Development of a Knowledge Management System Restoration Archaeological Site

Suphot Phuangkamnerd [1] Prachyanun Nilsook [2] Ravisada Thamrongviwanna[3] and Somporn Phuangkamnerd[4]

[1] North Bangkok University, Bangkok, Thailand
[2] King Mongkut's University of Technology North Bangkok, Bangkok, Thailand
[3]The Royal Thai Police Association, Bangkok, Thailand
[4] P.V.C. Likitkarnsrang Limited, Bangkok, Thailand

(suphot.ph@northbkk.ac.th[1]) (prachyanun@kmutnb.ac.th[2])
(ravi.marinepolice@gmail.com[3]) (somporn.pkn@gmail.com[4])

Abstract-**Thailand has many important archaeological sites. necessary to restoration and upgraded to include shape of harmonious look same the original as possible but must shows the difference what is available original and what made new. Historic restoration there are steps a sophisticated. is the wisdom Thai that should manage these knowledge. The research team have developed a knowledge management system for develop a historic restoration is a application. Has online database use language HTML5 the system can store data knowledge in historic restoration of experienced technicians has as described in the form of photos showing the process of the restoration project from start to finish restoration projects. Causing a source of learning the restoration. It is also guidelines on bringing awareness to convey to younger generations of Thailand. The assessment system efficiency technique Black Box Testing there are two groups of evaluators. 1) Experts evaluation results at a good level. ($\overline{X}$ = 4.12, S.D. = 0.58) and 2). General users evaluation results at a good level. ($\overline{X}$ = 4.00, S.D. = 0.43) The system can be deployed in fact circumstances had.**

Keywords-**Knowledge Management System, Restoration, Archaeological Site**

I. INTRODUCTION

Archaeological sites and many antiquities have been damaged [1] There are attempted to maintain historic sites listed kept Just as the restored RuenPhraKhamaSakkhi, RuenPhraSurapee Which is a case study of the research and development of the system Two traditional wooden house built in the reign of King Rama sixth. Located within the Silpakorn University Sanam Chan Palace campus. Currently there state of disrepair so there project on restoration Ruen PhraKhamaSakkhi, RuenPhraSurapeeSanam Chan palace NakhonPathom province**.** Held during on January 3, 2015 – November 13, 2015 including of 315 days. [2] The cooperation of the planning division Sanam Chan Palace campus and Thai architecture Silpakorn University and The crown property bureau. Aider of the budget its purpose for a museum exhibit about the life of the Sanam Chan palace and Construction Technology in the reign of King Rama sixth. On the occasion mahamongkol PrincessMaha Chakri Sirindhorn's. Personal Affairs Division the age of 60 years. In the year 2015 by P.V.C. Likitkarnsrang Limited operated two of these restoration. The research team realized the importance of the knowledge management on restoration. Because knowledge management is important in the treatment of wisdom for Thailand. [3] Knowledge management is a process that must be done in a systematic manner so knowledge management is correct. [4] By using information technology in the knowledge management can disseminate and manage knowledge widely. [5] From experience, the researchers developing information systems in various styles found information system will help in information management. [6] especially if there is a knowledge management system based on the knowledge management system will help to manage the data effectively.so the research team have developed a knowledge management system for restoration to occur. The goal is to manage the knowledge of the steps in a restored ancient monuments from the user experience is described in the Format Picture shows the steps to perform restoration from the start of the project to complete the project to cause a source to learn the restored ancient monuments and also as a guide in the implementation of the knowledge to disseminate to the generation of youth of Thailand.

A. Research Objectives

To develop a knowledge management system the historic restoration.

To evaluate system performance by professionals and system users.

B. Scope of Research

System developed resembles a new application can be deployed on Mobile smart phone operating system Android has.

Administrators can manage the data specialist and can set access rights historic restoration project.

Specialist can add a photo of historic restoration. Can increase a historic restoration project. Can provide

November 26, 2015 www.icteched.org
Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok, Thailand

5

ICTechEd03EDU02

operational data historic restoration and can answer questions the historic restoration project.

The user can browse photos on historic restoration project. Can browse data question has and can question the historic restoration project.

