APPLICATION OF ICT FOR PROMOTING SUSTAINABLE DEVELOPMENT IN WORLD HERITAGE SITES: CASE OF LUANG PRABANG, LAO PDR

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ABSTRACT

Under the collaboration among UNESCO, La Maison du Patrimoine, and Tokyo Institute of Technology, the project was conducted focusing on the means of how information and communication technologies (ICT) could contribute to promote sustainable development of a World Heritage site. After the needs assessment, the development of database, establishment of network connectivity, establishment of local ICT center, creation of website and training of local human resources were identified as ICT applications. Such activities aim at providing better access to information on heritage site to local people and visitors. This paper highlights major activities of the project including the selection of the platform for provision of sustainable information service, development of the database, establishment and operation of the local ICT center, as well as initial evaluation of the ICT center.

1. INTRODUCTION

Luang Prabang is an outstanding example of cross-fertilization between two different cultural traditions; Lao traditional architecture and urban layout on the one hand, and the 19th and 20th century western influences on the other hand. With such an unique integration, the town of Luang Prabang was inscribed as a World Heritage Site in 1995. La Maison du Patrimoine (MdP) was established in 1996 to plan and manage heritage site of Luang Prabang. Its specific tasks include: 1) controlling, protecting, restoring and embellishing the listed heritage; 2) managing natural conservation site; and 3) coordinating the conservation and other heritage related activities among international organizations and relevant donors.

People in the town and peripheral rural areas have difficulties in obtaining necessary information for their lives. For example, locals do not have easy access to legal information related to the conservation, construction, and restoration of the houses in the heritage zone of the town.

This may affect low level of awareness among local community on importance of cultural and natural heritage.

In the past years, MdP has accumulated abundant information on cultural and natural heritage of the town. Such information not only has the cultural value but also is useful for the development and conservation activities in other heritage sites. Most of information in MdP was paper-based in deteriorating condition. Furthermore, the database system which was established on voluntary basis was a standalone system and thus, individually updated data could not be shared effectively among users even within MdP. Given these conditions, Tokyo Institute of Technology (Tokyo Tech) proposed to manage the information strategically by using database system to enable data storage in good condition. In this way, information can be shared among institutions.

2. NEEDS ASSESSMENT RESULTS

A collaboration among UNESCO, MdP and Tokyo Institute of Technology developed a project entitled "Application of ICT for Promoting Sustainable Development in World Heritage Sites: Case of Luang Prabang, Lao PDR" in April 2005. Under this project, careful needs assessment was conducted. The study focused on the means by which the Information and Communication Technology (ICT) could contribute to promote sustainable development. The results underlined how ICT could be developed in five areas [1,2]:

a. *Operation of a database management system (DBMS) and development of database (DB) applications:* This aims to develop an effective management and utilization of significant information which MdP and other local institutions have created, accumulated and archived. DBMS provides easy access to necessary information and sets of data. Effective database management also ensures consistency of data.

b. *Testing and Establishment of Network Connectivity:* Network connectivity facilitates access to information and promotes interactive information sharing among government offices and different institutions.

c. *Development and management of a Web site:* In order to share information on the activities of MdP and on Luang Prabang effectively among public, the MdP needs to build a web site. The ultimate goal is to enhance information sharing and develop external use of valuable information on the World Heritage site.

d. *Establishment and Development of ICT center:* The purpose of developing ICT center is to provide easy access to information and knowledge on cultural and natural heritage to local communities as well as visitors. The center is also expected to serve as a non-formal educational center to provide ICT training to young students or individuals interested in ICT.

e. *Development of local human resources:* Human resource is always a key to successful transfer of technology. The local ICT team has been established with the members from MdP, Ministry of Information and Culture, and urban development administration agency (UDAA). Series of intensive training on the utilization of ICT have been conducted.

3. DATABASE SYSTEM

3.1. Background Philosophy

Free and open source software (FOSS) was used to develop the database system. The maintenance cost of commercial software is a big issue for sustainability. The legality of the software was essential for the international cooperative project. FOSS is the software whose licenses give users the freedom to run the program for any purpose, to study and modify the program, and to redistribute copies of either the original or modified program without having to pay royalties to original developers.

The database management system deployed in the project is in the client-server architecture. The database management system running on the server can be shared by users connected via network simultaneously. Thus group development and maintenance of the database becomes more efficient because the database can be kept always updated.

The established system provides web based user interface (UI). This aspect profits in terms of information sharing and dissemination because the clients do not need specific software for UI and the access via the Internet can be very easy.

