

# Designing Mobile Application Interaction for School Internal Communication Using User-centered Design

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**Abstract**—In order to fastened up the process, the school internal communication system has been changed from its conventional way using linking book and announcement letter, to messaging groups or mobile applications. This was done to create a good communication between teachers and parents for their children. But parent capability on using mobile application has been causing problems. In this paper, we present the result of our observation for the current school internal communication system problem and made the better solution. To make sure the application design matches with parent's capability, the user-centered design method is applied. The final result of this study is a high-fidelity prototype of the application for parent side built using Sketch tools. The usability testing has been done to student parents. Based on the test result, this prototype has a good interaction, user-friendly interface for parents, and also already fulfills the usability goal and the user experience.

**Index Terms**—Interaction, Parents, Prototype, User-Centered Design

## I. INTRODUCTION

The growth of technology and its innovations have contributed to improve communication in any fields, including education. In education field, the good communication between parents and teacher is needed to contribute on student success [1]. According to Ramirez, integrating technology can help schools more quickly communicate information to parents [7]. No wonder every school tries to find the best internal communication system, including trying to use technology which is mobile application. Several school use group feature in mobile messaging apps or google classroom apps. For group mobile messaging they usually use WhatsApp, the common text messaging application to spread the information. Google classroom is a classroom management apps that developed by Google. This application is actually only can access by teacher and student. Parent can access it by sign in with their child account. That its causing a several problem and limitation for parents.

User-centered design (UCD) is a method that used to develop product and make sure the product meets the user needs [2]. UCD focusing user in their development from observation, analyzing, designing, testing, and evaluating and iteration usually occurs. Because of this method involving user in every step, there is the big chance that the design is right solution for user problems and user will use it in daily basis.

Observation has been done and shows that there are problems faced by parents. The major problem is they had difficulty to get their children school information easily and quickly in detail. Either parents can't access the application cause of their ability, parents just missed the information cause of their own job, or parents lost the information resources. Another problem is parents find it's hard to talk to teacher and parents it's hard to differentiate their children activity. As a result of this problem, parents will not be able to supervise and accompany their children learning process at home.

Based on the problem that found from parents, in particular when trying to get information from school, we will make a mobile application prototype as a solution by using user-centered design method. This method is chosen because from the previous research the proposed design result from user-centered design method have been accepted and rated well by their users [8,9]. The process and the design results with the evaluation are described in the next section of this paper.

## II. THEORIES

### A. Usability Goals

Usability goals are quality attribute that can measure how easy the apps are to use for their user [3]. There are six usability goals; effective, efficient, safe to use, having good utility, easy to use, and easy to learn.

### B. User Experience

User experience is how the product behave to the user or how the product being used by their user [4]. User experience also can define as user feeling and reaction while using the apps.

### C. User-centered Design

User-centered Design (UCD) is a method that used in product development that makes the product based in user needs [2]. Includes 5 stages, which was used in this study: (1) Defining the scope, (2) Analyzing the problem, (3) Design content solution, (4) Design and implementation, (5) Testing and evaluation.

Iteration in UCD is occurs in step number four and five. While the result from the evaluation shows the prototype not good enough, the prototype must be revised. The iteration stopped when the test result shown that the prototype already fulfilled usability and user experience goals.

## III. PROPOSED METHOD

In this study, user-centered design approach was used. This approach chosen because we want to make suitable solution for the user which are parents who has various problems, needs, behaviors, and goals. By using this approach, we can focus on users and involve user in every step on the development.

### A. Defined Scope

In this step, we define the users of the application. Users for this study quite diverse, but the users must have at least one child that go to school. Realizing the target user from this study is parent, so we only make the design of application for parent side not for teacher side.

### B. User Research

User research is done to gain information and insight from user. Two methods being used in this research which are questionnaire and interview. By questionnaire method, we get the quantitative data. Not only that, some of the question collect profile, preferences, needs, and user insights. This questionnaire got 96 respondents. Interview method also done to get qualitative data. By this method, we get the answer more detail and can dig deeper from user answers. The interview has been done to 9 respondents. After obtaining users data through questionnaire and interview, we did an in-depth analysis from the results.

