Open Access Journal of Information Systems (OAJIS)

Available at http://is.its.ac.id/pubs/oajis/index.php

The Third Information Systems International Conference

KMS-CS: A Client Server Application for Storing Toddler Health Information in Posyandu

Ratih Nur Esti Anggraini, Siti Rochimah a*

Department of Informatics, Institut Teknologi Sepuluh Nopember, Surabaya, 60111

Abstract

Children under 5 years are usually said in a golden age where they grow and learn very rapidly. Somehow in this age they also prone to illness and lack of nutrition which will inhibit their growth. Therefore, it is important to monitor toddler growth in their golden period to keep them healthy so that they can grow well physically and mentally. In Indonesia, toddler growth are recorded on a card called KMS which used anthropometric index to assess child nutritional status. In this research, we will built a client server KMS application. Client server architecture is used to prevent from data loss and to provide real time data. Parents can monitor children growth record through mobile application called m-KMS that has been built using PhoneGap framework. Posyandu will use web application since they have to insert many toddlers' data every month so a wider interface will be more suitable. KMS web was developed using PHP framework. Z-score is implemented to assess toddler nutritional status. Black box testing was carried out on all functionality and showed that all features work correctly.

© 2015 Published by ISICO

Keywords: KMS;client-server; toddler

1. Introduction

Every parent wants their children to be grow healthily. A child's health can be seen one through their growth according to their age. Weight and height can be used to monitor children growth [1]. Anthropometric index can be used to determine the nutritional condition of a child.

Posyandu is Indonesian government program to give health service especially for expected mothers, babies and elders [2]. There are several activities in Posyandu such as immunization, weighing or health services for mothers and infants. The weighing and immunization results in Posyandu usually are

* Corresponding author.
E-mail address: ratih_nea@if.its.ac.id.

recorded in a card called KMS. By using this card, parents can monitor their child growth and know whether the growth are fit with child's age or not. Somehow, it is not very effective to bring the printed KMS card everywhere just to know children growth status.

Previously we have built m-KMS application to record baby's growth [3]. M-KMS was built as mobile application so parents can use it easily anywhere and anytime since parent are usually bring their mobile phone. However this application have several weaknesses namely it cannot save more than one child record and the record can be loss if m-KMS are uninstalled.

In this study, we will fix and improve the application by develop a client server KMS application. Further section 2 will give an explanation for some related works. The discussion about proposed system will be given in section 3. While section 4 will give the conclusion.

2. Literature Review

2.1. Kartu Menuju Sehat (KMS)

Kartu Menuju Sehat (KMS) is a card that contains the child's normal growth curve based on anthropometric indices weight based on age. By using KMS, growth disorders or risk of excess nutrients can be known in advance, so that preventive measures can be carried out more quickly and precisely before the problem is more severe.

KMS in Indonesia has been used since the 1970s as the main means of growth monitoring activities [4]. Monitoring growth is a series of activities consisting of several steps as follows.

1) Assessment of the child's growth on a regular basis through each month weighing, charging KMS, determine the status of growth based on the results of weighing; and
2) Follow up on every case of growth disorders. Follow-up results of growth monitoring is usually in the form of supplementary feeding counseling, nutrition and supplementation referral

KMS card record three main toddler health data.

a. Immunization record where there are six mandatory immunization that needed to noted
b. Vitamin A supplementary that are given twice a year
c. Weighing that are done every month. A chart are prepared to assess nutrient status based on toddler's weight.

2.2. Anthropometric Index

To assess the nutritional status of children based on weight per age (W / A), the weight figures of every toddler converted into the form of standardized values (Z-score) using WHO standard anthropometry 2005 [6]. Equation (1) shows how to calculate Z-score.

$$Z\text{-score} = (NIS - NMBR)/NSBR \quad (1)$$

Where:
NIS: the value of individual subjects that toddler's weight,
NMBR: the median value of the reference standard
NSBR: the value of the reference standard deviations

After a Z-score obtained the nutritional status BB / U can be categorized as follows.

- Malnutrition, if Z-score <-3.0.
- Nutrition Lack category, - 3.0 <= Z-score <-2.0.
- Good nutrition, if - 2.0 <= Z-score <= 2.0.
- Excess Nutrition category, if the Z-score> 2.0.

