Promoting Conservation through the Introduction of Information and Communication Technologies: Luang Prabang, Lao PDR

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1. Introduction

Luang Prabang, a town of 33,000 inhabitants in northern Laos, was inscribed in UNESCO's World Heritage list in December of 1995 on the basis of three criteria deemed to be of outstanding universal value: 1) nature and culture links; 2) juxtaposition of Lao and French urban pattern; and 3) fusion of traditional Lao and late-19th and early-20th century French architecture.

Common to many regions and countries in the process of development, Luang Prabang's economic progress is rooted in its natural and man-made beauty, which has enabled a new tourism industry to flourish, as demonstrated by an increase of annual visits from 67,000 in 1997 to 260,000 in 2005. This influx has had a positive economic impact on local businesses that provide support services to the increasing number of visitors. However, the possibility of uncontrolled urban development resulting from substantial tourism activity threatens the unique atmosphere of Luang Prabang. Such development could potentially jeopardize Luang Prabang's authenticity, integrity, and economic base in the near future.

Tokyo Institute of Technology (Tokyo Tech) is undertaking a project to introduce Information and Communication Technologies (ICT), with the goal of emphasizing the importance of the conservation agenda in sustainable development while also building the capacity of the local population to use such technologies.

2. Context

2.1 Luang Prabang History

Luang Prabang is located on the confluence of the Mekong and Nam Khan rivers, about 500 kilometers upriver from Vientiane and 200 meters above sea level. It is the capital of the Luang Prabang province and Laos's oldest town still in existence. The settlement was named Muang Sua following its conquest in 698 A.D. by Khun Lo, a Tai prince. Under the long reigns of Chanthaphanit and his son the town became known by the Tai name of Xieng Dong Xieng Thong.

During the reign of King Fa Ngum between the years of 1354 and 1372 A.D., Xieng Dong Xieng Thong was renamed Luang Prabang after the gold image of Buddha, the Phrabang. Luang Prabang became the capital city of the Lan Xang Kingdom (the kingdom of a million elephants) and was the Laotian religious and cultural centre. Luang Prabang remained the capital of the Lan Xang kingdom until 1545 when King Photisarat moved it to Vieng Chan, which remains Laos's capital today.

In 1707 the Lan Xang Kingdom fell apart, and Luang Prabang became the capital of an independent Luang Prabang kingdom. When France annexed Laos, the French recognized Luang Prabang as the royal residence from 1893 to 1954. Eventually, the ruler of Luang Prabang became synonymous with the figurehead of the French Protectorate of Laos. When Laos achieved independence, the king of Luang Prabang, Sisavang Vong, became the head of state for the Kingdom of Laos. Until 1975, Vientiane served as administrative capital whist Luang Prabang continued to serve as royal centre. In 1975 the Pathet Lao gained control, and Laos became a republic.

Today Luang Prabang is the capital of the Luang Prabang province and serves as its administrative centre. The population of Luang Prabang is approximately 33,500 inhabitants occupying an urban area of 420 hectares,

according to the *Schéma de Cohérence Territoriale (SCOT)* undertaken by the *Agence de développement et d'Urbanisme du Chinonais* (ADUC, Region Centre, France) in November 2004 for the *Agence Française de Développement* (AFD).   The total area includes three sub-zones as identified by the SCOT: the royal village, formed 500 years ago; the colonial village, consolidated 75 years ago; and the modern village, urbanized 25 years ago. These sub-areas occupy 45, 55, and 320 hectares respectively. The current density is calculated at an average of 80 persons per hectare. The peak density is to be found in the royal village, with 125 persons per hectare.

Luang Prabang retains distinctive traits such as a unique urban fabric that blends—in a harmonious, human-scale microcosm—sacred and civil structures, colonial and vernacular land use patterns, and natural and man-made landmarks.

2.2 Statement of Significance

Luang Prabang was inscribed in the World Heritage List on 2 December 1995. The attributes that merit such nomination are mentioned in UNESCO's *Periodic Reporting on the Application of the World Heritage Convention* as follows:

Luang Prabang has a high concentration of remarkable specimens of religious and vernacular architecture. A number of Buddhist temples, such as Vat Xieng Thong, Vat May, and Vat Vixun are sophisticated constructions ornamented with magnificent sculptures, carvings, paintings, gilt patterns, and furnishings.

