

The Development and Validation of Interview Protocol Design for Factor Affecting Agile Maintenance Adoption

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Abstract

Qualitative research often been used when there is a problems or issues that need to be explored. The exploration is needed since certain variables are extracted from informants voices based on their experiences in the phenomenon studied. Interviews is one of the data collection approach in qualitative research. Prior to conduct the interview sessions, qualitative researcher need to prepare an interview protocol to facilitate the process. Managing software maintenance requires different knowledge and experience from the practitioners. Despite, the emergence of new method in performing software maintenance processes requires deep understanding from the practitioners. Furthermore, introducing agile methodologies in software maintenance imposed significant impact to software industries. This phenomenon sparks the need to understand the practitioners' thoughts to develop understanding based on their experience. The objective of this study is to refine the previously constructed interview protocol to identify the current practice in agile maintenance and the criteria involved during the selection of agile method. This is to ensure that the protocol is easily understood and covers all research questions and objectives. This study employed the four steps in Interview Protocol Refinement (IPR) framework which is (1) ensure alignment of research questions and interview question, (2) construct inquiry-based conversation, (3) received feedback on interview protocols and (4) interview protocol pilot testing. The IPR framework is a helpful tool in order for researcher to improve the interview protocol reliability and validity. This study presents the design of the interview protocol that was based on the findings from literature review and experts' validation.

Keywords: software maintenance; agile maintenance; qualitative research; interview protocol.

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I. INTRODUCTION

Data collection in qualitative research commonly collected via interviews[1]. Interviews, requires reliable instrument in order to get a high quality of interview data. The reliable instruments which is the interview protocol, is useful for new qualitative researchers to assist them during the data collection phase[2], [3]. The interview

protocol often be a list of questions to be asked together with the opening and closing remarks during the interview process. The opening and closing remark is the script of what should be said before and after the interview session.

Interview as one of the data collection method in qualitative research, are divided into two categories: 1) in-depth interview (IDI), 2) focus

group discussion (FGD)[4], [5]. In our research, IDI was employed as the data collection method. Due to different people have different point of view in performing software maintenance process, IDI would suit this research better. Selected informants can freely express their own opinion regarding the question being asked without being influence by other people.

In empirical software engineering research, the researchers are not only based on technical view, but have to look into non-technical aspect which involved human behaviour[6]. Human behaviour need to be observed in order to gain some meaning to develop understanding in phenomenon studied. In software maintenance, knowledge that lies in each and every practitioners are different. This is because, difference experience will give different perspectives to them. Furthermore, software maintenance activity usually performed by different people which is not involved in initial development of system being changed[7]. Facing these challenges, the newly develop interview protocol need to undergo a refinement process to ensure the questions suits the research objectives and obtained a good quality of data.

This study embarks on qualitative interview as a method of data collection. Creswell in [8] highlight that data collection are series of activities that aimed for information gathering towards answering the research questions. Figure 1 explain the process involved. Recently, qualitative interview have gain significant recognition in empirical software engineering as a method of data collection. This method offer rich information in order to get deeper information from the field[9].



Figure 1 Activities in Data Collection[8]

Qualitative interview can viewed as structured, semi-structured or unstructured as well as individually or with groups[1], [10]. In the pre-develop interview protocol, a semi-structured interview were adopted. This is because of this kind of interview can answer the “why”, “how”, and “what” questions effectively[11]. In this study, we aim to refine the pre-develop interview protocol guided by Interview Protocol Refinement (IPR) framework.

In this study, we aim to refine the pre-develop interview protocol guided by Interview Protocol Refinement (IPR) framework. This interview protocol used as research instrument to conduct a semi-structured interview for data collection to address the factors to be considered for the adoption of agile method in software maintenance. This paper aims to refine the pre-developed interview protocol to address the factors that affecting agile maintenance adoption among software practitioners in Malaysia. Section 2 will provide the information regarding materials and methods involved in this study while Section 3 discuss about the result and discussion through the refinement process. Section 4 concludes this study before embark for data collection in major study.

II. MATERIAL AND METHODS

This study is part of our research to investigate the factors contributing to the adoption of agile

methods in software maintenance process. A qualitative approach was selected since this approach is suitable to describe the phenomenon which is based on human experiences[12], [13]. Previous studies shows that qualitative approach help to understand peoples' experience, opinion and beliefs that cannot be measured statistically[14].

To gather those information from informants, an interview(s) will be conducted. Interview is one of the data collection methods in qualitative research, where through interview, informants can express their feeling, opinion and their experience freely[4], [15]. Rather than words that can be captured during the interview session, the informant body language also can be observed which later can use to strengthen the research findings. Data collections through interviews offer rich and detailed information regarding issues studied[16].

