INFORMATION SYSTEM DEVELOPMENT FOR TAODAM FOREST CONSERVATION AND EDUCATION NETWORK

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Thesis
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INFORMATION SYSTEM DEVELOPMENT FOR TAODAM FOREST CONSERVATION AND EDUCATION NETWORK

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ABSTRACT

The objective of this research was to develop a web application information system for Taodam Forest Network so members can input Taodam Forest data and users can search for data using the internet. The system was developed by using a Structure Analysis and Design approach together with a System Prototype method. Dreamweaver UltraDev was used to aid ASP, VBScript and HTML in developing the web application while Access2000 was used to build the system database.

Users of this system were classified into 3 levels: 1) administrators, 2) members and 3) general users. Because the information is arranged in a database accessible by web applications, it is easy for members to input data, for administrators to edit and update data and for users to search for required information. Taodam Forest Network members can therefore disseminate news and share knowledge and experiences so they can communicate in cyberspace.

The system was evaluated by four database administrators and thirty-six users. Most of them scored features similarly, between a medium to good level. This result may have been caused by the incompleteness of the development, because the system was a prototype and so some modules had not been finished.

This research recommends: 1) developing the system to a fully functioning system, 2) developing virus protection, 3) including searches by thumbnail image index, 4) making the system easier to use, 5) creating a backup plan for the system, 6) inserting more data into the database and 7) using more multimedia in the web application.

KEY WORDS: WEB APPLICATION / INFORMATION SYSTEM / INTERNET / WEB-BASED DATABASE / TAODAM FOREST NETWORK / FOREST CONSERVATION AND EDUCATION

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การพัฒนาระบบสารสนเทศเพื่อสนับสนุนเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ
(INFORMATION SYSTEM DEVELOPMENT FOR TAODAM FOREST CONSERVATION AND EDUCATION NETWORK)

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อพัฒนาโปรแกรมประยุกต์บนเครือข่ายอินเทอร์เน็ตของระบบสารสนเทศเพื่อสนับสนุนเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำที่สมาชิกสามารถเพิ่มข้อมูลและผู้ใช้สามารถสืบค้นข้อมูลได้โดยผ่านทางระบบเครือข่ายอินเทอร์เน็ต การพัฒนาระบบได้ดำเนินการตามขั้นตอนการพัฒนาระบบแบบ Structured analysis and design กับ System prototype method และได้เลือกใช้โปรแกรม Dreamweaver UltraDev เป็นเครื่องมือ โดยใช้การเขียน ASP, VBScript, HTML ในการสร้างเว็บแอพพลิเคชั่น และใช้ Microsoft Access2000 ในการสร้างฐานข้อมูลของระบบ

กลุ่มผู้ใช้ระบบแบ่งเป็น 3 กลุ่ม ได้แก่ ผู้ดูแลฐานข้อมูลระบบ สมาชิกเครือข่าย และผู้ใช้ทั่วไป สารสนเทศในฐานข้อมูลจะเข้าถึงได้โดยโปรแกรมประยุกต์บนเครือข่ายอินเทอร์เน็ต เกิดความสะดวกสำหรับสมาชิกในการเพิ่มข้อมูลเข้าสู่ระบบ สะดวกสำหรับผู้ดูแลฐานข้อมูลระบบในการจัดการแก้ไข ปรับปรุงข้อมูล และง่ายสำหรับผู้ใช้ระบบในการค้นหาสารสนเทศที่ต้องการ สมาชิกในเครือข่ายป่าเต่าดำก็สามารถแลกเปลี่ยนข่าวสาร ความรู้ และประสบการณ์กัน จึงสามารถสื่อสารกันได้อย่างกว้างขวางในไซเบอร์สเปซ

ผลจากการประเมินระบบโดยผู้ดูแลฐานข้อมูลจำนวน 4 คน และผู้ใช้อินเทอร์เน็ตจำนวน 36 คน พบว่าทั้งผู้ดูแลฐานข้อมูลและผู้ใช้ระบบ ส่วนใหญ่ให้คะแนนในด้านต่าง ๆ เป็นไปในทิศทางเดียวกันคือค่อนข้างดีทั้งนี้อาจมีสาเหตุจากการที่ระบบยังพัฒนาไม่สมบูรณ์ เนื่องจากระบบนี้เป็นระบบต้นแบบ ดังนั้นการทำงานบางส่วนที่ออกแบบไว้ยังไม่ได้พัฒนาให้แล้วเสร็จทั้งหมดทั้งระบบ

