Biometric Security: Model of Free Health Care Service Control for Poor People in the City of Mataram

Abdul Manan[1], Heroe Santoso[2], Muhammad Tajuddin[3], Ahmat Adil[4]

[1]Mayot Office of Mataram, Pejanggik St., Mataram, NTB 8313
[2,3,4]STMIK Bumi Gora Mataram, Ismail Marzuki St., Mataram NTB 8313
([1]manan.mti@gmail.com, [3]judin61@yahoo.com)

Abstract - The field of health care of the Medium Term Development Plan (*RPJM*) of Mataram is dealing with health care authentication security method that is more for user access, with a biometric security fingerprint technology that received considerable attention of the Mataram government to provide better service for poor people (poor card receivers) and other people in the public health centers. The implementation of the biometric security fingerprint technology is quite extensively in the service information system as a control for the physical access, virtual access, and e-health applications. The method used in this research is "Waterfall" by using stages; Data Analysis, System Design, Implementation and Test Programs. In the stage of biometric security fingerprint technology implementation, there are three steps to do; strategic planning and budgeting, developing a system reliability plan and documentation. The results obtained during this study is a health service model (e-health) using health information systems connected with the biometric security finger print technology as the health care controller that is standardized, integrated technology applications and management of data bank based on the concept of biometric security.

Keywords- authentication, user access, e-health applications and biometric security

I. INTRODUCTION

Security by using a password is now having many weaknesses. Firstly, it has only verification function, secondly, many people use only one password for everything; from from e-mail, ATM card, until mailing list membership. To overcome the weakness of the password use, the biometric technology is developed, it is a method of database security using body part such as fingerprints, hand geometry, retina (eye), the voice and face to replace the password (Weber, 1999) .

Biometric technology is developed to serve dual functions; identification and verification. Beside that, the biometric has characteristics such as, cannot lose, unforgettablely, and cannot be falsified since its existence is inherent in human body, and each other will not be the same, so its unique characteristic will be secured.

Application of fingerprint biometric security is ideal to use in the public health centers in Mataram since the city has 3600 km2 with a total population (in 2011) is 408 200 people; spread in 6 districts and 50 villages. From the population, there is 21.331 poor families and 80.433 people (Department of Population, 2008). This is certainly being a priority of Mataram government to provide free services to the poor, among them is the health care. The implementation of free health care for poor people is by issuing Poor Card. But the card is often missing and sometimes used by people who are not poor which difficult to identify.

The development of information technology, the security of biometric fingerprint is able to keep the security system data for people (Poor Card receivers) in conducting free medical care in public health centers, integrated in Mataram city, rapidly and accurately.

II. LITERATURE REVIEW

A. Introduction to Biometrics

Biometric system is essentially a pattern recognition system that recognizes a person by determining the authenticity of specific physiological or characteristics possessed by people. The main problem in making a practical biometric system is how to determine a person to be recognized. Dependent on the application being used, the system may be referred to as a biometric verification system or an identification system (Weber, 1999).

1. Verification System: proving one's identity by comparing the captured biometric characteristic possessed by the biometric template stored into the system before. It is set one by one compared to determine whether the claimed identity of a person is right. One of verification systems that accept or reject the is delivered as identity.

2. Identification System: recognizing a person by searching the entire database template to match. It is set one until several comparisons to determine a person identity. In the identification system, the system determines subject identity (or damaged if the subject is not registered into the system database) without having identity right.

The term authentication is also often used in the field of biometrics, sometimes as a synonym of verification. The reality in the language of information technology, user authentication allowing the systems to know regardless of the user identity from the way of verification or identification.

B. Use of Confidentiality, Integrity and Availability (CIA)

Data protection is important in security issues. The data security system can be categorized into;
a. Public data, i.e. data that can be accessed by anyone.
b. Confidential data, i.e. data which may not leak to other party which have no right.
c. Random data, the data that is free.

In the design and discussion of security systems usually we will be faced with a consideration of the CIA triangle terms;
a. Confidentiality, i.e. all efforts related to the prevention of accessing the information by other parties which have no right.
b. Integrity. That is something that is related to the prevention of information modification by other parties which have no right.
c. Availability, i.e. the prevention of information resources or control by other parties which have no right.

C. Biometric Authentication

From these concepts can be stated that authentication in security is very important to maintain the security of the data, but has a lot of technology that is applied to preserve the authenticity, but it is a lot of obstacles in their applicability and still less provide a safe refuge. Biometric authentication technology offers a biologically enables the system to recognize users more precisely. There are several methods such as: fingerprint scanning, retina scanning, and DNA scanning. Last two methods are still in the early stages of research, while fingerprint scanning is now used extensively and used together with smartcard authentication process (Schneider, 1999).