Traditional Lao houses are also found in large number, as well as buildings of blended "colonial" style that embody the fusion of Lao and western architectural traditions.

Luang Prabang has a unique urban arrangement, mixing Lao and French land use patterns on a rich topographic setting: a long peninsula defined by two rivers and a high hill in the centre.

The built heritage relates to the natural environment with remarkable harmony. The natural landscape is composed of riverbanks, green areas with vegetation, ponds, Phousi Mount, and the Pu Thao and Phu Nang Mountains.

Luang Prabang has a rich and vibrant culture heritage, offering the visitor an enchanting atmosphere.

2.3 Tourism Growth

Figures on tourist arrivals obtained from the Luang Prabang Provincial Tourism Office (Table 2.1) demonstrate a remarkable increase in the number of visitors in Luang Prabang after the town's nomination to the World Heritage list in 1997. In just eight years, the number of visitors has shown a sustained growth, quadrupling by 2005.

 Table 2.1.   Tourism Arrivals 1997-2005

Source: Luang Prabang Provincial Tourism Office

Origin/Yr	1997	1998	1999	2000	2001	2002	2003	2004	2005
Lao	31,579	34,596	45,728	45,015	47,250	75,697	58,983	90,593	128,381
Foreign	30,769	44,583	55,307	65,225	68,250	94,846	78,129	105,513	133,569
TOTAL	62,348	79,179	101,035	110.240	115,500	170,543	137,122	196,106	261,950

This influx has had an immediate impact on the economy, as shown by the sharp increase in the number of local tourism agencies, hotels, guesthouses, and restaurants (Table 2.2). The increase in the number of local tourist attractions encourages tourists to stay longer, an aim of the local authorities and business sector.

Table 2.2. Number of Tour Agents, Hotels, Guesthouses, and Restaurants 1997-2005

Source: Luang Prabang Provincial Tourism Office

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Tourism agencies	7	8	10	11	12	13	21	17	17
Hotels	10	11	11	12	13	14	12	14	17
Guesthouses	19	33	64	80	108	114	123	125	146
Restaurants	22	25	34	43	57	58	65	70	75
Tourist sites	29	31	42	42	54	70	70	108	109

2.4 Key Actors

Maison du Patrimoine The Maison du Patrimoine (MdP) is Luang Prabang's core administrative organization concerned with heritage, and it is the main recipient of foreign financial assistance for heritage preservation. MdP received in 1995 the mandate of preparing a complete Safeguarding and Valorisation Plan (*Plan de Sauvegarde et de Mise en Valeur*, PSMV), comprising extensive documentation on architectural styles, details, building techniques, and materials for both religious and secular buildings, as well as urban components.

In addition to the preparation of the PSMV, MdP trains local professionals, examines construction permits before they are submitted to the Issuing Committee, prepares bidding processes, and undertakes demonstration restoration projects in inventoried buildings. MdP dissemination tasks include the preparation of informative campaigns, giving advice to the local population on issues of conservation and new construction, and providing a quantity of construction materials to owners of protected houses.

Urban Development and Administration Authority UDAA was created under Decree 177, through funds from the Asia Development Bank that covered initial set-up. A provincial executive body, UDAA is responsible for urban planning, infrastructure, and urban services provision, including solid waste management, water and sanitation, drainage, roads and river bank maintenance and improvements, and the management of public parks. The body also issues construction permits, which all new built and renovation projects need to obtain.

UDAA's operating funds come from taxes on construction permits, waste, parking, electricity, water supply, and an operation and maintenance budget from the national budget that totaled LAK 100,000,000 (about EUR 8,300) in 2005. The organization manages 33 villages, covering an area of 8 sq km and a population of around 30,000. This responsibility is expected to increase in the short term (1-3 years), when the UDAA will be assigned responsibility over 58 villages and a population of 41,000.

Provincial Committee for Preservation of Historical, Cultural and Natural Heritage The Provincial Committee for Heritage is chaired by the Chair of District 1 of Luang Prabang (equivalent to mayor) and additionally composed of directors from the Department of Communication, Transport, Post and Construction (CTPC), the Department of Information and Culture (DIC), and the Department of Tourism, among others, who bring expertise concerning urban codes, construction monitoring, cultural heritage policy, tourism, and other social concerns. The Provincial Committee of Preservation is an advisory body of principal provincial government departments that meet in order to integrate conservation efforts with town development. The Maison du Patrimoine reports to the Provincial Committee for Heritage as well as to the National Inter-ministerial Commission of Cultural, Natural and Historic Heritage, based out of the capital, Vientiane.