II. RESEARCH METHODOLOGY

Operations in collecting data restoration Ruen Phra Khama Sakkhi, Ruen Phra Surapee Sanam Chan palace Nakhon Pathom province. Learn practical data from the expert from P.V.C.Likhitkarnsrang Limited. Learn from major those involved. Learn from text books and learn form related research By bringing information technology to support the design and development of systems.

The development of the system will this new technique for analysis and design of the object that uses the language UML (Unified Modeling Language) to help you design it offers two sections: 1. Architecture Design 2. Detail Design

The design of the Architecture contains 1. (Use Case Diagram) Displays the page that the operation of the system. 2. (Class Diagram) Display the relationships and structure all that is in the system. 3. (Sequence Diagram) Show the page and the relationship of the Use Case and Actor by the time axis is important. And 4. (Activity Diagram) Show the details of the event that occurred in Use Case by offering the following order.

A. Use Case Diagram

Displays the page that the operation of the system that contains the action (Actor) This will be the user or the action with the system and Use Case displays the page that the operation of the system by both this section is a line connecting the relationships that in the illustration 2 will find that the use of the system. 3. The permission level: the System Administrator, User, staff where each one of the parts will have the work that vary according to the type of work schedule.
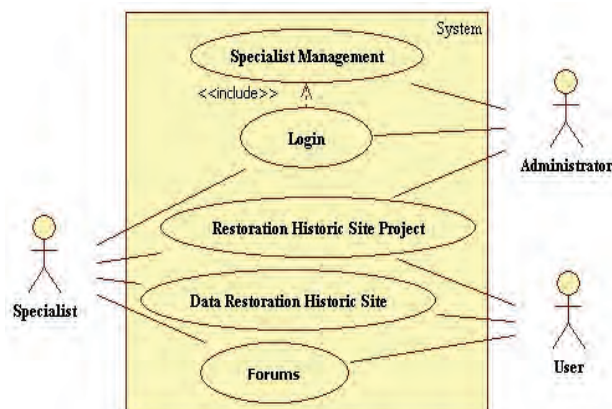

Figure 1. Use Case Diagram

Administrator to login the system can to manage specialist are members of the system. And set access permissions historic restoration project.

Specialist to login the system can add a photo of historic restoration. Can increase a historic restoration project. Can provide operational data historic restoration and can answer questions the historic restoration project.

The user can browse photos on historic restoration project. Can browse data question has and can question the historic restoration project.

B. Class Diagram

Class Diagram to display the relationships and all the structure that is already in the system that will enable them to learn that the class is a component in the manner of a diagram to understand the program will display a preview of the class diagrams as shown in the Figure 2
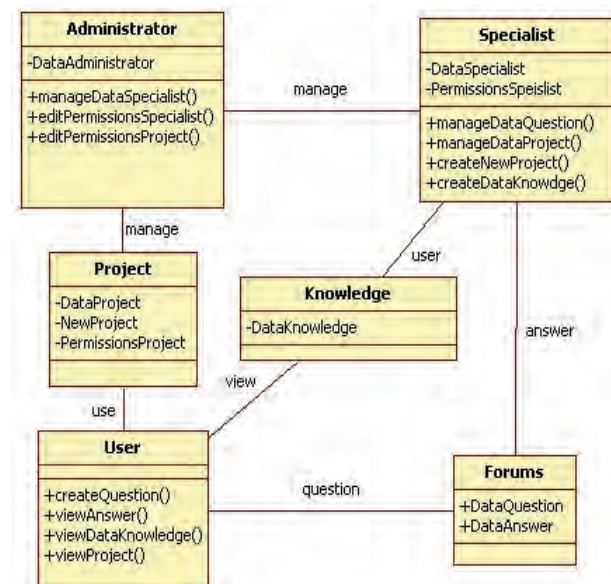

Figure 2. Class Diagram

Class Administrator has Attribute as DataAdministrator is information of administrators which has methods manageDataSpecialist as following; edit Permissions Specialist, specialist assign permissions to access the system.,and edit Permissions Project.

Class Specialist include Attribute DataSpecialist is data of experts and Permissions Specialist as access to the system. Has Methods manage Data Question answer a question form use , manage Data Project , Manage data Project,Create New Project,Add new project and Create Data Knowledge , Add knowledge.

Class User include Methods create Question Specialist, View Answer Specialist, View Data Knowledge, View Project.