D. Fingerprints

In North America, a man named E. Henry, in 1901, had a successful first use of fingerprints for identification dismissal of workers to cope double remuneration. Henry system was from ridge pattern centralized fingers patterns, especially the toes. The classic method of ink and rolling finger on a printed card to produce a unique ridge pattern for each individual digit.

It has been reliably proven that no two individuals have the same ridge pattern, the pattern cannot receive inheritance ridge, ridge pattern formed embryo, ridge pattern never changes in life, and only after death may change as a result of decay. In life, ridge pattern changed only by chance a result, injuries, of fire, disease or other causes that are not reasonable. Identification of fingerprints requires distinctions of form papillary circumference unbroken ridge, followed by mapping of the disorder or anatomic signs the same ridge. There are 7 papillary ridge pattern is Loop, Arch, whorl, Tented Arch, Double Loop, Central Loop and Accidental pocked (Eko Sediyono, 2009:7).

There are three papillary ridges from the seven patterns most commonly described below. (Loop has 1 delta and inter center line on the loop and will be shown on the delta. A whorl has two deltas and inter lines delta should be clear. An arch has no delta).
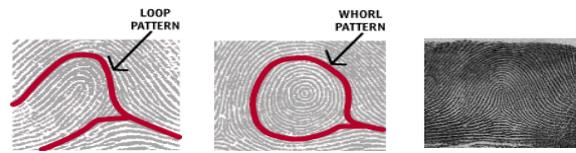

Figure 1. Some examples of papillary ridge patterns

E. Application of Fingerprint Biometric Service Delivery

The general structure of a fingerprint scanner that reads a sensor finger surface and change into analog digital readout via an A/D converter (Analog to Digital), an interface module is responsible for communicating (sending pictures, take orders, and so on) with external tool (personal computer / PC). Most of the recognition system itself does not menyipan fingerprint images but only store numeric feature of the extracts (Joshua, 2004).

F. E-Health system based Image Processing

Many activities of the development and application of image processing technology (image processing and medical imaging) and use it in the field of e-health to get a greater benefit for the improvement of public health services (Soegijardjo, 2010). Medical image acquisition followed by the conversion to digital format, various types of image processing (in the broadest sense, for example: initial processing, image compression), transport and storage, de-compress the image, medical image interpretation, and follow-up. The important thing to note is, that in every stage of the process, no room for error and / or loss of medical information; This needs to be demonstrated through a number of clinical trials.

Various examples of the application of e-health systems are included in this group, such as: recording and biometric-based identification of patients, early detection of osteoporosis and osteoarthritis (many methods), detection of diabetic retinopathy, cataract tele-diagnosis, teledermatologi, tele-radiology, study about gait analysis, algorithm development and image processing software for a variety of functions supporting the diagnosis stage. Image processing for detection of osteoporosis is shown in the following figure.
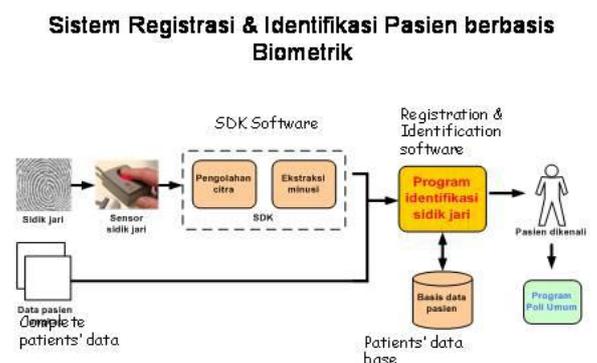

Figure 2. Patient Registration and Identification System Based Biometric

G. Information Systems

Many experts stated the definition of information systems, such as: "The information system is a man-made system that is generally consist a set of computer-based and manual components are made to collect, store, and manage data and provide information to the user" (Oram, Gelinas, & Wiggins, 1991). "An information system aims to collect, process, store, analyze, and disseminate information for specific purposes" (Turban, McLean, & Wetherbe, 1999).

"Information System is a series of formal procedures where data is classified, processed into information, and distributed to the user" (Hall, 2001). Using the system approach, the information system can be understood through its components, among others:

a. Hardware, such as computers and printers.
b. Software, a set of instructions that allows the hardware to be able to process the data.
c. Procedures, rules that are used to realize the data processing and produces the expected output.
d. Personnel, all those responsible for the development of information systems processing, and use of information systems output.
e. Database, set of tables, relation of tables, and other related to data storage.
f. Computer networks and data communications, interface system that allows the use of resources are shared by multiple users.

