

Web Based Information System for Motoric and Mental Development in Early Childhood

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Abstract—The period of the first five years of children (early childhood/toddler), a period which is very sensitive to the environment, and known as the "golden age", "windows of opportunity" and "critical period". Fostering child development in a comprehensive and quality are carried out through the stimulation, early detection and intervention developmental aberrations toddlers. Currently, medical information systems are so various, but there is rare to assist the medical personnel especially in helping early childhood development.

Motoric and mental development in early childhood is one of the most important things to educate the toddler. This early childhood development decision support system research aims to facilitate medical personnel (health centers) in determining and monitoring of early childhood development. System design method used is waterfall method that uses a systematic and sequential approach starting from the level of defining the system requirements to maintenance. While the methods used in decision an early childhood development status is a method of AHP (Analytical Hierarchy Process) that a comprehensive model of decision-making with multiple criteria, the AHP model is a comprehensive model of decision making. Priorities are taken to decide the status of the development of correct answers is half the value of the number of questions. So that the developmental status is determined based on the statement/question criteria.

Based on the results of the test system, medical personnel (health centers) can easily determine and monitor from the system in determining the status of early childhood development.

Keywords : motoric and mental development in early childhood; decision support system;

I. INTRODUCTION

Currently, information system in the medical world have significant rule, but some of there are not enough to assist the work of a medical personnel, especially in helping early childhood development.

The period of the first five years of children (early childhood/toddler), a period which is very sensitive to the environment, and known as the "golden age", "windows of opportunity" and "critical period". Fostering child development in a comprehensive and quality are carried out through the stimulation, early detection and intervention developmental aberrations toddlers [1].

Based on the problem background, this research is providing solutions to these problems to help toddler's mother, medical workers and health institutions (health centers) to monitor both of mental and motor development, in computerize not manually.

Decision support system of early childhood development were designed and constructed to assist medical personnel in the process of helping parents to enhance the development of a toddler from the mental and motor skills. This system works to take the conclusions/decisions related to motor and mental development of a toddler, the answer to the question will be processed by the system so that the output will show the conclusions statement of early childhood development.

System is applied in posyandu for developmental status in the system are motor and mental development toddlers. The purpose of the research is to design and make a decision support system web-based early childhood development in order to overcome the problems occurred between medical personnel and parents toddlers, and also build systems that can assist medical personnel and health institutions (health centers) in monitoring early childhood development.

II. RESEARCH METHOD

Research methodology to be used in building web-based system of early childhood development is the waterfall method [2] as illustrated in Figure 1.

Waterfall method is a method that uses a systematic and sequential approach starting from the level of defining the system requirements to maintenance. Each phase in the Waterfall done sequentially, but less in the iterations at each

level. In the development of Web-based Information Systems, Waterfall has a stiffness to the previous iteration. Web-based Information Systems is always developing both the technology or the environment.

Waterfall method has several stages, namely:

- a) Defining the needs, the intention is to collect requirements and entities required to prepare a small amount of information analysis, both the strategy and business areas.
- b) Analyze the needs, means that translation of the first phase, which outlines the definition of system requirements include software, applications used, interfaces, form processing information, expected performance, and other documentation relating to the definition and focusing problems of software engineering.
- c) Designing systems and software, is a multifunctional elaboration stage of the analysis of needs, the process through the stages of data structures, software architecture, interface representations, algorithms, and others.
- d) Coding, namely the manufacture of a program or translating the design into a particular programming language. Writing program code in accordance with the design created, so that it can produce applications that benefit users.
- e) System testing and integration, which is conducting tests on applications that have been made to fit the needs, as well as integrating components in the system.
- f) Implementation and maintenance, which is already applying the integrated system and perform maintenance or repairs if there is a mistake.

