwell (1994) indicated that, interview is the primary data gathering method for the qualitative research. It is particularly useful for getting the user story and follow-up to the certain user respondents to the interview question (McNamara, 1999). The research interview was held in a form of informal personal conversation rather than structured questionnaires, with the open-ended discussion and the loose determined question, the interviewee was steered in the direction of sharing user story and feedback base on their user experiences, hence, the research could obtain enough information and collected more data for the analysis of the research. With the purpose of increasing the data representative and reliability, the interviewees were chosen by the criteria that, each of them had at least one-year touchscreen mobile device use experiences.

This research was conducted in both descriptive and explanative way. In terms of the descriptive approach, the research was concentrated on finding the abstract user experiences on touchscreen devices, it was a procedure that analyze and organized the raw data collected from the interview, and achieve the general level

of the user experiences by described and illustrated the user story based data, as well as applied techniques of data categorize and data summarize. As for the process of finding the cause and the factors that affect the user feeling towards the touchscreen devices, which was defined as an explanative approach, is mainly analyzed the user story and user feeling, together with literature studies, to concluded and generalized the causing problem of the disappointed user experiences, or the merit aspect from the approved user experiences.

2.4   Conceptual framework

The research was concentrate on the conception concerning the use of touchscreen mobile devices, it signifies the activities of telephoning, Internet surfing, gaming and application exploring by using the iPhone, and the Android phone, iPad or other touch-based terminal devices.

As the main concept run through the whole research, the user experiences refers to the user reaction towards to the activities of using touchscreen mobile devices, it is mainly the practice-oriented experiences which concentrates on the usage of touchscreen and comparison to the ordinary mobile devices, rather than the personal attitude or conventional customs. It is the mainstream concept that provided the basic guidance on the research question establishes, data collection, data analysis, further developmental suggestions and conclusions. The user experiences was usually stands for the general linguistically user story and feedback, the goal of the research was to conceptualized the various pieces of user experiences into more abstracted higher level conception, and offers help to analyze the cause and factors which behind those user experiences.

The third concept was the factors that affected or enhanced the user interaction experiences on touchscreen mobile devices. Each experiences has an explanation behinds them, despite the approved ones or the disappointed ones, with the help from the literature and raw data from the interviewee, the factors was analyzed and found by categorized and summarized the problem that usually aroused when the user use the touchscreen, then understanding and resolving the reaction or feedback from the interviewee. It occupied the main analysis part of the research, and delivered strong evidence for the current user reaction about the touchscreen

mobile phone, correspondingly, the factors also proposed some valuable further suggestion for the touchscreen mobile application from the view of developmental aspect.

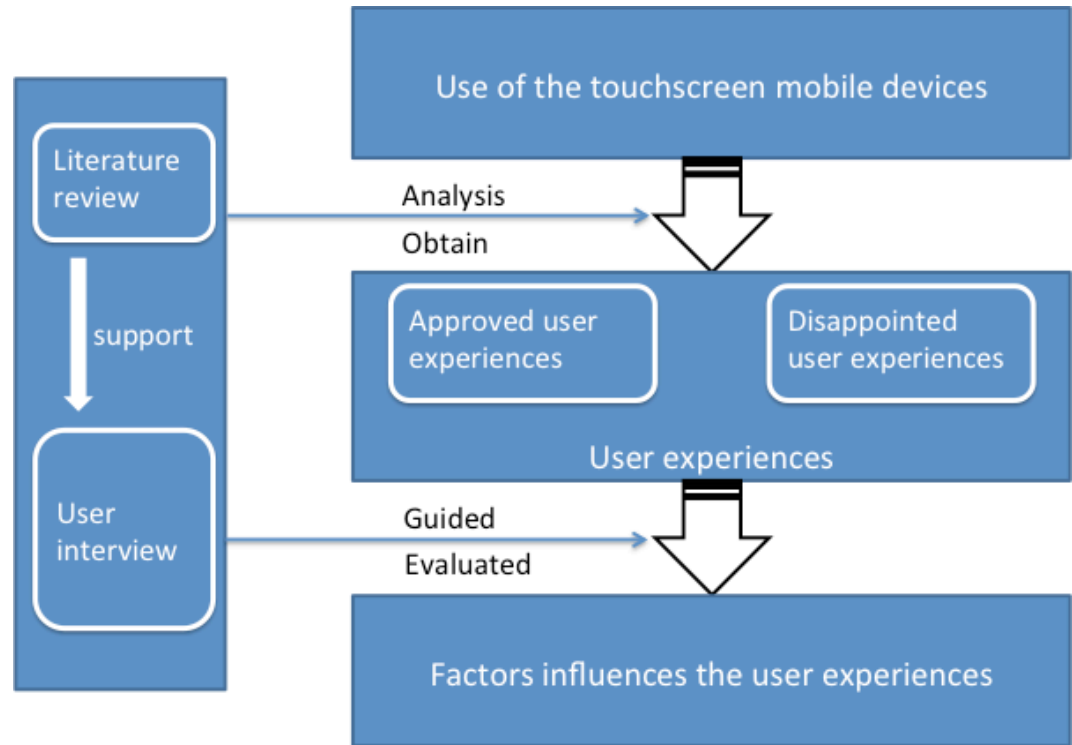The concept map is demonstrated in figure 1

Figure 1 Conceptual framework

3 STUDY ON MOBILE USERS AND TOUCHSCREEN

This chapter is emphasis on the previous study for the research. The review of the previous analysis of the title related topic forms an important section of the thesis, where its purpose is to provide the justification and provision to support the research undertaken (Bruce, 1994), in order to solve the research question concentrated on user experiences on touchscreen mobile devices, the following sections of knowledge need to be clarified.

3.1 Mobile user characteristics

The research was mostly study on the mobile users. Hence it was essential to identify the unique characteristics of the target group, in order to provide the suggestion to the point of user experiences.

Consider the typical desktop computer users, they usually sit quietly in front of the computer, dedicating most of their time and resource to focus on the onscreen application within a certain time, once steps away from the machine, they are no longer binding to the task or the network. While the mobile user were quite different in a way that they are being mobile (Ballard, 2007), meaning that they could use application or access the information despite the change of location, physical and social context, with the benefit brought by the 3G mobile network, the mobile user could receive email, browsing the internet, locating GPS information and undertake many more tasks that even could not be accomplished on a computer.

Sociable are usually considered to be the principal characteristic of the mobile phone users. The creation of the mobile phone is designed to provide the users with the ability to connect to friends and socials, from the earlier time when mobile phones have the only fundamental function of making and answering phone calls, to nowadays diversity method of communications are equipped on most of the mobile phone, like text messages, instant messages, VoIP calls, social network applications, or even video calls, the mobile phones have always made people connected (Lugano, 2008).

Following, the availability is another main characteristics of the mobile users. Users carry the mobile phone with them in most of their daytime, makes the presence of the user and the accessibility of the running mobile application to be constant and immediate, enables the user to access the upcoming information or notification instantly.

In the mobile users point of view, the expectation of high intelligence of the mobile phones is rather common, users in most of the cases do not need their phone to be extremely powerful in functions and performances, however, they require the phone could smart enough cleverness to assist and mange their daily life (Ballard, 2007). Ideally, the mobile users hope the mobile phones could achieve self-managed, for example, offer weather forecast according to the current location, recognize the time or locale information to set the corresponding alarm, notification and predefined actions, set reminder according to the user calendar and many other tasks that a mobile phone is capable to handle with.