III. RESEARCH METHODS

A. Types of Research

Type of research is survey research, namely by taking a sample of the population using a questionnaire as a data collection tool that fits (Singarimbun , 1989) . Survey research conducted with the purpose of explanation (explanatory or confirmatory) that provides an explanation of the relationship between variables through research and testing was formulated earlier.

B. Research Sites

Study sites were used for the utilization of existing biometric fingerprint taken five (5) locations of public health centers: Karang Taliwang, Cakranegara, Mataram, Tanjung Karang, and Health Department.

C. Data Collection Techniques

In this study, data collection is done by:

a. Interview, conducted by leaders in the health centers, people who visit the health center, the head of health department, and the health center management staffs of the health centers in Mataram.

b. Documentation, obtained among other, book contains a collection of information, procedures and rules regarding the health services in health centers and health department of Mataram.

c. Observations, the authors observed data flow procedures. Observations is made of data entry process, identification biometric security system equipment, data validation services, database integration model, data processing, document printing and reporting.

D. Data Analysis Techniques

Analysis will be conducted on the use of biometric fingerprint technology in health centers, health care information systems, design LAN/WAN connected between health department with community health centers, which include the following:

a. Models and the identification of the working procedures in utilizing biometric fingerprint security technology.
b. Model and data processing procedures of health services in health centers
c. Model and procedures of the working of integrated network that uses LAN / WAN network technology
d. Web-base model and procedures of health services information system
e. Model and procedures of reporting in the health care services and health department.

E. Research Design

Development of problem-solving system and user needs is a principal goal of this development. Compliance with both of these key success or failure of systems development. To meet that development should pay attention to the principles of information systems development. Principles to be applied are as follows:

a. Involving users using the system.

b. Through a number of activity phases. This is done to simplify management and increase effectiveness.

c. Following standard to maintain consistency and documentation development.

d. Planting system development as a model.

e. Have a clear scope.

f. The division of the system into a number of subsystems, thus simplifying the development of the system.

g. Flexibility, making it easy modified and developed further.

In addition to fulfill the principles of system development must also implement information systems development methodology. One methodology is very popular, waterfall model (waterfall) by Pressman, with structured and prototyping techniques. The method used is development method of health services information systems using fingerprint biometric security through the System Life Cycle (SLC) or also known as "waterfall approach".

IV. RESULTS AND DISCUSSION

Research that has been done shows that information systems dealing with free health care to people in the city of Mataram in an integrated and integrated between health centers, hospitals and health authorities Mataram .

A. Results of Health Service Information System

Healthcare information systems have integrated part of data processing, information and administrator, which consists of:

- a. Main menu
- b. Health Center Data Form
- c. Doctor Data Form
- d. Clinics Data Form
- e. Patient Data Form
- f. Medicating People Data Form
- g. Information of Medicating Community
- h. Doctor Information Data
- i. Patient data information and their fingerprint
- j. Security biometric model for patient
- k. Security biometric model for operator

B. Database Structure

Implementation of health care information system for the city of Mataram using an integrated database structures between health centers, hospitals with the health department, to generate the database structure with the following table.

a. Hospital and Health Center

Fields	Type	Width
Code	Char	5
Name	Char	50
Address	Char	50
Head	Char	50
Employee Number	Char	20

b. Patient

Fields	Type	Width
Code_patient	Char	20
Name_patient	Char	50
Address	Char	50
Number_fingerprint	Char	250
Family Card Number	Char	25
Staff Number	Char	25

c. Doctor

Fields	Type	Width
Code_dokter	Char	5
Name_dokter	Char	50
Address	Char	50
Specialist	Char	50
Code_clinic	Char	3

d. Clinics

Fields	Type	Width
Code_clinic	Char	3
Name_clinic	Char	50
Code_doctor	Char	5

e. Care

Fields	Type	Width
Date	date	
Code_patient	Char	20
Code_doctor	Char	5
Code_clinic	Char	3
Desease_suffered	Char	100
Medicine	Char	100
Remarks	Char	50

f. Resident

| Fields	Type	Width
Resident Card No.	Char	25
Name_resident	Char	50
Place of Birth	Char	50
Date of Birth	Date	
Sex	Char	1
Marital Status	Char	30
Citizen	Char	6
No._Family Card	Char	30
Remarks	Char	50