3.2. Software Components

From plentiful candidates in the group of FOSS, following software components were carefully chosen to develop the database system.

Linux is chosen for the operating system, which is the most popular free operating system. *Debian GNU/Linux* is one of the Linux distributions and is well known for its abundance of optional packages up to eighteen thousand [3].

Zope is an open source web application server written by Python language [4]. Zope can provide web-based UI and it can be managed from any PC connected through the network. There are many third-party add-ons called products, which are quite helpful in database application development. The database adapter for the connection to SQL database is also available as a product.

Python is an object-oriented script (interpreter) language [5]. Since Zope is written by Python. The Python scripts can be called within Zope as an additional object for complicated customization.

PostgreSQL is a relational database management system (RDBMS) [6]. PostgreSQL supports the Structured Query Language (SQL) which is the world wide standard language for database management. PostgreSQL is known for its sophisticated function and reliability.

JavaScript is only the script language which is supported by the web browser [7]. It is utilized to make web UI more interactive and intuitive.

As a basic technology to make a web-based UI of DB application, *HTML and CSS* were used inside the Zope [8,9]. HTML (hyper text markup language) is used to write the web document, and CSS (cascading style sheet) is a simple mechanism to describe the presentation of a document written in HTML. CSS separates the presentation from document itself and improves accessibility to the content.

SVG (Scalable Vector Graphics) is an XML specification and a file format for describing vector graphics [10]. SVG was used to create an interactive map within the web pages.

3.3. Training of Local ICT Team

As learning materials on ICT in Lao language were merely available, Tokyo Tech dispatched the interns (graduate students) to conduct training for local ICT team.

Initial trainings covered the usage and administration of Debian GNU/Linux, development of web pages by using HTML and CSS, development of web application by using Zope, and database manipulation by using PostgreSQL. In the following phase, on-the-job-trainings of creating prototype database applications were conducted. Each of the local ICT team members took charge of just a part of a database application, and then those parts were integrated into one database application.

3.4. Database Applications and Other Contents

To acquire practical skills to create a database application, several prototype database applications and web pages were made through the training.

Database applications have the basic functions, such as data maintenance (addition, delete, edit and search), browsing and searching.

a. Heritage Database
To disseminate the information of the heritages of Luang Prabang, creation of the heritage database was most

prioritized. The information and the photos of heritage buildings, ponds as well as roads were included in the database.

Users can browse and search the data, photos and drawings in each of the categories through the graphical navigation. In addition, individual search result is shown together with a map indicating where the target is located for the heritage buildings.

b.   Photo Database of Luang Prabang

Photo database is the collection f the pictures of life, nature, building, food, etc. in Luang Prabang. Comments are attached to individual photos.

c.   Feedback Database

Feedback database has been developed to collect the evaluation from the visitors of the ICT center. Contrary to other database applications, data input by the users is the major functionality. .

d.   MdP Website

The contents of the website of MdP were decided through the preliminary needs assessment. This website facilitates tourists as well as local people to learn about the role of MdP. Most of the contents were taken from the master plan of the heritage site, which was published only in French and Lao [12]. English contents will be prepared in near future.

Figure 1. *UI of Heritage Database*

Figure 2. *UI of Heritage Database*

e.   Yellow Page

Yellow page provides the detailed information of guesthouses, hotels and restaurants in Luang Prabang, for the convenience of tourists. By now, local ICT team members collect the data in voluntary basis, and the web pages are created manually. They should be implemented as another database application when the data are accumulated.

4.   ICT CENTER (HEUANCHAN)

The ICT center was established on July 13th 2006 to provide an easy access to information and knowledge to local communities as well as visitors. The contents explained in the previous section are accessible in the center to helping visitors getting information about the heritage site. The official name "*heuanchan*" in Lao language is translated as moon house which can be referred to "knowledge place."

4.1. Introduction to ICT Center

Ban Xieng Mouane was selected as the first site for the local ICT center due to its strategic location. It is located in close proximity to the city center. Further, Villa Ban Xieng Mouane is a restored traditional Lao architecture under UNESCO project, and is planned to be an ethnographic museum. Two-story annex building of Villa Ban Xieng Mouane is a main facility of ICT center. First floor is opened to public for free information access. Second floor is used as the office of local ICT team where development and management of the databases are carried out. In the ICT center, 5 PCs are installed for visitors and a shop keeper is managing the daily visitors. Local area network (LAN) is also established to provide access to the database from every computer in the ICT center. To promote financial self-sustainability, ICT center also produces and sells Heuanchan T-shirts, brochures, and post cards for visitors. Profits from sales of such products are spent for management of Heuanchan.