Furthermore, the identification of the user is as well a unique characteristic of the mobile users, because the mobile phones are personal from both the device side and the user account side. Taking iPhone as an example, each registered apple id could be used on only one device, and users could access and manipulate all the system applications via that apple id, moreover, several instant message applications acknowledges the apple id as the account id of their service (Ballard, 2007).

3.2   Touchscreen specialty

Most of the current touchscreen smart phones are capable of multi-tasking, which refers to running multiple applications simultaneously. However, different from the actual multi-tasking on desktop, the touchscreen mobile phone serves one application at a time on the screen, so that the users could only concentrate on that certain application, while the other running applications are invisible (Morris, 2011). Benefit from the unique touchscreen approach of using applications, the users are tended to be more focused on the current application without the disturbance of the popup box, notification sound or other interruptions that commonly seen on the desktop computer. However, As Morris (2011) stated from

the opposite point of view, one application per window might cause lack of the information display, usually the users need to switch between applications to applications in order to obtain different information, therefore, applications requires to be designed in a way that, the action of exit or open should be done instantly and without any lagging time, so that the user could gain more valuable time on using the application rather than waiting for the application to response.

Another most exclusive feature of the touchscreen is the multi-touch function. Multi-touch technique refers to the touch-based sensing ability that the screen surface is capable of, in which could recognize the presence of two or more points of contact (3M Touch, 2010). With the competence of the multi-touch, the touchscreen enables the user to experience even more on the new user interaction design, large numbers of newness on the user experiences have emerged over the last few years, for example, the iPhone touchscreen provided by Apple Inc., which the users could pinch to zoom and view the images, or rotate the pictures using their two fingers alike the way they do in real life, as well as on the iPad, where the user could pinch the thumb and other four fingers to rapidly close the application and jump back to the home page. The Multi-touch techniques not only brings enjoyment and great user experiences to the touchscreen users, it also provides the application developer with various inspirations, especially for the gaming developer, they could enhance the application by adding more numbers of touch point support to achieve more improved gameplay experiences, for example, the multi-player game and etc. (3M Touch, 2010).

3.3   Touchscreen application UI design principles

3.3.1   Optimize for the finger

The major tools that been use for the interaction between the users and the touchscreen is the finger, hence, optimizing the user interface of the application to achieve maximum performance of the finger manipulation is the main guidance for the touchscreen user interface design (Gupta, 2010). In terms of the ordinary keyboard mobile phones, the application user interfaces are developed aiming to fit the small screen and lower screen resolution, in which the texts and buttons are

small, the page elements are organized compactible, as well as the high contract in the colour scheme to highlight the important information, therefore, users could navigate through pages using track-ball or arrow key more efficiency and effectiveness. However, as for the touchscreen, especially in mobile devices with screen size ranged from 3-4 inches, the application developer should pay more attention on the size and prominence of the clickable element. Basically, the area of the button or the other tap-required element needs to be large enough for most of the user finger size, in terms of the state of selection, which is quite different from the non-touchscreen application where the selection is commonly highlighted with background color, the touchscreen elements should give certain feedback for the user to determine the basic click state like finger down, finger up, pressed, selected, and etc.

As Gupta (2010) illustrated in his blog, the Facebook was an excellent example of the finger optimization on touchscreen, as the figure 2 indicated below, the left one is the ordinary mobile oriented Facebook web application, while the right one is the improved version for touchscreen usage. The theory of size and prominence enhancement is distinctively shown between the different two versions on how the links and menu are presented.

Facebook - Mobile   Facebook - Touch

Figure 2 Example of the finger optimization

3.3.2   Minimalist design – less is more

Minimalist is a trend in the content design that usually described as stripping out all the superfluous and unnecessary element, color, shapes and textures, only keep the basic but most important and outstanding content. Likewise, as a touchscreen mobile application that is intended to provide the user with information and productiveness, it requires even more on the application to highlight valuable information, which could receive most of the attention from the users, to the very forefront of the screen, while at the same time minimize all the other distractions away for the user (Knight, 2009). The reason is straightforward, the total screen size on the touchscreen mobile devices is limited, and therefore, any unnecessary element on the screen could correspondingly influence the present of the main information, moreover, the burden element usually have really low exposure to the mobile user, since when the mobile users using an application, they are tended to be more focus on rapidly getting things done, they will only go for the needed data directly, rather than enjoy the diversity and magnificent user interface design like the web user or computer users.

Windows Phone 7 is a decent example of well implementing minimalist design on the user interface as well as the application logic, different from the other touchscreen smart phone like iPhone and Android, which the user needs to open a certain application in order to obtain the needed data, the WP7 phone have the tile based home screen which directly display the in-app data to the user, brings huge productivity to the users since they could get information like weather or news feed instantly as they open their screen. The figure 3 and figure 4 stated how many steps the used need to perform in order to get the weather information between the Windows Phone 7 and the Android platform, which the WP7 resulted to be more minimalist and requires much less steps when comparing to the Android.

Windows Phone 7   Android
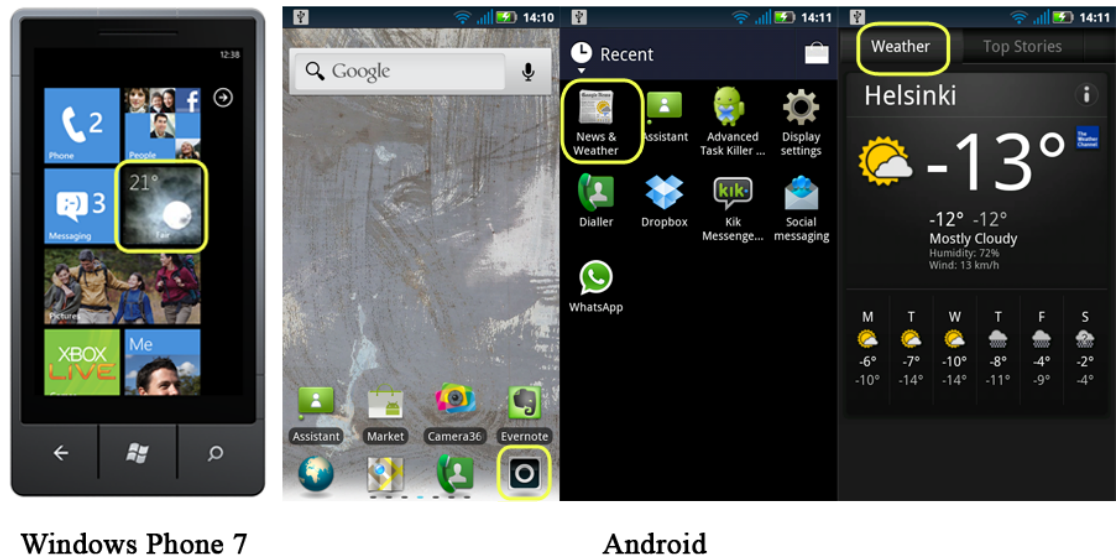
Figure 3 Example of minimalist

3.3.3 Let thumbs reach them

Almost all the mobile users grip the mobile phone using one hand, especially in the case of touchscreen, users usually use their palm and four fingers to hold the device while allowing the thumb take responsibility to the tap and click tasks. Thus, in order to achieve enhanced user experiences and usability, the application should be designed and developed in which most of the clickable elements are located within the comfortably reachable area of the thumbs (Paojiao Android, 2011). Apple did an extraordinary improvement on the iPad base on the theory above, before the version 5.0 operating system on iPad, the landscape keyboard on iPad was too large, consequently, it is painful for most of the user to reach their thumb trying to click the middle key like "G", "H". However, in the newer version of the iOS, where the landscape keyboard has been improved, in which the soft-keyboard could be split into two parts, and peacefully aligned on each side, gives the possibility for the thumbs to hit the middle key without stretching, as a result, the Apple company gained massive numbers of positive feedback and user experiences from the user, and turn the iOS 5.0 to be the most user friendly portable operating system.