Class Project include Attribute DataProject is a data project, New Project is a new data project, Permissions Project is a access to data project.

ICTechEd03EDU02　　　　　　　　6　　　　www.icteched.org November 26, 2015
Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok, Thailand

Class Knowledge consists of Attribute, DataKnowledge as the knowledge data.

Class Forums consists of Attibute, DataQuestion as the question data, and DataAnswer as the answer data.

C. Sequence Diagram

The diagram shows the function of the system, with Object and time providing the sequence of the work, and focuses on the instant of object. Sequence Diagram is a diagram that shows the interaction between object based on the sequence of the incidence at a specific time. Messages between class would lead to the creation of method within the relevant class. The researcher therefore present the sequence of incidence as shown in Figure 3.
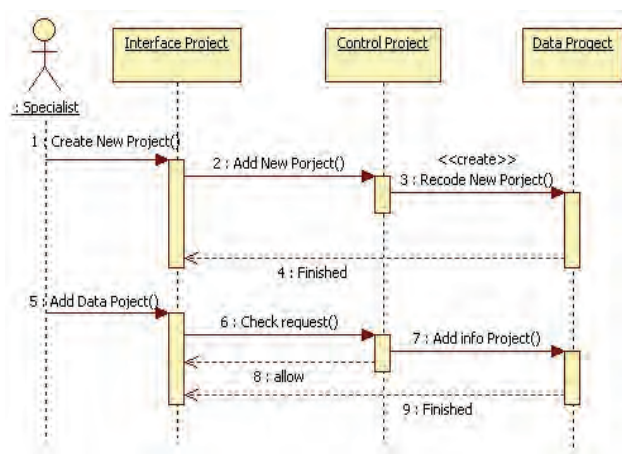

Figure 3. Sequence Diagram

From figure 3 shows the incidence that shows the process of adding new Historical site restoration project, and adding data about the restoration of historical site with 1 actor and 1 access level, the sequence of process are as follow:

Specialist, who adds new projects via Interface Projector.

Interface Projector send the requested information – as made by Specialist – to Control Project.

Control Project adds new project data into the Data Project database.

Data Project notify the specialist of completed records.

Specialist wants to add data about restoration of historical site within the project via Interface Projector.

Interface Projector check access right to access the project.

Control Project add the data.

Control Project confirm access of data.

Data Project notifies specialist of completed records.

D. Activity Diagram

This part shows the detail of each activity that happen in each use case to show the composition, and relationship between each activity. The design in this part uses the activity diagram would provide example of

essential diagram that is crucial to the decision-making process – as shown in Figure 4.
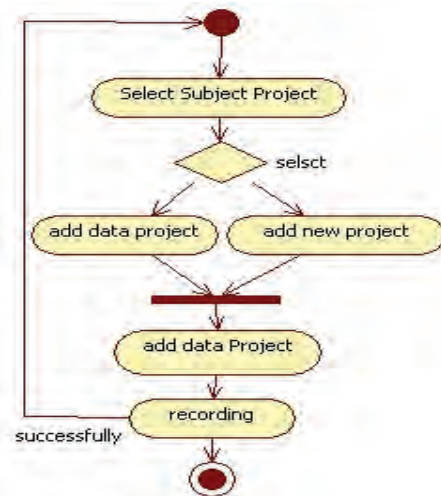

Figure 4. Activity Diagram

The activity flows as follow:

Specialist logins to the system.

Specialist must be able to select the need between adding new project or adding data to existing projects.

When completing the desired function would save the data.

When data is completely saved the system would notify the specialist of the completion of record.

