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QUALITY-BASED REQUIREMENT PRIORITIZATION FOR CROWD BASED ELICITATION

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QUALITY-BASED REQUIREMENT PRIORITIZATION FOR CROWD BASED ELICITATION

By

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Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Master Degree of Software Engineering

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ABSTRACT

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Master Degree of Software Engineering

QUALITY-BASED REQUIREMENT PRIORITIZATION FOR CROWD BASED ELICITATION

By

NURUL AFIQAH BINTI ABDUL AZIZ

June, 2018

Chair: Dr. Mar Yah Said

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Acquiring requirements through crowd based elicitation for covering breadth or number of stakeholders to a much higher degree ideas for software requirements. The crowd involvement will contribute for a better and more efficient product to be developed. However, one of the challenges is to identify necessary requirements that need to be implemented from the various requirements proposed by the crowd. In addition to the greater demand in technology, requirements can increase in ten-fold and choosing them require an efficient technique in restricted time. Requirements prioritization is an approach to identify requirements that need to be focused and implemented first. However, most prioritization techniques suffer from usability and scalability problem and are not meant to focus on quality attribute of

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requirements. This thesis aims to propose an approach for requirements prioritization to identify requirements that are prioritized based on customers' preference. The proposed approach is based on existing approach, Kano's model theory. A prototype tool is developed as a proof-of-concept and used for the evaluation purposes. An evaluation with an appropriate case study was conducted and the results shows that the objectives are achieved and fulfil the satisfaction level for the requirement prioritization.

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ABSTRAK

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia

Sebagai memenuhi keperluan untuk Ijazah Sarjana Kejuruteraan Perisian

PRIORITISASI KEPERLUAN BERASASKAN KUALITI UNTUK ELISITAS ORANG RAMAI

Oleh

NURUL AFIQAH BINTI ABDUL AZIZ

Jun, 2018

Pengerusi: Dr. Mar Yah Said

Fakulti: Fakulti Sains Komputer dan Teknologi Maklumat

Mendapatkan keperluan melalui elisitasi orang ramai untuk meliputi keluasan dan bilangan orang berkepentingan untuk memperoleh idea keperluan perisian yang lebih tinggi. Penglibatan orang ramai akan menyumbang kepada pembangunan produk yang lebih baik dan efisen. Namun, salah satu cabaran ialah untuk mengenal pasti keperluan yang penting untuk di guna pakai daripada pelbagai keperluan yang telah di cadangkan oleh orang ramai. Tambahan pula, ada permintaan yang tinggi dalam teknologi, keperluan boleh meningkat sebanyak

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sepuluh kali ganda dan proses memilih memerlukan teknik yang lebih efisen dalam masa yang terhad.

Keutamaan keperluan ialah salah satu cara untuk mengenal pasti keperluan yang perlu diberi fokus dan dilaksanakan terdahulu. Tetapi, kebanyakkan teknik untuk mengutamakan keperluan mempunyai masalah kebolehgunaan dan skalabiliti dan tidak bermaksud untuk difokus kepada atribut kualiti keperluan. Tesis ini bertujuan untuk mencadangkan pendekatan unutk mengutamakan keperluan untuk mengenal pasti keperluan yang akan diutamakan berdasarkan pilihan pengguna. Pendekatan yang dicadangkan adalah berdasarkan pendekatan yang sudah sedia ada iaitu teori Kano model. Satu prototaip telah dibina sebagai bukti konsep dan digunakan untuk tujuan penilaian. Penilaian dengan kajian yang bersesuaian teah dijalankan dan keputusan akhir menunjukkan bahawa objektif telah dicapai dan memenuhi tahap kepuasan untuk mengutamakan keperluan.

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DECLARATION FORM

Declaration by graduate student

I hereby confirm that:

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LIST OF ABBREVIATIONS

1. AHP : Analytic Hierarchy Process
2. HCV: Hierarchal Cumulative Voting
3. SI: Satisfaction Index
4. DI: Dissatisfaction Index

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CHAPTER 1

INTRODUCTION

1.1 Overview

In general, requirement prioritization has been a concern for product development and thus, there has been many research and tool creation to properly choose requirements from the listed user stories for the project manager to resolve all the conflicts. According to (Lehtola, Kauppinen, & Kujala, n.d.), a lot of company goes by tacit knowledge from experience or feelings to determine the truly important requirements needed for a product to be develop. Hence, the process does not goes under systematic practices for these analyses. However, decision to include the requirement in the next phase of product development needs high-level information from customers' preference. The priorities that the customers provide to their own raw requirements would have more value in managing customer satisfaction.

The rising use of agile methodology in developing product has made its point in proving that the development process is a value creation process that relies on active client participation (Racheva, Daneva, Sikkel, & Herrmann, n.d.). The value creation is ensured both through the final product as well as through the process itself. Requirement prioritization plays an important role in determining the quality of a software product. Aspect associated with the quality derived from the ability to satisfy the needs of customers and users through their own preferences that will constitute the basis of the product or release (Lehtola et al., n.d.). It is not unusual that projects in demand with the current technology have a large number of individual requirement. Having to implement all of them in a system is impossible due to restricted requirement engineering budget, long schedule, limited project resource and the difference in importance of each requirement (Firesmith, 2004). The information about priorities is needed,

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not only to allow restriction to the least important requirements, but also to help project managers to resolve conflicts, make plans for the staged deliveries and necessary trade-off (Lehtola et al., n.d.)