Recent activities of these administrative bodies include:

> Conservation of the former Customs Office, now used as the MdP Office, supported by UNESCO and the Region Centre;
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> Conservation of a number of temples including Vat Siphutthabat, Vat Pa Fang, and Vat That Luang;
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> Conservation of traditional houses, such as Ban Xieng Muane and Boua Kang Boum;
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> Conservation of "venelles," or traditional lanes;
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> Conservation of urban wetlands; and
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> Drainage and sewage works, and river bank consolidation.

Key representatives from these management agencies and bodies were extensively interviewed during the project's inception stage. All actors welcomed the project and remarked on its importance to the future development of Luang Prabang. A key issue detected in these interviews was the project's educational potential in issues pertinent to conservation and the environment at both theoretical and practical levels. This includes transmitting to the general public the importance of complying with urban planning guidelines and regulations.

Interviewed actors were consulted on the best way to communicate the project's aim and how to make its database accessible to the local people. In addition, actors gave valuable suggestions as to the information that should be included in the database. Many interviewees felt that the database should not only focus on technical information about heritage, but that it must also contain practical information for tourists, including sights and lodging. The UDAA also remarked that, in the future, the information available in the database will contribute to resolving village conflicts, such as disputes caused by drainage, waste water, and noise levels.

3. Understanding Pressures and Needs

The economic opportunities brought about by the rapid development of the tourism industry have revealed a series of pressures on Luang Prabang's urban environment, affecting both its integrity and its long-term sustainability.

The other side of the coin of the current lucrative dynamism based on a growing influx of visitors shows a series of pressures. These pressures include uncontrolled urban development, a rapidly growing population attracted by economic opportunities, its consequent territorial polarization, and an escalating burden on the environment from the number of visitors.

Pressures of growth are recognized in UNESCO's periodic reporting, which expresses "concern over the potential negative impact of a number of public works projects financed by international development co-operation agencies, as well as over the rapid tourism development works at the site." Specific concerns were raised over the Asian Development Bank-financed riverbank consolidation, drainage and sewage works, electricity transmission poles, and the proposed construction of a bridge over the Mekong River, which would dramatically alter today's urban shape and its balance. UNESCO, involved in coordination of international cooperation for Luang Prabang since 1995, in partnership with the city of Chinon, has insisted on the importance of public works to improve the town's infrastructure but has also pleaded for greater sensitivity to the heritage value of the site.

The local Luang Prabang authorities have, through the PSMV and SCOT management tools, identified a series of improvements necessary to best overcome the pressures of growth. These improvements range from strengthening cross-departmental management linkages to having a place to connect with people. The following summarizes these recommended improvements.

3.1 Management

Weak coordination exists within domestic administration departments, both horizontally and vertically. Weak coordination exists specifically between the Conservation Plan (PSMV), prepared by MdP, and the Infrastructure Modernization Plan, prepared by the Urban Development Administration Authority supported by the Asian Development Bank; and between local administration and international cooperation agencies. The involvement of a higher authority would improve conditions for PSMV implementation, for example, by enforcing sanctions to violators.

3.2 Capacity

Despite 10 years of on-the-job training at MdP, local capacity for management remains inadequate in fields such as architectural restoration, engineering, environment sciences, and education programming. The current staff requires training in topics such as: architectural conservation (of both vernacular and colonial buildings), site management, public relations, jurisprudence, business administration, additional skills in the use of information and communication technologies, and development of a geographical information system (GIS).

3.3 Dissemination and Networking

A center of tourism information is necessary, as is the production and dissemination of materials like a Web site, maps, guides, illustrated books, signboards, posters, and postcards. Cross-departmental partnerships and collaborative structures between providers of provincial services are advisable for departments such as Information and Culture, Education, Technology, Sciences and Environment, and Police. There is a need to involve other organizations in preparing and undertaking awareness campaigns. These organizations include the Youth Organization, Lao Women's Union, National Construction Front, and the clergy.

