

Selecting elicitation technique on requirements elicitation process: A case study on education application for children

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Abstract. Children's educational applications are designed to help children in the learning process; thus, direct child involvement in elicitation process helps to achieve learning objectives. Failure in the requirements elicitation stage may lead to undefined user requirements for the application affecting the quality and usability of the developed software. Failure in requirements elicitation occurs because the user is not directly involved in the application. It is also caused by the lack of the elicitation team's knowledge in selecting elicitation techniques that match the characteristics of users, where children have different characteristics with adults and parents. Communication in exploring the needs of users is closely related to elicitation techniques selection. Selection of elicitation techniques that are inconsistent with children's characteristics can lead to failure in exploring the children's needs for children educational application. The results of questionnaires and interview with the application developers show that the prototype and interview techniques are the techniques most suitable in the elicitation process involving children as respondents because these methods are suitable for the child characteristics and the short elicitation time required in the application development.

1. Introduction

Requirements elicitation is an initial and crucial stage in requirements engineering [1],[2],[3]. Failure in the requirements elicitation stage may lead to undefined user requirements for the application properly, which affects the quality and usability of the resulting software [3]. It will also affect children's education applications, where no involvement of the children in the elicitation process can lead to building applications that do not meet the needs of the child's developmental age [4]. Based on interviews with developers and literature review, current application developers tend to explore only the needs of the teachers and parents [5], [6]. The user-centered design states that users' involvement helps to define the need for the users of the application [7]. Failures in other requirements elicitation occur due to lack of knowledge of elicitation teams in communication caused by the limitations in choosing elicitation techniques [8], [9], even though there are 15 techniques of requirements elicitation that have been implemented widely [10]. Both of these factors have a close relationship to the type of users as the respondents. Piaget states that children have different characteristics with adults and parents both in communication and learning process [11]. The selection of elicitation techniques that are not suitable with the characteristics of children can lead to the failure of the process of extracting the child's needs and causing the child education application that is built do not achieve the purpose of the learning process [3]. Hence, it is essential to select a proper elicitation technique that is suitable for the



characteristics of the child's developmental age so that his needs on the application can be well defined. This research aimed to select the proper elicitation technique that is suitable for both of the children characteristics as the respondents and the knowledge of the development team of a children education application. The selection of the proper technique was expected to involve the children directly, and the developer team considers the required time for developing the product and its ability.

2. Methods

The methods used in this research were an interview and giving questionnaire regarding factors and attributes in elicitation election technique. The interview was conducted to explore the developers' knowledge when selecting elicitation techniques and the selection process. Meanwhile, the questionnaire was used to verify and validate the selection of elicitation techniques using the factors and attributes developed in Dante et al. [10] study. Two types of questionnaires were used to explore existing elicitation techniques from developers. The first questionnaire contained factors and attributes with a certain value, where the values were adjusted for each attribute. The purpose of the first questionnaire was to know the value of every attribute of each factor to the elicitation process. The second questionnaire contained factors and attributes containing values according to the first questionnaire combined with 15 widely used elicitation techniques [10]. The second questionnaire used three types of values, which were recommended (V) means the technique is adequate for this attribute value, not recommended (X) that means technique is indifferent to the attribute value in question, and indifferent (-) is the technique has a low adequacy level for the attribute value in question. The second questionnaire was made to obtain the value of adequacy as one of the references in obtaining the appropriate elicitation techniques used. The results of the first and second questionnaires were then processed using statistical analysis to find out which technique had the highest mean value; thus, selecting the most suitable technique to be implemented in the elicitation process involving the child directly as a respondent.