Figure 3. *ICT center (Heuanchan)*

Figure 4. *Inside the Heuanchan*

4.2. Activities in ICT Center

Since ICT center was established, activities were organized to promote ICT center to the public and government officials. In September 2006, the local ICT team has conducted an on-site introduction workshop, and has invited province officials from Department of Construction, Transport, Post and Communication, Department of Planning and Investment, Soupanouvong University and Ban Xiengmouane Village.

Another recent effort was Local Children Drawing Contest and Exhibition for children under 12 years old with the aim to raise the awareness of younger generation on the heritage value of Luang Prabang and familiarize with the center. The contest was held for the first time on July 23rd – 27th 2007 and exhibited for 11 days later. The contest managed to attract 71 entries from the local children, among which 29 are computer drawings and 42 are hand drawings. The children drew nature scenery, villages, animals and festivals. ICT center staff observed that nearing the period of contest, more than 10 children visited the center to practice their drawing skills daily from morning till 5 pm.

4.3. Evaluation of ICT Center

Since its opening, the local ICT team has been monitoring the performance of the center. Users' feedback has been collected to measure how well it was received from local people and visitors. The initial result of one year evaluation (July 2006 – July 2007) is summarized as follows:

a. General trend of visitors

The center received a total of 7,622 visitors in one year as shown in Figure 5. On average, 20.9 people visit the center per day. The flow of visitors corresponds to tourism seasonality, with a remarkable increase in the high season of October - April. Unexceptionally high number of visitors during high season and tourists visited in groups. July lies in the low season. However, a comparison between July 2006 and July 2007 shows a significant three fold increase of visitors. This indicates

that ICT center is more activity used by people compared with the time of initial opening.

b. Type of visitors in ICT center

More than 40% of total visitors are Lao people (43%), which is a good indication of local participation in the center. Regarding the type of visitors, foreign tourists (52%) are the main users, followed by local children (30%) as illustrated in Figure 6. In the span of a year, the increase of local people especially children was very significant. In the evaluation of first three months, there were no local children visitors. However later, the staff observed that from October 2006 onwards, local primary school children began to visit daily in the afternoon to type alphabets and play with computer drawing.

c. Feedback from local and foreign visitors

Written questionnaire was conducted among database users in the ICT center. General evaluation of the center is very positive as indicated in Figure 7). Large majority of feedback respondent were male under age of 30 for local users and male of 20s to 30s for foreign visitors. In the database, feedback questionnaire were created both in Lao and English. The main questions asked include users' impression on the database, usability, environment, accessibility to the center, quality of equipment and others. Visitors appreciate the easy usage of the database, friendliness of the staff, clean and comfortable environment of the center. On the other hand, both local and foreign visitors encountered the same problem of difficulty in locating the center. Majority visitors discovered the center by chance and with the help of tour guides. In written comments, some of the visitors suggested that information in database be made available in the internet..
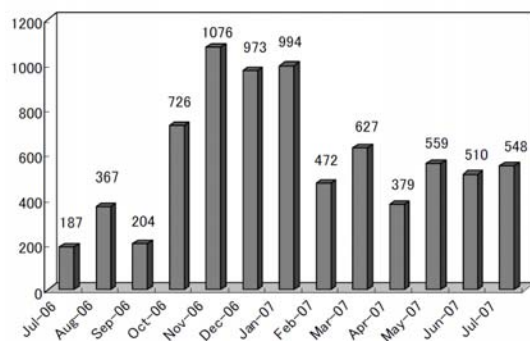

Figure 5. *Total number of visitors (N=7,622) in ICT center from July 2006 to July 2007*
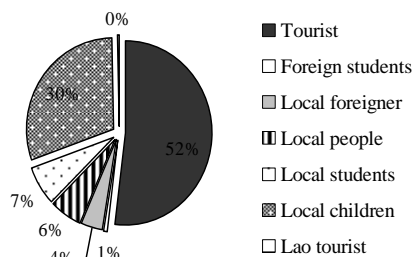*(Source: Feedback summary of ICT center, Luang Prabang, Laos, July 2007)*