4. The Project

4.1 Goals

Tokyo Institute of Technology, under the aegis of UNESCO and Maison du Patrimonie, is undertaking a technical assistance project with a view to contribute to the sustainable conservation of Luang Prabang. Tokyo Tech's project would specifically touch on the areas and topics detected by the local authorities as being in need of improvement, with the following goals:

> embrace conservation as an integral part of the sustainable development agenda; and

> educate the local community in preserving what makes Luang Prabang a special place.

The project consists of the introduction of an information and communication (ICT) system. The project introduction will include (a) the development of a database—which will be introduced progressively—containing information on Luang Prabang's built and natural heritage and (b) the arrangement of a pilot site (or sites) for public access to the database.

It is anticipated that an ICT system will contribute to the progress of heritage conservation by:

> raising public awareness, especially among younger generations, of the reasons for preservation and what is to be preserved;

promoting controlled urban development through the dissemination of architectural guidelines;

bringing conservation issues to the forefront of the agendas of agencies, government bodies, and civic groups;

providing a framework for the development of cooperative linkages between local government departments and administration bodies involved in heritage preservation and urban development and management;

providing better tourist information, thus contributing to the extension of visitors' lengths of stay;

broadening employment opportunities for the local population through the introduction of skills in information technology.

4.2 Activities

The project plan prescribes a three-year timeframe. The following activities have taken place, or are programmed to do so, in the fiscal years of 2005, 2006, and 2007.

4.2.1 Project Inception

The project's inception stage began in the first quarter of 2005. It consisted of a series of project identification missions undertaken by a team of multidisciplinary experts from Tokyo Institute of Technology and the Agency for Cultural Affairs from the government of Japan.

Data was collected first through extensive interviews with the key actors mentioned in 2.4. Additionally, in order to best understand local dynamics, needs, and opportunities, the team conversed with representatives from the Department of Communication, Transport, Post & Construction; the Department of Planning and Investment; the Luang Prabang Provincial Tourism Office; the Science, Technology and Environment Administration; and the Luang Prabang Chamber of Commerce. These dialogues continued with local and international experts currently stationed in Luang Prabang on European Union and AFD projects; local business associations, such as the Internet Café Association; individual entrepreneurs running businesses related to tourism; and finally students, especially potential end-users, like those enrolled in IT courses and those interested in tourism and conservation.

This data-gathering stage was complemented by a thorough literature review of past and current projects, as well as an on-site review of the landscape. The team conducted a number of field visits to historical sites, the villages surrounding Luang Prabang, and the potential location(s) of the pilot site(s). Through these combined activities, the team was in a position to articulate a project concept that aligned with the needs identified by the local authorities.

4.2.2 Training

In the summer of 2005, Tokyo Institute of Technology launched a technical training program for those who would constitute the project's technical team. In order to promote cross-communication between local government bodies, the technical team was comprised of staff from La Maison du Patrimoine (three persons), the Urban Development Administration Authority (two persons), and the Ministry of Information and Culture (one person).

The training began with basic computing skills to then move on to specific training on Linux OS, HTML and CCS, interactive web application server, and database management systems. The training is expected to continue for the remainder of the project, focusing on practical applications. Up to March 2006, Tokyo Tech had committed over 600 hours of on-site training by Tokyo Tech researchers and graduate students. The training took place at a facility provided by MdP at first and then moved to the initial pilot site.

The training purposely promotes the use of open source software in developing the database application. At present, the focus on open source software is believed to enhance the financial sustainability of the project. The common experience of a number of other projects shows that dependence on expensive commercial software threatens economic self-sustainability; these other projects' activities were ultimately discontinued or suspended due to insufficient funding.

4.2.3 Database

The heritage database developed by the Tokyo Tech technical team contains about 3,000 drawings and about 2,500 images of over 700 civic buildings, temples, roads, and urban wetlands. These drawings, images, and other documents have been recorded since 1995 on non-digital formats such as ink and paper. They were all at risk of physical deterioration. They depicted invaluable data on architectural heritage, the environment, and cultural intangibles, all of which was gathered in the course of the preparation of the PSMV and other projects financed by UNESCO, the European Union, AFD, and the Region Centre.

