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PROTOTYPE OF MOBILE EDUCATION TECHNOLOGY WITH MULTIMEDIA FOR AUTISTS CARE PROGRAM

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Abstract—Autism is a neurobiological development disorder in children. This disorder causes difficulties for children to communicate and establish relationships with the environment. The impact, they cannot properly interact with other people or their surroundings, because of their inability to understand what other people mean. Parents or families who have family members with autism need the convenience and wide openness of information regarding education paths, pathways of care and treatment, lines of work, pathways of therapy, and other path information. Includes information about autism such as symptoms, characteristics of autism, and how to deal with tantrums. All information needed by all these parties should be easily accessible. This study proposes an educational technology that contains information needed by patients and their families**.** This educational technology is mobile-based and equipped with multimedia features so that educational materials are easier to understand. The method used for system development is prototyping. The output of this research is a prototype design of mobile-based educational technology with additional multimedia features.

Keywords: autism, education, mobile, multimedia, prototyping.

Abstrak—*Autisme adalah gangguan perkembangan neurobiologi pada anak. Gangguan ini menimbulkan masalah bagi anak, dalam hal berkomunikasi dan menjalin hubungan dengan lingkungan. Akibatnya anak autisme tidak bisa berinteraksi dengan siapapun secara berarti, karena ketidakmampuan memahami apa yang dimaksud orang lain. Orang tua atau keluarga yang memiliki anggota keluarga dengan autisme membutuhkan kemudahan dan keterbukaan informasi yang luas terkait jalur pendidikan, jalur perawatan dan pengobatan, jalur pekerjaan, jalur terapi, dan informasi jalur lainnya. Termasuk informasi mengenai autisme seperti gejala, ciri-ciri autisme, dan cara penanganan saat mengalami tantrum. Semua informasi yang dibutuhkan oleh seluruh pihak tersebut sebaiknya dapat dengan mudah diakses. Penelitian ini mengusulkan agar informasi yang bertujuan untuk edukasi tersebut dibangun dalam bentuk mobile dan disertai dengan fitur multimedia sehingga lebih mudah difahami dan di. Adapun metode yang digunakan untuk usulan penelitian ini adalah metode prototyping. Adapun keluaran dari penelitian ini adalah sebuah rancangan prototipe dari teknologi edukasi yang berbasis mobile dengan tambahan fitur multimedia.*

Kata Kunci*: autism, edukasi, mobile, multimedia, prototyping.*

INTRODUCTION

Autism is a neurobiological development disorder in children. This disorder causes difficulties for children to communicate and establish relationships with the environment. The impact, they cannot appropriately interact with other people or their surroundings because of their inability to understand what other people mean. Generally, symptoms of autism in children can be described as follows: (1) Communication disorders, verbal and non-verbal, such as late speaking, babbling in an incomprehensible language, even though they are beginning to communicate but they do not understand the meaning; (2) Social interaction disorder such as refusing face to face and refusing to look when called; (3) Behaviour disorder, hyperactivity, unable to stay for a while, undirectly motoric activity, jumping around, turning around, banging doors or tables, repeating specific movement, etc.; (4) emotional disorder, such as laughing ti him/her self, crying or angry with no known reason, rampaging out of control (temper tantrum), especially when she/he doesn't get what their wants, even be very aggressive and destructive; (5) Sensory disorder, such as kissing,

biting any toy or object, when hears aloud sound then immediately covers his/her ears, and dislikes touch or hug [1].

Bogor is one of a city in the west of Java that cares for children with special needs. 0n May 24, 2016, Bogor Government declared That Bogor a special children-friendly city Even for two years, Bogor officially is inaugurated as a child-friendly city at the middle-level Indonesia government (Madya)

KOMPAKK is a community that cares for children with special needed in Bogor City. In 2015, Ibu Naziah and her friends with autism spectrum children initiated this community. They ask other mothers with autistic children and other special needs (down syndrome, slow learner, Attention Deficit Hyperactivity Disorder (ADHD)) to join so that this community gets more members.

Karmella as a committee member of KOMPAKK explained that KOMPAKK actually is a group for mothers with autistic children, but then many parents came to join because of difficulties in accessing information related to the handling of their children with special needs. Karmela said that having a child with autism requires many things to do, such as several kinds of therapy (speech, behavior/behavioral, etc.), psychologists, special education (pedagogy), and health consultants.