E. Data Design

This part shows the structure in the recording of data in the entire system by saving in form of Relation Model database. As the data constantly changing, the researcher sees the appropriateness of using this type of database. ER-Diagrams would be used to present the relation of data collection so that users can see clearly the data within the system by using ER-Diagrams in explaining this system – as shown in Figure 5.
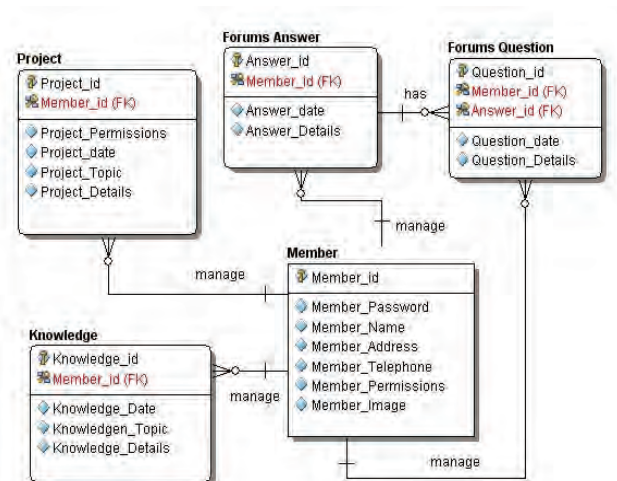

Figure 5. Data Diagram

November 26, 2015 www.icteched.org
Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok, Thailand
7
ICTechEd03EDU02

According to Figure 5, Table Member would keep Administrator and Specialist data – consist of Password, Name, Address, Telephone, Permissions, and link Image, and has Member id as Primary Key.

Table Project would keep the data of historical site restoration projects and consists of Permission, Data, Topic, and Details, and has Project id as Primary Key and Member id as Foreign Key.

Table Knowledge would keep knowledge data of the restoration of historical site and consist of Data, Topic and details and has Knowledge id as Primary key and Member id as Foreign key.

Table Forums Question would keep questions from general user data and consist of Date and Details and has Question is as Primary key and Answer id as Foreign key.

Table Forum Answer would keep specialist's answer data and consist of Date and Details with Answer id as Primary Key and Member id as Foreign key.

F. System Sitemap

The chat illustrates the function of the system. It shows the menus of the functions of the system so that the sequence and steps in using the system could be understood, as shown in Figure 6.
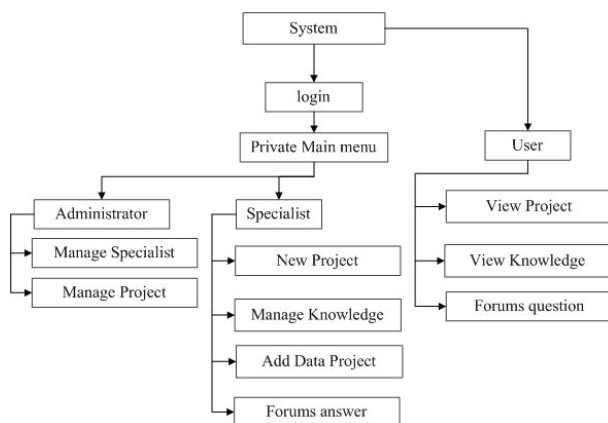

Figure 6. System Sitemap

From Figure 6, the System Sitemap could be explained as follows:

Administrator login to the system and manage the specialist data and establish project access rights.

Specialist login to use the system – adding new projects, adding project data, adding knowledge of historical site restoration, and answer questions from general user.

General users do not need to login to the system but they can view Historical site restoration projects, knowledge about the restoration, and post questions.

Evaluation of system effectiveness

The evaluation of system effectiveness would check the development of system and its correctness – with steps and process in the evaluation as follows.

In the creation of evaluation tools, the developer uses Black Box Testing which tests the correctness of Input data and Output data of the system. The main tool used in the evaluation of the effectiveness of the system is the use of questionnaire. The steps to create the questionnaire are: 1) study the information about the creation of questionnaire and 2) select questions and make additional questions that are appropriate to the context of the system.

The steps in evaluation of the program effectiveness are using 5 specialists and 20 general users by conducting as follows:

Invite to trial out the questionnaire and set up appointment for testing the system.

Start using the system and test different functions as outlined in the questionnaire.

Suggest improvements about the system and make improvements as needed.

There are 5 main criterion in the evaluation of the program effectiveness: 1) evaluation of the function of the system for each user 2) evaluation of the need of each user 3) evaluation of the function of the program 4) evaluation of the results 5) evaluation of the program security.

The researcher uses 5 level rating-scale to evaluate the effectiveness of the program – both qualitatively and quantitatively, and the rating from program testers should rank over 4 to accept that the program is effective in real-use condition. The 5 rating scale can be divided as follows: 4.50 – 5.00 as very good, 3.50 – 4.49 as good, 2.50 – 3.49 as mediocre, 1.50 – 2.49 as low, and 1.00 – 1.49 as lowest.

