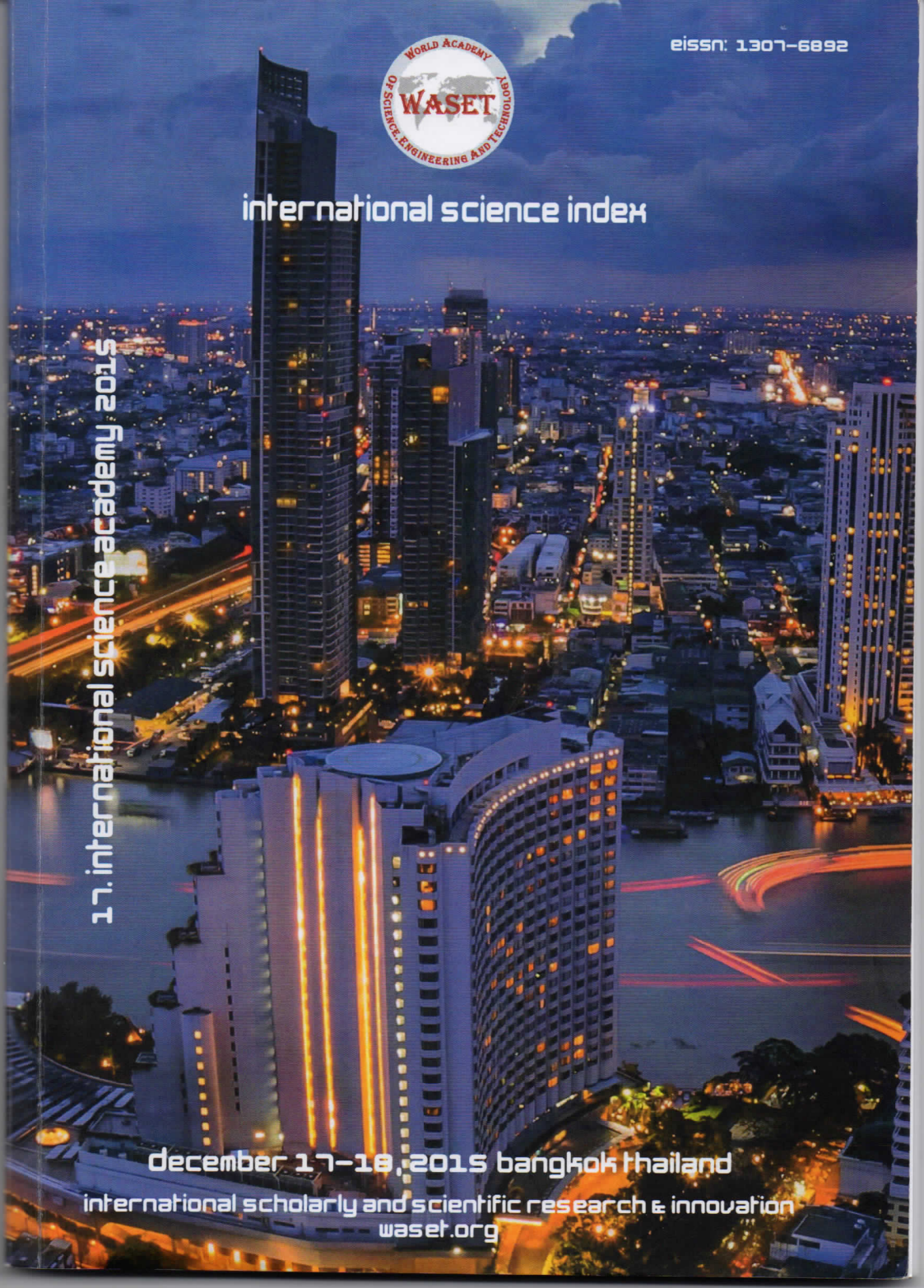
eISSN: 1307-6892



WASET
World Academy of Science, Engineering and Technology

international science index

17. international science academy 2015

december 17-18, 2015 bangkok thailand

international scholarly and scientific research & innovation

waset.org

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E-Vet Smart Rapid System: Detection of Farm Disease Based on Expert System as Supporting to Epidemic Diseases Control

Malik Abdul Jabbar Zen, WiwikMisacoYuniarti, AzisyaAmaliaKarimasari, NovitaPriandini

