

Understanding mobile application development and implementation to monitor *Posyandu* data in Indonesia: a 3-years hybrid action research to build "a bridge" from community to national use

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Abstract

Background. There is little evidence available to better understand how mobile health application technology on mother and child health is designed. This study aimed: (a) to explore community health worker (CHW)/cadre and mothers' activities information related with *Posyandu*, as well as inputs and feedbacks in developing the *Posyandu* mobile application, (b) to compare between training and implementation phases of the application, (c) and to see the potential use of the *Posyandu* mobile application in the country.

Method. Using a hybrid method in which the action research principles and qualitative-quantitative methods were synergistically combined for the end users. The study was conducted in Pasawahan sub-district, Purwakarta, Indonesia from 2017 to 2019. Content analysis, coding and categorizing were done using NVivo 12 Pro for the transcribed data. Wilcoxon Test (2018 and 2019) was conducted using STATA 15 Special Edition.

Results. (1) the use of CHW notebook for data entry in *Posyandu* information system book made a long delay in the data reporting process, thus, the development of mobile application would be necessary, (2) there were significant differences of CHW's knowledge ($p=0.000$) and skills ($p=0.0097$) on training (2018) and *Posyandu* phases (2019), (3) As many as 964 *posyandu* are registered to *Posyandu* mobile application from almost all provinces in Indonesia.

Conclusions. The 3-years hybrid approach suggests the crucial phases to build a mobile application in a more user-friendly manner that can replace the CHW's old-fashion book use, and that it is promising for national use.

Background

The mobile health application technology practice in the health sector has been applied for public use and generate more effective improvement (1, 2). However, its application may be complex due to the issue of practicability among the community health worker (CHW)/cadre of mother child health (MCH) services in the Indonesian setting, known as the integrated service post or *Posyandu* (2). A qualitative action research can be implemented to explore the plausibility of an android-based health application and continued with its development (3, 4). Recent systematic reviews suggest little evidence to better understand how mobile health application tool is designed using the qualitative approach in order to enable performance of the CHW in community-based mother and child health services (5-8).

A qualitative approach in action research is crucial to construct a foundation evidence to design an android-based application. It is conducted to explore the information on how to adjust and prepare the acceptability of the CHWs and mothers to the practice of new intervention where technical problems such as mobile network overage, internet access and maintenance of the gadget may be challenging (9). To adjust the CHWs' work into a new improvement, understanding the principal to the technical scope of ideas from the previous activities in running *Posyandu* is important. The *Posyandu* activities consist of 5

categories: registration, height and weight measurement, documentation, education and healthcare (family planning, immunization). Based on the activities, *Posyandu* is divided into four levels, named in order, as follows: *Pratama* (performance of 5 *Posyandu* activities by less than 5 CHWs in an irregular recurring interval), *Madya* (consists of *Pratama* + more than 8 times of activities performance per year), *Purnama* (consists of *Madya* + independent community-fund with less than 50% participants) and *Mandiri* (consists of *Purnama* + more than 50% participants). During the registration, a national report form called the *Posyandu* Information System (PIS) book provided by the Ministry of Home Affairs has to be filled by the CHWs and supervised by a village midwife. However, a long queue arises as another problem because the CHWs need to find mothers' and children's names in order to fill in the PIS book (10).

To adjust with the time constraint, the CHWs found an idea to write the mothers' and children's names and data in a book for a temporary purpose prior to rewriting them into a monthly and yearly national report format. Later, after the *Posyandu* activities, they open the PIS book and enter the data. However, the CHWs' time is limited due to the family time while data entry and report is time consuming. Preparing a new intervention to support the CHW is done by exploring the CHW's point of view on their habits in running *Posyandu* and designing the intervention. This is important because the CHWs have a main role to connect between the community and national level through the healthcare providers in the Public Health Centres (PHC) that are distributed across the country (11). In *Bahasa* Indonesia, the term PHC is referred to as *Puskesmas*. The CHWs have to provide a monthly report to link between the community condition and *Puskesmas*' policy to decide the budget for the community health programs.

Scaling up the CHWs' capability and supporting their data monitoring and reporting or evaluation within a flexible time to fulfil their role is a main factor for sustaining the program in *Posyandu* (11). There are many mobile technologies for health that are implemented amongst low- and middle-income country. Then, identifying the key obstacles in its implementation is a continuing process (12). Monthly report on the data extracted from the *Posyandu* Information System (PIS), namely those related to the comprising nutrition data of infants to children under 5 years old, mother pregnancy, post-partum data include exclusive breastfeeding data and couple in reproductive age, is required for *Puskesmas* midwife. In this study, the PIS design on the intervention to ease the data entry and reporting works was conducted based on the information acquired from the CHWs and mothers.

There are many strategies that can be done to increase the participation of mothers to come to *Posyandu*, such as data monitoring of the nutrition status of babies and children under 5 years old, immunization status including pregnancy mothers data, nutrition counselling by the CHW to control MCH programs, and emphasizing the benefits of *Posyandu* (10, 13). Data documentation and report are important to store the data, which can be a basis of the evidence-based strategies and their effectiveness evaluation for *Posyandu*. It can help *Puskesmas* and village office to allocate necessary budget to improve the existing prevention program in a manner that will give the feedback for the results of each program. In a recent literature review, measuring the effectiveness of the MCH prevention intervention by the CHWs is a very important step for MCH program of a country (14).