The criterion to accept the effectiveness of the developed system would be based on the average score of the specialist group and general user group, the score should average around good level (score 3.50 – 4.49) to accept that the system is effective in real-use condition.

III. OPERATION PERFORMANCE

From the process of identifying problems, analyze and design of the system , until the development of the Historical Site Knowledge Management system – it could be summarized the process of the research from the use of HTML5 in the development of application, and the evaluation of the effectiveness of the program.

The research and development of the Historical Site Knowledge Management system, based on the access rights, can be categorized into 3 levels as follows:

A. System Administrator

This access can manage specialist information, and determine access rights to historical site restoration projects as shown in figure 7.
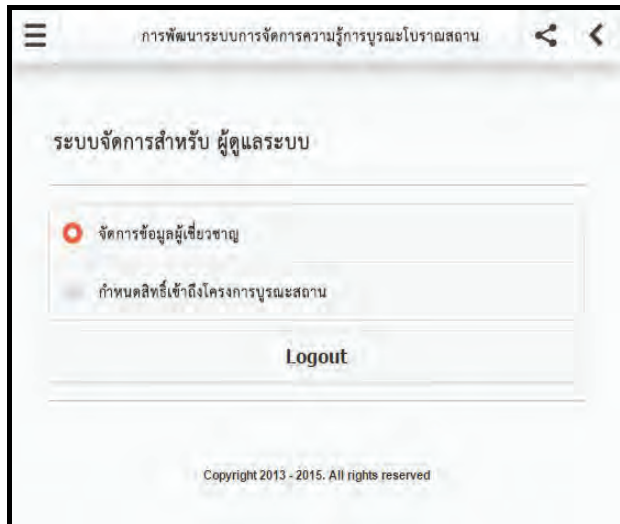

Figure 7. Administrator interface

B. Specialist

This access can add picture or data of the historical site restoration projects, can create new projects, provide information about each project and answer question about the project, as shown in figure 8
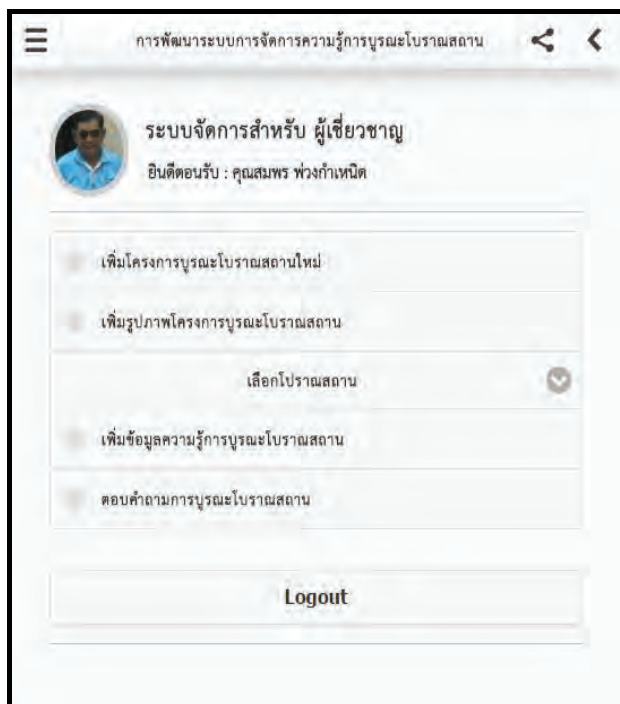

Figure 8. Specialist interface

C. General User

This access can recall pictures of the Historical Site restoration projects, can recall project information and posts questions about the project, as shown in figure 9.

Figure 9. User Interface

IV. RESULT AND DISCUSSION

The evaluation of effectiveness of the system would use 2 groups of samples: 1) specialist would be 5 software specialists and historical site restoration specialists and 2) 20 general users. The evaluation results are as follows.