### C. User Problem and Goals

Based on the user research, we analyze and conclude user problems. There are 9 problems which are parents can't meet their child to get school information, child didn't tell complete information

from school to teacher, parents hesitate to speak at online messaging group, there is no communication room between parent and specific subject teacher, parent found lot of difficulties using Google Classroom, often forget school information, miss important school information because of parent busy life, lost information resource provided by school, and it's hard for parent to differentiate several child school information.

From the user problems, we can construct and define the user goals as the basis for designing solution in this study. There are 6 user goals; (1) knowing detailed task information, (2) knowing detailed test information, (3) knowing detailed school event information, (4) aware of each info when it comes to deadline, (5) have conversation with homeroom and subject teacher, and (6) distinguish school information for every child.

### D. Persona

Persona is user models that represented as specific, individual human beings. They are not actual people but the fictional data derived from the observation facts. Persona, like any models, must be based on real-world observation [5]. There are two types of persona in this study. The first one is a 36-year old workaholic woman named Nurul who has 2 children who wants to get school information without seeing her children and get notify when it comes to deadline. Because of their daily activity at work, she is familiar with using mobile application. The second one is a 53-year old man named Yanto who has 1 child in junior high school. He only use mobile phone if it is really needed and usually left or delete an application if it is too complicated for him to use. The first persona was defined as the main persona as this persona represented the largest percentage of target users.

### E. Usability Goals and User Experience Goals

To develop prototype that solve the user problem, we must define suited usability goals and user experience goals for school internal communication apps. The prototype design will be made based on this goal. The usability goals that chosen are: (1) Effective, the school internal communication apps able to give all information from school, (2) Easy to learn, the school internal communication apps should be easily learned by every parent, (3) Easy to use, the school internal communication apps should be easily used every time user want to use.

The user experience goal that chosen are: (1) Helpful, users should feel helped when using the school internal communication apps, (2) Satisfying, users should feel satisfied by the information shown and all the features given by the school internal communication apps.

F. Feature Analysis

The feature that designed for the school internal communication apps must support and help user to achieve their goals. There are several features proposed that will help user achieve their goals. Each feature is a proposed solution to support each user goals and the feature is grouped into three feature group. After the feature group defined, we choose the usability goals and user experience goal for each group. Mapping of the user goal to proposed solution is on Table I.

TABLE I. PROPOSED SOLUTION AND FEATURE

User Goal	Proposed Solution	Feature Group	Usability Goal & User Experience
1	List of school task, Detail information for each task	Child School Activity List	Effective, Easy to use, Helpful, Satisfying
2	List of school test/remedial, Detail information for each test/remedial		
3	List of school event, Detail information that need to be prepared for school event		
4	Reminder or push notification when the deadline come	Teacher Conversation Room	Effective, Helpful, Satisfying
5	Provide communication line with homeclass teacher, provide communication line with all subject teachers.		
6	Separate each child profile, Display school information for each child seperately	Split Children Activity List	Effective, Easy to learn, Helpful

IV. PROTOTYPE DESIGN AND IMPLEMENTATION

Prototype is the initial model that describing and visualizing a product. Prototype is used to show product concept before they are built by developer. User-centered design process emphasizes the use of prototype so we can take users feedback before implementing the product. This study uses two type of prototypes which are low-fidelity and high-fidelity prototype. Prototype design will be done repeatedly until it fulfilled all defined goals. Before designing prototype, we designed the concept of the prototype first including, information architecture, navigation design, and visual design.

A. Low-fidelity Prototype

Low-fidelity prototype is uncompleted prototype that not have all interaction with black-and-white colors but already can visualize the content and the interaction of the application to users [10]. The low-fidelity prototype was developed using Sketch. We designed the interface of prototype based on several design principles such as visual hierarchy, consistency, direct manipulation, metaphors, and

feedback [6]. The design is also made by considering several things which are usability strength and weaknesses of existing application that have been analyzed previously. Figure 1, 2, and 3 show the initial idea of the design for every feature that will be implemented in the high-fidelity prototype.