Currently, there are 110 members of KOMPAAK, consisting of parents with special needed children. Since 2016, KOMPAKK has been regularly conducting many activities. Until now, chatting group applications and social media is used by KOMPAKK for sharing important information among their members. They share information about therapy services, children's growth and development clinic, hospital services, education services (school, university, course, and so on), pedagogic services, and other information. Chatting application used is what apps group and social media used is Facebook.

However, the use of these two media for sharing information still causes obstacles like overwrite information between them. New information will overwrite the previous information. Another medium is through various activities carried out by KOMPAKK with cooperation partners. This activity usually involves experts related to autism to share their expertise with community members. However, this activity cannot be carried out routinely because this community consists of housewives who tend to be very busy in their daily lives.

Based on the explanation above, the problem proposed in this study is the limited information media for KOMPAKK related to the following:

1. Information about autism, tantrums, and other basic information related to autism.
2. Information about educational institutions such as schools, academies, courses, and colleges that accept autistic patients
3. Information on various types of therapy and treatment sites for autistic patients.
4. Information about health service places for autistic patients including clinics, medical centers, hospitals, and others.
5. Information on doctors and medical personnel
6. Information on pedagogic experts for learning tips for autistic patients.

Based on the above problems, the research team proposes a prototype of educational technology related to autism for KOMPAKK. The proposed technology is mobile-based so that it can be easily accessed using a mobile device, such as a smartphone. Mobile technology has entered people's lives, as well as students who always use mobile devices in their everyday life. Technological sophistication and lower prices are supporting factors for increasing smartphone users. The presence of mobile learning is a complement to learning and providing opportunities for students to relearn less mastered material whenever needed[2].

The proposed technology will also involve multimedia in presenting the information so that the information presented on the system is easier for users to understand and use [3].

Regarding educational technology by utilizing multimedia, it has been carried out in previous studies, first, research was conducted by I Kadek Bangkit Ardana, Luh Gede Surya Kartika, and Ida Bagus Suradarma. This research uses multimedia to present information about marriage procedures for Hinduism. Information is presented on mobile-based. So that learning materials can be accessed via mobile devices. According to research, the background of the learning system built is poorly understood by modern society. The information provided by the application includes Manawa Dharmasastra, Types of Marriage, Marriage Procedures, Marriage Conditions, Marriage Purposes, and the Meaning of the Song. Applications developed with Visual Studio 2010 software and the programming language C #[4].

Second, research was conducted by Mr. Muhamad Ali. The research background is because the electromagnetic field course is a difficult subject for students to learn. This difficulty is due to its abstract nature and involves specific mathematical science, namely vectors and others. The indicator of difficulty in this course can be seen from the fairly high repetition frequency. In addition, the average student grade for this course is B-. From these considerations, the researcher proposes a computer program based on interactive multimedia to support the learning process of electromagnetic

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fields. The concept that the researcher wants to emphasize is the concept of independent learning. Through computer programs, students can study electromagnetic fields more easily. Also, users can interact with computer programs by responding to the system. The research method used is Research and Development with 5 stages, namely needs analysis, media design, media development, testing, and implementation[5].

Another form of technology that implements multimedia on mobile-based technology is educational game applications [6]. In 2011, game education users reached 6.5 people, in line with the increasing number of game developers. Educational games are defined as games that promote education and learning. Educational games aim to make it easier for students/learners to understand the educational content presented [7]. For example, the use of educational game technology for children with special needs such as autism. This educational game technology also involves multimedia features and can also be implemented on mobile-based devices [8]. The use of a combination of mobile and multimedia technology was carried out in a 2018 study by three researchers. This study produces a mobile-based interactive animation for the introduction of the Sundanese language for children. The system development method used in this research is the ADDIE method. Based on the evaluation results using the logical validity of a set of questionnaire entries, the validity score was 82.6%. It means the interactive animation application developed can be used to support learning [9].

MATERIALS AND METHODS

In this study, the required data were obtained from a community known as KOMPAKK through interviews and observations. The data collected are as follows:

- Autism-related data and other related matters.
- Activity from the community to socialize autism to many people.
- Data about several educational institutions, clinics, hospitals, therapy centers for autism patients in the City and Regency of Bogor.
- Data of characteristics, symptoms, method of treatment, treatment process, etc. for autism patients

Analysis of the problem based on the data collected was carried out using a cause and effect diagram. Meanwhile, to design the proposed prototype, this study uses a use-case diagram [10]. Another design is database design. The database design includes conceptual, logical, and physical designs [11].

