AN ALTERNATIVE METHOD FOR COLLECTING AND GATHERING DATA USING SMARTBOARD APPLICATION IN THE FIELD OF INTERACTION DESIGN AND CHILDREN (IDC)

LAILI FARHANA BINTI MD IBHARIM

05-4506832 pustaka.upsi.edu.my Perpustakaan Tuanku Bainun Kampus Sultan Abdul Jalil Shah PustakaTBainun ptbupsi

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE MASTER OF EDUCATION IN MULTIMEDIA

FACULTY OF ART, COMPUTING AND CREATIVE INDUSTRY
UNIVERSITI PENDIDIKAN SULTAN IDRIS

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DECLARATION

I hereby declare that the work in this dissertation is own except for quotation and summaries which have duly acknowledged.

01.07.2011

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LAILI FARHANA BINTI MD IBHARIM
M20092001236

ACKNOWLEDGMENT

Bismillahirrahmanirrahim

First of all, I would like to say Alhamdulillah, for giving me the strength and health to finish this dissertation until it has done. Thank you to my beloved parents, Haji Md. Ibharim b. Arrafin and Hajah Khadijah bt. Yacob for their love and blessing. Not forgotten to my siblings for their supports and understanding. They have given supports and have encouraged me to complete this task. Here, I am proud to say that I love them so much.

My grateful thanks go to my great supervisor, Dr. –Ing Maizatul Hayati bt. Mohamad Yatim. The supervision and supports that she has given truly help the progression and smoothness of the project. Thanks for being not only my guidance but, be my lovely sister along this journey of phase. Your cooperation and concern are much appreciated.

My greatest appreciation also goes to my research mates especially Ms. Amily Shafila, Mrs. Nursaadah, Mrs. Nadia Akma, Mr. Azhar and Mr. Suhairunnizam for their great contributions and advices. All works during the research would be nothing without the enthusiasm and supports from them. Besides, working with them has made me to apprehend the value of working together as a team and I see it as a new experience in a working environment, which is a very fantastic moment for me. Special thanks to Dr. Ahmad Zamzuri, Dr. Norasikin, Dr. Norazah, Dr. Ramlah, Mrs. Nor Zuhaidah and Mr. Che Soh who gave their cooperation and trust. Experiences with their children throughout the research process were very exciting and it brings wonderful memory in my life.

A great deal of thanks and appreciation goes to my precious friends especially to all my course mates (MT30) and my best buddies throughout my life for all their ideas, advices, supports, care and love. I wish all of us will success and achieve our dreams. Last but not least, I would like to thank the members of FACCI, UPSI for this opportunity and for those who contributed to this dissertation.

Indeed, I will not forget the kindness I received from each and everyone. May Allah S.W.T reward all of them. The whole research time really brought us together and I really appreciate the true value of friendship and respect of each other.