ข้อเสนอแนะของงานวิจัยครั้งนี้คือ 1) การพัฒนาทั้งระบบให้เสร็จสมบูรณ์, 2) การป้องกันไวรัส, 3) การพัฒนาวิธีการสืบค้นข้อมูลด้วยรูปภาพขนาดเล็ก, 4) การปรับปรุงระบบให้ใช้งานง่ายขึ้น, 5) การจัดทำแผนการ สำรองข้อมูล, 6) เพิ่มข้อมูลในฐานข้อมูล และ 7) ใช้มัลติมีเดียมากขึ้นในการพัฒนาเว็บแอพพลิเคชั่น

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CHAPTER I
INTRODUCTION

1.1 Background Justification

Forest is one of the most important natural resources supporting the human living. It yields benefits to human beings both directly and indirectly. For direct benefits are those 4 basic needs of human beings: food and fuel, drugs and herbs, construction and furniture and other useful miscellaneous products from forest. The indirect benefits of forest are more important in their plenty of ecological values such as supporting the natural balance; maintenance of the humidity, the temperature, the climate and the season; taking the role as the earth's largest sponge to absorb the rainfalls so preventing the flood and the drought; preventing the soil corrosion and the storm; the source of genetic resources and biodiversity. Moreover, forest is the place for recreation and traveliing and also the place for Buddhistic monks to practice their peace of mind.

From past to present, forest was destroyed continuously. In the past, forest covered more than half of the entire Thailand. Nowaday, the forest area is about one fourth or 25% of the country. The government has developed the forest conservation policy since 1989 by cancelling the concession to work a forest all over the country. However, forest has still been destroyed secretly and continuously, especially in the western forest of Thailand which is related to local officers and mafia benefits. So it is hard to prevent the forest destruction.

One of the most intruded forest is Taodam Forest in Saiyok National Park in Kanchanaburi province. It borders with Mienmar and covers the area of 48 square kilometers. From the research studies supported by BRT during 1997-2000, it was found that Taodam Forest had abundant biological resources both plants and animals. It has never been invaded by the concession to work a forest. The forest ecology was still in an originally natural condition which was precious for the biological study and

research. Now Taodam Forest is at risk from the project to build the road connecting "Bongty-Tawai" which will lead to the large environmental impact on the ecological system of one of the important forest of Thailand.(1)