The method for the system development is prototyping but this study will be separated into two parts. The first part, the stage until building the prototype. The prototype will then be evaluated with black-box testing. The purpose of the evaluation is related to the function of the system. This evaluation method ensures whether all functions or feature displays have met user needs [12]. Usually, the evaluation results by black-box testing are presented in a table form that lists the system's functions and then signs confirmation with the requirements [13].

RESULTS AND DISCUSSION

In this section, the results of each stage of the research will be presented as well as an explanation of these results. Following the system development method used, namely prototyping, the first stage of the system development life cycle is gathering needs and making prototypes. And finished with testing or evaluation. Based on the research output, then the evaluation will be done to system prototype. According to the definition of a prototype then we can evaluate the prototype the same as system test methods such as black-box testing, white-box testing, and others.

At the gathering needs stage, the developer and the user have a meeting to determine general goals and general needs. At the beginning of this, many details of needs may be overlooked. The results of research at this stage are in the form of data needed and business processes that are currently running. At this stage, users convey their activities, problems, and needs. The explanation from the user is then analyzed by the developer to identify optimal problems and needs.

Based on the previous explanation, the problem in this study is how to educate KOMPAKK members regarding various information needed by patients and families of autism patients. If you adopt the technique of making cause and effect diagrams, the causes of the problems raised are grouped into 4 groups, namely people, environment, method, and machines. Figure 1 is a representation of the problems and causes identified based on the collected data as a problem analysis process.

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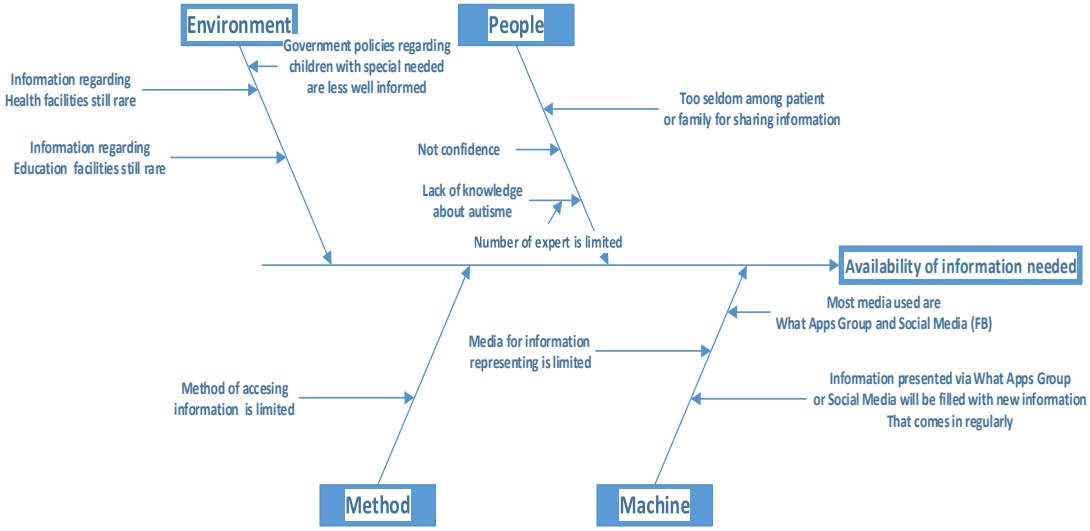

Figure 1. Fish Bone Diagram

The problem with this study is the limited availability of information needed by patients and their families who are members of the KOMPAKK community. While the causes are divided into 4 primary causes, namely methods, machines, people, and the environment. The four causes are then distributed again into secondary causes.

After analyzing the problem, it is followed by a needs analysis. The results of the needs analysis are functional and non-functional requirements. Functional requirements are representations of functions or features that must be met by the system. Meanwhile, non-functional requirements include security aspects, hardware/software specifications to run the proposed technology.

Following the functional requirements identified in the previous stage, the functional requirements are then translated into a use case diagram [14]. usecase diagram presents the features or functions that will be presented by the system. Figure 2 below is a use case diagram display of the proposed educational system or technology. From the picture below, there are many functions offered by the system to show the interaction between the user and the system such as login and logout function for both of user and admin, view health services function for the user, view education services for the user, view autism general information for the user, and entry data function for admin. In addition, generate a serial number for the user is included by the login function. View education services fee is as extend from education services function, and View health services fee is also as extend of view health service function.