Drawings and images have been digitized, systematized, and uploaded to the database following the document structure in the PSMV. The database is fully searchable, and information is displayed in English. The database application has been developed on the platform composed of open source software, namely, Debian GNU/Linux as the operating system, PostgreSQL as DBMS, and Zope as the Web application server. DTML/Python on Zope dynamically creates Web-based user-interfaces structured with HTML/CSS, JavaScript, and SVG, while manipulating SQL database transactions.[1]

Acknowledging that the database must serve a diverse user base, its design will consider its audience both local and foreign, young and adult, computer literate and absolute beginner, versed in conservation and unaware of its importance, and affluent and disadvantaged, to name a few variables. This scope requires the database to have two "faces": one, educational and primarily for the general public, which contemplates softer issues of conservation; and another, technical and directed to official and professional use. This duality must be considered in early project stages so that it does not later become a considerable challenge in terms of both database programming and interface design.

With regard to language, the database is a bilingual effort in its innermost conception. The system's interface, as well as signage, operational guidelines, feedback forms, and technical documents, will be presented in Lao and English. Whenever possible, French will also be utilized, capitalizing on the current volume of records that have been produced in Lao and French. Regarding programming languages, English will be the prevalent language. Efforts will be made to overcome current shortcomings of commercial software with Lao language applications and search engines.

An attractive and colorful imagery, a user-friendly interface, and an appropriate facility will attract users in the project's initial days; but, in order to maintain a comparable degree of civic interest, content must be updated frequently. An overall revision of the database's content is recommended to take place monthly or at least bi-monthly. These revisions, to be undertaken by the technical team trained by Tokyo Tech, will allow the insertion of further multi-disciplinary and multi-dimensional data, which would contribute to establishing better horizontal linkages amongst relevant local authorities. In addition, it is intended that in the future, contributions by users will be able to be uploaded in real time.

4.2.4 Pilot Site

The pilot site, initially known as the "Knowledge Kiosk" in the project inception stage, is a space containing a number of computer terminals that grant access to the database. The pilot site is intended for the use of both the local population and tourists, thus creating a focal point in the dissemination of Luang Prabang's heritage and conservation efforts.

The project was only known as the "Knowledge Kiosk" internally. This designation is believed to be perhaps too technical for the common user, hence it was considered a "code name" before the project's launch. As participation was considered very beneficial throughout the project, a competition was organized to name the pilot site. Competition entrants included Lao and foreign project staff as well as staff from MdP. The competition called for a name that, rooted in Lao language, had a memorable meaning to locals whilst also sounding good to foreigners. The chosen name was "Heuanchan," which means "Moon House."

Heuanchan, the first pilot site, was opened in July, 2006. It is located in the Ban Xieng Mouane compound, a remarkable building located centrally within Luang Prabang's historic core. The compound has an interesting flow of people. It is frequently visited by tourists and is crossed by a foot path frequently used by the local population, especially children returning home after school.

 Fig. 4.1. Heuanchan exterior. Source: authors

UNESCO and MdP plan to accommodate, in the near future, a new ethnographic museum in Ban Xieng Mouane. The museum will also feature a multi-use center with space for exhibitions, open areas for performances, and a café/bar, which will create a vibrant cultural ambiance. The cohabitation of complementary activities promoted by MdP, other agencies, and/or community groups concerned with civic culture is believed to contribute to the creation of a critical mass interested in Luang Prabang's culture and its conservation. To ensure cross-fertilization of activities and their co-promotion, monthly programs shall be prepared, taking into account that the facilities have distinct content focuses.

Heuanchan is strategically located in a newly built structure adjacent to the main Ban Xieng Mouane building. The pilot site will share with the future museum an open space and a number of ancillary facilities, such as storage rooms and toilets. MdP and UNESCO have indicated that the construction cost of the adjacent structure will be included in the museum's budget available from AFD.

Understanding that an appealing facility will contribute to attracting a broad user base, Tokyo Tech has prepared floor plan layouts to guide interior design and furniture production. The team believes that it is of great importance that Heuanchan's space be inviting and comfortable, and that its interior maintain a continuity of design with the adjacent historical building rather than attempt a "high-tech" look with a "futuristic" design vocabulary. The space should convey an image of familiarity with the styles present in Luang Prabang. The styles should be executed as authentically as possible, with traditional materials and construction techniques. Furniture elements and their placement are intended to compose a spatial order that is recognizable in Lao interiors. Tokyo Tech will provide the server and the computers to access the database.