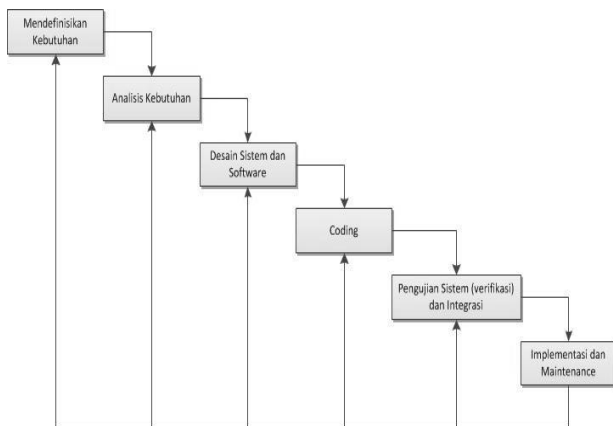


FIGURE 1. WATERFALL METHOD

Research for the manufacture of the system, the basis for the analysis of problems encountered using the theory of AHP (Analytical Hierarchy Process) which is one of decision making or optimization techniques used in the multivariate analysis of wisdom [3][9]. AHP that is only used as a theory to help shape a decision of existing problems and the establishment of decision/early childhood

development is adapted from DENVER II TEST that based on age.

Methods to find out the status of early childhood development is done as follows.

1. Developmental aspects.
 - Aspects of the development is divided into 4 (four) parts, such as gross motoric, language, fine motoric adaptive and social personal. That have provisions for any age range has the distinctive aspects. Points of the criteria are as follows:
 - Aspect < 3 parts = 0
 - Aspect > 3 parts = 1
2. Answers.
 - Number of “ yes” answers of the questions that correspond to toddler age range who have been given a value as follows.
 - Number of “ yes” answer < a half of questions = 0
 - Number of “yes” answer > a half of questions = 1

If all criteria are fulfilled then the total weight of assessment is 2 to be used for determining the status of early childhood development. Status is determined based on the results answer/test of the questions/statements posed by the examiner/medical personnel. It can be concluded that the determination of priorities is the number of comparisons between the answer/result of questions every age range, which is any question in accordance with aspects of the development consisting of 4 (four) aspects.

Data Flow Diagrams (DFD)/data flow that occurs in the system is described as shown in Figure 2 and Figure 3.

Database design system of early childhood development can be seen in Figure 4 are described in terms of ERD (Entity Relationship Diagram)[10].

Feasibility system testing was conducted by using questionnaires, questionnaires are given to people that have relationship with this system, such as parent's toddler, posyandu staff, and medical personnel.