Data documentation and report by the CHWs in *Posyandu* has been problematic in Indonesia because of many activities that are handled by the CHWs such as inviting mothers and their children or babies, sweeping them when they are not coming to *Posyandu*, communicating with sub-village and religious leaders in order to influence every households to build a community engagement to bring mothers and children to *Posyandu*. After asking the participation of mothers and children/babies, the CHWs would manage the registration in *Posyandu*, measure weight and height data of the babies and children, document the data, educate mothers and refer them and their babies to the village midwife for an immunization appointment. The intervention regarding data documentation and report that is fit with the emerging problems in *Posyandu* require a key problem identification to be the basis of an initiation to work in developing solutions. This study aimed: (a) to explore community health worker (CHW) and mothers' activities information related with *Posyandu*, as well as the inputs and feedbacks in developing the *Posyandu* mobile application, (b) to compare between training and implementation phases of the application, (c) and to see the potential use of the *Posyandu* mobile application in the country.

Method

Action research is a research comprising of a stepwise development which begins with an assessment to identify initial ideas, implementation, and feedback for improving the ideas. The steps after the improved ideas are improved implementation, more feedback and subsequent steps are repeating so forth. In this case, the initial ideas need to fit with the needs of certain community to prepare an implementation/intervention to help the CHWs in making report of *Posyandu* data. The information is important to develop a plan to design an intervention starting from the initial blueprint and should be presented to the community in order to create an improvement such as the intervention design and further action steps in delivering the intervention. The ideas and intervention are also required to prepare for the advocacy to relevant stakeholders e.g. government and or private sectors. The combination of action research principles, qualitative and quantitative (hybrid approach) methods are synergistically applied for end users, in this case, the CHWs and mothers, in 8 phases: (1) Analysing and understanding users' activities which refer to a process of exploring their activities in *Posyandu*, (2) Making a prototype design on paper, (3) Evaluating the design with the users by presenting and discussing it. Any feedback is correction for step 2, then proceed to step 3, (4) Designing the prototype, (5) Creating a dynamic design prototype or a dynamic design that is a programmed with planned features but still not in the executed form, (6) Evaluating design with the users to decrease miscommunication, (7) Evaluating the executed prototype and the coded version, and (8) implementing the final version of the user interface. User interface design is an activity to ensure that good user interface program design is complimented with good quality of program. The initial action research is conducted in qualitative approach because the community insights have to be developed after the observation of information. Thus, the intervention can fulfil the needs in the community. In phases 1 to 3 the qualitative design was used for phase 4-5. Then in phase 6 to 8, the mixed-method (embedded quantitative-qualitative approaches) design was employed to identify the end users' knowledge and skills including their feedback in using the application (Figure 1).

In the qualitative research method, a focus group discussions (FGDs) of 6-15 informants which included the CHWs and mothers in 2017, the CHWs in 2018, and the CHW and Midwives from each village in 2019 were established. This method was implemented because these population were considered as a higher response group who were able to use smartphone mobile application technology, and midwives' role as supervisor of *Posyandu* in every village. The research was conducted in Pasawahan sub-district, Purwakarta district, West Java province, Indonesia. We interviewed the informants of focus group discussion (FGD) by using open questions about the problems that arose when running the *Posyandu* to understand their solution. Inputs were given for the solution, followed by feedbacks when the solution was implemented. Sample qualitative was chosen using a purposive sample technique according to their activity and ability to use smartphone. Illustration for this explanation is provided in Figure 2.

In order to enable the cadres to operate *Posyandu* mobile application, an instruction/user guide training is required. The qualitative data was acquired by implementing the FGD with *Posyandu* cadres to explore their opinion on the *Posyandu* mobile application instruction. The FGD was conducted with 12 *Posyandu* cadres representing each village in Pasawahan sub-district. The information acquired was used to establish a *Posyandu* mobile application guide needed by the cadres. After the user guide creation process was completed, it was then given to the cadres as an application use reference during the training.

After that, a quantitative data was collected to assess the cadres' knowledge and skills in using *Posyandu* mobile application during the training. The knowledge assessment was conducted using questionnaires, while the skill assessment was conducted through a quantitative observation using a checklist. During the observation process, the researchers were assisted by selected 10 cadres (those who were most active and trained) to be facilitators.

The facilitators were trained in using *Posyandu* mobile application based on the instruction book. Each facilitator should be able to operate *Posyandu* mobile application and to guide the cadres on how to use *Posyandu* mobile application. Each facilitator was provided with an android/tablet and in charge of 8-10 cadres. The facilitators organized a visit schedule to the cadres under their responsibility. For a month, *Posyandu* cadres were guided by *Posyandu* mobile application implementation trainer using the provided tablet/handphone in rotation.

The treatment group consisted of the cadres who fulfilled the inclusion criteria (active cadre) and participated in the *Posyandu* mobile application training for one day with an instruction book and guided by a trained cadre facilitator. The control group comprising cadres with the inclusion criteria and only participated in the one-day training. The knowledge and skill assessments were conducted one month after the training (2018) and during the implementation of *Posyandu* (2019)

The quantitative research sample size was counted based on the objective to test the significance between groups and between two points of time (training time and implementation at *Posyandu* time).

