An Empirical Study of the Software Project Requirements Engineering Practice in Malaysia Public Sector – A Perspective from the Stakeholders' Challenges

Aedah Abd Rahman, Azlena Haron, Shamsul Sahibuddin, and Mazlan Harun

Abstract—**Stakeholder is one of the software success factors for software project in Malaysia Public Sector. The stakeholders are defined as person who are close to the business process and really know what the requirements needed. Requirement is an important factor for the development of any project and it defines what different stakeholders (users, customer, manager and developer) need and how system will fulfil these needs. They are the main actors in the business process. Requirements are used as input in the design, implementation and validation stage of product development. Eventually, a software project can succeed or failed at any time during project life cycle because of poor requirement gathering and managing process. Among the key problems of information systems requirements process is the gap between analysts and stakeholders. Therefore, this paper describes the empirical study performed in public sectors in Malaysia to identify the challenges and problems arising from the stakeholders.**

Index Terms—**Requirement, requirements engineering, challenges, stakeholder.**

I. INTRODUCTION

Software project requirement engineering is considered as the vital process in software development. In most cases, requirements engineering practices which involved requirements development and requirements management are greatly emphasized whenever an organisation adopts quality best practices in their processes. Most widely used best practice and process improvement is the Capability Maturity Model Integration (CMMI), which embed the use of Requirements Development and Requirements Management process areas. The use of single process improvement or multi process improvement framework in organisation also indicates the important role of software project requirement [1]-[6]. This paper outlines the role of requirements engineering and the stakeholder issues. In order to identify the relevant stakeholder roles, the persons or organizations should have an active interest in the system because they will actually use it or are directly involved in processes that the system will change [7]. The stakeholder expressed in natural language for everyone can well understand. It helps the analyst to better understand which element and function are

necessary in the development of particular project. Requirements are used as input in the design, implementation and validation stage of product development. Usually this means that requirements provided by the analyst to a designer significantly inverse with the actual needs of the future system users [8]. So, a project can succeed or failed at any time during project life cycle because of poor requirement gathering and managing process. In real project development environment, some issues will appear such as miscommunication and conflict with the developers. One of the key problems of information systems requirements process is the gap between analysts and stakeholders. Another issue is the misalignment with their knowledge about the business process and misunderstanding during the requirements approval process. Therefore, misunderstanding requirements are likely risk to deliver inadequate solutions [9]. The identified challenges include implementation of new requirements which may cause unpredictable interaction with existing requirements, requirements that are not traceable, and that requirements are too vague to be tested.

II. RESEARCH METHODOLOGY

The empirical study on the requirements engineering (RE) practice is conducted based on survey performed in Malaysia Public Sector. Survey method is selected as the research strategy which contains four parts of the questionnaire instrument: Demographic Profile (Part 1), Personal Experience in Software Project Requirement (Part 2), Problems during Software Project Requirement (Part 3), and Investigation on RE Practice during software project requirement (Part 4), and Comments and Suggestion (Part 5). This paper focuses on the challenges and problems of the stakeholders in the conduct of RE practice, which are covered Part 1, 2 and 3.

The objective of the actual survey is to get the implicit and explicit experience of RE practice which implemented during the software project requirement. Based on initial research planning, the scales for certain parts in the survey are defined in this paper. The scale of Part 3 is 1 to 10, which 1: Not happened all the time and 10: Happened all the time. While the scale of Part 4 is 1 to 10, which 1: Not implemented all the time and 10: Implemented all the time. This study used SPSS to analyse the data.

The planning also involved Part 4 and Part 5 of survey instruments. The explicit and implicit of RE practices are derived from Part 4. These parts are divided into five sections: Elicitation Process, Analysis and Negotiation

Process, Documentation Process, Management Process; and Verification and Validation Process [10]. The practices developed from the RE Critical Issues [11] in every RE process are defined.