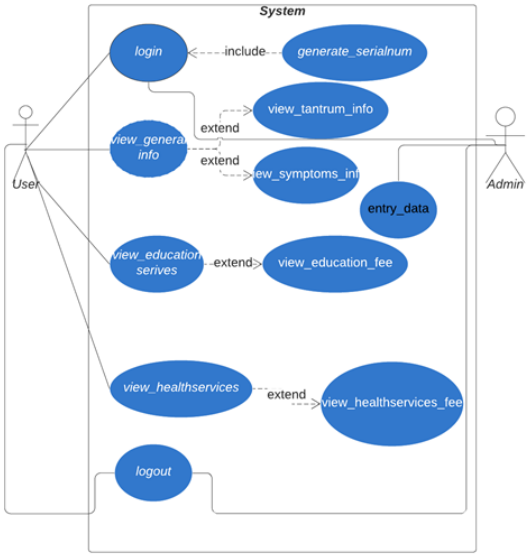

Figure 2. Use Case Diagram

The next stage is to build the database design into ER diagram (ER: Entity Relationship). ER-diagram shows the relation among the entity involved. How entities interact with each other. Besides entities, there is cardinality in the ER-Diagram. Cardinality show relationship among entities. Cardinality consists of three classifications: 1 to 1, 1 to many, and many to many. ER-Diagram is a method for denoting a database by defining the database structure before it is stored in the DBMS (database management system). Technically, the database structure is described in a series of tables connected by each key [15]. According to figure 3 show that cardinality among entities is many to many.

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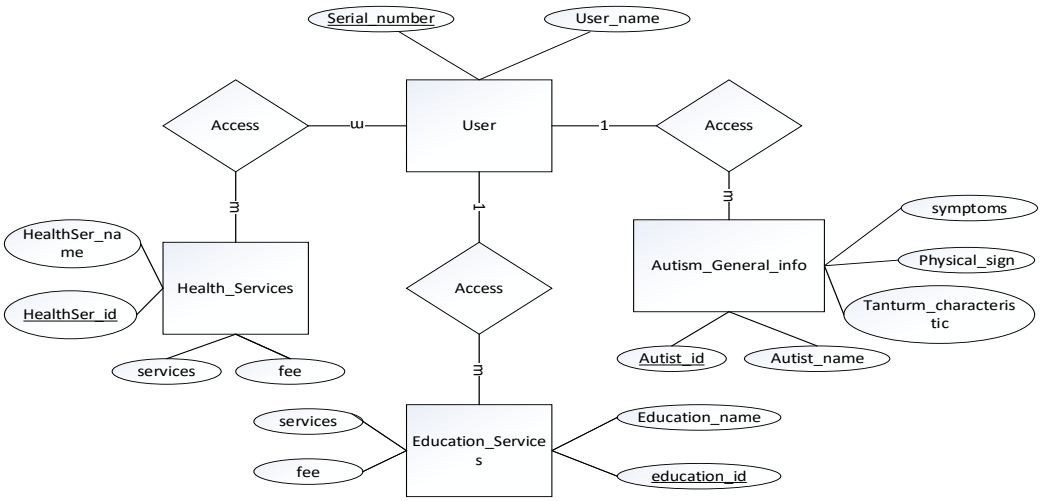

Figure 3. Conceptual Database Design-ER Diagram

This ER-Diagram will be implemented physically on the DBMS (database management system) in the form of an interrelated table structure. ER-Diagram above will generate 4 tables as relation result following the cardinality: user, general information about autism, education services, health services, and access (as relation results among entity). Attributes of the user consist of the user name and serial number. This serial number will automatically generate each visitation. Then, general information of autism has some attributes such as autism_id, autism_name, autism_class, physical_sign, tantrum_charateristic, and symptoms. Likewise, the table results of the relationship between users and health services and users with education services.