We used per group sample equation from Hulley SB, et al, 2007 using α 0.05 (two-tailed hypothesis), β 0.10, effect size from previous research 0,56 (Park, Han, & Kaid, 2013)(15), resulted in a number of 72 to 86 respondents(16).

To see the impact from the local use to national use, we published the application on Google Play in December 2018. We analysed the distribution of registered *Posyandu* on the mobile application in the country. We used our admin website to download the excel file comprising all *Posyandu* that have registered to the *Posyandu* mobile application and stored the data in one database server. Firstly, we checked the data quality using STATA version 15.1 Special Edition License, and then secondly, to make a distribution map, we employed QGIS version 2.6 (open source) shapefile of 34 provinces in Indonesia to map the registered *Posyandu* until 31 December 2019.

Analysis

In qualitative analysis, we coded and categorized the answers of mothers and CHWs into problems when running *Posyandu* mobile application and solution suggestions to sustain its operations to improve efficiency. We dragged and grouped similar answers quote to a node/code and use the grouping's insight to name the node. We wished to build and understand the important connection between the needs and solution suggestions to be used as inputs to the mobile health application design. The analysis used content analysis nodes in NVivo 12 Pro License. The context of diagram and entity relationship diagram were extracted from the application program maker software. Subsequently, the results were exported and therefore can be displayed as a report. As for the quantitative data analysis, we used STATA version 15.1 Special Edition License to observe the significance of implementing T Test dependent or Wilcoxon Test as an alternative if data is not normally distributed. We also analysed effect by looking at Z score (Standardized test statistic, which is produced by STATA) divided by \sqrt{N} (N is number of all respondents) for time difference (training time, 2018, and implementation time, 2019)(17).

Results

Result of Data flow diagram in the database

Definition of the Scope of System

Posyandu information system is a system which is developed to support *Posyandu* data management and analysis. Data are documented by the CHWs which include the username dan password, mother identity, pregnant mother and giving birth mother, physical examination of pregnant mother, babies and under 5 identity, physical examination of babies and under 5 identity. This information can also be seen by the CHWs in the monthly report section of the application. The form is already categorized into the monthly and yearly national form. Meanwhile, parents can see the information about their babies and under five by performing the following steps: registering username and password, login, and choosing their babies or children whose data have been inputted by the CHWs previously. Afterwards, other information that can be seen by the parents (mother) are their identity, physical examination (of pregnant

mother), their babies and under 5 identity, physical examination of their babies and under 5 identity, and mother and child health book. The information is depicted in figure 3.

Qualitative result on the initial phase (2017)

The first result was the qualitative part of the study with the CHWs and mothers combined in one table and divided into themes, key insights and quotes.

Table 1 shows the delay time problem of data entry and report in a community-based mother and child health (MCH) service in Indonesia, which requires a mobile application for CHW and mothers. For CHW, it can help the data input process for *Posyandu*. As for mothers, it can help to view their babies/under five children's growth and development. Figure 4 illustrates the initial phase of the mobile application for CHWs/cadre and mothers.

Qualitative result on the middle phase (2018)

Table 2 (at the end of the document) illustrates the qualitative data analysis during the study in 2018 on 10 themes as indicated in the table.

Qualitative result on the final phase (2019)

In the table 3 below there are feedbacks from the cadres and village midwives on the development of application version to be a better one.

We analyse the advantages and disadvantages in the implementation of this application as indicated in the table 4 below (at the end of the document) from the side of the user, organization, technology and environment.

Evaluation of the cadre's knowledge and skills in the implementation of *Posyandu* mobile application during the training (2018) and *Posyandu* activities (2019) were conducted as an ongoing research.

In this intertemporal comparative study, from the previous research respondents in 2018 which consisted of 171 *Posyandu* cadres in the territory of Pasawahan Sub-District, Purwakarta District, there was a decline of 8.77 % in 2019 because there were some respondents who were lost to follow up as many as 15 people in both groups. The rest of the respondents that could be evaluated amounted to 79 people in the treatment group and 77 in the control group. Henceforth, the total number respondents that could be assessed was 156 people.

The difference of knowledge during the training in 2018 and the implementation of *Posyandu* application mobile during the *Posyandu* activities in 2019 is shown in table 6 below.

Based on table 6, the cadre's knowledge and skills during the training and *Posyandu* activities have a significant average score difference equals to the value of $p < 0.05$. This score shows that there is a difference of knowledge and skills between the training period and the performance of *Posyandu*

activities. Effect for knowledge and skill, were 0.34 (medium) and 0.21 (small), respectively according to Cohen(17, 18).

As many as 964 *posyandu* are registered to *Posyandu* mobile application from almost all provinces in Indonesia. The highest number recorded is located in the study area which is in West Java (34.54%), the rest is located in other provinces that shown their interest to register their *Posyandu*. After West Java, in an orderly manner from the highest number of registrations are Belitung, Jakarta, Central Java and Yogyakarta, while there is no registration from North Kalimantan and Maluku.