2.3. Related Works

Children and toddler need more attention from parent and their environment to grow well physically and emotionally. Some application has been built to stimulate their learning skills. Rankothge et.al built an application to improve toddler writing and speaking skills [5]. The application trained children using standard and cutting edge methodologies.

Other researches focus on giving nutrient recommendation for children. Anggraini et.al built a mobile application and uses forward and backward chaining method to recommend foods for under 2 year infant [6]. While Kale and Auti used ID3 for children menu planning [7]. A Posyandu application have been built by Indonesia researchers [8]. This application implemented Software-as-a-Service (SaaS) using cloud computing architecture.

Some studies carried out previously concentrate on maintaining health record such as building a cloud based personal health record [9]. This system support interoperability between different health record systems since they used standard health coding.

KMS application have been developed in web [10] and mobile versions [11]. However, those applications only assess nutrition status based on weigh and age but cannot record the growth data. Our previous research fix those weakness by building m-KMS that have the same function with real KMS card by record one children data locally [3]. In this research we will improve the application by integrating those mobile KMS with our KMS server so that data loss can be prevented. We also add web application that can be used by Posyandu Cadres to insert toddler data and create reports.

3. KMS-CS : The Proposed System

3.1. KMS-CS Architecture

In our previous research, a mobile KMS have been built [3]. Somehow it can only record one child per mobile phone. In addition, data loss would possibly occur because the data is saved locally.

This study will improve m-KMS by giving option to add more children. Client server architecture are used to prevent data loss. We built two application for user: web application and mobile applications. The architecture of KMS-CS are shown in Fig 1.

KMS-CS uses Apache as the web server and MySQL as database server. Parents can access KMS through mobile application. Mobile version of KMS was built using PhoneGap framework. Parents just need to connect to the server through internet and they will be able to access their children data.

PHP framework was used to develop web-KMS. We used web application for Posyandu because they will insert many toddlers' data every month and it will be easier if they use computer rather than mobile phone.

3.2. Implementation

As the substitute of KMS card, m-KMS has the same function to the real card. However it has additional feature compared to the printed KMS card that is complaint feature. In addition, m-KMS can store more than one children data that previously cannot be done in printed KMS. The functional requirements of m-KMS are shown in Fig 2. There are five features for parents in m-KMS.

1. Vitamin A supplementation
   This feature is used to record vitamin A supplementation. Fig 3 (a) show the interface of vitamin A supplementation history.
2. Immunization
   Immunization feature will record immunization history. There are six mandatory immunization for infants in Indonesia.

3. Growth data
   Toddler growth are recorded here. Their weighing histories are shown in a growth chart. Z-score are used to assess child nutrient status. There are four nutritional status: good, malnutrition, lack, and excess. The interface of growth data feature is presented in Fig 3 (b).
4. Children data
   This menu are the improvement of our previous m-KMS application. Parents can store more than one toddler data in this m-KMS. Parent can choose which child data needed to be seen. The interface of choosing children data is shown in Fig 3 (c).
5. Complaints
   This feature is an additional menu that can be used to post a comment or complaint to Posyandu. This can be functioned as communication media between parent and Posyandu.