Thank You

Best Regards,
LAILI FARHANA MD IBHARIM

ABSTRAK

Kajian ini bertujuan untuk mengkaji kebolehgunaan teknologi papan putih interaktif (Smartboard) sebagai alatan untuk mengutip dan mengumpul data seterusnya membina suatu kaedah baru dalam penyelidikan terutamanya di dalam bidang rekabentuk dan kanak-kanak. Kajian kebolehguaan ini menekankan kepada tiga aspek utama iaitu kanak-kanak, interaksi dan fitur-fitur Smartboard itu sendiri. Pendekatan yang digunakan lebih kepada keseronokan dan keterujaan dimana ini akan meningkatkan penglibatan kanak-kanak sebagai peserta aktif dalam penyelidikan untuk menyumbangkan data dengan lebih tepat dan bermakna. Sebuah aplikasi menggunakan perisian SMART Notebook yang bertajuk *'Introduction of Icon'* telah dibina berdasarkan model rekabentuk instruksional DDD-E. Pengguna sasaran untuk kajian ini adalah kanak-kanak sekolah rendah yang berumur 7 hingga 12 tahun di kawasan sekitar Tanjung Malim. Seramai sembilan orang kanak-kanak diuji didalam lab secara individu berkenaan aplikasi ini. Keberkesanan, kecekapan dan kepuasan hati diberi penekanan untuk melihat kebolehgunaan aplikasi dan teknologi ini. Empat jenis instrumen yang digunakan untuk kajian ini adalah 1) pemerhatian; 2) temubual; 3) soal selidik dan 4) artifak kanak-kanak (lukisan). Melalui analisis data yang menggunakan kaedah tipologi, perbincangan analisis bersama pakar dan transkripsi, pelbagai penemuan menarik terhasil terutamanya berkenaan sifat dan persekitaran kanak-kanak terhadap teknologi. Disertasi ini membentangkan hasil penyelidikan dengan kehadiran garis panduan kebolehgunaan. Ini dibuktikan oleh persamaan dan kebiasaan aplikasi pada Smartboard dengan dunia sebenar membuatkan ia berfungsi dengan baik dan proses mengumpul dan mengutip data daripada kanak-kanak menjadi lebih mudah dan tepat (kecekapan). Tambahan pula, Smartboard memenuhi keperluan penyelidik dalam menjalankan penyelidikan tetapi lukisan digital diatas Smartboard kurang memberikan maklumat berbanding lukisan diatas kertas lukisan (keberkesanan). Kanak-kanak berasa teruja dan berpuas hati menggunakan aplikasi Smartboard dengan interaksi yang lebih mudah dimana membuatkan mereka berasa seronok dan selesa (kepuasan). Sumbangan di dalam penyelidikan ini adalah 1) senarai kaedah dan instrument untuk mengutip dan mengumpul data dari kanak-kanak yang digunakan oleh penyelidik lain di dalam kajian mereka; 2) Analisi keperluan kanak-kanak; 3) senarai panduan penggunaan Smartboard untuk mengutip dan mengumpul data di kalangan kanak-kanak dan 4) senarai cadangan instrumen untuk mengutip dan mengumpul data daripada kanak-kanak menggunakan Smartboard. Secara keseluruhannya, penggunaan teknologi Smartboard telah mewujudkan suatu inovasi baru dalam kaedah untuk mengumpul dan mengutip data dengan cara yang lebih menarik dan berkesan.

ABSTRACT

This study aimed to investigate the usability of interactive whiteboard technology (Smartboard) as a tool to collect and gather data and next, to build an alternative method in doing research particularly in children and design field. The usability study will focuses on three main aspects which are children, interaction and the features of Smartboard itself. The approach used is fun and enjoyable which will increase the involvement of children as active participants in research to contribute more accurately and meaningfully data. An application using SMART Notebook software, entitled *'Introduction of Icon'* has been developed based on DDD-E instructional design model. Target user for this research was primary school children aged 7 to 12 years old in Tanjung Malim area. Nine children were individually tested in a lab on this application. Effectiveness, efficiency and satisfaction are the main aspect emphasized to measure the usability of application and this technology. Four types of instruments used for this research were: 1) observation, 2) interviews, 3) questionnaire and 4) child's artifact (drawing). Through data analysis using the typology, analysis discussion with expert and transcription evaluation, and variety of interesting findings arise especially in children nature and environments towards technology. This dissertation presents the results of the research with the presence of usability guidelines. This is justified by similarity and familiarity of Smartboard application with real world which make it well functioned and collecting and gathering data from children can be easy and accurate (efficiency). Furthermore, Smartboard meets the needs of researchers in conducting research but digital drawing on Smartboard give less information rather than paper-based drawing (effectiveness). Children feel satisfy and excited using Smartboard application with its easy interaction that makes them feel enjoyable and comfortable. The main contributions of this research are: 1) list of methods and instruments to collect and gather data from children will be used by other researchers in their research; 2) analysis of children need; 3) a list of guidelines of using Smartboard to collect and gather data for research in the field of children and 4) a list of instruments to collect and gather data from children using Smartboard will be used by other researchers in their research. The use of Smartboard technology has created a new innovation in the methods of data collecting and gathering in order to make it interesting and effective.