Discussion

Starting a qualitative research as part of the action research is an important step to create a basis, thus it can help to develop the intervention that fit with the community problems as well as their knowledge and skills to adjust with the intervention(19). Some researches started formulating an intervention directly from their mind without involving the mindset of the targeted community(20). This manner will engender a potential bias when performing the intervention. The bias can be in the form of a knowledge bias in the sense of gap between the intervention maker or expert-driven method (which is a top-down maker) and the end-user of the intervention(20, 21). Creativity in creating mobile health intervention should begin not only with a theory-driven process but also by exploring information from the end-user in terms of the targeted community(22). Then, the intervention designer should build the details of the intervention design based on the explored information. The previous researches compared different top-down and bottom-up applications, where it was revealed that a bottom-up application was more effective in the community(20). The hybrid approach comprising starting with a qualitative research, then followed by a quantitative research such as to quantify the significance of the implementation effect, which will render it more efficient and effective for the next improvement (action research). This effect can be accompanied by a qualitative research embedded with a quantitative research in the view to deepen the context of the reasons underlying the quantitative research result(23).

The application procedure is considered as good if it is established and displayed based on the community feedback because the culturally embedded factors are important to be explored (24). In the context of this research, *Posyandu* cadres and mothers are related in the data flow diagram (DFD) which is the 'kitchen' or back-end of this application. DFD consists of what the cadres and mothers do and what they get from this application. From the previous researches it is understood that building an application based on the feedback of the application user candidate will juxtapose the user's local context usage perception gap to the designer to support the community's adaptation and acceptance (25). The mobile application technology design can support more benefits in the establishment of strong partnerships between stakeholders to leverage the community capacity and empowerment e.g. CHWs and mothers (26, 27). The empowerment needs a capacity building to maintain the CHWs and mothers' knowledge and skills to perform screening in the community(28). In Indonesian health system, the access to screening in *Posyandu* which is performed and documented using *Posyandu* mobile health application by trained CHWs can strongly help the government to improve the data management and thus the quality

of information. The village midwife, nutrition and health promotion staffs of *Puskesmas* has a role to help the cadres activities including to validate the data of *Posyandu* before reporting it to *Puskesmas*(29).

The advantage of using mobile health for cadres is supported by a review literature conducted by Braun in 2013 where in general the CHWs has a role in the use of mobile technology in collecting a filed-based health data, obtain warning and reminder, facilitate health education sessions, and conduct a person-to-person communication. A programmed effort from the cadres can strengthen the health services performance which focuses on the compliance enhancement towards the standards and guidelines, education and community training, as well as leadership practice and management practice. Studies which have evaluated the program results have given some evidence that mobile health application (m-health) assisted the community health workers in enhancing the provided treatment quality, services efficiency, and program monitoring capacity (5). In addition, a similar research also revealed that m-health application is considered as beneficial for community health workers because it can help with their duties, support clinical decisions and to send instant data and feedback on the performance (30). Another finding indicated that mobile-based data collection increased the data collection punctuality, decrease the error level and enhance the data completeness (8).

Although in general the cadre's knowledge and skills in *Posyandu* mobile application implementation in the field have reached expectations, the implementation of a new information system is not easy because there are many influencing factors in the said implementation. The first factor is the user factor. The implementation of a new information system will be successful if each user has a similar performance expectation, which is to believe that *Posyandu* mobile application can ease their work burden. Performance expectation is a strong predictor from information system utilization interest (31-33). Apart from that is the usage facility, which is defined as when an individual feel certain that using the said system does not require any extra effort (34, 35).

By using a personal handheld phone, the cadre feels more freedom to learn *Posyandu* mobile application thus there is more time for the cadre to learn to operate it. The increase in the cadre's skills is possible because the cadre performs an independent learning. Although the cadres only received a dissemination of information and then they learn to operate the application independently they have similar knowledge and skills with the group of cadres that received a specific training. This is in line with a previous South African research in 2018, where the explorative study demonstrated that the respondent assessment value dramatically increased although an intervention had not been given. The interview result gives an overview that the cadres often gathered together and created bigger study groups (36). In the further action research, a quantitative research can be performed to objectively evaluate a video education that is embedded as part of the mobile application. This can also be continued by monitoring the steps because we want to identify the development of the cost-effectiveness to strengthen a strong partnership when we do advocacy programs to different stakeholders (37).

Conclusions

Hybrid approach is a very important and meaningful step in providing the basis of an intervention to fit with the community needs in relation to the MCH services on data documentation and reporting. 3-years hybrid approach suggests the ideal phases in providing the basis to build a mobile application in a more user-friendly manner and corroborates with the community needs in relation with *Posyandu* services on data documentation and report. It can also replace the CHWs' old fashion book use and build "a bridge" to the national use and national level reporting.

As for the community, the cadre's skills should demonstrate an improvement because skills are necessary for the cadre during the performance of *Posyandu* services in the field. A short dissemination of information followed by a continuing monitoring, independent learning and user-friendly application condition will result in the cadre's knowledge and skills that may be equally satisfying either for the group of cadres that receive training or the one that perform an independent learning by using *Posyandu* mobile application. For further development, an addition of education video in the application on how to use the application is recommended to replace the role of socialization.