III. THE STAKEHOLDERS IN REQUIREMENTS ENGINEERING PROCESS

Stakeholders are the people who are involved in a project and have some interest in the software to be developed, they may vary from one project to another. Stakeholder requirements are expressed through discussions, meetings or papers. Supportive and joint effort is necessary between project team and stakeholders to avoid misunderstanding and misinterpretation. Conflict between people is a constraint between stakeholder requirements and project team. In particular, stakeholder participation needs a way to detect misunderstandings and conflicts and solve them as early as possible [12]. The roles of stakeholder sometimes are ignored by the project team because of the project manager is more focused towards the presentation of the system application, the latest ICT technology and training to the developer. Stakeholders as defined by software engineering are the people and organisations that are affected by the application [13]. In the software project management domain, stakeholder is considered as people who have stake or interest in the projects [14]. In view of requirements engineering, the following definition on stakeholders is stated: system stakeholders are people or organisations who will be affected by the system and who have a direct or indirect influence on system requirements [15].

IV. CHALLENGES AND PROBLEMS ARISING FROM THE STAKEHOLDERS

A number of issues have been identified for the stakeholders consisting of miscommunication with the developer, misunderstanding during the agreement process, and misalignment of requirement with the business process, conflict with manager and conflict with developer. The results are further analysed statistically and later presented in chart illustration.

The information of IT Manager is derived from Part 1. The information included their department, organization, gender, education and working experience. Part 2 is purposely for getting the personnel experienced in the software project requirements. Here, the project involved, the person giving the approval, IT Manager position in this project and the length of project to be completed will be identified. From their experience in software project requirement, there are problems occurred such as the roles of manager, stakeholder and developer. In addition, the roles of business rules, business process and technology affect the stakeholder challenges [16].

V. ANALYSIS OF RESULT AND FINDINGS

Further discussion is based on Table I. There are five problems identified which arise from the stakeholder. Among the issues identified are: 1) miscommunication with the developer; 2) misunderstanding during the agreement process; 3) misalignment of requirement with the business process; 4) conflict with manager; 5) conflict with developer. The results are presented using description; table format containing the N value, mean and standard deviation as indicated in Table I.; and histogram chart generated from SPSS.

TABLE I: THE RESULT OF PROBLEM ARISING FROM STAKEHOLDER

Stakeholder	N	Mean	Standard Deviation
Miscommunication with developer	105	6.30	2.341
Misunderstanding during agreement process	105	6.16	2.450
Misalignment of requirement with the business process	105	6.17	2.347
Conflict with manager	105	5.37	2.466
Conflict with developer	105	5.65	2.515

A. Problem 1: Miscommunication with Developer

Requirements engineering is a process of seeking, uncovering, acquiring and elaborating [17]. These processes involve communication between stakeholder and developers. Techniques of communication that are normally used includes verbal, written and interpersonal. Miscommunications still happen with the developer because of different field and language of work. Stakeholder expectation cannot be fully understood by the developer. Stakeholder participation is supposed to reduce rework on documentation; to get easier approval; to have greater fit of the recommended solution to the organization and to reduce political conflicts among users [18]. Mean of miscommunication with developer is 6.30. This shows that miscommunication with developer happens all the time during software project requirement. It seems easy to cooperate with the stakeholder in the same field. Usually the stakeholder is the users who use the system. This user will give the requirements based on his needs, where he requires a system that is easy to use, manage and monitor. Fig. 1 illustrates the frequency level of the first stakeholder challenge, miscommunications with the developer.
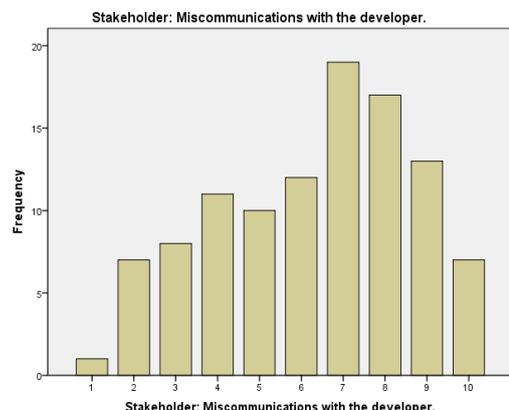

Fig. 1. Miscommunications with the developer.