***Abstract*—Zoonoses is as an infection transmitted from animals to human sand vice versa currently having increased in the last 20 years. The experts/scientists predict that zoonosis will be a threat to the community in the future since it leads on 70% emerging infectious diseases (EID) and the high mortality of 50%-90%. The zoonosis' spread from animal to human is caused by contaminated food known as foodborne disease. One World One Health, as the conceptual prevention toward zoonosis, requires the crossed disciplines cooperation to accelerate and streamline the handling of animal-based disease. *E-Vet Smart Rapid System* is an integrated innovation in the veterinary expertise application is able to facilitate the prevention, treatment, and education against pandemic diseases and zoonosis. This system is constructed by Decision Support System (DSS) method provides a database of knowledge that is expected to facilitate the identification of disease rapidly, precisely, and accurately as well as to identify the deduction. The testing is conducted through *a black box test case* and questionnaire (N =30) by validity and reliability approach. Based on the black box test case reveals that E-Vet Rapid System is able to deliver the results in accordancewith system design, and questionnaire shows that this system is valid ($r \geq 0.361$) and has a reliability ($\alpha \geq 0.3610$).**

***Keywords*—Diagnosis, Disease, Expert Systems, Livestock, Zoonosis**

I. INTRODUCTION

ZOONOSIS is predicted as a threat for human welfare since it causes 70% of Emerging Infectious Diseases (EID) [1] and the high mortality of 50%-90% [2]. The zoonosis' spread from animal to human is caused by contaminated food known as foodborne disease [3].

The healthy food is free from microbiological, chemical, and physical hazards. Biological hazards [5] due to the lack of supervision for food safety can impact on farm product commodity decrease. The government has already concerned on this case reflecting on the Law No. 19 of 2009 Chapter VI Article 56 which describes the Veterinary Public Health as the controlling and preventing zoonosis [4], Article 1, paragraph 2 describes about Animal Health, and Article 28 explains the Veterinary Authority. This requires the farmer should have basic knowledge about livestock diseases management. Veterinarians as a veterinary disease experts have a crucial role. However, the current number of veterinarian in Indonesia is not sufficient [6] that requires 8000 veterinarians to reach the ideal number.

The development of digital information systems is one of breakthroughs resolving the problem of minimum knowledge about disease. It is E-Vet Smart Rapid System as an expertise veterinary application to prevent, treat, and educate toward pandemic and zoonotic diseases. Thus, this system is able to facilitate the farmers or communities having often contact with animals, to diagnose the disease quickly, precise, and accurate. It can also help practitioners to take early action in case of inadequate veterinarians in a particular region.

This study aims to test the diagnostics system on the application of E-Vet Smart Rapid System, as well as to test the validity and reliability applications.

II. IMPORTANT REQUIREMENTS

Based on the Pan American Organization (PAHO), a zoonosis is an infection or disease naturally transmitted from vertebrate animals (spine) to humans or vice versa [1].

According Collins and Wall (2004), from 11 of the most feared zoonosis, 22% were cows, and the rest is dominated by ruminants and poultry in general [7]. This problem then requires a comprehensive and coordinated effort (One World One Health) in collaboration with across disciplines and programs. This coordination and cooperation include health, breeding, and research institutions, and international cooperation.

The national strategic plan 2012-2017 of integrated zoonosis control refers to Presidential Decree No. 30 of 2011 describes the strategy, namely community empowerment by involving businesses, universities, nongovernmental organizations, and professional organizations, as well as other parties [1].

On the other hand, the Decision Support System (DSS) is an information system able to assist people to make a decision [8]. Materials research is secondary data symptom, disease, and treatment obtained from books and journals. While the research tools include (1) the hardware, including the processor core of i 3, 2 GB of DDR3 memory, and 500GB hard drive; (2) software, including Windows 8 operating system, browser Mozilla Firefox and Google Chrome, and (3) applications, including Microsoft Excel, XAMPP, phpMyAdmin, Netbeans, and SPSS 17.

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DSS system was established from database stored in Microsoft Excel with the extension * .csv (comma delimited). PhpMyAdmin is a storage application database. Then XAMPP as the server, will connect with phpMyAdmin by Netbeans application. Netbeans is a program Java builder.