Abbreviations

CHW: community health worker/cadre; MCH: mother child health; PHC: Public health centre; PIS: *Posyandu* information system; FGD: focus group discussion; IT: information technology; SOP: standard of procedure; DFD: data flow diagram

Declarations

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Authors' contribution

Fedri Ruluwedrata Rinawan, Ari Indra Susanti and Indah Amelia performed the process from 2017 study design, data collection, data quality, and manuscript preparation; Mulya Nurmansyah Ardisasmita extracted the DFD design from the server and its explanation in the manuscript; Fedri Ruluwedrata Rinawan, Widarti, and Rima Kusumah Dewi involved in study design, data collection, data quality, data analysis of 2018 and 2019, and including manuscript preparation; Dani Ferdian analysed, interpreted "the

bridge” between community and government as a basis to make strong advocacy and partnership, as well as wrote them in the manuscript; Ayi Purbasari and Wanda Gusdya Purnama involved in the preparation of the mobile application development and data quality on server, analysis on the back-end, built website for admin, and interpreted function needed from community and government.

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Availability of data and materials

The dataset supporting the conclusions of this article are not publicly available due to confidentiality but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The proposal of this research has been approved by the ethical committee board in Faculty of Medicine, Universitas Padjadjaran, and by Purwakarta district office, West Java, Indonesia. During the research period, we asked for the informants and respondents’ informed consent after we explained about the research. The informant (qualitative) and respondent (quantitative) who agreed and signed the consent, continued to be part of the research. In the application, on terms and condition part, we also put explanations regarding the information about keeping their privacy prior to agreement.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Tables

Table 1. Focus Group Discussion results of CHWs, Mothers activities and list of mobile health application features

Theme	Key insight	Noteworthy quotes
<p>1. End-user activities</p> <p>2. a. CHW activities</p> <p>a. Mother activities</p>	<p>a. The direct use of CHW's notebook for MCH service</p> <p>b. Delay in rewriting to the <i>Posyandu</i> information system (PIS) book</p> <p>c. PIS book is a big work</p> <p>a. Mothers who work will ask others to bring their children to <i>Posyandu</i>:</p>	<p>"The notebook can be directly used to document mothers' attendance. The 5 years old child is also written in the notebook, the 3 years old is also written. But it is not in an orderly manner"</p> <p>"Yes right, after that we have to write the names to the <i>Posyandu</i> information system book in an orderly manner"</p> <p>"If the data is written directly to the PIS as the mothers come, it will make my head blown, confusing"</p>
<p>1. The needs of mobile application</p> <p>2. a. CHW</p> <p>a. Mother</p>	<p>b. i. babysitter ii. grandmother iii. neighbour</p> <ul style="list-style-type: none"> • Monitoring babies, under-five-children and mother • CHW need mobile application to report to <i>Puskesmas</i> 	<p>"For example, this (child), the child is taken care by another person (because) the mother is working"</p> <p>"Yes, nowadays it's the grandmother who takes care of the baby, not the mother"</p> <p>"Or maybe the child is taken care by the neighbour or other family members"</p>
<p>1. Main list of features</p>	<ul style="list-style-type: none"> • Mother needs mobile application to monitor their under-5 children 	<p>"With <i>Posyandu</i> it is possible to check the development of</p>

- Login children, examine pregnant mothers, immunization”
“It’s like a tool, but it can be re-accessed, like archive. Because we need it when *puskesmas* requests (a report), sometimes it can be accessed again”
- Reporting form in 12 months
- Similar with reporting form used in Puskesmas
- Baby data input to be an automatic data when the app is re-opened “(We) need to know our child development, so we can monitor by ourselves for our child”
“Yes, so we can privately look at it. So, we don’t have to ask the CHW, “I want to see my son’s data, so how?” It is just not practical”
- Child growth graph
- Automatic alert of child development “First, we click on Posyandu app, then we register in it, after that we click it once more, then we are connected to our children’s data”
“So, there should be a 12-month format in the reporting form to know whether the weight of the baby increases or decreases”
“So, the format is similar with the PIS, but the mobile version is much more organized.”

“It would be better if the date can be automatically sorted so it won’t be a hassle to find the baby’s date of birth like, “Oh, this baby was born on such date, this one on such date”. It would be easier if (the app) can automatically sort it alphabetically when we enter the contact.”

“The good (growth graph) is the green one, right? This yellow one means that it’s below (average)”...which is at least there is this graph, not for the toddler’s overall graph”

“Excuse me, ma’am, there is a bit feedback for that point, if it’s possible the increase and decrease status to be automatic. Such as, last month (the child’s weight) was such number, this month it’s such number, so that number to be automatically appear”

Table 2. Qualitative Research Data Analysis on *Posyandu* Cadre FGD

No	Theme	Key Insight	Noteworthy Quotes
1	Toddler Data Input	<ul style="list-style-type: none"> a. Toddler body weight measurement b. Toddler body height measurement time c. Toddler body height measurement according to WHO 	<p>“Monthly weight data is automatically noted”</p> <p>“We don’t measure the height monthly, only on several months”</p> <p>“The measurement method is by lying (the child) down or standing up”</p>
2	Toddler Data Display	<ul style="list-style-type: none"> a. Toddler data can be accessed anytime b. Toddler measurement result display c. Toddler data can be accessed by parents 	<p>“So, every month is like the last month, for example a baby is measured in January, in February is measured as well, for the February report will appear when we click the child’s name”</p> <p>“So, when all the data has a result, the graph will appear, yes?”</p> <p>“Sometimes the parents are like this, ‘ma’am does my baby’s weight increase or not?’, then we can show the data in the application”</p>
3	<i>Posyandu</i> Mobile Application Components	<ul style="list-style-type: none"> a. <i>Posyandu</i> mobile application menu b. Online report 	<p>“There are baby’s names, the ups and downs of toddler data, pregnant mothers, breastfeeding mothers, etc”</p> <p>“We want it to be like that, through an online reporting so we don’t need to measure the number of decreases”</p>
4	Benefits of <i>Posyandu</i> Mobile Application	<ul style="list-style-type: none"> a. <i>Posyandu</i> reporting and recording is easier b. Ease cadre’s duties in <i>Posyandu</i> 	<p>“Directly input the data, enter the data so that the report will be directly submitted to <i>Puskesmas</i>”</p> <p>“So, the recording division does not need to note manually to the SIP book, but the input can be done through the application”</p>
5	Cadre’s obstacle in using <i>Posyandu</i> mobile application	<ul style="list-style-type: none"> a. Confused/need to adapt 	<p>“A while ago some data was successfully stored, but some were unsuccessful”</p> <p>“During <i>Posyandu</i> working day it will remain crowded, so the data entry will be done after the end”</p>