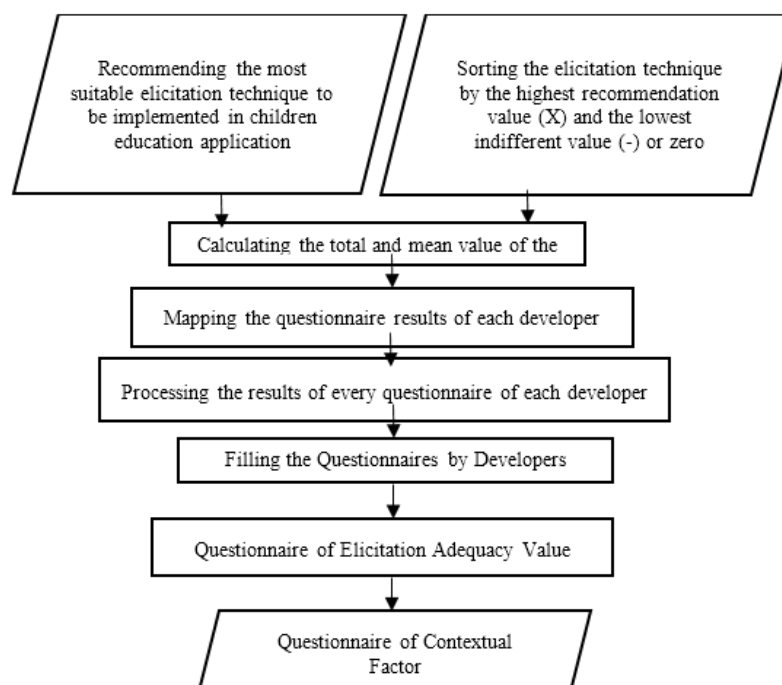


Figure 1. Flowchart of recommending the elicitation technique.

Figure 1 displays the flowchart of recommending the most suitable elicitation technique to be implemented in children education application.

3. Analysis and results

The samples used in this study were the developers of children education application in Indonesia based on the reference from Tech in Asia Indonesia (id.techinasia.com). The case study used in this study was the children education application in Indonesia. Based on the data from the Statistics Indonesia, the projection of child application market in Indonesia in 2015 reached more than 69 million or approximately 27% of the total population of Indonesia [12]. This is a great potential for children education app developers and the challenge is how to present apps that match the child's interaction behavior. Children have different interaction behaviors in accomplishing their tasks and this is affected by their age of development [13]. Therefore, involving children directly in the eliciting process is necessary.

The process of interviewing the developers was done to find out the extent of elicitation and involvement of children in elicitation. Questions given in the interviewing process were related to several things, including (i) whether the developer doing an elicitation stage, (ii) whether the developer has a special elicitation team, (iii) the elicitation technique used, (iv) involvement of children as respondents in the elicitation process, and (vi) the elicitation process. Interview and prototype techniques were the most preferred in the elicitation process. Interview technique is widely used because the respondents usually are teachers and parents, not the children. Teachers and parents are involved because that they are thought to have a reasonable understanding of children's behavior during learning. The interview technique is also preferred because it is considered quicker and more accurate. However, some developers who have had previous child education application products tended to use prototype techniques to explore the needs of the child directly. The prototype used tends to be from the previous application that has been created. Another reason the developers do not involve children was that they do not have a special elicitation team, especially those who can communicate with children. Besides, the targeted short development time makes the involvement of children was not preferred by some developers.

The developers also filled out questionnaires related to the contextual situation factors in choosing the requirements elicitation technique and measuring the adequacy value of each elicitation technique on the contextual situation factors. The measurement of adequacy value used the second questionnaire containing all 15 elicitation techniques commonly used in the first questionnaire. Then the results of the second questionnaire for each developer were analyzed based on the number of occurrence of a value. If the same values were found, then the appropriate value was determined based on the results of interviews with the developers. Table 1 shows the adequacy value of two of the factors based on developers' assessment.

Table 1. Adequacy value of two contextual factor on the elicitation techniques.

Factor	Attribute	Value	Interview Technique	Questionnaire Technique	Prototyping Technique	Observation Technique	Brainstormings Technique	Ethnography Technique	Joint Application Design (JAD) Technique	Task Analysis Technique	Domain Analysis Technique	Inspection Technique	Card Sorting Technique	Laddering Technique	Group works Technique	Scenarios Technique	Viewpoints Technique	Repertory Grids Technique
Elicitor	Training in elicitation techniques	High	V	V	V	V	X	-	X	V	V	-	-	V	V	V	-	-
		Low	V	V	V	V	V	-	X	V	V	-	V	V	X	V	X	-
		Zero	V	V	V	V	V	-	-	V	V	-	V	V	-	V	X	-

Table 1.Cont.