Figure 4 Thumb optimization application

3.3.4   Keep the UI responsive

The touchscreen interface environment enables the user to enjoy increasingly fast and easy user experiences. With the foundation of such intuitively user impression, the corresponding application's UI design and responsiveness must increase as well (Meredith, 2008). Typically, the mobile user will not spend time on the applications like the desktop computer user do, they always requires instant response since the application is usually used on the move. The merit of the advanced user interaction on touchscreen will be collapse if the user considers the application to be slow and buggy, over all, between the sluggish application on intuitive touchscreen and the excellent application on the ordinary mobile phone, the user will definitely select the later one.

4   DATA COLLECTION

In this chapter, the complete process of the data collection was introduced. Generally, the core data gathering technique that used for the research was the in-depth interview. There were in total 6 interviewees involved in, which were selected by the criteria that, all of them had experiences on the touchscreen mobile phone for at least one year. The interview was held using the form of face-to-face and telephone contact, and the length of the interview last approximately 30 minutes privately with each of them. Three demo Android applications were given to the interviewees to experiences and try out during the interview, aiming to explore more consistency and centralized result. The raw interview data was organized and documented under the permission of the interviewees.

4.1   PHASE ONE: Interview preparation

Interview preparation phase is the first phase occurs during the data collection procedures. It mainly targeted to identify the object of the interview, select the suitable person to make the discussion, and design and organize the interview. It is an essential stage that maximizes the data collection efficiency and ensures the success of the interview, yet requires extra attention and asset (BCG, 2008) (Berry, 1999). In practically, the interview preparation cost in total 3 weeks time as well as some other concerned resources.

4.1.1   Purpose of the interview

An interview is a purposeful discussion that collecting reliable data from the interviewee that is relevant to the research objectives (Kvale & Publications, 1996). Therefore, to well define the objectives of the interview was the foundation step of the research data collection. In order to gather the user experiences towards the touchscreen mobile devices, the data of the user and the user story was essential, for the user part, the interview would need to choose the suitable interviewees to ensure that the interview data was trustworthy and dependable. While for the user story aspect, the aim is to acquire as many valuable data as possible to provide efficiency to the data analysis. The interviewee would be asked to share their own feeling concerning the usage of the touchscreen, with the

guidance of steering-based questions, reasoning and direction-finding dialogues from the interviewer. Furthermore, the interviewee would be provided with three demo applications to try-out, targeting to collect the answers to the target question regarding the application's user interaction experiences, which had been pre-analysed by the interviewer. Besides, the scope of the interview could be extended according to the experiences or the willingness of the interviewees, since the deeper the interview went, the more information the research would obtain.

However, the purpose of the interview was to gain valuable, topic-concerned results, which could be used for further analysis. Any redundancy result that cost time and resources should be avoided.

4.1.2   Interviewee selection and training

The interviewees were selected using the criteria sampling technique. The selection process was designed to pick peoples who have experiences on using touchscreen mobile devices, and also ensures the diversity of the user experiences data by choosing the different age group, occupation, attitude to the touchscreen and etc. The total number of the interviewee was set to 4 because of the resources limitations of the research, however, in order to guarantee the quality of the interviewee selection, the final interviewee sample were sorted out from the initial sample which consist of 6 candidates, they were originated from the volunteers to the research, work acquaintances as well as few other topic-related peoples. Each candidate was asked to take a survey, and the last standing 4 interviewees were selected by the following criteria: confirm on the fact that touchscreen did improve the user interaction experiences; have working experiences on the mobile application development or related activity; at least used one kind of touchscreen mobile phone with the length of one year. The process could be visualized as figure three.
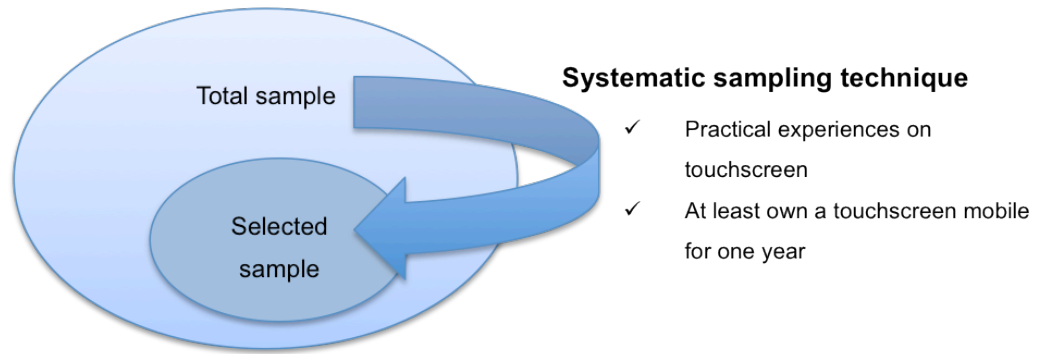
Figure 5 Interviewee sampling

Lastly, the interviewees were selected and involved with a young iPhone owner who enjoys to download and tryout new applications, a businessmen who had switched the mobile phone from the BlackBerry keyboard-based smart phone to Android last year, in addition, an Android developer who had two years development experiences on both front-end and back-end of the Android application and a college student majored in art and design who interested in user interface design. The detail profile of the interviewees was listed in Table one.

Age	Career	Experiences	Background	Attitude	Selected
21	Student	2 years	Study art/design, interested in UI design	Inspiring design	Yes
22	Coder	3 years	Android developer	Fantastic experiences	Yes
43	Manager	1 year	From BlackBerry to Android	Difficult to use	Yes
26	Student	4 years	Own the iPhone from the first version	Revolutionary design	Yes
30	Employee	1 year	Bought iPhone last year	Seems ordinary	No
22	Student	0.5 year	Having iPod touch, mainly play game	Better than before	No

Table 1 Interviewee selection

Before the actual interview roll on, the interviewees went through a training process, since the data from the interviewees controls the quality of the result, the

training step was crucial. It is a way to give the interviewees with the basic background knowledge about the topic, and familiar them with the process and the logic of the interview (Kvale & Publications, 1996). By conducting the training, a specific illustration of the entire study has been given to the interviewee, and all the interviewee understood the fact that their opinion has the direct impact on the data result, and they were confident on providing reliable data.

4.1.3   Demo application selection

For individual interviewees, the practical user experiences on touchscreen was distinct concerning using various platform, devices, and applications, therefore, despite from the fact that the data collected from them were valuable and reliable for the research, it still could not perfectly focus on finding the general factors behind the user experiences, since the experiences from the interviewees were varied from the applications and device they use. Hence, with the purpose of getting more concentrated data, the interviewees were given with three demo applications that operated on the Android platform with the single device, the selected applications involved with typical user experiences among the touchscreen mobile application, According to the study of Android App Review (2012), the two selected application stands for high-quality user interaction design while the another one often refers to low usability and poor user feedback.