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ABBREVIATION

Abbreviation	Name
ADDIE Model	Analys, Design, Develop, Implement and Evaluation Model
CCI	Child – Computer Interaction
DDD-E Model	Decide, Design, Develop and Evaluation Model
IxD	Interaction Design
IDC	Interaction Design and Children
IWB	Interactive Whiteboard
GUI	Graphical User Interface
FACCI	Faculty of Art, Computing and Creative Industry
HCI	Human – Computer Interaction
SPSS	Statistical Package for the Social Science
UPSI	Universiti Pendidikan Sultan Idris
VAK Model	Learning Style Inventory (Visual, Audiotary, Kinesthatic) Model

CHAPTER 1

INTRODUCTION

1.1 Introduction

Data collection and data gathering are important methods to measure the successfulness of research study. Within these two actions, the main purpose of these methods is to collect sufficient, accurate and relevant data so that, a set of stable requirements can be produced (Preece, Rogers & Sharp, 2006). Data collection and gathering also are treating as a way to collect evidence to support the study. For example, if we want to get the opinions from students on teachers' practices, we need to collect and gather data by asking the students through interview or making an observation during the class. There are many ways to collect data such as through questionnaires, observations and experiments. These methods are being use by researchers in their study in data collecting and gathering.

Chapter 1 describes the introduction of the background studies, statement of research problems, research objectives, research questions, hypothesis, limitations of the study, definitions and terminology used, motivation of doing the research, findings and the expected results, the conceptual framework of the study, scope of the study, contribution for the research and the structure of this dissertation.

1.1.1 Research Background

The method to collect and gather data from children is not as simple as we thought. Methods used in collecting and gathering data by researcher in their studies with children are sometimes a bit messy and the results are less accurate. It is because children's minds are different from adults in many ways especially in their cognitive development, motor control, language comprehension and reading ability (Edwards & Rachel, 2007). Furthermore, the methods used must be appropriate to the environment and the acceptance of children on how the method implement towards them.

Children need fun and interesting methods to collect and gather data from them (Yatim,2009). The more accurate and relevant method that we use, the more reliable and valid data we can get. Due to that, usability is seen as the main issue when we talk about efficiency, effectiveness and satisfaction of product (Dix. et al, 2004). There have been a number of studies focusing on methods that are specially design for adult but also been used with children in terms of collecting and gathering data for usability measurement such as Think Aloud, Co-discovery, Cooperative Evaluation and Peer-Tutoring (Xu, 2007). All these methods have own benefits and

drawbacks. The most important aspects to be considered is how these methods can answer research questions and evaluate the hypothesis accurately.

The objective of this research is to evaluate the usability of Smartboard application in terms of to collect and gather data for children in their learning environment. An application is designed for primary school's students in Tanjung Malim who are aged from 7 to 12 years old on topic 'Introduction of Icon'. This application is suitable for any races and gender. Smartboard was used as a medium to interact between application and children.

This research combines the theories and techniques from the field of usability study, educational technology for teaching and learning and the field of interaction design & children (IDC). The interaction design for children (IDC) has a pivotal role in the definition of what comprises good interaction design for children. It is a discipline that also has to take account of the specific needs of children across different ages and in varying contexts (Read, 2007). The purpose of usability testing involved with children is to evaluate the methods on how easy children use the application and device to collect and gather data using Smartboard with its functions and features. Four instruments are used which are 1) observation; 2) interview; 3) questionnaire and 4) child's artifact. Smartboard is a tool that when we use it well, it will help a teacher to measure their students' achievements and make the lessons more exciting, interactive, well-paced, motivate the children and also provide students with experiences they remember (Gage, 2005). An alternative method is the main outcome from this research on collecting and gathering data which is by using Smartboard.

1.1.2 Research Problem

A method of collecting and gathering data is used by researchers in their studies especially with children is quite challenging and difficult. It is believe that the method used is not appropriate to the environment and in this case there is no acceptance of children (Xu,2007). In addition, satisfaction is an aspect that cannot be measured and formulated. This is because satisfaction is something that covers a variety of subjective interpretation, evaluation and meanings. We can see the satisfaction of adults based on the expression and speech they express such as facial expression and words. However, for children, it is quite difficult because their interpretations are easily influence by the environment and people around them (cited in Hunt, 1969) Therefore, an alternative method should be created to solve this problem.

