DEVELOPMENT OF A UTILITY-BASED FRAMEWORKFORDETERMINING SOFTWARE PRODUCT USABILITY IN HOSPITAL INFORMATION SYSTEM

By:

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B.Sc., M.Sc. Computer Science

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SUPERVISOR'S CERTIFICATION

I certify that IKONO, Rhoda Nsikan-Abasi has fulfilled all requirements for the Doctor of Philosophy degree in Computer Science. This thesis is the result of research work and relevant studies carried out by him under my supervision in the course of the programme in the Department of Computer Science and Engineering, of TheObafemiAwolowo University, Ile-Ife.

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DEDICATION

This project is dedicated to the Almighty God for His goodness, mercies and faithfulness that never fails.

To the memory of Prof E. J. Erero you taught me how to applyorganizational behaviorin the context of this work. I pray that your gentle soul rest in peace, until we meet again.

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To our Lord and Savior, Jesus Christ who has the final thanks, may glory and honor and power be yours for ever and ever, Amen.

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ABSTRACT

This study analysed the problem of software product usability in Hospital Information Systems (HIS); designed data acquisition system and developed a utility-based framework for determining software product usability. This was with a view to determining the functionality of software product within its context of use.

The research employed a combination of quantitative, qualitative and mathematical modelling approaches. The problem of HIS usability was assessed through participatory observations, purposive interview and by administering questionnaires to selected hospitals of the case study comprising 41 Medical Record Officers, 23 Nurses, 12 Doctors, 10 Laboratory Technologists, 8 System Administrators, 7 Pharmacists and 6 Management personnel. The system was designed using Unified Modelling Language (UML), and a mathematical model derived from utility function was implemented using PHP: Hypertext Preprocessor. The data captured was stored in a relational database using a variant of a Structured Query Language called MySQL. The performance of the system was evaluated by testing the functional design of an existing software product using accuracy and the time required to perform specific tasks. The output was also validated with the survey data using Log Relative Error (LRE).

The result showed that the time taken in task performance was dependent on users' background knowledge in operating software product. The average time spent by 9% of System Administrators in accomplishing a specific task was 14 seconds; whilst 42% of Medical Record Officers used 16.3 seconds; 17% of the nurses, 20 seconds, 6% of the Pharmacist 25 seconds, 13% of the Doctors 47.5 seconds. Furthermore, the result showed that 42% of all the users found the patient registration module usable without modification; while 75% had difficulty in using the Statistics module in the package. The validation of the model's result output with the survey data showed that the LRE for number of steps between actual result of 2 steps and the modelled result of 2.25 steps obtained was 0.90. The LRE for response time between the actual result of 20 seconds and the modelled result of 21 seconds obtained was 1.30.

The study concluded that the failure of software product usability in HIS can be resolved by using utility-based framework to analyse the different modules familiar to the users in achieving their specific goals and further improved by implementing the feedback system in the framework. Thedeveloped model proved useful for data requirement analysis methods in Information System.

CHAPTER ONE

1 INTRODUCTION

1.1 Background of the Study

This research compliments the research effort being undertaken by the research group-Informatics Development for Health in Africa (INDEHELA). The objective has been to understand and solve real-life problems for Information Systems Development (ISD) with particular interest in healthcare. This objective is as depicted in Figure 1.1

In order to answer the question of certain fundamental elements that are present in software development to be considered sufficiently usable, there is a need to re-examine the interaction between humans and technology and in particular, information technology. Researchon how information technology is being used is dynamic; although, there has been a tremendous increase in the pace of information technology development over the past decades (Heeks, 2006).Hardwareand software usability was not a key issue for the highly skilled scientists who design this software.They were the same people who would use the new technology and at the same time process the information needed. Theuse of information technology is no longer restricted to research laboratory, instead it has become widely available to the broader community which has in turn brought the need to ensure that it is made as useful and usable as possible.

It is, therefore, expedient to study the usability of Information System (IS) with particular interest to Hospital Information System (HIS). A number of researchers consider IS as a communication technology (Heeks, 2006,Bovie, 2003), while some consider IS as a system (Soriyan, 2004,Groen,*et al.,*2005).