"Any.do" is an Android application that signifies the simplicity and the beauty of the touchscreen application, it cumulated earned over 1 million download over the Android Market, because of the stunning UI and impressive functionality. Generally, it is a to-do reminder application that applies simple color and customized font and icons. It is a very user-friendly application, to add an event reminder with the application is straightforward and fluent. The application involves the shaking detector that gives diversity user control and user interaction, the user could simple archive all the finished to-do event by shaking the phone. Further, the application requires little learning steps, it enables the user to easily dive in and enjoy the excellent user experiences (Android TAPP, 2011). By selected this application, the research was trying to gather the opinion and feedback from the interviewee about the application, which could be further refers

to the type of application that is simple and has gorgeous user interface, with less functionality but very user friendly.

"Dolphin browser" is another sample of the decent user experiences application that exists cross platform of Android and iOS. The attracting feature of the application is mainly emphasized on the user interaction point of view. In order to overcome the shortage of the browser application on mobile devices, in which the screen size is small while the content is comparably huge, the Dolphin browser configured with a swipe controlled menu and bookmark, by hiding those second important element away from the main screen, the user could get much more spaces for the web content. Moreover, the application supports multi-touch pinch and zoom, gesture shortcut, customized skin and themes and many more. The reason to have this application as the demo application was that, it represented the group of the application that provided with powerful user interaction resources, the content is usually huge and the usage is quite complicated however not disordered, generally, the user were required with a short tutorial period, once they were familiar with the convenient interaction, they would remark it as good experiences.

"PhotoNoter" is the one that has the less positive feedback from the public when compare to the previous apps. It is an application on iOS that functions on writing note on the photo that given by users. The user interface is deprived owing to the low-resolution icon picture and mismatch of colour usage. The idea of the application is to writing words or draw a picture on the given picture, but the area for writing or drawing is too small for finger, causing the application become extremely user unfriendly, and that is the main reason to select this application to be the demo application representing the low-quality user experiences ones.

4.2 PHASE TWO: Interview procedure

The research interviews with the four interviewees were conducted during 1st January 2012 to 22nd January 2012, three of the interviews were held in Lahti, Finland, while one of the interviews was organized over phone calls, since the interviewee was located in Shanghai, China. The total length of the interview was 30 minutes for each interviewee at average.

4.2.1   Semi-structured interview question

The semi-structured interview is the most common approach of interviewing. Different from the close-end interview that leads the interviewee to share a straightforward answer, the semi-structured interview provides the interviewee with an interest-oriented topic, which could guide the interviewee to talk openly and freely, at the same time, providing more in-depth information that is needed for the research(Lindlof & Taylor, 2002). In case of the research, the semi-structured interview questions were mainly concentrated on steering the interviewee to express their feeling and user story. The results of the interview question gather from the interviewees were varying from individuals, since the answers were constructed and organized by the interviewee themselves. With the help of such diversity and originate data, it was more effective to fully understand and discover user experiences. The semi-structured interview question could be found in the table 2.

Category	*Questions*
Background study	- Describe your background which related to the topic - What makes you chose to select the touchscreen mobile phone? - How your touchscreen mobile influence your life? - Share your general opinion about touchscreen

User experiences	- Describe a delighted user experiences
	- Describe an awful user experiences
	    - What is it?
	    - How is it and why?
	- Your opinion on what should a user friendly application be
	- Your most intolerant thing on an touchscreen application
	- What are the things you think is most important for an application to become user friendly

Demo application	- How do you like or dislike the application
	- Describe how you use the application
	- Require any learning curve
	- How do you like the UI
	- Function of the application
	- Logical flow of the application
Feedback	- If you are the application developer, what is your recommendation on the user interaction design?

Table 2 semi-structured interview questions

4.2.2 Pilot-test of the interview

The awareness of the pilot-test the interview is essential to ensure the quality of the data collection procedure, it mainly refers to test and evaluate the interview in terms of the interview question, interview schedule, the form of the interview and the float of the interview by having the first interviewee participate (Cemca, 2003). As for the research, one interviewee contributed to the trial test of the interview, based on the response from the interviewee, it was confirmed that the interview was designed to be understandable and meticulous, the research questions were within the interviewee's capacity, as well as the length and the content of the interview was considered to be suitable and efficiency.

4.2.3 Interview conducted

The four interviews were productively managed, with three of them conducted in forms of face-to-face while one interview held over the telephone. The interviewees were noticed by the phone call one day before the interview about where and when to meet or call the interviewer. As the interviewees arrived or answering the phone call, the interviewees were welcomed, and a brief introduction was provided to let the interviewees familiar with the whole interview process. After that, the interviewee was sat right next to the interviewer, and discussed about the topic under the guidance of the interview question.

For the demo application section, in order to balance the criteria and condition equally to all the interviewees, all the interviews were used the Nexus S Android phone as terminal devices to run the applications, while the demo applications were pre-installed to the device before the interviews. In terms of the distant interviewee, the instruction was given that the interviewee should also use the same devices to install the application, and the demo applications were given as the .apk installation file to the interviewee one day before the phone interview.

4.3   PHASE THREE: Data transcribing

Interviews were held one day per interviewees, left abundant time for the researcher to organize and absorb the transcript data recorded from the interviews, it was vital for the research to transcribe the data completely and in time, since the quality of the data directly dominate the outcome of the data analysis.

4.3.1   Data inspection and documentation

Throughout the interviews, the conversations were recorded as voice document files under the permission of the interviewees. After the interviews, the researcher replayed the voice files and documented the complete interview phrase by phrase, in which the data were transcribed into the separate word file with the labels of the corresponding interviewee, thus, the raw interview data could be printed out and provide researcher more convenience to carefully read though them.

In addition, due to the fact that the quality and the validity of the raw interview data directly determines the value of the final outcome, hence, each sorted word files with the interview data was sent back to the corresponding interviewee again, in which they could check the content to make sure that the data are presented base on the same understanding and purpose.

4.3.2   Data present

The collected raw data is sufficient in terms of the amount, with the total number of 20 pages of interview transcript. The data were gathered from four different interviewees: Kenneth (Company manager who had switched his phone from

BlackBerry to iPhone); Niko (A student who has own the iPhone and iPod touch devices from the first generation, a huge fan of touchscreen devices); Rebecca (A student majored in design and art, have speciality on the software user interface design); Alex (A senior mobile developer concentrating on the Android platform). The four interviewees were individually representative in their own experiences field and background, thus, the collected data were diversity because of the various points of view, in addition, the potential of the information overlapping was reduced considerably. Following sections, the data gathered from the four interviewees were generally summarized and presented.

Kenneth, 31 years old businessman whose major task is to manage the whole company business process, his daily job involves a huge amount of phone calls and emails, he has more than 400 contact numbers stored in the address book, with each of them been tagged and categorized. He used to be the huge fan of BlackBerry smart phone for over 5 years, until last year, he switched to Android phone because most of the colleagues around started to use the touchscreen phones. Overall, he thinks that the Android touchscreen phone did not increased his productivity as it expected to be, since the Android phone cost him massive time and resources to learn how to use the touch-based applications. He had more terrible user experiences on touchscreen application than the delight ones, among those serious stories, the most un-tolerated experiences is typing with the onscreen soft keyboard, he indicated that the input on the Android phone is extremely hard to use when compares to the physical keyboard on the BlackBerry phones, as a result, he continuously suffered from the slow message reply time and a high rate of wrong typing, which cause numerous problems on his business. On the other hand, he stated that the gaming on the touchscreen mobile phones is indeed much more amusing than the ordinary phones, however, he did not have too much time to playing games, the main purpose of install games is to entertained his little son. Furthermore, he suggested that, for those touchscreen mobile phones that are designed for business purpose, a physical keyboard must be configured to increase usability of the typing, while for the application development point of view, the aim of the application needs to be focus on the simple and intuitive usage rather than the fancy function and the innovative user interaction design.