If the system design and database design have been completed, the next step is to make a graphic interface design from educational technology. This graphic interface design shows the menus of the proposed educational system/technology. Figure 4 is one of the window or menu designs of this educational technology. There are 3 windows or menus proposed for this technology, namely:

1. The design of the initial page graphic interface. On this page, there are buttons for entering the username/visitor. By the database design in Figure 3, system users will be stored in the database. The aim is to identify who uses the system outside KOMPAKK members.
2. The design of the main page graphic interface. On this main page, several tabulations of information needed by users are displayed, such as information about autism and information on several health and education services.
3. The detailed page graphic interface design of each menu on the tabs provided on the main page. For example, when a user clicks on a hospital, the next will open a detailed menu related to the hospital.

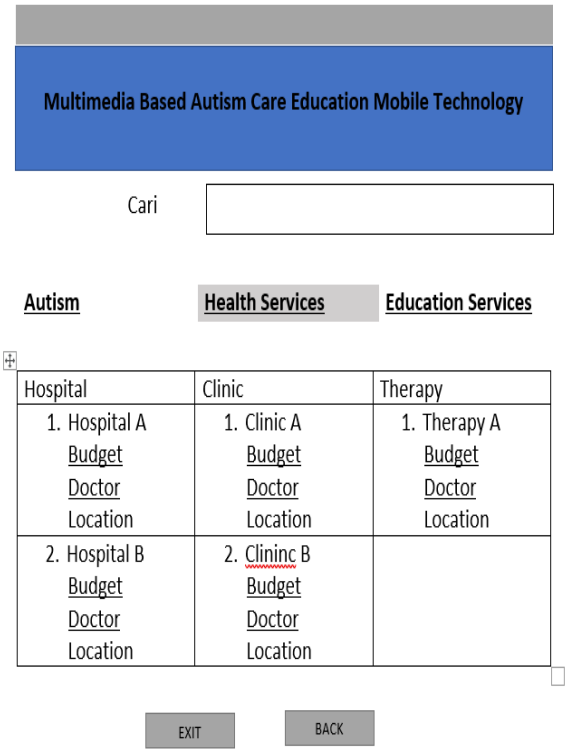

Figure 4. Graphical User Interface

The final result of this research is a prototype of educational technology related to autism based on mobile with the addition of multimedia features. The addition of multimedia features means adding media images, audio, video, text, or animation to the proposed technology. Figure 5 is a prototype made using the balsamic application.

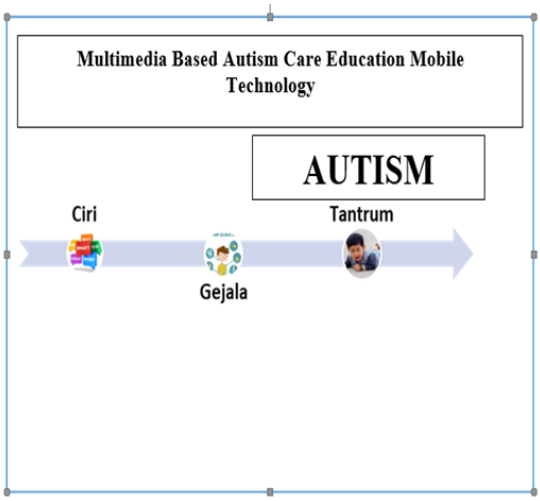

Figure 5. Education Technology Prototype

Before taking the conclusion, the prototype obtained is evaluated with a black box testing methodology. Black box testing evaluates the prototype based on system function. This method evaluates whether all system functional is met with user requirements. Table 1 shows the evaluation result for this system prototype.

Table 1. Evaluation Result

No	Function	Scenario	Result	Conclusion
1	Login	Entry Username	Get into system and system generate serial number	Meet the requirement
2	View general info of autism	User choose some general information displayed	System open window choose by user	Meet the requirement
3	View education services information for autism	User choose some education information displayed	System open window choose by user	Meet the requirement
4	View health service information for autism	User choose some health service information displayed	System open window was chosen by the user	Meet the requirement
5	Logout	User press logout button	System close the window	Meet the requirement

CONCLUSION

The entire series of research activities that have been carried out to produce output in the form of a prototype from autism care education technology, shows that the involvement of multimedia is very helpful in presenting information simply so that it is easier to use and understand by the system. In addition, the proposed system development method by prototyping is also very helpful for system analysts and designers when modeling or building a prototype of the system. With the consideration that most of the users of technology are housewives. So it is necessary to hold several meetings with these users to get a prototype of the system. Likewise, with the involvement of multimedia on system prototypes. Multimedia offer image, audio, video, animation, and text to preset the information needed. It is expected easier for the user to understand the material.

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