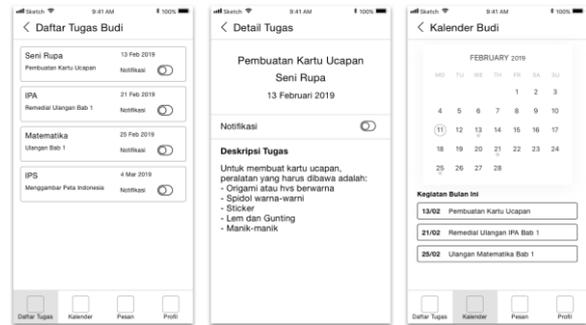


Fig. 1. Child School Activity List on Low-fidelity Prototype

Consistency was tried to be applied when designing this prototype. With consistency, we help users to easily learning every page. To maintain the consistency, every main page has a title at the top and navigation bar at the bottom. At the middle is the main information that will show base on the chosen menu at navigation bar. This consistency thing supported by the chosen navigation model, hub and spoke that shown by navigation bar. Hub and spoke with navigation bar is commonly used by mobile application.

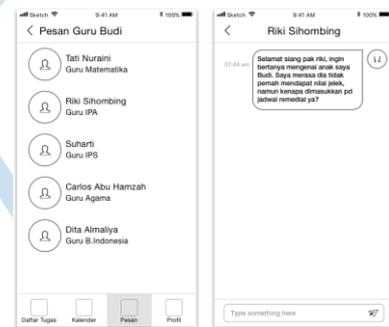


Fig. 2. Teacher Conv. Room on Low-fidelity Prototype

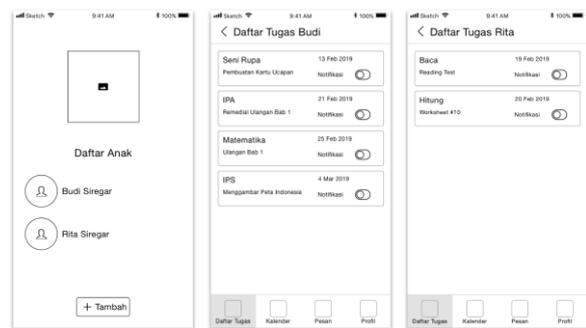


Fig. 3. Split Children Activity List on Low-fidelity Prototype

B. High-fidelity Prototype

High-fidelity prototype is complete version of this design which include color, image, and interaction [10]. High-fidelity prototype for school internal communication is the main result of this study. The high-fidelity prototype was developed using Sketch and can be access from Sketch Cloud.

The element of color, image, and other basic design element has been added in this prototype. In this study, we have two version of high-fidelity prototype. First one is high-fidelity prototype based on the improvement of the low-fidelity prototype. Second one is high-fidelity prototype based on the improvement from the iteration and has been declared as the final prototype.