Prior to the data collection, an interview protocol should be establish first. The interview protocol help to facilitate the interview process in a systematic way. The process to develop the interview protocol is based on research question, research objective and literature review. IPR framework used as a guide to refine the pre-develop interview protocol since this framework can support to strengthen the interview protocol reliability[17]. There are four phases involved in IPR framework (IPR) as presented in Figure 2: (1) Ensuring interview questions align with research questions, (2) Constructing an inquiry-based conversation, (3) receiving feedback on interview protocols and (4) Piloting the interview protocol. Details of the processes are explained in the next section.

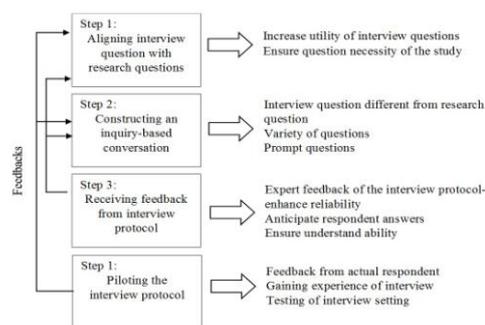


Figure 2 Phases in IPR Framework

A. *Aligning Interview Questions with Research Questions*

The first phase is to ensure the interview questions are aligned with research questions. An interview protocol matrix used to map the questions as shown in Table 1. The interview protocol start with demography information about the respondent. This kind of information is needed in order to know the respondents' background and getting to build a rapport with respondents.

The use of interview protocol matrix help to ensure that all research questions been covered through the interview protocol. More question was developed on the next section which is related to the nature of the software maintenance processes.

Table 1 Interview Protocol Matrix

	Background Information	RQ1: What are the practices in agile maintenance used by software practitioners in Malaysia?	RQ2: What are the criteria in selecting the appropriate Agile method for implementing Agile maintenance?
1. Demography	X		
2. Software Maintenance			
Interview Q1		X	
Interview Q2		X	

Interview Q3		X	
Interview Q4			X
Interview Q5			X
Interview Q6		X	
3.Project Nature			
Interview Q1			X
Interview Q2		X	
Interview Q3		X	
4.Customer Involvement			
Interview Q1			X
Interview Q2			X
5.Project Constraint			
Interview Q1		X	
Interview Q2		X	
Interview Q3		X	
6.Developer Team Skills			
Interview Q1			X
Interview Q2			X
Interview Q3			X
Interview Q4			X
7. Iteration			
Interview Q1			X
Interview Q2		X	
Interview Q3		X	
Interview Q4		X	

B. Constructing an Inquiry-based Conversation

Second phase started by constructing an inquiry-based conversation. The fundamental of this phase is to ensure that the initially developed questions are closed to daily conversation. This is to avoid using academic terms which might not be understood by the respondents. For example, some of the respondents are not aware that agile maintenance is the term being used when adopting one of the agile methodologies in their maintenance process. So, rather than asking them about agile maintenance, change to ask them about current practice in maintaining their agile developed software.

It is also important to establish a good rapport with the respondents earlier in the session. A brief introduction about the research are explained followed by introductory question to attract the respondents' interest.

C. Receiving Feedback on Interview Protocol

The third phase involved getting feedback from experienced lecturers and research committee, as the reviewer, whom familiar with qualitative research and software maintenance processes. Their expertise helped to tailor the interview question in appropriate manner. They will go through all questions, and try to use think aloud technique in order to get some ideas how the answer will contribute to the model later in the stage. For example, the interviewer ask the respondent "Do you facing any problem regarding current software maintenance practice?" the answer is either "yes" or "no" only which not a good sign as we need rich information from them. Then, after pilot testing, the question was modified to "What are the problems encountered based on current maintenance process". This is more beneficial since the respondents will freely talk about the problems they faced rather than giving "yes" or "no" answer.

At the end of the session, the reviewers come out with their feedback and suggestions as the following:

- The interviewer should prepare an explanation for certain terminologies used in the interview protocol since some of the respondents are not familiar with the jargons.
- The interview questionnaires should not be restricted to certain factors only. This is to avoid the interviewer from being tied to particular factors and not able to explore new emergence factors. Be general in

presenting the questions and add more probing question to respondents.

- Do not strict to the sequence of the questions. Be flexible and let the respondents speaks freely.

D. Pilot Test the Interview Protocol

In qualitative research, researchers is the main instrument for data collection, guided with interview protocol to facilitate the session[18]. Researchers need to convey the interview questionnaires in appropriate manner which can be understand by the respondents to get appropriate feedback.