Figure 6. *Classification of visitors who came to the ICT center in the one year span (Source: Feedback summary of ICT center, Luang Prabang, Laos, July 2007)*
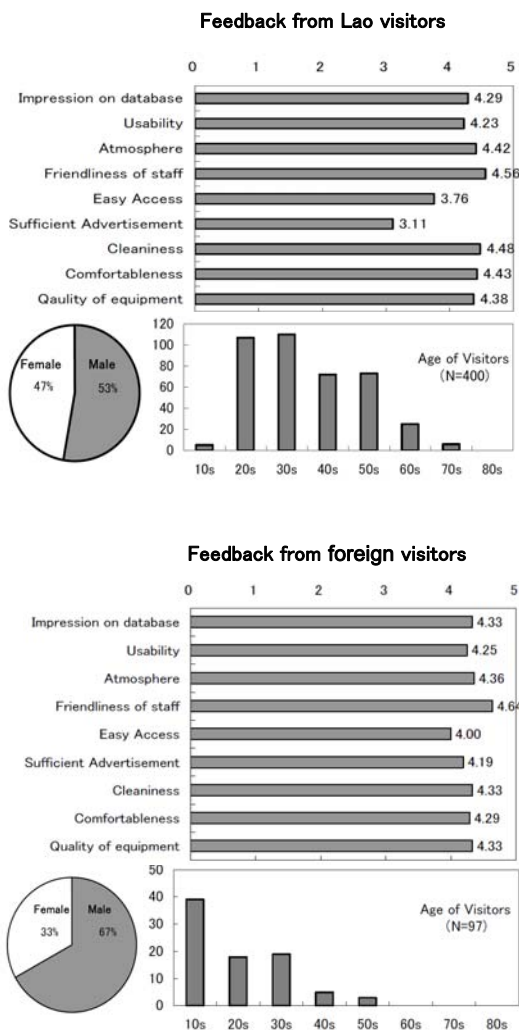

Figure 7. *Response from local and foreign visitors on local ICT center (Source: Feedback summary of ICT center, Luang Prabang, Laos, July 2007)*

5. CONCLUSION

Based on the result and needs assessment, database system was implemented using FOSS which require no financial cost over commercial software for sustainable

maintenance. The contents offered in ICT center include heritage database, photo database of Luang Prabang, feedback database, MdP website and yellow page. The first local ICT center was established to display and promote public access to the information. Local ICT team was trained continuously to improve their skills so as to develop and maintain the database. For the future development and the sustainability of the database system, ICT team needs continuous training and more experience on practical development. In addition, uploading the database application to Internet is planned to be undertaken for further information dissemination.

In the one year operation of ICT center, collaborative activities were carried out to promote the role of ICT center among the government officials and local community. Evaluations conducted on ICT center revealed that the visitors have increased and half of visitors are local. The feedbacks on database and center are positive. The major problem faced by visitors was difficulty in locating the center. It is hoped that the improvement of the contents and the service of the ICT center can promote future collaborative activities.

REFERENCES

[1] S.Y. Yamaguchi, J. Takada, N. Ooka, and J. Abe, "ICT contribution to promote the efficient management for sustainable development - Case study in the world Heritage site of Luang Prabang," *8th World Symposium of the Organization of World Heritage Cities*, Sept. 2005

[2] S.Y. Yamaguchi, J. Takada, N. Ooka, and Y. Kawaguchi, "Application of Information and Communication Technology to Promote Sustainable Development, A Case Study: Town of Luang Prabang, Lao PDR," *42nd World Congress of International Society of City and Regional Planners,* Sept. 2006.

[3] *Debian – The Universal Operating System* [Online]. Available: http://www.debian.org/

[4] *Zope.org* [Online]. Available: http://www.zope.org/

[5] *Python Programming Language – Official Website* [Online]. Available: http://www.python.org/

[6] *PostgreSQL: The world's most advanced open source database* [Online]. Available: http://www.postgresql.org/

[7] *JavaScript – MDC* [Online]. Available: http://developer.mozilla.org/en/docs/JavaScript

[8] *W3C HTML* [Online]. Available: http://www.w3.org/html/

[9] *Cascading Style Sheets* [Online]. Available: http://www.w3.org/Style/CSS/

[10] *Scalable Vector Graphics (SVG)* [Online]. Available: http://www.w3.org/Graphics/SVG/

[11] *Plan de Sauvegarde et de Mise en Valeur de Luang Prabang*, La Maison du Patrimoine, 2001 (in French).

[12] Y. Kawaguchi, "Interim Report of Local Activity No.2," unpublished.