Niko, 26 years old student from Helsinki, is a loyal follower of touchscreen innovation. Over four years of practical using on touchscreen, he experienced every version of iPhone and iPod touch from the very first generation, and he greatly praised the revolutionary user experiences design of the touch-based application. He mentioned that the biggest achievement of the touchscreen nowadays is the improvement of pointing experiences. In his story, he had a Palm PDA with a stylus styled pointing pen before he bought the iPhone, each time he wants interact with the PDA, he needs to push really hard on the screen, since the touchscreen back then was made from the pressure sensor material. However, the nowadays touchscreen tapping and clicking experiences became extremely smooth and decent, since the touchscreen was redesigned and made from the capacitance based material, thus, it increased the comfort of the interaction, while on the other hand, shifted the old-fashion stylus pen with intuitive finger control.

Rebecca is a talented student who majored in design and art, she has special interest on the mobile user interface design and had huge enthusiastic to the research topic during the interview. In her speech, she insisted that, the most important thing for a user-friendly touchscreen application is to simplify the application logic, and enables the user to use the application base on their instinct without any learning curve. She gave the researcher some applications that she considered to be user friendly on both the user interface design and the usability aspect based on her own study, she stated that a good touchscreen application developer nowadays should lean their focus more on the user interface design rather than the functions and internal coding. As to the impression of the touchscreen mobile phone, Rebecca remarks it to be inspiring, she used both the ordinary and the touchscreen phone, and she said that the application could be really improved on the aspect of the user experiences, when compares the touch-based application to the previous ones.

Alex is a skilled mobile application developer, who has worked in an IT solution company for nearly three years, as his main strength, Alex has experiences on both Android and iOS application development. Based on his knowledge, he signified some differences on the user experiences aspect between the two mobile platform, first of all, because of the internal logic enhancement and the performance optimization on iOS, the touch experiences on iPhone is much more

smooth and fluency than the Android phone, especially the user feelings on the page scroll, drag and drop and zooming interactions. However, the Android is more flexible on the point of creating the innovative and unique user interface and user interaction design, in which appears to be vital factors for the quality of the applications. Furthermore, Alex created an open source project about the custom Android user interface widget last year, which contains various extra useful widgets that were not included in the Android API, with the foundation of such practical experiences, he suggested that, the touchscreen mobile application should be designed with custom themes and controls, in order to give users more fresh impression and improved usability.

5   DATA ANALYSIS

This chapter mainly illustrated and presented the complete data analysis process of the research. The final conclusions to the research question were analysed inductively from the raw-collected data. In order to precisely conclude the result, the interview data were prepared and went through different analysis steps, including f deeply reading and annotating the data transcript at the very beginning, then create the data category containing similar patterns or themes, following by identify the connection between and within the categories, and finally according to the patterns and connections obtained the conclusion.

5.1   Analysis preparation

5.1.1   Focus of the analysis

To clearly identify the purpose and the focus of the research is essential when analysed the data. In this research, the focuses were concentrated on two aspects, one is the general user experience towards to the touchscreen user interaction, while another is the factor that enhanced or affected the user experiences on the touchscreen applications. During the analysis process, the main data were studied by finding the possible answer to the focused topic and questions from the interview data transcript, in which ensured that, the conclusion were analysed accurately and truthfully.

5.1.2   Data reading and annotating

The success of the data analysis largely depends on the fully understanding of the data, in terms of the qualitative analysis, in which the data are mainly linguistic, researchers are required to read and re-read the text (Renner & Taylor, 2003). For this research, the total amount of the interview transcripts were over 20 pages, the researcher carefully read through all the text three times before conducting any analysis, it is indeed a time consuming task to went deeply into every word of the interview data in order to grasped most of the valuable information out. After read though all the text, the researcher shortly discussed with the interviewees again to

confirm the understanding upon the transcript text were the same, therefore, ensured the quality of the data for the further analysis.

While reading the transcript of the data, the researcher made note and annotating simultaneously, with the purpose of better understanding and quickly index for the further data searching, the abbreviation and special code are used to stand out the most attractive information.

5.2 Analysis approach

The general data analysis approach of the research was to obtain the conclusion inductively from the interview data. Hence, finding the most appropriate method to make the analysis is vital to the quality of the final result of the research. The main method been use on the data analysis of the research is the coding methodology, the process involved with patterns and themes identification, data categorization, connections recognition, and the data interpretation.

5.2.1 Identify themes and patterns

The themes and patterns referred to the certain words or sentences that appeared in the interview data, in which concerned about user ideas, concepts, phrases, or behaviours, that related to the focus of general user experiences towards to touchscreen mobile devices.

When interviewees expressed about their feeling, they were mostly offer feedback with pieces of phrases, emotions in a user story or the verbal describe of an occurrence on using the touchscreen, in order to refine the user feeling with more abstract meaning, the researcher first gathered all the answers and opinions from the interviewee for a certain interview question together, following, read through the entire text and sorted out the keyword patterns that contain information related to the user experiences, then, the found keyword or key phrases were documented and considered as the patterns. The keyword patterns were believed to indicated a common user feeling for individuals, in which could be used as the foundation references for further analysis of the general user experiences.

The Microsoft Excel was used as a analysis tool, in which helped with the documentation and presentation of the different found patterns for each interviewees, in terms of the different interview question. With the strong and meaningful keyword patterns systematized and displayed on the screen, the researcher saved a large amount of time on the data viewing and organizing, therefore increased the efficiency of the research. The table 3 shows the sample layout of the Excel file.

Questions	Interviewee (Kenneth)	Interviewee (Niko)	Interviewee (Rebecca)	Interviewee (Alex)
Reasons to select the touchscreen phones?	#Fashionable #People around had one #Work need #Want to try #Need larger screen #No hard keyboard	#Huge fan #Follow the latest technology #Play games #More screen size	#Inspiration #Like the new technology #Efficiency #Study	#Work required #Touchscreen application developer #Efficiency #Adorer
General feedback on touchscreen application	#Hard to use #Need tutorial #Low productivity	#High productivity #Intuitive #Addictive gaming	#Like beautiful application #Like simple applications	#Usually needs learning curve #Cost too much time
…	…	…	…	…

Table 3 Sample table of the found Patterns

5.2.2 Categorize the user feeling

At this phase, the researcher extracted out the most valuable information or keyword patterns from the plain interview data, the next step was to individually evaluate the different patterns. The total amount of the emerged patterns were over 60, the researcher first listed all the patterns in a blank document, then organized the patterns that shared the common characteristics into the same group, each of the groups represented a set of similar user experiences, with all the patterns were categorized into their own belonging group, the individual of the groups was summarized and analysed to formed up a more abstracted category, with the general description of that certain user experiences. As a result, the key patterns of the user experiences were narrowed down into fewer categories with more general and concrete concepts.

In general, the categories of the general user experiences from the interviewees could be classified into two major groups, one of them stated that the touchscreen user experiences were decent and delighted, while the other group illustrated their user experiences to be poor and untoward. Each of the group was consisted of several sub groups, overall speaking, the categorized general user experiences including: the mobile phones with touchscreen are fashionable; no tolerant to the slow response and crashes; good application means simple and beautiful; the touchscreen application brings productivity; the touchscreen applications are difficult to use. The sections below would illustrate the different categories individually with more specific analysis.