The stakeholders are required to have an understanding to how development works and they are depend on for the process of prioritizing the requirements which relies on their learning experience (Hasan, Ta, & Razali, 2013). In a prioritization process, the outcome is a set of prioritised project backlog, which is a group of requirements that are significant for the project. The requirements that are at the top of the prioritised project backlog list will be considered for implementation in the first iteration (Hutchison & Mitchell, n.d.).

Careful requirement elicitation and prioritization reduces 40% of cost and time rather implementing ambiguous requirements (Karlsson, 1997). Requirements are prioritized effectively in agile methodologies as compared to traditional processes due to extensive user involvement (Racheva et al., n.d.). Prioritization approaches are divided into two categories: methods that base on giving values to different values to requirements (pair wise comparisons, e.g. AHP) and negotiation approaches (Shehzad, Awan, & Rizvi, 2014)(Wohlin & Verlag, n.d.).

Acquiring requirements through crowd based elicitation provides techniques for covering breadth or number of stakeholders to a much higher degree more explicitly, which will contribute to better and more efficient product development. It is the practice of obtaining product ideas by soliciting contributions from the wider public rather than just from employees or suppliers (Kepes, n.d.). As the cost of research escalates and the ability to deliver research quickly from within the organization is reduced, crowdsourcing is increasingly seen as a smart direction, even for the most traditional organizations.

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The aim of this project is to propose an extended technique that will satisfy a quality based requirement prioritization technique for a crowd based elicitation.

1.2 Problem Statement

Current prioritization techniques offers a lot of simplified ways to achieve the desirable requirements in a product. However, needless to say, not all techniques are made for every methodology. The goal of necessities investigation is to recognize and express requirements of client needs. This is to prevent any waste of resources as we develop further.

Nevertheless, the issue of necessity emerge with the end goal that:

i. **Scalability: While there are techniques that can produce reliable results, they are not easily scalable and difficult to use. (Narendhar et al.,2016)**

   (Karlsson et al.) admit that AHP and bubble sort both contain a scale up problem even though they are reliable.

   Some methods scale well to be used with larger number of requirements but provide very coarse results. **(Narendhar & Anuradha, 2016)**

ii. **Quality Wise: It is often not obvious which requirement contains high user satisfaction among the rest. (Alkandari & Al-Shammeri, 2017)**

   Technique that take account of customers' ideas and perspective for a quality requirement prioritization can have reliability problems with the understanding of the approach in the cases when the researcher does not well explain the theory and/or the respondents do not understand it well

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(Violante & Vezzetti, 2017).

iii. **Time Consuming: Several techniques on requirements prioritization have been proposed, but are difficult to implement, too complex, time consuming and/ or inconsistent. (Mkpojiogu, Emmanuel et al.,2017)**

Complexity of the techniques makes it difficult for the process to be conducted. Choosing and categorizing requirements priority using such technique from a crowd based elicitation would take a lot of time and effort.

Hence, the technique require further filtration to focus on having a quality approach for the product in a series of iteration, with consideration towards the time and cost.

1.3 Motivation

Many projects face difficulties in implementing the rightful important requirement due to limited resources and time. Resolving this problem matters the most since it involves complex communication and negotiation process with many stakeholders. Complications regarding of the interdependencies, or political issues that revolve around the requirements, are discussed in great length as it hinder the decision making in the context of requirement engineering process. Prioritizing requirements from the customer preferences would gain high level value in the market segment as it would comply exactly what matters with the end users. Accumulating these analysis allows the best basis to the product or release. Therefore, implementing the right practice in the process of requirement prioritization would give huge impact to the quality of the product and ultimately would provide the best outcome in the investment.

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1.4 Objective of Study

The proposal aims to have a requirement prioritization technique that can be used in any methodology, so we can achieve a quality requirement from a crowd based elicitation to be implement in product regardless of the methodology:

1) To propose an approach on quality based requirement prioritization that would be scalable.
2) To develop automated tool for the proposed approach.
3) To evaluate the effectiveness of proposed requirement prioritization approach and tool.

This project will focus on the quality aspect on the requirements prioritization, and take note of the cost and time for the project to take place. Some calculations, assumptions, and selections were made as a consideration of a proper and realistic design.

1.5 Scope of study

This project is proposed under certain defined scopes:

System User

i. The focus scope is specifically to help the developer to understand better and make decision on which requirement should be develop first after collecting response from the potential end users through Kano's questionnaire. .

Application Platform

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i. This application will be develop and run using system as a platform to show the data of prioritized requirements.

The general scope of this project are:

i. Computer Science Industry
ii. IT Company

Device used in this project:

i. Computer
    - A computer that used to develop code and system

1.6 Thesis Organization

This thesis consists of six chapters. Chapter 1 will be discussing about the introduction of the system, problem statements, objectives and scope of the projects.

Chapter 2 is a literature review that discuss about the existing prioritization techniques, its advantages and disadvantages, and existing tools for the prioritization techniques.

Chapter 3 is a research methodology that will discuss about the development of the proposed approach that is use for case study and during prototype development.

Chapter 4 is proposed approach, where it discuss about the details and flow of the proposed approach. The workflow, data process and gathering the requirement was recorded. Chapter 5 is evaluation, where the process in developing the prototype with illustration of a

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case study will be explained in this chapter. The testing and result discussion of the prototype will also be presented.

Chapter 6 is conclusion where we will discuss about the summarization of the project, all retrieved data and observe how far it can be fit into the project and its objective. We will also discuss on future suggestion and enhancement of this proposed approach.

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