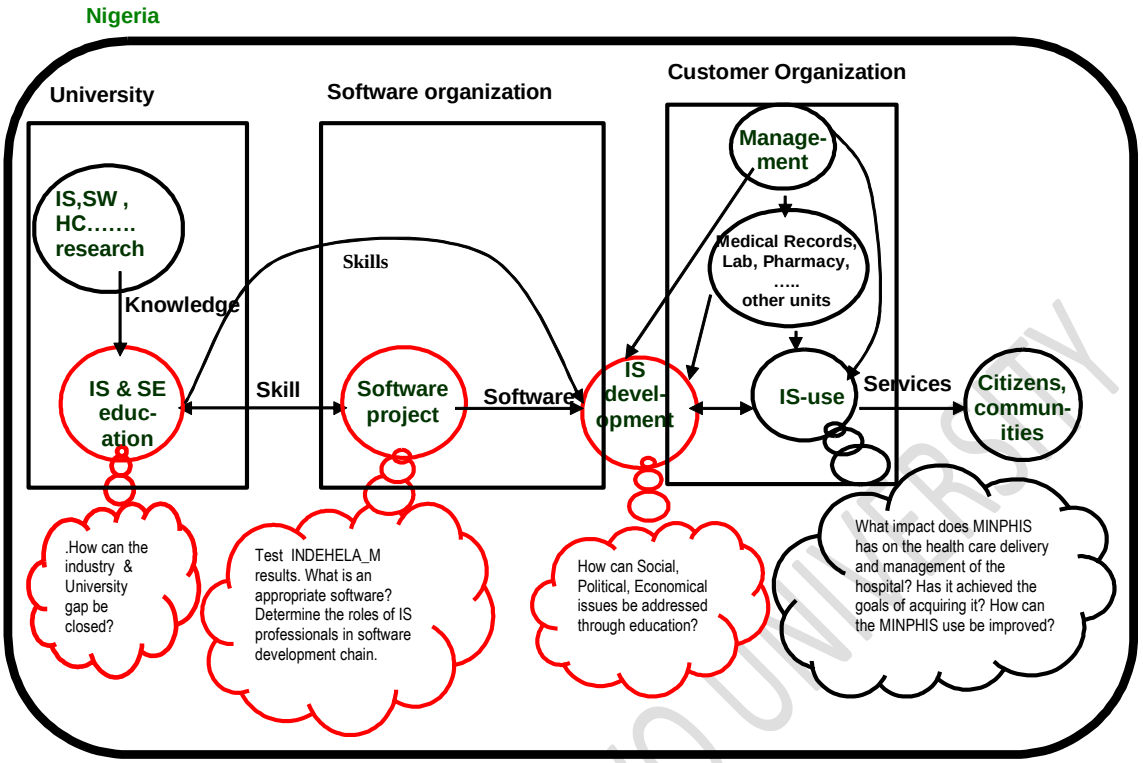

Figure 1.1: Information System and Software EngineeringEducation Research Framework

Source: (Soriyan, 2004)

According to Whitten and Bentley (1998),IS isdefined as an “arrangement of people, data, processes, software and environment that are integrated for the purpose of supporting and improving the day-to-day operations in a business, as well as fulfilling the problem solving and decision making information needs of business managers”.

Also, Information Technology (IT) is defined as “the combination of computer technology (hardware and software) with the telecommunication technology (data, images and voice network)”(Whitten and Bentley, 1998). Due to this fact, software cannot be studied without looking into the hardware it interfaces with.

The question of ‘how can IS be developed’ takes this research into the study of Information System Development (ISD) which is the process of the methodology of IS (Soriyan, 2004).Korpela*et al*. (2000) views ISD as"the process by which some collective work activity is facilitated by new information-technological means through analysis, design, implementation, introduction and sustained support, as well as process management."Inorder to achieve the aim of this study, research into the aspect of information system users and information technologyis expedient.Soriyan(2004) and Heeks(2008)explain how information is being disseminated around the stakeholders for decision making. If information is being disseminated then the channel in which data is being processed through is the Software Product (SP). How effective is the channel of information dissemination being utilized,not losing sight of the fact that, specificusers have specific problems trying to do specific work, in order to solve every day to day problems that have to do with information dissemination?

Since it is understood that the users of software product use information forinformed decision making,

they definethe problem to be solved; the opportunities