TOOL-ASSISTED MODEL FOR SOFTWARE REQUIREMENT NEGOTIATION

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in fulfillment of the requirements for the degree of Master of Computer Science
(Software Engineering and Intelligence)

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DECLARATION

I declare that this thesis entitled "Tool-Assisted Model For Software Requirement Negotiation" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

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Date : 9 January 2015

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APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Computer Science (Software Engineering and Intelligence).

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DEDICATION

To my beloved parents

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ABSTRACT

Requirement negotiation plays an important role in software engineering in order to get the requirements which are agreed by various stakeholders. Stakeholder with different background and culture tend to have different perceptions and perspectives. These differences will lead to conflicts, whether conflicts between stakeholders or conflicts between requirement, resources and capability. It is very difficult to solve conflict issue as each person see things in a different way. Here, Negotiation is vital to solve these conflicts and come to an agreement. Although requirement negotiation plays such a crucial role, the research of these field are still at the beginning of the stage as people tend to overlook or skip the process of requirement elicitation which involve requirement negotiation and immediately start with the development of system in order to save time. Due to advancement of technology nowadays, software system has become very important and widely use, one of the most popular software devices is smartphone where almost everyone already has one in their hand. And other technology also requires the presence of software in order to make the system intelligence, thus it is very important to gather the requirement of the system first before developing the system. As requirement negotiation is regards as one of the first step in any software system life cycle, one mistake in it will propagate to the other stages of software development life cycle, thus increase budget and time. Furthermore, different stakeholders may stay at different location. This research is about developing tool-assisted model for software requirement negotiation which provides a negotiation system for the stakeholders in order to reduce conflicts, ease the process of requirement elicitation and also allow distributed requirement elicitation in order to come to an agreement faster and thus obtain the requirements in a more convenient and efficient way.

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ABSTRAK

Keperluan rundingan memainkan peranan yang penting dalam kejuruteraan perisian untuk mendapatkan keperluan yang dipersetujui oleh pelbagai pihak berkepentingan. Pihak berkepentingan dengan latar belakang dan budaya yang berbeza biasanya mempunyai persepsi dan perspektif yang berbeza. Perbezaan ini akan membawa kepada konflik, sama ada konflik antara pemegang kepentingan atau konflik antara keperluan, sumber dan keupayaan. Ia adalah amat sukar untuk menyelesaikan isu konflik kerana setiap orang melihat perkara-perkara dalam cara yang berbeza. Di sini, Perundingan adalah penting untuk menyelesaikan konflik ini dan mencapai persetujuan. Walaupun keperluan rundingan memainkan peranan yang penting, penyelidikan dalam bidang ini masih pada peringkat awal kerana orang cenderung untuk mengabaikan atau melangkau proses keperluan elisitor yang melibatkan keperluan dan rundingan dan segera bermula dengan pembangunan sistem untuk menyelamatkan masa. Oleh kerana kemajuan teknologi pada masa kini, sistem perisian telah menjadi sangat penting dan digunakan secara meluas. Salah satu peranti perisian yang paling popular adalah telefon pintar di mana hampir semua orang sudah mempunyai satu dalam tangan mereka. Selain itu, teknologi lain juga memerlukan kehadiran perisian untuk membuatkan system mereka pintar, oleh itu ia adalah sangat penting untuk mengumpul keperluan sistem dahulu sebelum membangunkan sistem. Sebagaimana keperluan rundingan adalah berkaitan dengan salah satu langkah pertama dalam mana-mana perisian kitaran hidup sistem, satu kesilapan di dalamnya akan menyebarkan kepada peringkat lain dalam kitaran hayat pembangunan perisian, sekali gus meningkatkan bajet dan masa. Tambahan pula, pihak-pihak berkepentingan yang berbeza boleh tinggal di lokasi yang berbeza. Kajian ini adalah tentang membangunkan model alat-membantu untuk perisian keperluan rundingan yang menyediakan satu sistem rundingan bagi pihak berkepentingan untuk mengurangkan konflik, memudahkan proses keperluan elisitor dan juga membolehkan agihan elisitor keperluan untuk mencapai persetujuan dengan lebih cepat dan dengan itu mendapatkan keperluan dengan cara yang lebih mudah dan berkesan.