Elicitation experience	High	V	V	V	V	V	-	V	X	V	V	-	-	X	X	X	-
	Mediu	V	X	V	V	V	V	-	V	V	-	-	-	V	V	-	-
	Low	X	V	X	X	V	V	V	V	V	V	V	-	X	-	-	-
	High	V	X	V	V	X	X	-	X	-	-	X	X	X	X	X	X
	Low	V	V	V	V	V	-	X	V	X	-	-	-	X	X	X	-
	Experience	Zero	X	X	X	X	V	-	V	V	-	V	V	X	X	X	V
	with domain	High	V	X	X	V	V	X	-	X	-	X	-	X	X	V	-
	Number	Low	X	V	X	X	V	X	-	X	-	X	-	X	X	-	X
		Zero	X	X	V	V	X	X	-	V	-	-	-	X	X	X	-
	Project time	High	V	V	V	V	V	X	X	X	X	X	X	X	X	X	X
	constraint	Mediu	V	V	V	V	V	-	X	-	V	X	-	-	X	X	X
	on process	Low	X	X	V	X	V	X	V	V	V	V	V	V	V	V	V
Process time	Start	V	V	V	V	V	-	V	X	V	X	X	X	X	V	X	-
	Middle	X	X	V	X	V	-	V	V	X	X	V	V	V	X	-	-
	End	X	X	X	X	X	-	X	X	X	V	X	X	X	V	X	X

Table 2. Mapping results of one developer.

Adequacy Value	Joint Application Design (JAD) Technique															
	Repertory Grids Technique	Viewpoints Technique	Scenarios Technique	Group works Technique	Laddering Technique	Card Sorting Technique	Introspection Technique	Domain Analysis Technique	Task Analysis Technique	Ethnography Technique	Brainstorming Technique	Observation Technique	Prototyping Technique	Questionnaire Technique	Interview Technique	
V	11	8	14	12	11	1	2	6	9	0	3	1	7	12	1	0
X	5	8	2	4	5	6	6	5	5	6	5	2	9	4	3	0
-	0	0	0	0	0	9	8	5	2	10	8	13	0	0	12	16

Table 3. Results of analyzing the elicitation technique recommendation.

Elicitation Technique	V	X	Developer's View
Prototyping Technique	13,4	2,6	5
Interview Technique	11,25	4,75	5
Observation Technique	11	5	3
Brainstorming Technique	10,8	5,2	1
Scenarios Technique	10,2	5,8	0
Questionnaire Technique	8,5	7,5	1
Group works Technique	5,25	10,75	0

The mapping results of each developer were then summed according to the value of each adequacy value for every elicitation technique. An example of the results of one of the developers can be seen in table 2. After the total values were obtained, the most suitable technique was chosen by sorting the highest recommendation value (V) and the lowest indifferent (-) value of every elicitation technique. If similar results were obtained, then they were sorted using the least recommendation value (X). The results of data processing from the five developers in table 3 illustrate the average value of each elicitation technique. As can be seen in table 3, the most suitable techniques used when involving children directly as respondents in the requirements elicitation process were **prototype** and **interview techniques**. Both elicitation techniques could be used effectively in exploring user needs, especially for new needs [14], [15], [16]. The prototype technique can bridge the children's abstract thinking, and it has been familiarly used by developers [17]. The interview technique is also appropriate because it enables the developer to communicate directly with the child and it can be simultaneously combined with prototype techniques to obtain clear and complete information [18]. The interview technique also adopts human social activities that are inherently informal, and the effectiveness relies on the quality of interaction between each participant [19]. Combination of elicitation techniques is needed to get the needs clearly with consideration of the situation [20]. Observation technique also had a value that was nearly similar to the value of interview technique, but this technique is not suitable for elicitation process of children education application because it requires a long time [10] that is in contrast with the targeted short application time.

4. Conclusion

Based on the results of interviews and questionnaires conducted on five application developers, the elicitation techniques that were recommended for children education applications were prototype and interview techniques. Both techniques also had the highest recommendation by the developers as the most suitable elicitation techniques when involving children directly as respondents. The developers' perspective were adjusted to the team's knowledge of elicitation and the time required for application development. In addition, the language in the interview technique can be adjusted to children developmental age. The instruments used in both prototype and interview techniques should be considered to make an appropriate elicitation process with the children. Future work will design the instruments for both techniques to be implemented in elicitation on children education application.

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