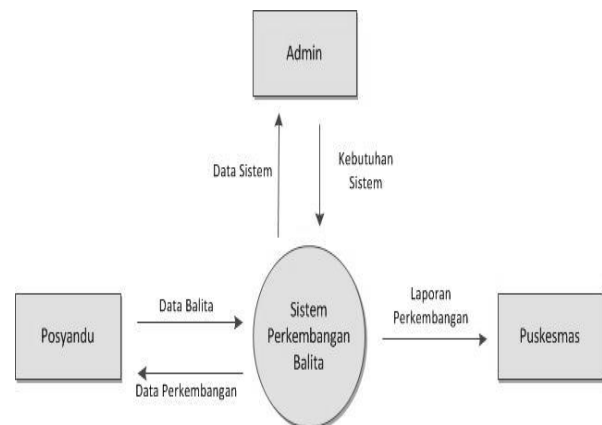


FIGURE 2. DFD LEVEL 0

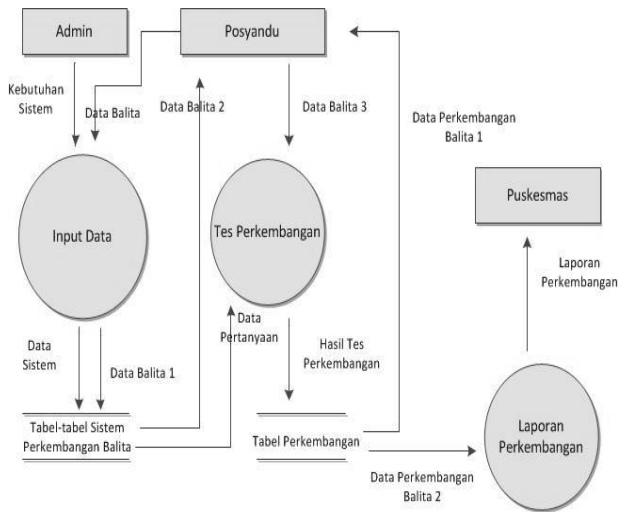


FIGURE 3. DFD LEVEL 1

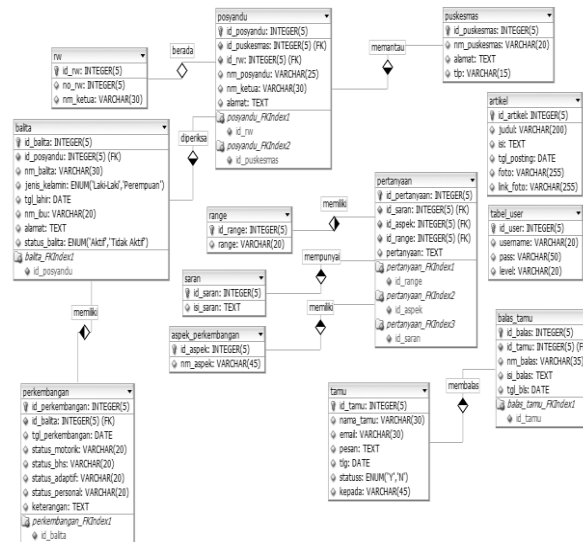


FIGURE 4. ERD (ENTITY RELATIONSHIP DIAGRAM) SYSTEM

III. RESULT AND DISCUSSION

Test form is list of questions to parents' toddlers about them that is asked by medics, output of test results of these developments indicated in the system displayed which states that motor and mental development of infants mature or less mature and is also given a special message for the development for less mature at a certain age. The results are stored in the database development to be compared with subsequent developments. Display test development and test results shown in Figure 5.

System testing conducted by using questionnaires, questionnaires are given in the test system is intended to be known system feasibility. The first step taken prior for a test by filling out a questionnaire which was to determine the number of samples that will fill in the questionnaire as described in Table 1.

Tes Perkembangan Motorik dan Mental Balita

Nama Balita = Ikwon Abid
Umur = 1 bln

1. Apakah anak anda mampu menunjukkan gerakan yang seimbang?

- Ya
- Tidak

2. Apakah anak anda mampu mengangkat kepala 45 derajat?

- Ya
- Tidak

3. Apakah anak anda dapat bereaksi terhadap suara yang diperdengarkan?

- Ya
- Tidak

4. Apakah anak anda mampu mengeluarkan suara (ooo/aah)?

- Ya
- Tidak

5. Apakah anak anda menatap muka lawan bicaranya?

- Ya
- Tidak

6. Apakah anak anda membalas senyum lawan bicaranya ketika diajak tersenyum?

- Ya
- Tidak

FIGURE 5. DISPLAY TEST DEVELOPMENT AT SPECIFIC AGE

Status Perkembangan Balita

Nama Balita = Ikwon
Umur = 1 bln

Status perkembangan yang dimiliki	
1. Motork Kasar	: <input type="text" value="matang"/>
2. Bahasa	: <input type="text" value="matang"/>
3. Adaptif Motorik Halus	: <input type="text"/>
4. Personal Sosial	: <input type="text" value="matang"/>
Pesan	: <div style="border: 1px solid gray; height: 40px; width: 100%;"></div>
<input type="button" value="Simpan"/>	

FIGURE 6. DISPLAY TEST RESULTS PROGRESS

TABLE I. SNAPSHOT TABLES DETERMINING THE AMOUNT OF SAMPLES FROM SPECIFIC POPULATIONS [4].