There are two types of E-Vet Smart Rapid System namely the test case and questionnaires. It is expected that test case would get the series of highest testing in revealing an error of software [9]. Test case conducted is black box focusing on domain information. Test questionnaire is able to provide certain specific assessment of variables including (1) the use; (2) the accuracy; (3) consistency; (4) display, E-Vet Smart Rapid System program to help users in making decisions. There were five rating scale (likert scale), namely: 1 (very poor), 2 (less), 3 (fair), 4 (good), 5 (very good). There were 30 respondents with veterinary profession background.

Testing the questionnaire is conducted by SPSS 17. The quality test consists of validity and reliability test, by the validity formula of the Pearson Product Moment [10]:

Specification:

rxy = coefficient Pearson's product moment correlation (the validity)
N = number of respondents
X = a score for each of the questions
Y = raw score of each variable
R_{count} value is adjusted with r_{table} product moment at significance level of 5%. If r_{count} is greater than r_{table}, then the assessment criteria are valid.

Reliability testing used to determine the consistency of the system is Cronbach's Alpha:

Specification:

r_{tt} = coefficient of instrument reliability (test total)
k = valid questions
= number of variant
= total of score variant
Reliability scale is accepted if $r_{count} \geq r_{table}$ is 5%

III. Result and Discussion

Implementation of E-Vet Smart Rapid System consists of the design of data, system, and interface, and data analysis results.

A. Designing Data

Database of E-Vet Smart Rapid System is derived from the knowledge of veterinary expertise that is categorized into 8 tables consisting of animal data; symptom data; disease data; treatment data; connection data between animals and diseases; relationships and symptoms data of the disease; and relationships and treatment data of disease . The table is stored in phpMyAdmin as shown in Fig. 1.

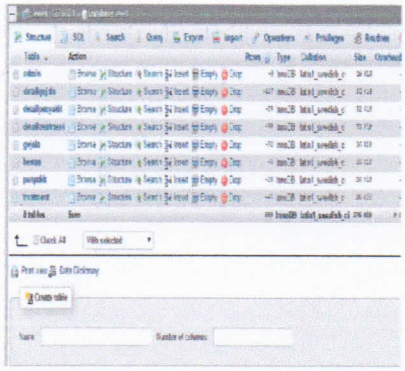

Fig. 1 Databases on the application phpMyAdmin

B. Design System

Design System uses DFD (Data Flow Diagram) as a tool-oriented system design data flow with the concept of decomposition and able to illustrate E-Vet Smart Rapid System. Context diagram describes the system in general, thus represent the whole process of the system and describes the relationship of input/output between systems with external entity. Context diagram shown in Fig. 2.

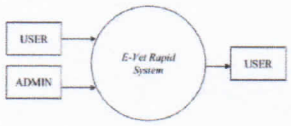

Fig. 2 Diagram of context

A controlled process can be controlled by the user is diagnosing animal disease, zoonosis threat, the characteristics of healthy livestock, and profiles of E-Vet Smart Rapid System. While the administrator handling the system can update the data to be submitted into E-Vet Smart Rapid System database. This database is then updated and processes the diagnosing of animal diseases.

C. Designing Interfaces

Interface design is designed for desktop display of E-Vet Smart Rapid System (GUI = graphical user interface). It is beneficial to facilitate the user to use the program that has been created. It is divided into three parts, namely the main view, the user view, and the administrator view.

There are several parts in the main view, namely: admin entry, education section for zoonosis, and characteristics of healthy livestock. At user interface display, it is divided into six pages, namely: education page of zoonotic hazards, educational page of healthy livestock, the profile page of E-Vet Smart Rapid System, input page of animal types, input pages of symptoms, and diagnosis results page.

Fig. 3 Program Main Page

Zoonosis education page contains the worldwide zoonosis threat, especially in Indonesia. While on the livestock health education page explains the characteristics of healthy livestock, particularly on cattle, goats, and chickens.

Symptoms input pages shown in Fig. 4 is a starting page containing the information related with livestock symptoms, automatically, the chosen symptoms will appear on the form "Symptoms Chosen" at the bottom. After inputting all the appropriate symptoms, it can be processed by pressing button "Diagnosis" to determine the diagnosis and its disease treatment.

Fig. 4 Symptoms Page Input

Diagnostic results page contains the results of the diagnosis of disease and its treatment from the previous page-the symptoms page input. This page is shown in Fig. 5. On the diagnosis results page indicates the description of a 6/6 from the inputted symptom. That six means symptoms total of the database and those six are true, so the diagnosis is 100%.