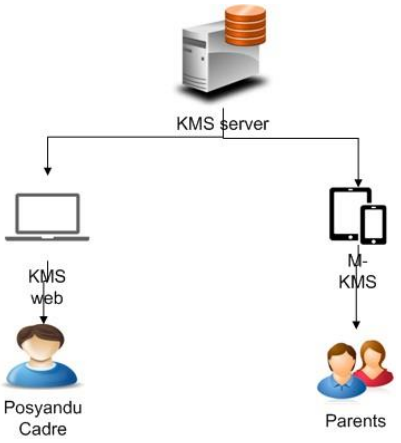


Fig 1. KMS-CS Architecture

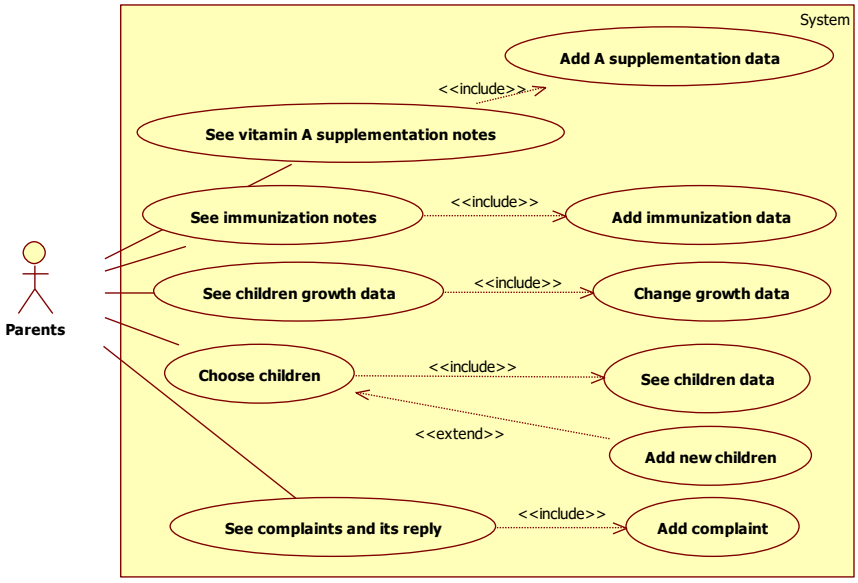
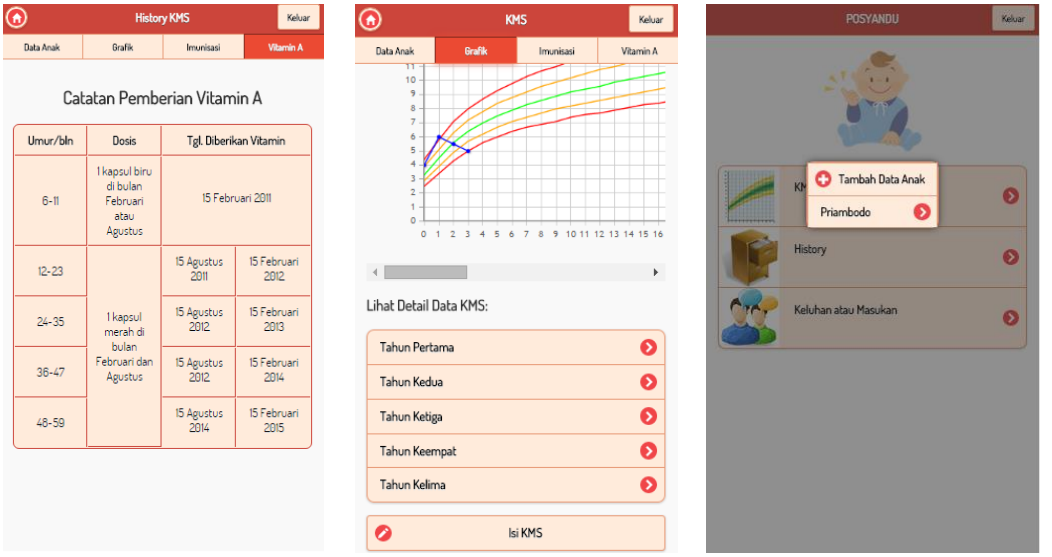


Fig 2. Use case of KMS-CS



(a) (b) (c)

Fig 3. m-KMS interface: (a) Vitamin supplementation, (b) Toddler growth chart (c) Choose or add toddler