B. Problem 2: Misunderstanding during Agreement Process

Agreement among stakeholders, belonging to different

perspectives, on factors that result in successful projects makes it is easier to achieve better teamwork [19]. Misunderstanding during the agreement process can cause inability to get the right requirement. In particular, project participants need a way to detect misunderstandings and conflicts and solve them as early as possible [12]. Mean of misunderstanding during the agreement process is 6.16. It shows that the misunderstanding during the agreement process occurred all the time during software project requirement. The user who does not use the systems will give the requirement based on scenario, experience, case study and benchmarking. The developer needs to know the groundwork such as gaining the user needs, identifying the needs, analysis, categories and documents. Fig. 2 illustrates the frequency level of the second stakeholder challenge, misunderstanding during the agreement process.
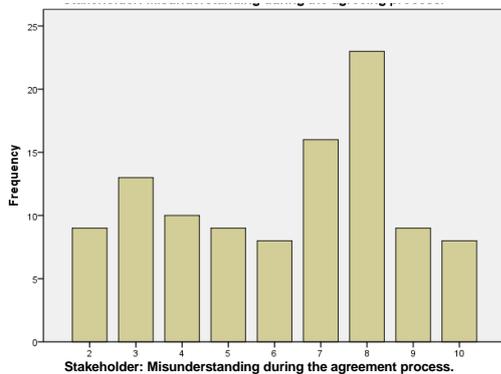

Fig. 2. Misunderstanding during the agreement process.

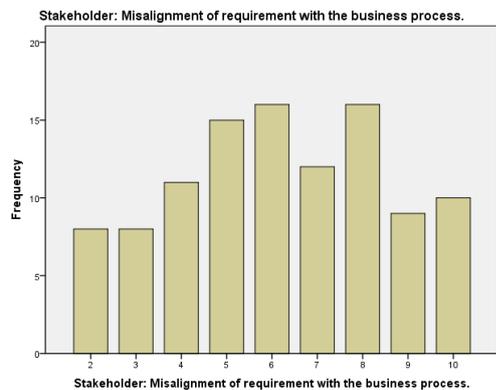### C. Problem 3: Misalignment of Requirement with the Business Process

Fig. 3. Misalignment of requirement with the business process.

Stakeholder is the one who knows about the business process. The need of business process will be translated to the requirement. Misalignment of requirement with the business process will cause of the allocation of requirement to the wrong place. Lack of knowledge of the business process by the user cannot be overcome except by either replacing the user, or having a senior analyst who has extensive knowledge of the business [18]. This is not easy, as it requires the involvement of the human resource department. Participating users is influenced by authority within the user organization. This is critical because, in most situations, the participating users must subsequently to their respective departments and the commitment of task [18]. Mean of misalignment of

requirement with the business process is 6.17. It shows that the misalignment of requirement with the business process happened all the time during software project requirement. The stakeholder should know the business process and the developer should understand the users' needs. Discussion sessions or brainstorm sessions are needed to resolve this issue. Fig. 3 illustrates the frequency level of the third stakeholder challenge, misalignment of requirement with the business process.

D. Problem 4: Conflict with Manager

Stakeholder conflict is the biggest challenge in requirement process [20]. Stakeholders' needs are always incomplete, inconsistent process description, continuous and difficulties to consult the requirements.

Project manager needs to inspect particular tasks that are performed by IT Personnel [20]. Explain the roles, responsibility and expectation to stakeholder. Conflict with manager will cause lack of cooperation between IS groups and users, and between project members [18]. If there is any significant gap between them, the project manager can take necessary action to remedy the situation [17]. One possible action is to replace the member of the development team or to request a new person to represent the stakeholders. By taking action at the early stages, the project manager can ensure that the software requirement process will reflect the requirement needed. Mean of conflict with manager is 5.37. It shows that the conflict with manager happens all the time during software project requirement. This situation seldom happens but if it happens will cause critical issue. The manager should know his roles and responsibility. Fig. 4 illustrates the frequency level of the fourth stakeholder challenge, conflict with manager.

Fig. 4. Conflict with manager.