		b. Unsupportive <i>Posyandu</i> situation	
6	Learning process	<p>a. Cadre's knowledge on <i>Posyandu</i> mobile application</p> <p>b. Cadre's skills on the use of <i>Posyandu</i> mobile application</p> <p>c. Cadres need more training</p>	<p>"We were trained, one post held the tool, we received training to enter the data"</p> <p>"We think we can use it because we are used to use and play with handphone. But before that, the application should be made available first"</p> <p>"When it's time to learn, all of us should be gathered like a training"</p>
7	<i>Posyandu</i> mobile application guidebook	<p>a. Significance of <i>Posyandu</i> mobile application guidebook</p> <p>b. Guidebook format</p> <p>c. Guidebook size</p> <p>d. Guidebook writing style</p> <p>e. Images in the guidebook</p>	<p>"A guidebook is necessary because we often forget things"</p> <p>"A small format is appropriate" (while the woman pointed at an A5 paper)</p> <p>"The letters should not be too small"</p> <p>"The writing should be black and white"</p> <p>"If the writing is black and white, the images should be coloured"</p>
8	Information in the guidebook	<p>a. Instruction</p> <p>b. How to register an account/login</p> <p>c. How to input baby/toddler data</p> <p>d. How to input pregnant mother data</p>	<p>"In the manual guidebook there should be an instruction and screenshot"</p> <p>"Such as how to do login and accompanied by a screenshot beside"</p> <p>"For example, if we want to input toddler data, we should click this if we want to add it"</p> <p>"Usually, pregnant mother data has a record on the number of children"</p>
9	Cadre's hopes	a. Tablet/HP provision	<p>"Yes, if there are three <i>Posyandu</i> in a village then there should be three (tablet/HP) in a village"</p> <p>"If using the application if possible then so be it, (I) can't wait to use it"</p>

		b. Use of application in <i>Posyandu</i>	
10	Cadre's worries	a. Internet quota availability	"Well, <i>Posyandu</i> does not have the budget, I asked the villagers about the internet quota fee and they already shook their heads"

Table 3. Qualitative Research Result on the Cadre and Village Midwives FGD for *Posyandu* Mobile Application Development

No.	Theme	Key Insight	Noteworthy Quotes
1.	Identity	Village name correction editing menu	"Here, the name of my village in this application is wrong"
2.	Account	Account owner photo	"Ma'am, can't we put our photo? So, there won't only be our name. Even Google mail has the owner's photo. So, the cadre's sense of belonging will be high"
		Alternative password	"Oh, I forgot the password. It's not possible to login. It would be great if an alternative password exists"
		Special account for Village Midwife	"That's it, in the future it would be great if there is an access for the Village Midwife, not only for the cadres. So, it won't be a hassle to enter one by one. Now there is only 5 <i>Posyandu</i> in one village, in other locations even 13 <i>Posyandu</i> are handled by one single Village Midwife"
3.	Website	Web creation	"We hope that there will be a Web to monitor at a larger scale for the Midwife. The Web can make it easier to read the report"
4.	New menu	Pregnancy age automatic calculation	"It is hoped that after the input of the first day of the last period, the pregnancy age will be automatically calculated in the next examination schedule"

Table 4. Advantages and Disadvantages Analysis in the Implementation of *Posyandu* mobile application based on the Cadre and Village Midwife FGD

No	Analysis Result	Advantage	Disadvantage
1.	User		
	a. Receipt	Cadre's receipt to the application	
	b. Problem Solution	Problem solution by the cadre when facing a difficulty	
	c. Skill	Cadre's skill in operating <i>Posyandu</i> Mobile Application	
	d. Resistance		It takes time because there is a reluctance in the part of some cadres to change into the digital system-based services
2.	Organization		
	a. Policy	There is a Midwife Village leadership as the direct supervisor of <i>Posyandu</i> activities	
	b. Organizational Support		Cadre's facility in the implementation of <i>Posyandu</i> mobile application is still necessary
	c. Standard Operating Procedure (SOP)	Positive response in the advocacy to the government	Double work burden between manual and digital because there is no SOP which regulates the implementation of