N	s		
	1%	5%	10%
10	10	10	10
15	15	14	14
20	19	19	19
25	24	23	23
...
10000	622	336	263
15000	635	340	266
20000	642	342	267
30000	649	344	268
...
950000	663	348	271
1000000	663	348	271
∞	664	349	272

Note :

N : total population

s : number of samples at a certain error rate

Overall number of posyandu staff is 4, while the toddlers parents taken 4 persons. Then the sample plus one person from the health center representatives. Thus, the total population is 9 people with 4 toddlers parents (parent toddler groups) as well as 4 persons from posyandu and 1 medical personnel. Based on Table 1 with a population of 10 and 5% error rate. The data is taken as the sample is 9, 9 samples of data taken with the mistake level 5% for a value of 9 was nearing 10, and samples taken in the study can be seen from (1) and (2).

$$k = (p/N) \times s \tag{1}$$

$$P = \sum(k) \tag{2}$$

Note :

k : number of samples per group

p : number of populations per group

N : number of total population

s : number of samples at a certain error rate

P : total number of samples

Calculation of the sample according to (1) and (2) are:

- The number of sample groups of medical personnel = $5/9 \times 9 = 5$
- The number of samples parent toddler group = $4/9 \times 9 = 4$
- Thus, the number of samples in this study is $5 + 4 = 9$ (consisting of five medical officers and 4 parent toddler).

The test conducted on a sample/respondent is charging an opinion or answer to the respondent through the questions in the questionnaire. The maximum value is 10 per chosen answers that option 1, 2, 3, 4 has weight 10; 7,5; 5; 2,5 respectively.

Based on the result of feasibility test, on seven criteria all off respondent have good assessment to this system, for the second and fifth criteria any people give responds enough assessment.

IV. CONCLUSION

Web-based Decision support system for early childhood development has been completed that accordance with the analysis, convenience and facilities. Based on the t results in posyandu Temu Ireng 16 on July 8, 2011, posyandu staff now can easier to give a decision related to early childhood development because it has been helped by the system , parents' toddlers also can see clearly the development of babies with each period.

The system has been able to help posyandu staff and medical personnel in monitoring early childhood development and health centers in monitoring at each posyandu, so health centers can enhance the development of each territory under its control.

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TABLE II. COMBINED RESULTS OF THE TEST GROUP OF MEDICAL PERSONNEL AND PARENTS TODDLERS

NO	Variabel Yang Dinilai	Jawab			
		1	2	3	4
1	Kemudahan sistem	Sangat Mudah	Mudah	Cukup Mudah	Sulit
	Jumlah Penjawab :	1	6	2	0
2	Tampilan	Sangat Bagus	Bagus	Tidak Bagus	Sangat Tidak Bagus
	Jumlah Penjawab :	4	5	0	0
3	Membantu menentukan perkembangan	Sangat Membantu	Membantu	Tidak Membantu	Sangat Tidak Membantu
	Jumlah Penjawab :	6	3	0	0
4	Mengolah data	Sangat Membantu	Membantu	Tidak Membantu	Sangat Tidak Membantu
	Jumlah Penjawab :	7	2	0	0
5	Kejelasan menu	Sangat Jelas	Jelas	Cukup Jelas	Tidak Jelas
	Jumlah Penjawab :	2	3	3	0
6	Kecepatan akses	Sangat Cepat	Cepat	Tidak Cepat	Sangat Tidak Cepat
	Jumlah Penjawab :	3	6	0	0
7	Informasi	Sangat Mudah	Mudah	Cukup Mudah	Sulit
	Jumlah Penjawab :	3	6	0	0
8	Kelengkapan menu	Sangat Lengkap	Lengkap	Tidak Lengkap	Sangat Tidak Lengkap
	Jumlah Penjawab :	4	5	0	0
9	Keseluruhan Sistem	Sangat Baik	Baik	Tidak Baik	Sangat Tidak Baik
	Jumlah Penjawab :	4	5	0	