With the rapid technological development nowadays, the Smartboard offers variety of functions and features that will help not only in terms of improving teaching and learning processes but, it can also help the process of collecting and gathering data from children become more easily. Smartboard is a new technology that can be used in Malaysian education system (Raja Maznah,2006). Just a few established schools which have taken an effort to use it in their teaching and learning sessions as its price is quite expensive. Generally, the use of Smartboard is only focused on its effectiveness as a medium for teachers to present their teaching and for students in their learning outcomes. But, there are no specific researches or findings to prove the usability of Smartboard in term of to deliver information to students and as a data collecting and gathering tool. Furthermore, we cannot measure and evaluate the

usability and the acceptance of children with Smartboard as an alternative medium to collect and gather without concrete research and findings.

1.1.3 Research Objective

The research goal is to identify the usability of Smartboard application as a tool to collect and gather data for usability testing with children. To achieve this goal, the idea is to design an application which is related with theories, principles and guidelines in multimedia project that was integrated in Smartboard. Besides, it is also designed to study about the effectiveness, efficiency and satisfaction of children interactions with this new technology and its role as a tool to collect and gather data. The main objectives are as follows:

i. To identify Smartboard's features, functions and interactions that are suitable for the children's activity to collect and gather data.

ii. To measure Smartboard's usability and user acceptance for its effectiveness, efficiency and satisfaction elements.

iii. To suggest an alternative method to collect and gather data using Smartboard.

1.1.4 Research Questions

The entire objectives were achieved with the following questions:

i. What is the best feature and function in Smartboard that can be used to collect and gather data?

ii. What types of interaction was occurred between students, teachers and Smartboard in data collection session?

iii. What is the limitation and problem when using Smartboard?

iv. How usability in terms of ease of use can be measured?

v. How can children satisfaction be express when using Smartboard?

vi. What is the best method and instrument to collect and gather data from children?

vii. Is children drawing on the Smartboard able to give information and easy to interpret?

viii. Is Smartboard suitable to be used as an instrument to collect and gather data from children?

1.1.5 Research Hypothesis

Ha1. Smartboard can be a good tool as data collecting and data gathering from children rather than conventional tools such as pen and paper, Linkert scale and interview.

Ha2. Children can express real data within what they are doing and write rather than what they say.

Ha3. The use of Smartboard to collect and gather data on children's satisfaction is easier and child-friendly other than existing method.

1.1.6 Research Limitation

There are some limitations and challenges in conducting this research:

i. There is no disclosure of the Smartboard to children which is causing them to feel awkward and afraid to try and use the application on the Smartboard for the first time.

ii. Although Smartboard is suitable for collaborative team work activities, it only allows the use of individual equipment for one time.

iii. Smartboard needs additional equipments such as cameras and microphones to suit a particular model.

1.1.7 Operational Definition

1. Data Collection and Gathering

Data Collection and gathering is an original action to obtain information from participants after the tests are conducting to them. This action is closely related to the method used. In this study, the data of children's developed activities was gathered and collected through the application on the Smartboard.

2. Usability

Usability is defined as the ability of applications and Smartboard technology is seen in helping to gather and collect data from children with a more simple, systematic and accurate. This matter emphasizes on efficiency, effectiveness and user's satisfaction for the use of Smartboard as a tool and media.

3. Interaction

Interaction is a kind of action which occurs as two or more objects have an effect upon one another. Interaction in this study involves the relationship between the child and the board. Forms of interactions that involved are the use of special device which

are pen, eraser and finger. This is consistent with the type of interactions selected for the study which are manipulation and exploration.

4. Smartboard

Smartboard is a series of interactive whiteboards developed by SMART Technologies Inc. that uses touch detection for user's input. It operates as part of a system that includes the interactive whiteboard, a computer, a projector and white board software called SMART Notebook collaborative learning software. For this research, Smartboard is used as a tool and medium to collect and gather data based on the application.

5. Children

Children in this study refer to boys and girls of primary school in Tanjung Malim aged 7 to 12 years old. These children are normal person who do not have any learning difficulties such as dyslexia or physical disability.