			<i>Posyandu</i> mobile application
3.	Technology		
	a. <i>Application/Software</i>		
	i. Accuracy	Appropriate and correct use of application	
	1. Facility	User-friendliness of the application when being operated the cadre	
	1. Availability	Availability of the application in Google Playstore to be used or operated	
	1. Relevance	Conformity of the application menu with the needs of the cadre or as planned by the Government	
	1. Punctuality	Real time condition of the application to display the information or examination result	In the region with low network coverage, an offline version of the application is needed to input the data which will be submitted after the network appears
	1. Challenge		Application bugs obstacle needs to be fixed
	b. <i>Hardware</i>		
	i. Network		Unstable network for some providers/carriers

	1. Handphone		Some versions of android are not compatible with the application
	1. Quota		Some cadres do not have quota
4.	Environment		The situation that is not conducive (the community have difficulty to queue) during <i>Posyandu</i> period

Table 5. Respondent Characteristics based on the age, education, years of service as *Posyandu* cadre in Pasawahan Sub-District, Purwakarta District, year 2018 and 2019

Characteristics	2018		2019	
	Treatment (n=86)	Control (n=85)	Treatment (n=79)	Control (n=77)
Age (year)				
26-35	18	22	16	19
36-45	32	33	31	33
46-55	36	30	32	25
Education				
Elementary School	24	31	21	26
Junior High School	32	33	30	30
Senior High School	30	21	28	21

Table 6. Difference of Knowledge and Skills during Training and *Posyandu* Activities

Variable	Occasion	Value				
		Min	Max	Mean	P Value	Effect
Knowledge	Training	84	100	94.69	*0.0000	0.34
	<i>Posyandu</i> Activity	76	100	91.91		
Skill	Training	7.69	100	85.63	*0.0097	0.21
	<i>Posyandu</i> Activity	27.63	100	93.05		

*Wilcoxon signed-rank test



Figure 2

The process of Focus Group Discussion for the dynamic, evaluated and executed Posyandu mobile application

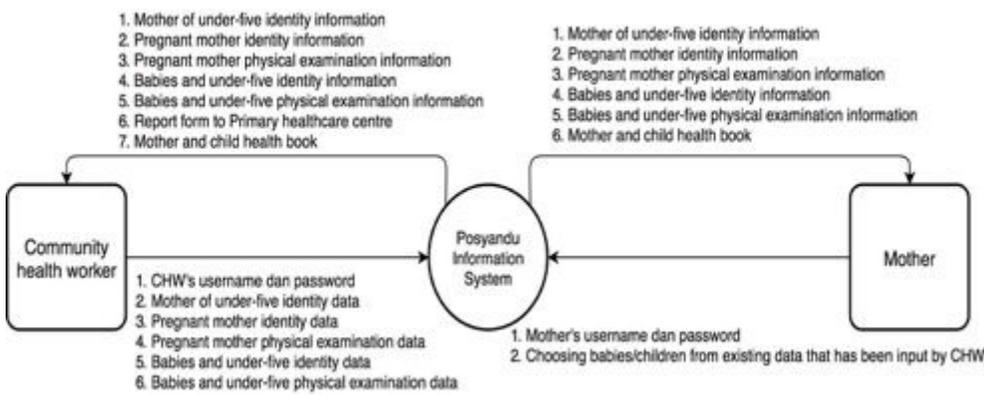


Figure 3

Data flow diagram of the mobile health application design in Posyandu information system (national form)