Pilot testing intended to test the newly developed interview protocol, to ensure the instrument will work accordingly in the real environment[19], [20]. It is anticipated that after pilot testing, the researchers need to add some probing questions and remove unnecessary information. Due to different experiences and different knowledge of the respondents, it is important to know how they interpret each questions based on their understanding. Their feedback are important as an input for refining the interview protocol.

Respondents for the pilot testing are selected using purposive sampling technique. They must have an experience in conducting software maintenance projects either it is traditionally developed or agile developed software. The interview was conducted in their organization facility which takes around one hour per session. Prior to start the session, a consent form are presented, as a permission for recording approval.

III. RESULTS AND DISCUSSION

In this study, IPR framework was used as a guide for the interview protocol refinement process. However, there is no standard method for

the refinement process, thus, researchers are advised to tailor their interview protocol according to the research objectives and research requirements. At the end of this study, a reliable interview protocol for data collection been constructed.

The interview protocol was designed based on the findings from literature review. The main and essential factors for agile maintenance adoption were identified as project nature, customer involvement, project constraint, development team skill and process iteration[3], [12], [15], [18]. Each of these factors consist of several related questions to support the identified factor. The breakdown questions or items are as follows: - project nature (4 related questions), customer involvement (2 related questions), project constraint (3 related questions), development team skill (4 related questions) and process iteration (4 related questions). There are 16 related questions in the protocol. In addition, there are 6 questions associated with software maintenance in general.

Before going for real interview session, this protocol is validated by experts to ensure the reliability and suitability of the questions. This is the third phase according to IPR framework. Two of the experts are from industry related and another two were lecturers that experience in software maintenance and qualitative research. The criteria for expert selection is based on academic degree, position, area of research interest, academic and practical experience[21].

The expert panel from industry give their input based on real process that happen within the software maintenance project they involved. The suitability of the question are tailored to ensure the correct data can be extract during the real data collection. Some of the questions need to be modified according to their common term being used and there are some questions discarded.

The pilot interview was also conducted with respondent from industry selected. They have experience in software maintenance and also involve in practising agile methodologies in their projects. Input from pilot interview used to improvised the structure of the interview protocol and lesson learnt obtained really help for the next data collection. For example, during the interview session, the respondent will throw their words freely and it is identified that they already answer the question that not being ask yet. It is either do not ask the question again or just verified what they have said once we reach to the question later. During the pilot interview, we also discover that, we cannot really stick to the interview protocol, but need to be more flexible when piloting the process.

IV. CONCLUSIONS

Adoption of agile method in software maintenance processes requires relevant experiences from the software practitioners. Literally, they involved in various software maintenance project as well as software development project. Each project will have different criteria such as organizational budget, available of the resources, skills owned by the maintenance team and also knowledge of team. For example, the skills and knowledges owned by them is important to select the most appropriate methodologies available.

Data collection in qualitative research requires lots of effort from the researcher. Starting from the development of initial interview protocol until pilot testing, then only field data collection can be done. This is to ensure the reliability of the interview protocol for data collection is being constructed. IPR framework is used as a guide to refine the newly developed interview protocol for this research.

During the interview protocol refinement process, it is anticipated that there will be some amendment need to be done. For this study, a lots of information received during step three of interview refinement protocol. The experts' feedback really help to enhance the reliability of the questions. It is anticipated that each answer from informants supposed to give significant contribution during the development of the selection model in main study. After receiving the feedback, researcher need to do the correction and made an amendment as required by the experts. This step will ensure the development of the interview questions will align with the research question.

The refinement process then continue with pilot study phase, for the revised interview protocol questions. This process started once the expert panel are agree with the correction made from previous feedback. In this study, pilot study has been done with two respondents from industry. They have experience in maintaining agile projects as well as agile software development. During the pilot study with the respondent, we found out that we cannot strictly follow the sequence of the questions planned. This is due to the respondents freely speak what they have in mind based on their personal experience for the related phenomenon. Basically they understand the question but when they answer, they elaborate further and answer the next question without noticing it.

The pilot study went well in this interview protocol refinement process. The expert panels give their feedback especially for some terminology that been used in industry which is somehow have some contradiction with what has been used by researcher. As the researcher, the pilot study really helpful in order to ensure the time consume for each interview and how to deliver the questions in the way that understood by

the respondent. This pilot study also help researcher to plan what to say accordingly and control the situation to be more efficient, and get valuable data for the main research.

This study was carried out with the purpose to validate the newly developed interview protocol using IPR framework. For future work, the collected interview data will be analysed and used as the input for the proposed agile maintenance model.

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