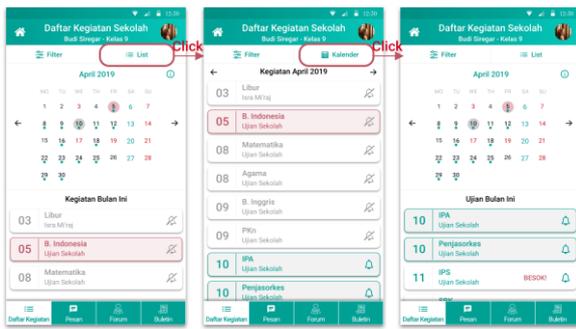


Fig. 4. Teacher Conv. Room on Low-fidelity Prototype

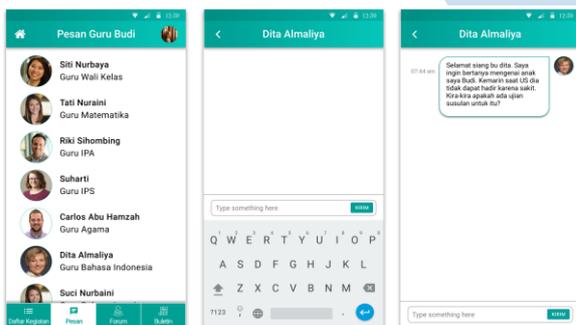


Fig. 5. Teacher Conv. Room on High-fidelity Prototype

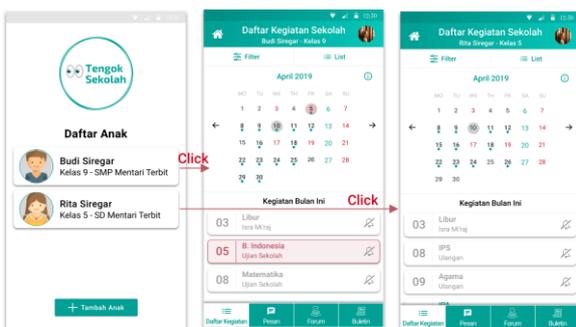


Fig. 6. Split Child Activity Task on High-fidelity Prototype

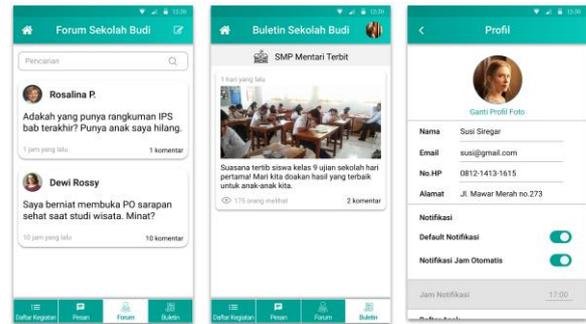


Fig. 7. High-fidelity Prototype (a) Discussion Forum, (b) School Bulletin, (c) Profile

Figure 4 until 7 shows the final high-fidelity prototype of school internal communication apps. This prototype was an improvement from the last iteration. Usability testing has been done for this final prototype.

Figure 4 shows the child school list feature. This feature contains the main page that shows child activity for one month with calendar. If users only want to see the list, they can hide the calendar. This feature offering a filter for user so they can see some categorize activity easily; task, test, school event, etc. By clicking the activity card users can open activity detail page that show activity name, description, deadline, subject, and teacher of the subject.

Figure 5 shows the teacher conversation room feature. This feature contains two main page which are the teacher list page and chatroom page. By clicking the teacher name card, user will open the chatroom for that teacher.

Figure 6 shows the split child activity feature. This feature contains child list page and add more child page. Child list page is the first page that will user see after sign in. They must choose one child that they want to see the activity. After clicking the child name card, the child school activity will show based on the name their chosen.

Figure 7 shows the addition feature from the last iteration which are discussion forum and school bulletin. The profile page is the additional page for parent to manage their account and information.

V. TESTING AND EVALUATION

For test and evaluate the prototype, we used usability testing method. Usability had been done several times and iteratively. Figure 8 shows the flow of the testing and evaluation process. We did usability testing three times, one time for evaluating the low-fidelity prototype and two times for evaluating the high-fidelity prototype. At that time, the prototype already fulfilled all the defined usability goals and user experience goals.

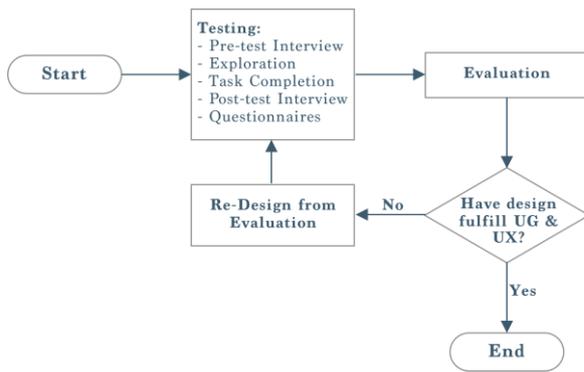


Fig. 8. Testing and Evaluation Flowchart

Respondent for the usability testing were chosen to suit the characteristics of the personas. The first and second iteration were tested on 10 respondents: 5 persona 1 and persona 2 for first iteration and 7 persona 1 and 3 persona 2 respondents for second iteration. The final iteration was tested on 12 respondents: 8 persona 1 and 4 persona 2 respondents. For further observation, every usability testing conducted was recorded. The usability testing phase was divided into 5 stages.