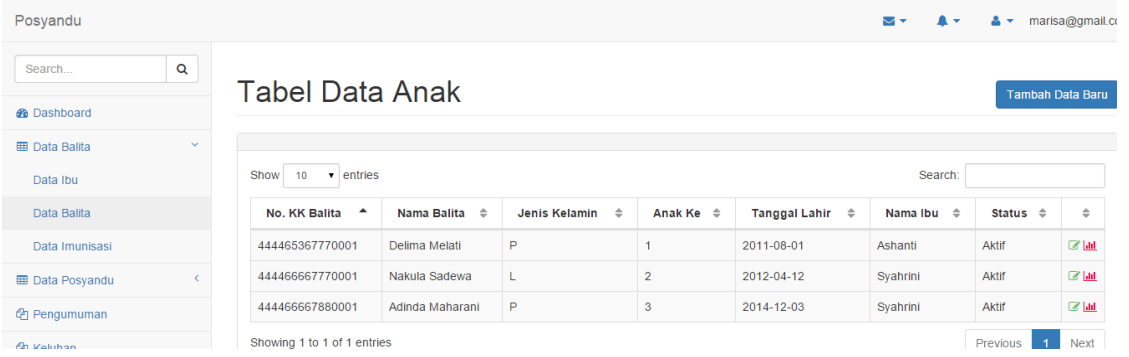


Fig 4. Web KMS interface for toddlers data

Web KMS is built to manage toddler data in a Posyandu. The features are similar to m-KMS but with a wider interface making it more suitable to manage a lot of data. Fig 4 shows toddlers data feature in web KMS that can show children data in a Posyandu.

Currently, we are in progress to test the application especially for the usability aspects, since it is very important to the user (mothers and Posyandu cadres). However, we have finished to test the correctness of the application and the overall results are succeed. We plan to test the usability aspect in early Oktober 2015 following the schedule of Posyandu meeting. We choose Posyandu Matahari in Keputih Surabaya as a place to establish the test.

4. Conclusion

In this research, we built a KMS application as the improvement of the previous m-KMS that record data locally and can only save one children in the application. KMS-CS applied client server architecture to prevent from data loss and provide real time data. Apache is utilized as the web server and MySQL as the database server. KMS web version was built using PHP framework, while mobile version was implemented using PhoneGap framework.

Blackbox testing has been done to all application functionality and it shows that the system can work correctly as expected. The limitation of this research is m-KMS only been deployed into Android OS and has not been tested on other mobile operating system. Later it is important to deploy and test it on other mobile operating systems.

References

[1] Frisancho, A.R.(2004) Anthropometric Standards for the Assessment of Growth and Nutritional Status, The University of Michigan Press

[2] Departemen kesehatan RI. 2006 Buku Kader Posyandu Dalam Usaha Perbaikan Gizi Keluarga. Jakarta. Departemen Kesehatan RI

[3] Ratih Nur Esti Anggraini, K. D. (2014). m-KMS: Kartu KMS pada Perangkat Bergerak. Seminar Nasional Teknologi Informasi dan Multimedia. Surabaya.

[4] M. K. R. Indonesia, "Penggunaan Kartu Menuju Sehat (Kms) Bagi Balita". Indonesia Patent NOMOR 155/Menkes/Per/I/2010, 2010

[5] Rankothge, W.H.; Sendanayake, S.V.; Sudarshana, R.G.P.; Balasooriya, B.G.G.H.; Alahapperuma, D.R.; Mallawarachchi, Y., "Technology assisted tool for learning skills development in early childhood," Advances in ICT for Emerging Regions (ICTer), 2012 International Conference on , vol., no., pp.165,168, 12-15 Dec. 2012

[6] Anggraini, R.N.E.; Rochimah, S.; Dalmi, K.D., "Mobile nutrition recommendation system for 0–2 year infant," Information Technology, Computer and Electrical Engineering (ICITACEE), 2014 1st International Conference on , vol., no., pp.272,275, 8-8 Nov. 2014

[7] Kale, A., & Auti, N. (2015). Automated Menu Planning Algorithm for Children: Food Recommendation by Dietary Management System using ID3 for Indian Food Database. Procedia Computer Science, 50, 197-202.

[8] Bhaskoro, S.B.; Supangkat, S.H.; Baskara Nugraha, I.G.B., "Posyandu cloud: Healthcare networks to support user-oriented (Maternal and Neonatal) in Indonesia," ICT for Smart Society (ICISS), 2013 International Conference on , vol., no., pp.1,5, 13-14 June 2013

[9] Yeong-Tae Song; Sungchul Hong; Jinie Pak, "Empowering patients using cloud based personal health record system," in *Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), 2015 16th IEEE/ACIS International Conference on* , vol., no., pp.1-6, 1-3 June 2015

[10] Javakedaton Indonesia. "Kartu Menuju Sehat (KMS) Online". http://kms-online.web.id/, diakses terakhir pada 1 Maret 2014

[11] Google Playstore. "Kartu Menuju Sehat". https://play.google.com/store/apps/details?id=com.javakedaton.kartumenujusehat , diakses terakhir pada 1 Maret 2014