A number of promotional efforts were made to announce Heuanchan's existence and location to the public. These efforts included street signage, in both main streets and those surrounding the facility, as well as promotional

materials, such as informative leaflets and posters displayed in restaurants, hotels, shops, and travel agencies. Promotion is also foreseen through future initiatives, such as the Heritage Pass.

With regard to the facility's economic sustainability, Tokyo Tech prepared a preliminary set of income and expenditure assumptions looking to achieve a neutral cash flow balance at the end of Year 2 of the operation of the pilot sites. This expectation is to reinforce the premise that the facility must be run as a self-sustaining operation and thus cannot rely on sources of income other than those that it can generate itself.

Heuanchan is staffed by two members of the technical team on weekly rotations. Their tasks are varied; they introduce new users to the database, record visitor's reactions, and act as shop-keepers when visitors wish to buy merchandise.

4.2.5 Evaluation

During project inception, and certainly before its operation, Tokyo Tech deemed it necessary to lay out a series of key performance indicators (KPIs). The indicators would allow the team to periodically measure the project's public reception both qualitatively and quantitatively, and thus estimate its performance vis-à-vis a set of pre-established goals. Qualitative KPIs are based on perception, such as users' ratings of ease of navigation, the appropriateness and interest of its content, and the comfort and attractiveness of the facility. Feedback is recorded through a special survey section in the database that users are asked to fill in. Quantitative KPIs include the number of hours that the computers are being used by the public, frequency of use, and visitor return rate. All of this data is collected by the technical team during on-site duty. The following is a summary of findings from the 90-day evaluation.

Qualitative Indicators

The results below are based on averages from a questionnaire completed by 200 visitors between July 14 and October 27, 2006. The value range for questionnaire responses is between 1 (worst) and 5 (best).

> Respondents' perception of content interest: 4.5
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> Ease of navigation: 4.4
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> Appropriateness of facility: 4.5
>
> Helpfulness of staff: 4.7
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> Appropriateness of advertising: 3.5

These figures indicate that the pilot site had a very good overall reception. Visitors' feedback has helped the team realize that further Heuanchan advertising is needed.

Quantitative Indicators

Computer Use The observations and records kept by the team manning the Heuanchan pilot site shows that on average the computers were used to 8% of capacity. This number is well below what was originally forecasted, with a minimum satisfactory value of 30%. The actual computer occupation number considers only those dates that had computer occupation recorded; the number discards days on which visitors are registered but lacks a record of computer occupation. This computation is due to the fact that the staff has acknowledged that they sometimes forgot to input data like computer occupation.

Number of Visitors The number of visitors to the site averaged 13.5 persons per day. This number is well below that which was originally forecasted, with a minimum satisfactory value of 30 persons per day.

Balance Sheet Comparing the actual balance of Heuanchan with the original forecast shows the following findings:

Table 3. Forecasted and Actual Balances. Source: authors

Month	1	2	3	4
Forecasted Balance (in USD)	-867	-337	-337	-337
Actual Balance (in USD)	-645	-392	-285	-251

Heuanchan is losing money but slightly less than the forecasted loss for the first four months.

The numbers indicate that the reason for this trend is that forecasted and actual expenditures are similar but merchandising sales are higher than expected.

Average daily sales total USD 16. This is higher than what was originally forecasted. The minimum satisfactory value was established at USD 15 per day.

Although merchandise sales are higher, margins for merchandise sales are lower than originally forecasted.

Fig. 4.2. Heuanchan interior. Source: authors

5. Phasing

Further openings of pilot sites are intended to be phased in throughout the project's timeline, through April 2008. This phased approach will allow for experience with operational issues and the public's reaction to the first facility to influence later pilot sites. Future pilot sites are to be located in remarkable buildings that have been the focus of MdP's conservation efforts. These have been initially identified as Boua Kang Bum and Villa Vat Mai.

Boua Kang Bum This remarkable building sits on a wetland in a sheltered compound with abundant vegetation. It is located off the heritage trail and off the area of focus for most visitors. This position requires a strong campaign of

prominent street signage to attract users who might not be aware of the building. The space, which is currently used for exhibitions, is to host an environmental museum as well as a café/bar; the bidding process for this project has not yet commenced. The space for the next pilot site, which was suggested by MdP, is located on the back of the building, and it consists of 14 m^2. The space is adjacent to a room of 41 m^2 that is to be used as a projection room. The layout of the facility can perhaps be adjusted as the viability of the environmental museum becomes clearer. The layout proposed here integrates both projection and project facility in the same room, leaving the adjacent room for the display of artwork.