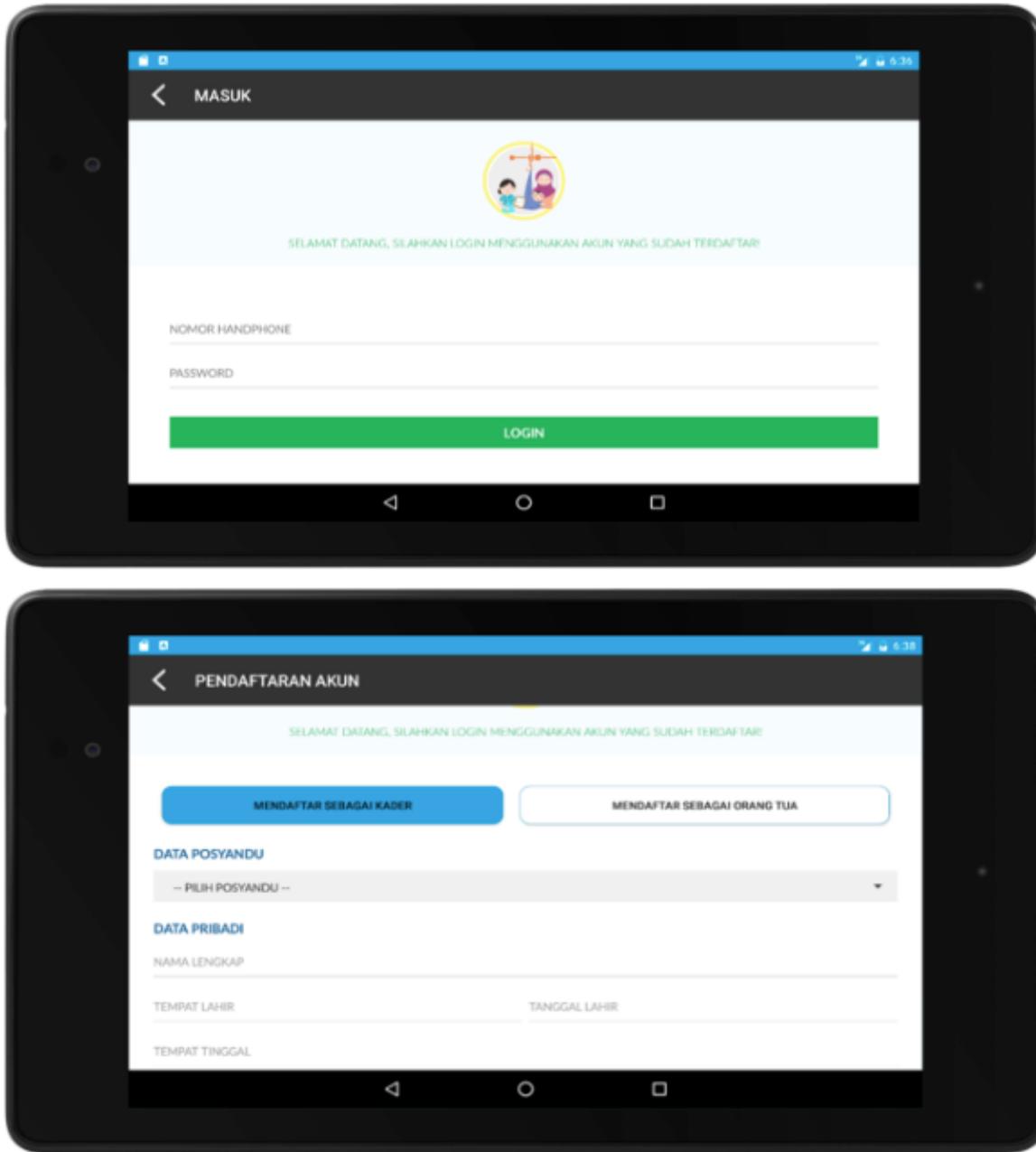


Figure 4

Illustration of the mobile health application on the initial phase

2019

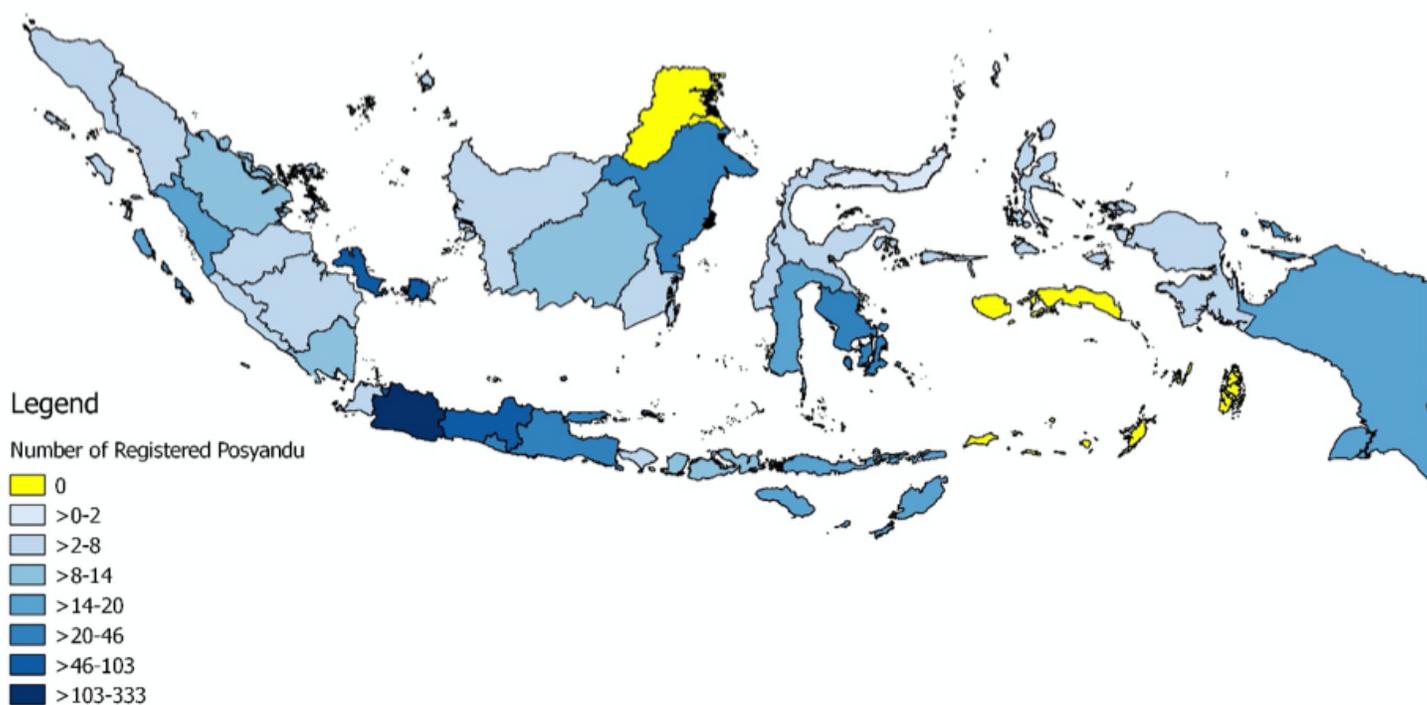


Figure 5

Distribution of registered Posyandu on the mobile application in Indonesia until 31st of December 2019

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