E. Problem 5: Conflict with Developer

Conflict with developer is one of the issues during requirement process. Lack of cooperation between users and IT Personnel will cause failure to get valid requirements. It is usually difficult to get their time commitment to the requirements engineering phase. The IT Personnel have the policy of building products they feel the users will need and then try to market them to the users [18]. This will result in the identification of missing requirements, inconsistencies and requirements conflicts. It is necessary to ensure that all

relevant factors such as technical, economic and political to use the appropriate influence on resolving stakeholders conflicting requirements [21]. Mean of conflict with developer is 5.65. It shows that the conflict with developer happens all the time during software project requirement. The stakeholder feels they have gave the good list of needs for developer to translate to the requirement. The developer tries to interpret the user need. This situation when being performed separately will give different meaning. Several discussions need to be conducted to avoid the issues from happening. Fig. 5 illustrates the frequency level of the fifth stakeholder challenge, conflict with developer.
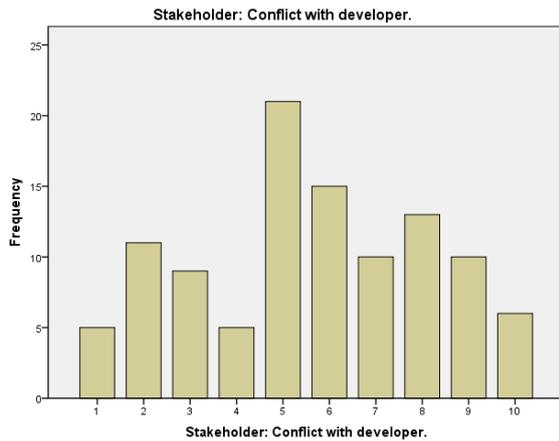

Fig. 5. Conflict with developer.

VI. CONCLUSION

The survey identified five requirements engineering issues and challenges from the stakeholder perspectives. The respondents agree that the problem listed happened all the time for the stakeholder during software project requirement. From the survey conducted it is expected the RE practice for stakeholders shall be defined. The empirical study concluded that there is a communication gap between stakeholder and development. Future works are expected to investigate two categories which are: 1) when the practice suggests implementing all the time during software project requirement; 2) when the RE practice suggests not implementing all the time during software project requirement.

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A. A. Rahman is a lecturer with the Software Engineering Section, Malaysian Institute of Information Technology (MIIT), Universiti Kuala Lumpur, Malaysia. She was born in Kuala Lumpur, Malaysia. A. A. Rahman earned her bachelor of Computer Science in 1998 and masters of Computer Science in specialization in software engineering in 2002 degrees from the University of Malaya, Kuala Lumpur, Malaysia.

She has worked in various university environments. Her job is related to teaching and learning, research, and administration in university. In 1999, she has served Universiti Tun Abdul Razak as a lecturer and head of Software Engineering Department. She continued her career in academic in Open University Malaysia until 2005. Currently, she is working in Universiti Kuala Lumpur, Kuala Lumpur, Malaysia since 2009. Her 14 years'

experience in academic pursuit, also involves research and academic publication national and international level. Her research interests and area of expertise include requirement engineering and management, software process quality and improvement, software quality and process evolution, real-time and embedded system and software engineering.

Ms. Rahman is a member of Malaysian Software Engineering Interest Group (MySEIG).

A. Haron is with the Malaysia Public Sector as the the director of System Development Section at the Department of Survey and Mapping Malaysia, Kuala Lumpur, Malaysia. She is involved with coordination of ICT projects in Malaysia Public Sector. She started services with Public Service Department in 1993 as System Analyst. Her experiences involve the development and management of application system and trainer for Diploma programs. She is also experienced in managing Data Center and Networking. Currently, she is a Ph.D. candidate at the Faculty of Computing, Universiti Teknologi Malaysia (UTM), Malaysia. Her research interest is in the area of requirements engineering.

S. Sahibuddin is a professor with the Advanced Informatics School, Universiti Teknologi Malaysia International Campus, Kuala Lumpur, Malaysia. He is also the dean of Advanced Informatics School. His has produced various publications including journals, papers, monographs, teaching modules and other form of publications. He also joined as a committee member for many conferences and professional membership such as Association of Computing Machinery, ACM SIGGROUP and ACM SIGSOFT to name a few. His research interests are not limited to software engineering, groupware application and software process improvement.

M. Harun is currently the deputy director (ICT) of National Institute of Public Adminstration (INTAN). He has been involved in Malaysia public sector ICT agenda for over 30 years. He obtained a Ph.D. in Computer Science from the University of Loughborough, United Kingdom in 2000, M.Sc. in Computer Science from University of New York (SUNY), USA in 1991 and B.Sc in Computer Science from Universiti Sains Malaysia in 1979.