Villa Vat Mai A horizontally-elongated wooden house on stilts, Villa Vat Mai is centrally located on the main street opposite Vat Mai. The building's façade has good opportunities for signage, as apparent from current exhibition signs. MdP suggested a room of 25 m^2 for the project. The room would have to be shared with an MdP information room, which could make the space cramped if not properly designed. The room is well located within the building, as it is close to the main entrance. Adjacent to it is a larger room of 40 m^2 that could present opportunities for cooperative work.

6. Conclusion

In the town of Luang Prabang and its peripheral areas, two applications of information and communication technologies for conservation and sustainable development have been identified: first, the development of an information management tool in the form of a database; and, second, the development of pilot site(s) intended for public database access.

The development of a database will assist MdP in effectively undertaking conservation activities for a number of reasons. The database systematizes the guidelines in the safeguarding and valorization plan (PSMV) for easy consultation. This helps homogenize information between agencies and institutions, including the PSMV and the Infrastructure Modernization Plan. The database also constitutes a resource of traditional construction techniques and appropriate palettes of materials and colors. Additionally, it is a flexible framework in which to consolidate the inventory of historical buildings and issues related to their contemporary life, including refurbishment permits, allowed uses, and the tax situation. Finally, the database provides easy storage for digitized drawings and images, and the format averts deterioration.

The pilot site is a valuable didactic tool. It disseminates information in an attractive manner, edifying users as to the benefits of preserving what makes Luang Prabang a special place. Heuanchan is also a space of confluence. Local children have been seen next to seasoned travelers, both parties learning about the environment that surrounds them. Young freelance guides also come, to improve their knowledge of Luang Prabang's patrimony so that they can become more valuable in guiding visitors.

The project process in itself imparts a positive experience in agency integration, as the technical team is comprised of staff from three government bodies (MdP, UDAA, and the Ministry of Information and Culture). Team members will be prepared to undertake technical leadership positions upon their return to their respective posts after project completion. In addition to bringing valuable familiarity with cross-agency work, they will be able to prepare "train the trainer" programs and further disseminate their experience and knowledge.

During the activities of the project, the team became aware of several valuable lessons for the future. First, a database is a project with a dual profile. It has an obvious technical nature, but it also has to have a public face. To be accessible to the general public, the database must have a non-technical interface. It is to everyone's advantage to keep this goal in mind throughout the development process. The team found that it is often not easy for young, technical trainees to realize that the project's success depends not only on their technical skill; success also depends on their ability to put themselves in the end user's shoes, specifically in the shoes of the majority of people who have little technical expertise or interest in the backbone of a database. This anticipation of end user needs was an important issue in cultivating capacity building and human resource development.

Overcoming information territoriality has proven to be another issue that the team must not underestimate. Agencies involved in diverse aspects of urban planning do not always welcome a project that requires them to share their information with other agencies. Patiently lobbying organizations and explaining the mutual benefits of information exchange was a time demanding task, especially in project inception stages.

As demonstrated in Luang Prabang, the introduction of information and communication technology must serve *actual needs* and not *create* a new need. That is, efforts should result in financially secure, sustainable institutions that benefit the area. To achieve this end, the technology introduced must be both affordable and easily maintainable, so that the database can be upgraded well beyond the project's completion date without requiring monetary support from a sponsoring institution.

One final lesson to draw from the Luang Prabang example is the importance to the project's success of understanding local conditions. The project team considers it critical to recognize local dynamics and expectations; this input informs not only the initial hypothesis but also day-to-day activities. Local conditions can be assessed by diverse means of local participation. In this manner, the project team establishes a better position to not only meet the needs of a local community, but to also anticipate potential technical and political obstacles.

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[1] Acronyms in this paragraph refer to:
DBMS: Database Management System
DTML: Document Template Markup Language
HTML: HyperText Markup Language
CSS: Cascading Style Sheets
SVG: Scalable Vector Graphics
SQL: Structured Query Language