C. Biometric Fingerprint Models For Health Care Information Systems

Model design of biometric devices with information systems, Integrated LAN network design, and integrated with a biometric fingerprint web-base used in this study consists of:
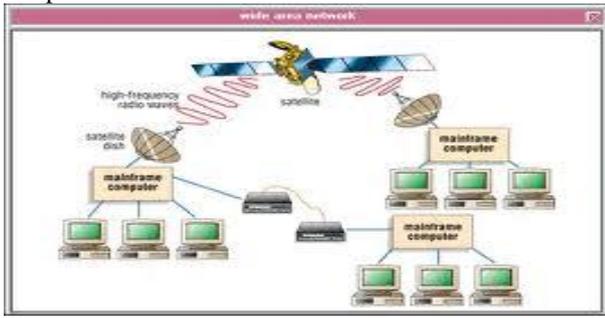
a. Models use fingerprint biometrics with the computer system


b. Wireless Network Model
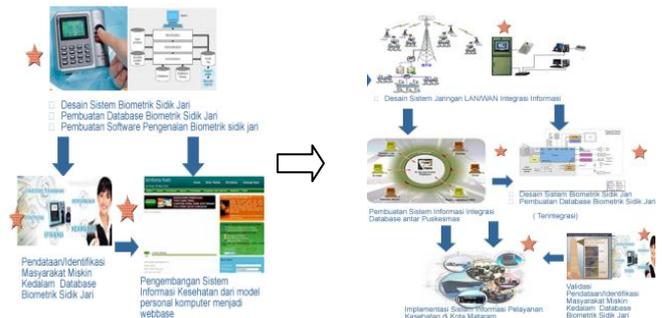
c. Computer Network Model

d. Model of Biometric Services and MIS Influence on Individual and Organization

Identification and verification process by utilizing the fingerprint will store fingerprint data fingerprint equipment installed at each clinic. Furthermore, the data will be linked with health care information systems (e-health) who has created as part of health care products in their respective health centers in the city of Mataram. Of the service process model for the management of health services is made by using biometric pinger print for the poor people.
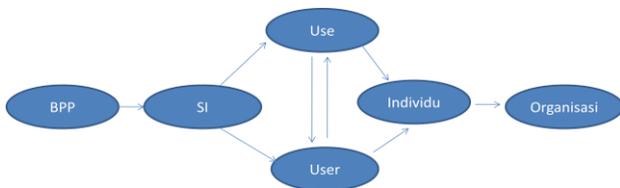

Keterangan :
BPP   : Peralatan Biometrik Pinger print
SI   : Sistem Informasi
Use   : Penggunaan
User   : Pengguna
Individu   : Dampak Bagi Indivudi Masyarakat
Organisasi   : Dampak Bagi Pelayanan di Bidang Kesehatan

e. Results of Health Service Information System (e-health)

Healthcare information system is based web-base that connects between the health center / hospital with the health department. Database is in the health department to keep all health care transactions, while identification process conducted in each health center when a patient comes to the hospital for treatment. was first performed at the same time perform the identification and recording in computer centers, will then send the data centers / hospitals for treatment of patients with data based health centers / hospitals that perform the service process.
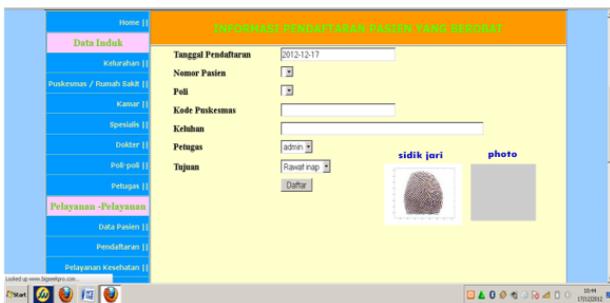
The information system also provides a means to check the authenticity using their identity and family cards. So the practice of counterfeiting in utilization of free treatment can be avoided.
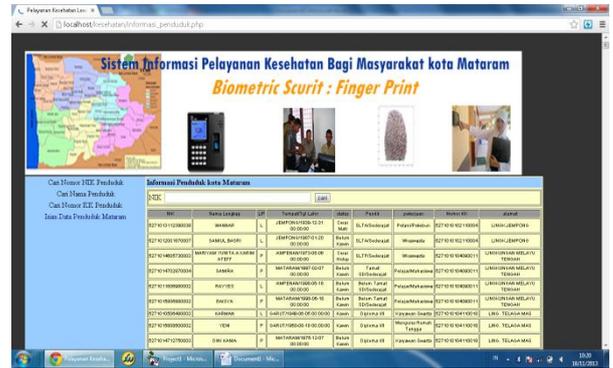
f. Software Development Model
 o Use of Interagency Network on education and Mataram city web to make integrated care clinic as the city of Mataram .
 o Creating Network LAN / WAN that connects the city health department with 11 (eleven health centers) using the Quality of Service (QoS).
 o The use of biometric systems security to simplify and speed service to the Society.