1.2 Motivation

Learning theory by Dewey & Piaget in a paper written by Ackermann (2004) suggested that aspect of learning by doing and by thinking about what they do, which can improve the question of what and how children learn. Smartboard provides variety of features and functions that can be used by teacher to achieve their lesson

objectives. There are too many researches about the effectiveness of interactive whiteboard which is including Smartboard in teaching and learning process but, there is none about a method for children in term of collecting and gathering data. So, it motivates the researcher to search an alternative method and approach to collect and gather data for children in order to prove on how teacher can observe their students' performance and achievement from classroom's activities by using Smartboard. Besides that, Smartboard supports collaborative and cooperative learning which can be used with a group of users (SMART Technology Inc, 2006). Good application with good usability will empower the technology and learning process.

1.3 Expected Outcomes

At the end of the research, the researcher expects the results as below:

i. An alternative method to collect and gather data for children using Smartboard.

ii. Empirical evidences on the usefulness methods, tool and techniques used for the evaluation process with children.

iii. A list of guidelines in conducting usability testing on children by using Smartboard.

iv. An application is designed and developed for children by using Smartboard to test the alternative method for collecting and gathering data.

1.4 Conceptual Research Framework

This research has two main stages which are theoretical and methodology. During theoretical stage, researcher has studied about children cognitive development, children needs and the visual communication. Researcher also had studied about constructivism learning and user experience for Smartboard especially on its usage as a tool to collect and gather data. Another aspect of this research is interaction. Interaction is like a bridge which connects children and Smartboard that researcher had studied by referring Interaction Design and Children (IDC) field. At the end of this stage, researcher has produced a list of requirements and need analysis of these three areas and their relationship.

Second stage of this research is methodology stage. In methodology stage, researcher develops an application on topic '*Introduction of Icon*' by using Smartboard software using DDD-E model. Once the application has completed, researcher had evaluated the application using Smartboard. Smartboard had used as the tool for collecting and gathering data, as intended in the research. For this matter, researcher was conducted a usability testing with children to evaluate the methods on how easy the children can use the application and device including their satisfaction using Smartboard together with its functions and features. Here, there are four instruments used, 1) observation; 2) interview; 3) questionnaire and 4) child's artifact.

All these methods had conducted and referred to some guidelines and principle to make it runs systematically and effectively.

At the end of the research, it is expected that there are three main findings produces in this research which are 1) empirical evidences of the research; 2) a list of guidelines to collect and gather data by using Smartboard and 3) an alternative method to collect and gather data by using Smartboard especially for children. From these three findings, researcher had analyzed the goal and the hypothesis of this research.