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LIST OF ABBREVIATIONS

EWW - EasyWinWin

GSS - Group Support System

WebRQs - Web Requirements Elicitation and Negotiation System

PDF - Portable Document Format

RE - Requirements Engineering

SVG - Scalable Vector Graphics

SWF - Shockwave Flash Format

SECO - Software Ecosystem

UML - Unified Modeling Language

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Requirements Engineering (RE) is a cooperative learning process where stakeholders from different backgrounds with different experiences and objectives have to communicate to elicit and validate requirement (Bustard 2002). One of the most important topics in Requirement Engineering is requirement elicitation. Requirement elicitation process plays an important role because it acts to gather the information and specifications about a new system which will be developed. It is important because without the correct information and specifications, developers will not be able to develop the correct system. Requirements elicitation can be regards as complex and difficult task as it involves several processes in obtaining the requirements from the stakeholders with different background. In addition, the requirements must end with a consensus in which all stakeholders agreed upon.

Indisputable, it is almost impossible to complete requirements elicitation process without any conflicts. Conflicts occur are mainly due to different viewpoints and goals of stakeholders. For instance, developers would like to have a system which is very flexible, more features and stable, while buyers or end users may only want a cost-effective system. Studies have proven

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that conflict is extensive especially in software engineering (Curtis et al. 1988), however, many existing method has overlook the process of conflict handling and issue solving. Thus, negotiation method has become one of the researches being increasingly studied.

Requirement negotiation is one of the crucial steps to solve conflict issue during requirement elicitation process. It is important to come to a consensus in getting the requirements of the system so that the system can satisfy the stakeholders. In fact, consensus outcomes which are not achieved through negotiation will lead to stakeholders' dissatisfaction and non-acceptance of requirements (Coombes 2001). Requirement negotiation is one of the first steps in any software system life cycle, and its result probably will cause the most significant impact on the system's value (Boehm & Egyed 1998).

Hence, this study aims to develop tool-assisted model for software requirement negotiation which can provide the stakeholders a conflict handling mechanism, improve the process of requirement elicitation and allow long distance requirement elicitation process in order to obtain the requirements more effectively.

1.2 Problem Statements

Issues pertaining requirements elicitation have become a main concern since the early days of computing. Numerous researchers have identified that requirements elicitation plays the most crucial task in determining the success or failure of a software project. However, in the process of identifying the correct requirements from stakeholders, conflicts are commonly occurred due to mismatching opinions and goals. Indisputable, it is very challenging to capture agreements that may satisfy the needs of every stakeholder who have different point of views,

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concerns, ideas, responsibilities, and goals. Negotiation is therefore useful in this situation to resolve and handle the disagreement among the respective stakeholders.

Likewise, disagreements often lead to constraints such as longer project life cycle, increase budget and late delivery. Hence, this project aims to develop tool-assisted model for software requirements negotiation to overcome the issues in selecting the correct requirements.

1.3 Research Objectives

i) To design and develop a tool-assisted model for software requirements negotiation in order to overcome the conflict issues in requirement elicitation.

ii) To allow different stakeholders to do requirement elicitation process at different location.

iii) To analyze the applicability of the requirements negotiation support system in requirements elicitation.

1.4 Research Scope

This study will focus on the negotiation of the stakeholders during requirement elicitation process. This study will also focus on developing a tool-assisted model to act as a requirement negotiation system for the stakeholders.

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1.5 Research Significance and Contribution

In the process of identify and collecting requirements, conflicts are common since different stakeholders usually have different goals (Ahmad & Muda 2011). Reaching agreements among stakeholders with different domain are not easy. Thus, it is important to have negotiation during requirement elicitation process in order to help solving the issue of conflicts among stakeholders.

Besides, requirement negotiation is also one of the first steps in software system life cycle. This means that any mistakes in this step will lead the whole system to be started from the beginning again, thus increase the workload and time to develop the system.

Furthermore, software has become one of the most important elements in today technology products. One popular example would be the handheld android smartphone. Without software, android smartphone or other technology products will not exist as software provide the intelligence for the product. Thus, it is very important to negotiate in order to get the specifications of the software system which agreed by all stakeholders.

In addition, different stakeholders may live at different location or country. It may be inconvenient for them to come to a meeting at other country just for 1 or 2 days. So, by using this proposed tool, the stakeholders are able to do requirement elicitation at their own places.

In this study, with the development of proposed tool-assisted model for software requirements negotiation, it is hope that the tool-assisted model can provide a negotiation platform for requirements elicitation in order to acquire the best requirements which accepted by all the stakeholders.