The mobile phones with touchscreen are fashionable

All the interviewees shared one similar characteristic, in which they were switched to the touchscreen mobile phone from the ordinary smart phone with a smaller screen and the full keyboard. The researcher believed that, the reason of why they want to use the touchscreen mobile phone was the vital factors that gives influences to their user experiences, with more specific analysis, the researcher found that, most of the interviewee thought the touchscreen is adorable. As Niko stated: " *Friends think I am awesome when I got my first iPhone … I like the way how application works on the touchscreen"* and Rebecca reported that: "

touchscreen mobile phone has the massive screen, it is gorgeous compare to my old phone… touchscreen is the fashion… inspiring design" The evidence indicated that, the touchscreen gave the user with impressions of fashionable and stylish, compare to the ordinary phone, the touchscreen user were more willing to show their phone to their friends and use it in more other way rather than just make phone calls.

In addition, the researcher noticed that people like the touchscreen experiences because of the fashion trend of the touchscreen adoption. As the interviewees that work in the business industry, Kenneth and Alex indicated that they would like to bought the touchscreen mobile phone because most their friends and colleague had one, they would like to fit in as one of them and more easy to make contact. As they stated that *"I'm the only one using BlackBerry while the others all had iPhone… maybe kind of jealousy…watching others flip their finger on the screen looks really cool"*

No tolerant for the slow response and crashes

During the interview, one of the demo applications consumed the massive amount of time to process the large image data, caused long waiting time for the interviewees, the result shown that, none of them appeared to accept the situation, Kenneth mentioned that: *"I've already got a fast response touchscreen, why the application still slow and buggy"* while Rebecca gave the alike response: *"Mobile phone is not a place that worth to spend hours on, I need to done my task on the phone instantly… even worse if I spend time and patient, but finally the application crashes."* The opinion from the interviewees were straightforward, they required the touchscreen application to be fast and instantly responded, they thought it is the nature advantages of the touchscreen, otherwise, if a touchscreen application was lag and slow, then there was no difference between the ordinary phones and the touchscreen ones.

Alex as a mobile application developer, he had more knowledge on the application interaction design, once he experiences the time lag on the demo application, he said that the application should have created a new thread beside the main UI thread to manipulate the huge image processing task, so that the

massive task is run in the background while the front-end still remain responsive. He suggested to the mobile application developers that, the most important thing to keep in mind when developing an application is to keep the application UI isolated and optimized without the effect from the internal logic conflict.

Good touchscreen application means simple and beautiful

As the touchscreen mobile users, most of them would prefer to enjoy the elegant user experiences with diversity finger controls and other interaction benefit like the multi-touch, or gesture recognition, rather than performance and resolve complexity and functional tasks on the touchscreen. Basically, the touchscreen was aiming to redesign the user interaction experiences, instead of making revolution on the capability of manipulating more difficulty tasks.

Most of the interviewees agreed that, they prefer to download simple applications or games on their touchscreen mobile phone, and among those simple applications, some interviewees like Rebecca and Niko prefer to choose the one with the beautiful user interface, "*refreshing user interface always arouse my interest ... I usually don't want to handle the huge task on touchscreen mobile phones, it consumes too much resource and reduce the performance*"

Another reason for interviewees to choose the simple application is that they usually do not have enough time to use mobile applications, Kenneth gave the evidence that: "*The main purpose of the touchscreen application for me is to play games and kill times, usually, I like simple games and small applications, the one that does not consume most of my battery*"

Applications on touchscreen is hard to use

As the majority feedback from the viewpoint of poor user experiences, some interviewees were indicated that the touchscreen change the conventional design of the mobile application, therefore, cause some difficulties on usage. As Kenneth illustrated that, he often feels "*frustrated ... lost ... unexpected*" when using the touchscreen application, since he just bought the touchscreen mobile phone years ago, and he was still in the phases of getting himself familiar with the touchscreen.

Although Niko has experiences on using touchscreen mobile phone for nearly 4 years, sometime, he still get confused by some applications, *"I don't know what I can do with the application… I just can't find what I need from the pages… need learning time"* Rebecca shared the same opinion, at the same time provided some valuable information on the user interface design aspect, in her knowledge, the application on touchscreen is so different compare to the ordinary phone, significant numbers of new feature emerged, leaving both developer and user huge amount of learning time to adapt and get used to the new interaction design.

The touchscreen brings productivity

Touchscreen is such an intuitive product, which enables the user to use the mobile phone with the human instinct, without constrains of the keyboard and the tracking navigator, the user could achieve a task simply using their finger. Niko talked about how the touchscreen increased the usability of the internet browsing, he illustrated how the touchscreen saved the browsing time and how finger interaction provide convenience on the webpage manipulation, *"using touchscreen to surf the internet is enjoyable, it is very fast and efficiency, It is even productivity than the desktop computer."* Also Alex gave ideas about: *"the obstacle between me and the webpage disappear, I could literally touch the webpage."*

Besides the Internet surfing, other tasks like word processing, calendar scheduling, and telephony were also been optimized on the touchscreen, the users could finish the task with less time and more joy user experiences.

5.2.3   Connections recognition

After knowing about the categories of the user experiences, the analysis of the connection and relationship between each category were essential and helpful for the further conclusion. Basically, the categories contain information about what benefit that the touchscreen could bring to the user experiences, including touchscreen is a fashionable product and it could increase productivity, while the other aspects of the categories implicit the demand on the touchscreen for better user experiences, including why touchscreen is hard to use and what is the basic requirement for a user friendly touchscreen application.

In general, the categories that been found earlier could be connected to each other and formed up a single solid theory, more specifically, the touchscreen application needs to be designed in a way that, it is simple and user friendly from the aspect of functional logic, while beautiful and configured with diversity of the user interaction design from the user interface point of view. As a result, the touchscreen could indeed bring productivity to all levels of the user, hence, optimized touchscreen user experiences effectively.

5.2.4   User experiences interpretation

Overall speaking, the user experiences could be summarized into two main groups, for the first group, in which the users were commonly young and usually willing to adopted the new technologies, they were normally thought the touchscreen is the most fashionable and enjoyable way to interact with the mobile phone, and believed the touchscreen largely increased their daily productivity. While for the second group, which involves more business-oriented users, they indicated that the touchscreen did not brought much delight user experiences, since the touchscreen application is more difficult to use when compared to the ordinary phone with straightforward conventional usage, the touch-based user interaction required long times of learning, therefore, reduced their working efficiency.

However, all the user claimed that, the touchscreen mobile devices was indeed a revolutionary product, they would feel confident and joyful to switch the mobile phone from the ordinary smart phone to touchscreen ones. In addition, users commonly prefer the simple and beautiful application rather than the powerful and functional applications, since the value on touchscreen is significant user interaction experiences instead of the performance on completing huge tasks.

5.2.5   Factors behind the user experiences

Finding the factors behind the different user experiences involved with deeply analysis the reason that directly affected the user feeling. According to each abstracted user experiences categories, the researcher tracked back to the original patterns and re-analysed the user story, base on the understanding, the information

about why the interviewees gave the certain feedback or story were extracted and listed, then, the researcher documented and categorized them into the table which is shown below.