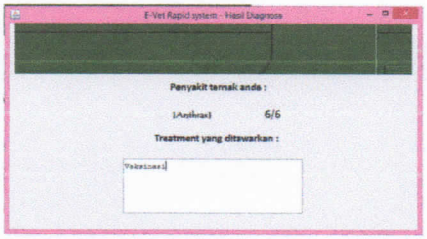

Fig. 5 Diagnosis Page

The administrator page can be accessed by entering the username and password; therefore the user cannot access its page. Each data management is equipped by the function of "Add" and "Update". "Add" is for inputting the ID and Type of Animals/Diseases/ Symptoms/Treatment. While the "Update" is for delete or edit the ID and Type of Animals/ Diseases/Symptoms/Treatment. General administrator page is shown in Fig. 6.

Fig. 6 Admin Program Page

IV. Results and Analysis

Testing of test case is through black box. In functionality, the application of E-Vet Smart Rapid System has never been error while undergoing testing. The whole ID Test provides output in accordance with the system design.

In addition, questionnaire testing has analyzed by its validity and reliability. At the level of validity, the results of calculations in SPSS is shown in Fig. 7.

		Kegunaan	Ketepatan	Konsistensi	Tampilan	TOTAL
Kegunaan	Pearson Correlation	1	.682**	.370*	.594**	.892**
	Sig. (2-tailed)		.000	.044	.001	.000
	N	30	30	30	30	30
Ketepatan	Pearson Correlation	.682**	1	.559**	.328	.817**
	Sig. (2-tailed)	.000		.001	.076	.000
	N	30	30	30	30	30
Konsistensi	Pearson Correlation	.370*	.559**	1	.195	.642**
	Sig. (2-tailed)	.044	.001		.303	.000
	N	30	30	30	30	30
Tampilan	Pearson Correlation	.594**	.328	.195	1	.709**
	Sig. (2-tailed)	.001	.076	.303		.000
	N	30	30	30	30	30
TOTAL	Pearson Correlation	.892**	.817**	.642**	.709**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Fig. 7 Testing the validity of SPSS 17

From the analysis of Fig. 7 reveals the total scores of each assessment criteria which are compared with r_{table}. R tables is obtained from 5% significance test of two sides and N=30, that is 0.361. The interpretation results for each criterion questions are shown in Table I.

TABLE 1
INTERPRETATION RESULTS OF VALIDITY LEVEL

Criterion	R_{count}	Description	Interpretation
Use	0,892	≥ 0,361	Valid
Validity	0,817	≥ 0,361	Valid
Reliability	0,642	≥ 0,361	Valid
Display	0,708	≥ 0,361	Valid

In the reliability test is obtained an alpha value of 0.805 as shown in Table 1.While the value $r_{critical}$ (test of 2 sides) at the 5% significance with N=30 (df = N-2 = 28) results in the value of 0.361. Because the value of α> of 0,361, then the application of E-Vet Smart Rapid System has reliability.

Reliability Statistics

Cronbach's Alpha	N of Items
.805	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Kegunaan	21.90	14.576	.835	.713
Ketepatan	22.50	16.948	.759	.763
Konsistensi	22.30	18.355	.554	.800
Tampilan	21.73	17.375	.615	.782
TOTAL	12.63	5.413	1.000	.766

Fig 8 Testing of *Test Case*

V. CONCLUSION

E-Vet Smart Rapid System is an application proposed for veterinary expertise and profession based on Decision Support System (DSS) as a medium for the prevention, treatment, and education against pandemic diseases and zoonotic diseases. E-Vet Smart Rapid System is capable to deliver the results in accordance with the system design based on black box of test case. In terms of usability, accuracy, consistency, it is obtained the value of 0.892 respectively; 0.817; 0.642; 0.708 based on formulation of Pearson Product Moment. This value is valid because each value is > 0.361. Meanwhile, based on reliability test, an alpha value is 0.805 that is α> 0.361; so the system has a level of reliability.

ACKNOWLEDGEMENT

The first acknowledgment is for God Almighty. Then to our parents, DVM, respondents of E-Vet Smart Rapid System, and all those who cannot be mentioned one by one. Hopefully, this work can be beneficial for the society.

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