V. CONCLUSION AND SUGGESTION

A. Conclusion

a. Develop a database security system to prevent theft or leakage of the use of free health care for the community by using fingerprint biometric technology.

b. Introduce and communities are receiving identity data collection Raskin has the right to free health care use , at the time came for treatment clinic / hospital using biometric fingerprint technology as a substitute for a poor card .

c. Developing and utilizing biometric fingerprint technology to secure for services information systems management.

d. Model LAN / WAN can connect data from the Department of Health with a health center of Mataram integratedly.

e. Development of services information system that is stll in personal computer to become Web-base programs.

B. Suggestion

1. Expected to provide fast service to the poor in all the health centers in Mataram

2. Expected to prevent the use of false identity for the people who have no right.

3. Poor communities can directly come to the nearest health centers in the integrated treatment as an integrated database

4. Make it easier for officers to do health service quickly and accurately
5. Can provide leaders to obtain information regarding the handling of health services in order to create better service
6. Development of recommendations for the government policy in determining which location has the potential as a center for the development of fingerprint biometric technology in Indonesia

REFERENCES

[1] Ahmadjayadi, Cahyana (2004), Concept-Based Infrastructure Security and Protection of Information Technology, Ministry of Communications and Information, Information System Security Control and Audit Conference 2004

[2] Ax-S Biometric (2005, January 20). "Biometric Security Risk Assessment", Available: http://www.ax-sbiometrics.com/Downloads/PhysicalRiskAssessmentbrief.pdf Byrne, Jim (2003), "Large-Scale Biometric Management: A-Centralized, Policy-based Approach to Reducing Organizational Identity Chaos ", Information Systems Control Journal, Vol 6, page 41-44.

[3] Chandra, Akhilesh & Calderon, Thomas G (Fall 2003), "Toward a Biometric Security Layer in Accounting Systems", Journal of Information Systems, page 51-70.

[4] Donny, Cracker: Cause and Effect and the Rule of Law, Information and Communication Technology Watch, Available: <http://free.vlsm.org/v17/com/ictwatch/paper/paper061. htm> (January 6, 2005).

[5] Department of Population, 2008, "Population Data Mataram", page 3.

[6] Eko Sodiyono, Yessica N., Chrisanty M.R. , 2009, Classification of fingerprint using wavelet methods Simlet, page 7.

[7] Golman, 1999, "Computer Security", http://as.wiley.com/WileyCDA/Section / index.htm, Book (ISBN 0471978442 [sett]).

[8] Hall, J.A. (2001). Accounting information systems. Jakarta: Salemba Empat.

[9] International Biometric Group, Available: <http://www.biometricgroup.com/reports/public/market_report.html> (2005, January 17). "Biometric Market and Industry Report 2004-2008".

[10] Jawa Pos (2005, January 5) "Bag-Tech Biometric", Available: http://cdc.eng.ui.ac.id

[11] Josua Taringgan, Biometric Security: Alternative Control In Computerized Accounting Information Systems, http://puslit.petra.ac.id/journals / accounting / 2004

[12] Liu, Simon & Silverman, Mark, "A Practical Guide to Biometric Security Technology", Computer Society, Available: <http:\\www.computer.org> (2005, January 5)

[13] Media Indonesia (July 4, 2002), "Survey of 450 CIOs Against-Weak Information Systems Security Planning.", Nakertransnet, Available: <http://www.nakertrans.go.id> (2005, January 4).

[14] Oram, Gelinas and Winggin, 1991, Systems development is the process used to solve information processing problems.

[15] Radio Singapore International (October 19, 2004). "Better Safe With Biometric Passport", <http://www.rsi.com.sg> (2005, January 4).

[16] Annual Conf. Magnetics Japan, p. 301, 1982].

[17] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University of Science, 1989.

Abdul Manan was born in Utan, Sumbawa, West Nusa Tenggara, Indonesia at August 15, 1971. Graduated from Master of Information Technology, Technique Faculty, Gadjah Mada University, Indonesia, in 2008. Beside as a civil employee in Mayor Office of Mataram, he is a lecturer in STMIK Bumigora of Mataram, teaches Web Programming, Computer Networks, Simulation and Modeling, and so on. Some of his research experiences are Integrated System of Private Tertiary Education in West Nusa Tenggara (2013), Biometric: Health Service Model for Poor People of Mataram (2012), Mapping the Komodo Island as Tour Destination Using GIS (2012), Master Plan of West Nusa Tenggara Province (2010).