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1.6 Conclusion

Requirements elicitation involves identifying and gathering requirements from different stakeholders. Conflicts are common due to different background, perspective, and goal of stakeholders. Requirement negotiation plays an important role in solving conflict during requirement elicitation process. The negotiation is vital in order to get the most correct requirements which can be accepted by all the stakeholders. If requirements are achieved without negotiation, it will lead to stakeholders' dissatisfaction and also requirements rejections. This indirectly will delay the development of a system as the developers do not have a clear goal about the system to be developed. As requirement negotiation is also the first step of software system life cycle, improper process of negotiation will surely block the system life cycle, causing serious problem as the system development will be stuck at the first step of the life cycle. Thus increase time and budget of the system. Furthermore, different stakeholders may stay at different location. To solve these problems, this study aims to develop a tool-assisted model for software requirement negotiation in order to help solve the conflicts issue, and also provide a bridge for different stakeholders at different location to perform requirement elicitation at their own location. It is hope that by using this system, one can obtain better, more convenient, more complete and all-agreed requirements from the stakeholders.

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CHAPTER 2

REVIEW OF LITERATURE AND STUDIES

2.1 Introduction

This chapter discusses literature review and some related studies. Literature review is basically about studying and understanding previous work and reviews them in order to gain some background knowledge and obtain new insight of the research area. In addition, from literature review, we can understand the latest previous work so that our work will not collide with previous work. Furthermore, these literatures can help one to improve the knowledge of certain research area. In this chapter, studies related to requirement negotiation are presented. Before discussing requirement negotiation, it is good to understand about requirement engineering first.

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2.2 Requirement Engineering

Requirement Engineering is basically establishing user requirements and identifying software system specifications by using engineering approach (Sutcliffe, Alistair G., 2013). Engineering approach include using systematic way such as tool in order to obtain the most appropriate and agreed users requirements. Requirement engineering is the process which enables one to systematically determine the requirements for a software product. Requirement engineering plays an important role in the successfulness of a software product as requirement engineering is the first step of software engineering process. The main role of requirement engineering is to guide the development of a project toward producing product that will be satisfied by the customers (Bjarnason, 2013). There are various definitions for requirement engineering (Zave, 1995), however, they are usually about finding out the requirements and needs of the users about the product. The statement "Software systems requirements engineering (RE) is the process of discovering that purpose, by identifying stakeholders and their needs, and documenting these in a form that is amenable to analysis, communication, and subsequent implementation" which quoted from Nuseibeh and Easterbrook (2000), is perhaps, one of the best definitions for requirement engineering. In short, requirement engineering allows one to come up with the full specification of a software product which defines the requirements of each stakeholder.

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2.3 Requirement Negotiation

In requirement engineering, conflicts happening are inevitable due to stakeholders' different background, culture and needs. Different stakeholders like customers, users, developers, managers, and domain experts, come to a project with different expectations and interests (Grünbacher & Boehm 2001). In order to solve these conflicts in requirement engineering process, requirement negotiation plays a vital role to reach consensus. Negotiation is useful in handle conflicts and to resolve disagreement among stakeholders (Ahmad & Muda 2011). Requirement negotiation allows the stakeholders to negotiate or discuss among themselves if any disagreement happen to reach win-win situation. In case of conflicts, negotiation provides a way for the stakeholders to come to better agreements.

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2.4 Requirement Negotiation Method

In requirement engineering, there are various ways of negotiation methods presented by other researchers from the past to present. In 1995, Boehm et al, presented 'Theory W' which is used to produce the outcome of stakeholders win-win conditions (Boehm et al., 1995). Then, later in 1990s, inspired by 'Theory W', Boehm et al (1998), introduced 'WinWin Model' which is in order to help stakeholders negotiate conflicts and reach their win conditions more effectively and successfully. After that, in early 2000s, the 'WinWin Model' were improved and evolved to the groupware methodology called the 'EasyWinWin' which is a tool to provide requirement negotiation for the stakeholders (Grunbacher and Boehm, 2001).

Besides the 'WinWin" approach, there are several other efforts been made to aid in conflict management. One of the example were 'Conflict-Oriented Requirement Analysis' (CORA) researched by (Robinson and Volkov, 1996 - 1998). Apart from these, there are other researches which related to negotiation methods are done in order to provide optimum requirement negotiation.

In order for the negotiation of requirement to work well, it is definitely in need of a good negotiation method. A good negotiation method is usually based from a good requirement negotiation model. A requirement negotiation model is a model used to describe the process of negotiation. There are a lot different models for requirement negotiation. But currently, one of the most frequently model used for requirement negotiation model is called WinWin Negotiation Model which is developed by (Boehm et al. 2001).

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