The specialist's evaluation shows that the overall effectiveness is at good level ($\overline{\text{x}}$ = 4.12, S.D. = 0.58), with good level effectiveness in all 5 categories: evaluation of the function of the system for each user ($\overline{\text{x}}$ = 4.20, S.D. = 0.83), evaluation of the need of each user ($\overline{\text{x}}$ = 4.20, S.D. = 0.84), evaluation of the function of the

November 26, 2015 www.icteched.org
Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok, Thailand

9

ICTechEd03EDU02

program ($\overline{X}$ = 4.00, S.D. = 0.71), evaluation of the results ($\overline{X}$ = 4.20, S.D. = 0.83), evaluation of the program security ($\overline{X}$ = 4.12, S.D. = 0.58), respectively.

The general user's evaluation shows that the overall effectiveness is at good level ($\overline{X}$ = 4.00, S.D. = 0.43), with good level effectiveness in all 5 categories: evaluation of the function of the system for each user ($\overline{X}$ = 3.95, S.D. = 0.82), evaluation of the need of each user ($\overline{X}$ = 4.10, S.D. = 0.72), evaluation of the function of the program ($\overline{X}$ = 3.75, S.D. = 1.21), evaluation of the results ($\overline{X}$ = 4.20, S.D. = 0.77), evaluation of the program security ($\overline{X}$ = 4.00, S.D. = 0.72), respectively.

The development of Historical Site Knowledge Management system has the main objective as to develop the system to collect data and information about the restoration of significant historical site of ancient, construction value, and historical value in Thailand. Several researches have made attempt to systematically categorize such knowledge [7]. Also the program can be used as sources of information for the younger generation to understand these important processes [8]. Also, the development of this program is in line with the restoration of Sanam Chan palace in Nakhon Pathom province and commemorates the 60th Birthday of HRH Princess Maha Chakri Sirindhorn. The development of this system uses the analysis and design of object with UML language to help with the design of the system. HTML5 is used in the development of application portion of the program.

V. CONCLUSION

Knowledge management is the process of bringing knowledge that arise from experiences so that people can learn and further apply such knowledge. The knowledge regarding the restoration of historical sites and artifacts are considered unique and valuable experiences and restore and keep Thai cultural heritage and store its value. The knowledge management system is considered technological tool that help enlighten the knowledge and record such knowledge for further generations to come.

VI. ACKNOWLEDGEMENT

VII. REFERENCES

[1] Monuments and Museums Act 2504 as amended d'recent 2535 and 2528, the Department issued regulations

[2] Chairoj Janetamrong research report Thai Wooden House reign of King Rama sixth in Sanam Chan Palace Data collection for preservation. [Nakhon Pathom: Research and development Silpakorn University], 2538.

[3] Nilsook, P. and Sriwongkol, T. ((2009The Development of Multi-weblog with Knowledge Management for Thailand's Higher Education. *2009 International Conference on Information and Multimedia Technology (ICIMT (2009*December 19-18, : 2009Jeju Island, South Korea. p. .318-315

[4] Anupan, A., Nilsook, P. and Wannapiroon, P. (2015) A Framework for a Knowledge Management System in a Cloud Computing Environment Using a Knowledge Engineering Approach. *International Journal of Knowledge Engineering*, Vol. 1, No. 2, September 2015. pp 146-149. DOI: 10.7763/IJKE.2015.V1.25.

[5] Piriyasurawong, P. and Nilsook, P. (2010) Web-based Training on Knowledge Managementfor Vocational Teachers in Thailand. *Asian Journal of Distance Education*. Vol 8, no 2, 2010. pp 65 – 71.

[6] Phuangkamnerd, S., Nilsook, P. and Thamrongviwanna, R. (2015) Digital Library Operating Management System by North Bangkok University. *The sixth International e-Learning Conference 2015 (IEC2015)*, July 20-21, 2015, BITEC Bangna, Bangkok, Thailand, pp.132-139.

[7] Keoplang, P., Rungkasiri, T,. Sophatsathit, P.,and Nilsook, P. (2011).Convergence of Mobile Learning Technology and Knowledge Management System Innovation for SME Clustering.*Proceedings of the 6th International Conference on e-learning*, pp. 468-476.

[8] Ruen Phra Khama Sakkhi, Ruen Phra Surapee Sanam Chan Palace Researched and compiled by Professor Opart Wongtavesap 20 January 2015

ICTechEd03EDU02   10   www.icteched.org November 26, 2015
Faculty of Technical Education,
King Mongkut's University of Technology North Bangkok, Thailand