User experiences	Possible factors
The touchscreen application is hard to use	- The virtual keyboard is hard to make the input - Application is too complicated and without tutorial pages - User interface design break the conventional rules (e.g. shake the phone to go to the next pages), user could not easily find what they want - The UI element is too small for finger to tap on it
Good application is simple and beautiful	- User do not have time to handle the extensive task on touchscreen - Touchscreen application is too many, only the attractive ones gain attentions - Touchscreen user required the application to response instantly, simple application has more advantages
No tolerant for the waiting time and crashes	- User don't want the application consumes too much resources, therefore reduce the performance of the touchscreen. - Touchscreen application should developed to be fast response to fit the intuitive design
Touchscreen brings productivity	- Finger touch removed the barrier between human and the mobile phone, manipulation became straightforward - Larger screen usually came with more information and content
Touchscreen means fashion	- Totally shifted user interaction design - Hot trend to own an touchscreen devices - Adorer & worshipper of the touchscreen

Table 4 factors enhance or affect the user experiences

5.3   Data analysis validation

With the purpose of ensuring the quality and the validity of the research result, the whole data analysis process involved with stakeholder examinations. Generally, the researcher invited all the interviewees as the analysis observer, in which their main task is to check the outcome from every stage of analysis, in order to ensured the conclusions were built upon the same understanding between the researcher and the interviewees, therefore, increased the validity of the final conclusion.

6   CONCLUSION

As the touchscreen mobile devices tremendously popularized, the increasingly amount of people started to use and get familiar with touchscreen mobile devices and applications. Under such a perspective trend, to figure out the general user experiences towards to the touchscreen appeared to be essential for the touchscreen application developer and designer, in which they could fully understand the user feedback and the requirement, therefore develop more user-friendly application.

Based on conducted research, the general user experiences contain both the delight and ones and the disappointing ones. For those users who gave the approval impression to the user experiences, they often think that own a touchscreen mobile phone is fashionable and outstanding from friends, mostly, they are the adorer to the touchscreen devices and have great enjoyment on using and manipulating the touch-based applications, games and all other different interactions. They highly insisted that the touchscreen brought them with increased productivity, in which the touchscreen applications were claimed to be quickly response, larger capability and more intuitively.

In terms of the users who stated that they have unsatisfactory user experiences on the touchscreen, they usually signified the fact that the touchscreen totally shifted the conventional user interaction, therefore, causing a huge amount of learning time and resources spending for them to get familiar with the brand new interaction design. In addition, they insist that the touchscreen application development is still not matured enough for them to experiences, since there are still spaces to make the improvement, such as the finger optimization for the onscreen element; software keyboard upgrade with more precisely input experiences; clearly and obvious UI controls and application logic and etc.

Each of the user experiences have its own explanation, after the research, the researcher concluded several factors that might interpreted the presentation of the different user experiences, especially for the unapproved user experiences, which could give suggestion and references for the further development and optimization.

Generally, the factors were categorized into two major groups, firstly, the limitation of the touchscreen mobile phone would affect the user experiences, more specifically, it means that the mobile user usually do not have enough time spent on the mobile phone as much as the desktop user does, therefore, users were usually required simple and attractive application rather than the powerful and functional ones. Besides, the limitation also represented on the hardness input of the software keyboard, low accuracy of the pointing experiences and many other shortage of touchscreen interaction design. Second major group concerned more about the users, as a touchscreen mobile user, they usually expected the application to be more intuitive and perceptive than the ordinary ones, since the applications were developed upon the great innovation and resources of the touchscreen, therefore, the threshold for a decent user experiences on touchscreen climbed higher than ever, in which gave the application developer more challenge and more possibility to unsatisfied the touchscreen users.

7   THEORY COMPARISON AND EVALUATION

In this section, the researcher compared and evaluated the conclusion of the research to the previous study, concerning about the general factor behinds the different user experiences towards to the touchscreen usage. By connected to the old theory, the new conclusion that analysed from the research could be more valuable and sophisticated, for the purpose of offering benefit for the further researcher and the touchscreen mobile developers.

7.1   Touchscreen brought impressive user experiences

Direct and intuitive might be the most commonly seen features of the touchscreen. As the main breakthrough compare to the ordinary screen, the touchscreen open the possibility for the users to use their finger as the pointer, which bond the relationship between the hand and the cursor in terms of the direction of the movement as well as the speed and distance value (Waloszek, 2008). The way that user manipulating the onscreen object on the touchscreen is alike to the real world communication and operation, correspondingly, the research gave the same result, in which the touchscreen mobile users are expected to have impressive user experiences on touchscreen usage, and the touchscreen makes the mobile phone looks smarter and more humanistic.

Fast interaction is another key merit that is considered as one of the main motivation that mobile users select the touchscreen. Waloszek (2008) indicated that, the improvement on the speed and efficiency is profit from the transformation of the interaction approach. Formerly, the items on the screen are arranged linearly, if the user wants to select the lowest item of the screen, he or she needs to navigate the cursor through all the items on the screen from the top, one after another until reaches the bottom, it is the ordinary process which is believed to be excessively time consuming when comparing to the tap-based touchscreen pointing. The navigation on the touchscreen is purely simple and quick, the whole approach of item selection is done by tapping the area where it is located, moreover, without the barrier of the previous relational layout, the usability of the touchscreen application has increased, since the UI element could

be allocated freely according to the desire UI layout of the application rather than considering the navigation flow.

Morris Jason (2011) proposed a concept of All-in-one concerning the touchscreen in his book, in which he illustrated that the touchscreen integrated all the necessary elements that a smart phone is consist of, makes the touchscreen mobile phone extremely compact and handy, for instances the old fashion physical keyboard on previous smart phone is substituted by the virtual onscreen keyboard, the stylus pen has trimmed out while users could use their own finger instead, as well as the screen takes charge of both display and interact functions. Consequently, the mobile phone becomes increasingly lightweight and convenient to use, which enhance the user experiences and usability, at the same time supply additional space and resources for the hardware configuration upgrading and performance improvement.

7.2   Challenges of the touchscreen

The conclusion of the research indicated that, touchscreen users sometimes thought the touchscreen application was hard to use, mainly because they were not familiar with the touchscreen manipulation. Also Morris (2011) stated that, unlike the desktop computer with mouse and keyboard, the touchscreen provides less interaction feedbacks to users from the touch-based applications, because the interaction is lack of response like mouse-hover information, click confirmation, multi-select and etc. It brings the challenges for the mobile application design, which the developers are required to certainly optimize the user interface and the application logic to overcome the drawbacks. Basically, in ordinary mouse driven applications, the user could obtain helps information when they mouse over the element, for example, the button, to figure out what is this button used for and what actions will be triggered if the user click on it. While in the world of touchscreens, when the user saw a button, he or she needs to be unquestionable about the function and the usage of it, since there is no tutorial or learning step for them to understand the button they about to click, which requires the developer to well construct the application logic, more importantly, follow the user experiences convention.

Furthermore, the touchscreen mobile phones that often regarded as the palm device are usually small in terms of the size. Comparing to other touchscreen terminal device like ATMs or desktop monitors, which the screen size is large enough for the touch-oriented application to allocate its onscreen elements in a clear and user-friendly way (Hartson & Hix, 1992), the applications on the mobile phone commonly give users with small buttons and tiny texts, owing to the constrains of the limited total screen size, simultaneously required to have enough UI element on the screen to serving the needed functionality. Presently, The typical size of the mobile phone touchscreens in the market is ranged from 3.5 to 4.1 inches, although it is a rather appropriate size in terms of the palm-fit appearance design and hardware support, for certain users, they are considered it to be small, since in most of their cases, it is hardly to tap or hit the little button area with their thick fingers, which causing many unexpected manipulate that might brings problems and awkwardness to the users.