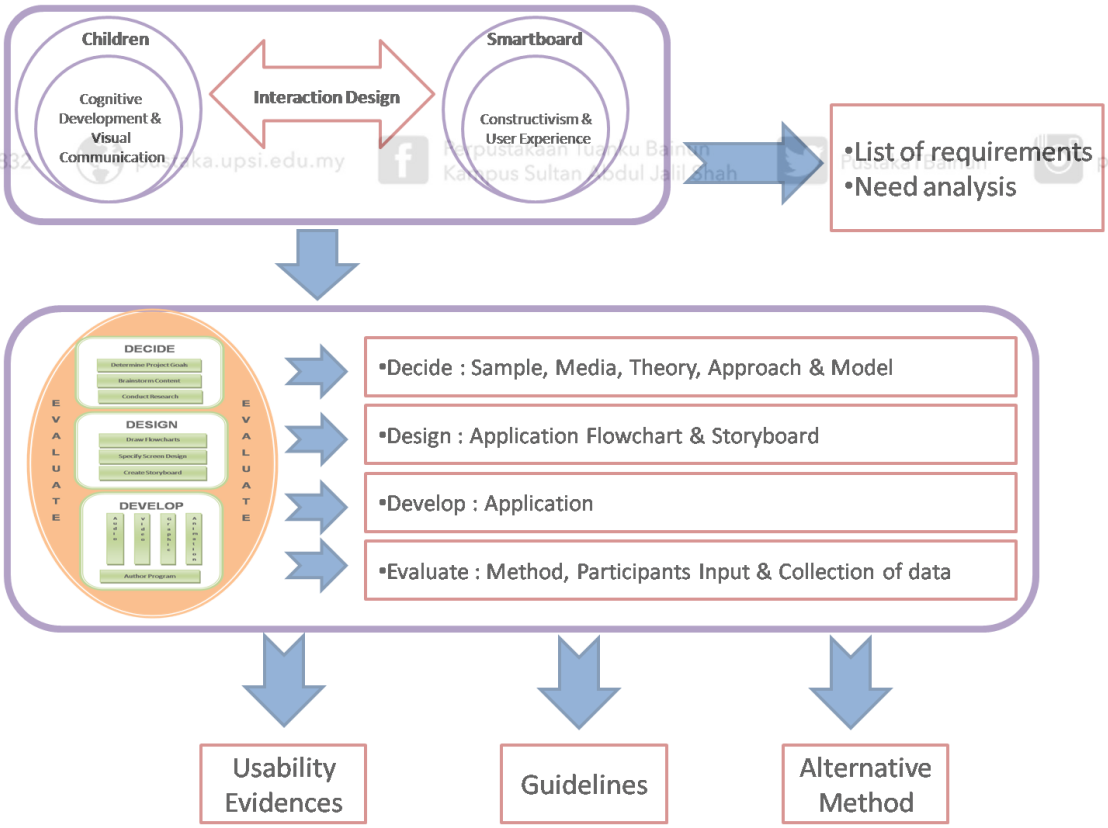

Fig.1.1: Conceptual Research Framework

1.5 Research Scope

The scope of this study is children who are aged from 7 to 12 years old of primary school in Tanjung Malim area. This study focuses on appropriate and effective methods that can be applied to the interactive whiteboard (Smartboard) to collect and gather data from children. Therefore, this study is to see the terms of usability which consists of three main elements 1) effectiveness; 2) efficiency and 3) satisfaction in providing required data with more easily and accurately

1.6 Research Contribution

Three main researcher's contributions of this research are:

i. List of methods and instruments to collect and gather data from children will be used by other researchers in their research (Table 2.2).

ii. Analysis of children's needs to understand the attitudes and environment of the childs, appropriate forms of interaction involving children and the need of Smartboard in studies which is involving children (Table 3.1).

iii. A list of guidelines of using Smartboard to collect and gather data for research in the field of children and (Appendix D1).

iv. A list of instruments to collect and gather data from children using Smartboard will be used by other researchers in their research. (Table 6.1)

1.7 Structure of the Dissertation

Chapter 1: Introduction

This chapter briefly describes the introduction of the study that had conducted. This includes issues like research background, research problem, research objectives, research questions, research interests, hypothesis, limitations of the study, and study motivation in producing the expected results at the end of the study. In addition, the conceptual research framework is also included to describe the course description of the study that have conducted.

Chapter 2: Literature Review

This chapter tells a summary of previous researchers who have conducted the related research. It is also a reference and the proof of the theories that have being used throughout the study. There are four core areas which have been emphasizes: 1) interactive whiteboard and early year children, 2) usability, 3) interaction design for children and 4) data collecting and data gathering from children.

Chapter 3: Development

Smartboard application development which is entitled *'Introduction of Icon'* have been explained in detail in this chapter. This includes a description of each phase in

the DDD-E model. Flowchart and storyboard application were included to the understanding and reference for researchers and readers.

Chapter 4: Methodology

Methods, instruments, participants, locations and procedures about the studies were described in detail in this chapter. Apart from the testing of usability that had conducted; a description of the pilot study was explained to test the validity and reliability of the instruments which had been used in the usability testing. In the end of the chapter, a brief description of the methods for analyzing and interpretation of data had included.

Chapter 5: Result and Analysis of Data

The findings of a pilot study and the usability testing were analyzed and interpreted according to rules and procedures that have been decided. The data collected and gathered was presented in a table, pie chart and graph form to make it easy to understand.

Chapter 6: Conclusion and Recommendation.

Discussion of the findings has discussed and the overall conclusions made by the researcher based on studies carried out in the previous chapters. Hence, an alternative method for collecting and gathering data from children was raised and a suggestion for future research was proposed.