#### A. Pre-test Interview

The test begins by introducing and informing respondent about the research and purpose of this usability testing. Then followed by start to asking the pre-test question which explores about respondent demography, habits, and abilities related to mobile application. The interview also consists of question related to current school internal communication and problem they faced, and what they think of existing school internal communication system.

#### B. Exploration

After the pre-test interview, respondent was give the prototype to be explored. Respondent is given around three minutes to perform any activity with the prototype. This exploration is done to give respondent knowledge about prototype without given instructions.

#### C. Task completion

After the exploration, respondent are given several tasks to be finished. The purpose of the task is given at this test is to evaluate whether the users understand the flow, the objective of every element, and also the information given on prototype. The tasks were made based on feature and the user goals that want to be achieved. There are nine tasks defined for this phase, the tasks are:

- 1) See list of activity
- 2) Use filter to see activity
- 3) See detail of a task
- 4) Sent a subject teacher a message

- 5) Add topic at discussion forum
- 6) See school bulletin
- 7) Turn reminder/notification off
- 8) Change child activity list
- 9) Add another child

The result show that majority of the respondents perform all of the tasks successfully without any difficulty. The respondent also understands all of the elements implemented in the prototype except for several respondents that categorize in persona 2 who are novice users.

#### D. Post-test Interview

After the task completion, there is post-test interview. The questions were made to gain respondent feedback after using the prototype. Each question is designed to explore the respondent overall insight through the use of prototype. The question that been asked include how respondent views the prototype, what user likes and dislikes, what respondent need for further feature, and what improvement can be done.

#### E. Questionnaires

Questionnaire is given to respondent in order to get the quantitative data from respondents. The questionnaire used a 5-scale Likert scale technique. Rate 5 represent the best value and rate 1 represent the worst value. The questions of the questionnaire being asked to gather information whether the usability goals and user experience goals have been reached. Table II shows the results of the questionnaire from the final iteration.

TABLE II. QUESTIONNAIRE RESULTS

Parameters	Achievements		Response				
	Usability Goals	User Experience	5	4	3	2	1
General opinion	Easy to use		10	2			
User interface	Easy to use	Satisfying	11	1			
User experience	Easy to use	Satisfying	6	6			
Usability of activity list	Easy to use	Helpful	12				
Usability of teacher conv. room	Easy to use	Helpful	9	3			
Usability of split child task	Easy to learn	Helpful	9	3			
Easy to use	Easy to use		5	4	3		
Easy to learn	Easy to learn		5	4	3		
Information utility	Effective		10	2			
User satisfaction		Satisfying	9	3			

From the results we calculate the average score for every usability goals and user experience. The average score for usability goal easy to use is 94%, easy to learn is 89%, effective is 96% and user experience helpful is 96%, satisfying is 94%. That percentage all above 80% and all users agree that the prototype fulfills usability goals and user experience goals. The prototype also solved all of the problems observed in the school internal communication as well.

## VI. CONCLUSION AND FUTURE WORK

The suitable usability goals for parents in school internal communication apps are easy to use, easy to learn, effective. In addition, the suitable user experience for parent is helpful and satisfying. The proposed design for school internal communication apps based on those goal had been achieved and accepted by users. All users agree that the is easy to use, easy to learn, effective, helpful, and satisfying.

For future work and development, the prototype can be implemented as a software and teacher side application for school internal communication should be designed and implemented too. The user-centered approach proofed to be great for making good application and should to be used for future development.

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