No more physical keyboard attached is one of the excited slogan advertised by the touchscreen. It is indeed a revolutionary innovation that flips over the past impression about the mobile phones. However, from the prospect of the research result, as well as the statement from Waloszek (2008), the software keyboard on the screen is far more difficult to make the input than the old ones. First of all, the size issues, which have been illustrated previously, are causing huge inconveniences for the users to type on the virtual keyboard, as they often click on several keys that near to each other at the same time, resulted in misprint and low usability. Secondly, the virtual keyboard regularly occupied most of the screen as it pops up when the users need to write text or fill a form, sometime, the keyboard will block the important information that obstructed the users to proceed.

8   FURTHER STUDY SUGGESTION

The aim of analysing the user experiences and the factors is to provide the suggestion for the application developer to create more user-friendly application. Therefore, the further study on the optimization and evaluation of the better-designed user interaction design is necessary and useful.

Base on the found factors, further research could be conducted by improving a poor user experienced sample application to a user friendly one, from both the user interface side and the logical side. In order to evaluation the found factors was indeed essential and helps to improve the user interaction experiences, a gathering of the interviewee feeling about the application would conducted on the original application as well as the improved one, so that to compare and validate the improvement.

Proposal solution to make the improvement:

- Less learning steps for users to know the application
- Add the application tutorial page or help page at the user first entry
- Follow the conventional usage, but enable the users to have diversity controls
- Clear UI flow and application logic
- Use custom UI widget
- Avoiding internal error which causing the UI crash
- Memory management improve UI responding time

9 DISCUSSION

9.1 Limitation of the study

Because of the limitation of the time and resources, the amount of interviewees were only 4, as a result, the source of the data might be insufficient. The researcher believed that, besides the found user experiences in the research, there should be more detailed experiences waiting for the further exploration.

9.2 Reliability and validity

The reliability of the research was comparatively lack of objectiveness, since there were only four interviewees attended the research, and they could not represent the whole touchscreen mobile users. However, the whole research process and research outcome is valid, the reason is that the data is collected from a real interviewee with skilled touchscreen experiences and background.

PUBLISHED REFERENCES

Ballard, B. (2007). *Designing the Mobile User Experience.* West Sussex PO19 8SQ, England: John Wiley & Sons Ltd.

Berry, R. (1999). *Collecting data by in-depth interviewing.* leeds: University of Exeter & Hong Kong Institute of Education.

Bruce, C. (1994). *Research student's early experiences of the dissertation literature review.* London: Kogan Page.

comScore. (2009). *Touchscreen Mobile Phone Adoption Grows at Blistering Pace in U.S. During Past Year.* RESTON, VA: comScore, Inc.

Goddard, W., & Melville, S. (2004). *Research Methodology: An Introduction.* Johannesburg: Juta Academic.

Hartson, R., & Hix, D. (1992). *Advances in human-computer interaction, Volume 3.* New Jersey: Ablex Publishing Corporation.

Hashimi, S., Komatineni, S., & MacLean, D. (2010). *Pro Android 2.* New York: Apress.

James, K. (1997). *Research Design in Occupational Education.* Oklahoma: Oklahoma State University.

Kaplan, B., & Maxwell, J. (1994). *Qualitative Research Methods for Evaluating Computer Information Systems.* chicago: Sage publications.

Kvale, S., & Publications, S. (1996). *Interviews: An Introduction to Qualitative Research Interviewing.* California: Thousand Oaks.

Lindlof, T., & Taylor, C. (2002). *Qualitative Communication Research Methods (Second Edition) .* Thousand Oaks, CA: Sage Publications.

Lugano, G. (2008). *Mobile social networking in theory and practice.* New York City: First Monday.

McNamara, C. (1999). *General Guidelines for Conducting Interviews.* Minnesota: Minnesota.

Morris, J. (2011). *Android User Interface Development - Beginner's Guide.* Birmingham: Packt Publishing.

Redman, L. V., & Mory, A. V. (1934). *The Romance of Research .* Washington: Journal of Chemical Education .

Renner , M., & Taylor, E. (2003). *Analyzing Qualitative Data.* Sheboygan, WI: University of Wisconsin-Extension Cooperative Extension Madison, Wisconsin .

Speckmann, B. (2008). *The Android mobile platform.* Michigan: Eastern Michigan University.

Waloszek, G. (2008). *Interaction Design Guide for Touchscreen Applications.* Newtown Square: SAP Design.

Weiss, S. (2002). *Handheld Usability.* New York: John Wiley & SONS, LTD.

ELECTRONIC REFERENCES

3M Touch. (2010, 5 20). *What Is Multi-touch.* Retrieved 2 3, 2012 from Touch topics:
http://solutions.3m.com/wps/portal/3M/en_US/TouchTopics/Home/Terminology/WhatIsMultitouch/

Android App Review. (2012, 1 20). *Application Review.* Retrieved 1 24, 2012 from Android TAPP: http://www.androidtapp.com/

Android TAPP. (2011, 12 13). *Any.DO an Utterly Gorgeous & Productive To-Do List Manager App for #GTD.* Retrieved 1 24, 2012 from Android TAPP: http://www.androidtapp.com/any-do-to-do-list-task-list/

BCG. (2008, 08 01). *The Importance of Interview Preparation — No Matter How Confident You Feel about Your Interviewing Skills.* Retrieved 1 21, 2012 from BCG - Attorney Search: http://www.bcgsearch.com/pdf/60582.pdf

Bray, T. (2010, 11 24). *What Android Is.* Retrieved 1 9, 2012 from ongoing by Tim Bray:
http://www.tbray.org/ongoing/When/201x/2010/11/14/What-Android-Is

Cemca. (2003, 2 12). *Manual For Educational Media Researchers Know Your Audience.* Retrieved 1 24, 2012 from CEMCA:
http://www.cemca.org/books/index.html

Gupta, M. (2010, 9 4). *UI Design Tips for Touch Screen Apps.* Retrieved 2 4, 2012 from G-Cube Blog: www.gc-solutions.net/blog/?p=256

Knight, K. (2009, 12 1). *Minimalist Web Design: When Less is More.* Retrieved 2 4, 2012 from Webdesignerdepot.com:
http://www.webdesignerdepot.com/2009/12/minimalist-web-design-when-less-is-more/

Meredith, W. (2008, 5 16). *Best Practices of Touch Screen Interface Design.* Retrieved 2 5, 2012 from 360Angels:
http://voltagecreative.com/articles/best-practices-of-touch-screen-interface-design/

Paojiao Android. (2011, 8 1). *Android Market and windows phone7 marketplace.* Retrieved 2 4, 2012 from Paojiao.cn: http://anzhuo.paojiao.cn/android/allinfo/1/30318.html

Segan, S. (2009, 2 1). *Why I Hate Touch Screens.* Retrieved 1 1, 2012 from pcmag: http://www.pcmag.com/article2/0,2817,2337575,00.asp

Takahashi, D. (2011, 8 17). *Touchscreen market growing 10 times faster than other displays.* Retrieved 12 23, 2011 from VentureBeat: http://venturebeat.com/2011/08/17/touchscreen-market-growing-10-times-faster-t han-other-displays/

APPENDIX

Demo application download link:

Any.do:

https://market.android.com/details?id=com.anydo

Dolphin browser:

https://market.android.com/details?id=mobi.mgeek.TunnyBrowser

PhotoNoter

http://itunes.apple.com/us/app/photonote-lite-photo-+-note/id293009256?mt=8