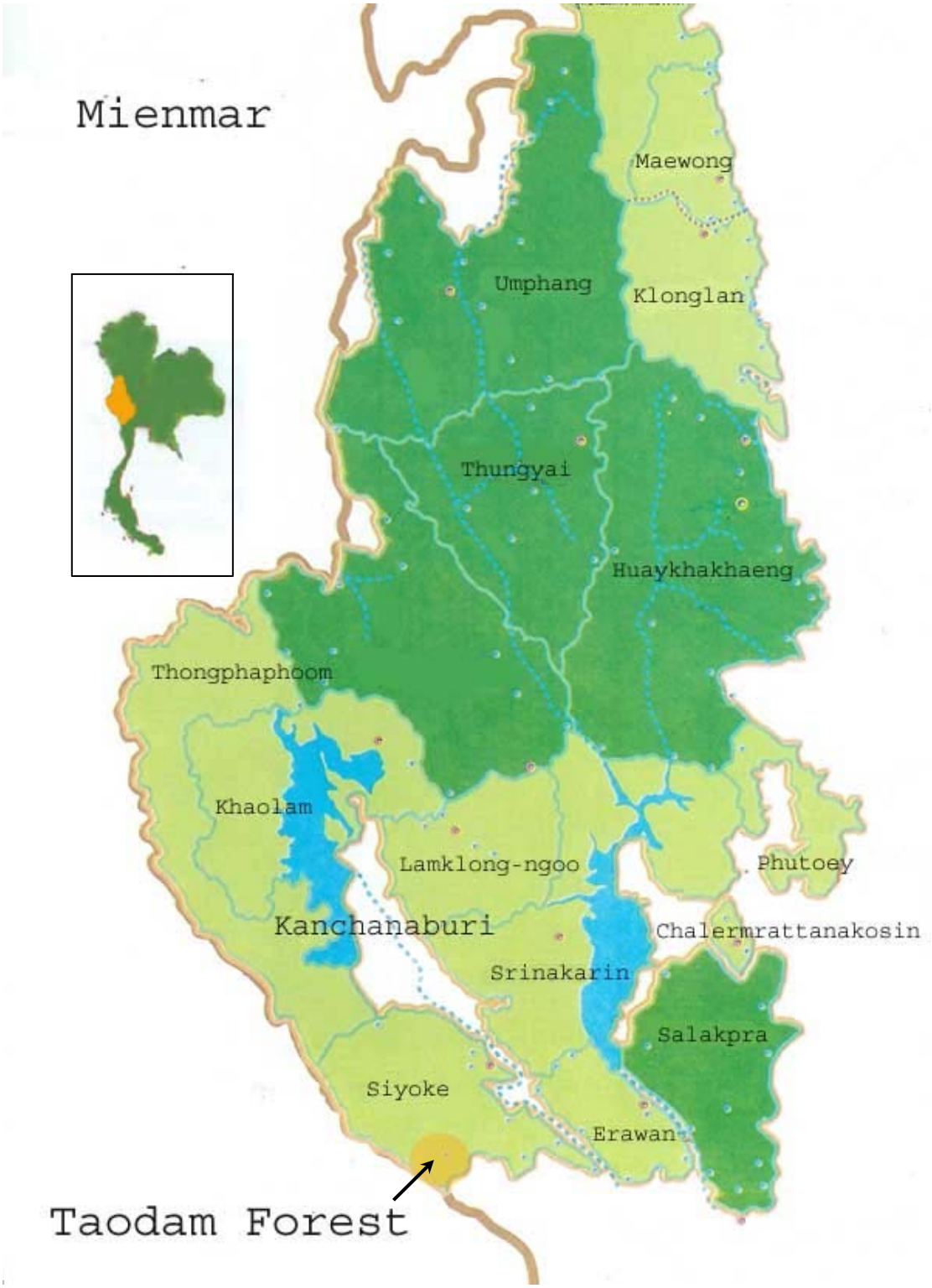


Figure 1-1 Map of Taodam Forest

The appropriate trail for the reduction and prevention of damages to Taodum Forest consists of the building of the cooperation network among individuals, groups and organizations to manage Taodam Forest as research and study materials to train youths, students, communities and civilians to encourage the sense of forest and natural resources conservation.(1)

In Kanchanaburi province, the leaders of the social movement against environmental problems are middleclass. Their protests have continuously been supported by external conservation organizations. The conflicts which were extended to public issues, could gather more associated communities out of the problem area such as students from the universities, academicians, monks, soldiers, forest officers, teachers, mass mediums, etc. According to their unity to preserve Taodam Forest, Taodum Forest Watch was established in 2000. They have performed forest hiking activities to prevent Taodam Forest from the wood logging business since 2000. These actions can help reducing risk from the detrimental infestation of Taodam Forest to some extent.(2)

Taodum Forest Watch, like other enviromental organizations, has published its own website, www.taodum.com, which is responsible for promoting its organization concept and activities in Taodum Forest to the public. Moreover, the website has opened the newly interactive 2-way communication among members in the network system such as webboard, guestbook, e-mail, etc. However, there are so few websites which are emphasized on an environmental knowledge. While the internet users increase, there are still a few amount of environmental websites so the communication system on the cyberspace is not efficiently used. But for ones who are interested in an environmental conservation, websites will be the new and highly performanced communication way.(3)

The problems of taodum.com are the dissemination of the information, the knowledge management has still not been compiled into the database form to enable the data search, the lack of the forest conservation education and the comprehension about the relationship among forest and other natural resources. From the interview with the webmaster team of taodum.com, it was found that the webmasters encountered difficulties from the lack of information and knowledge on some issues, manpower and communication among members in the team. Also, the data obtained

from the interview with the webmaster team pointed out that sometimes they had problems with the website security such as popup banners, unwanted links, virus, etc.

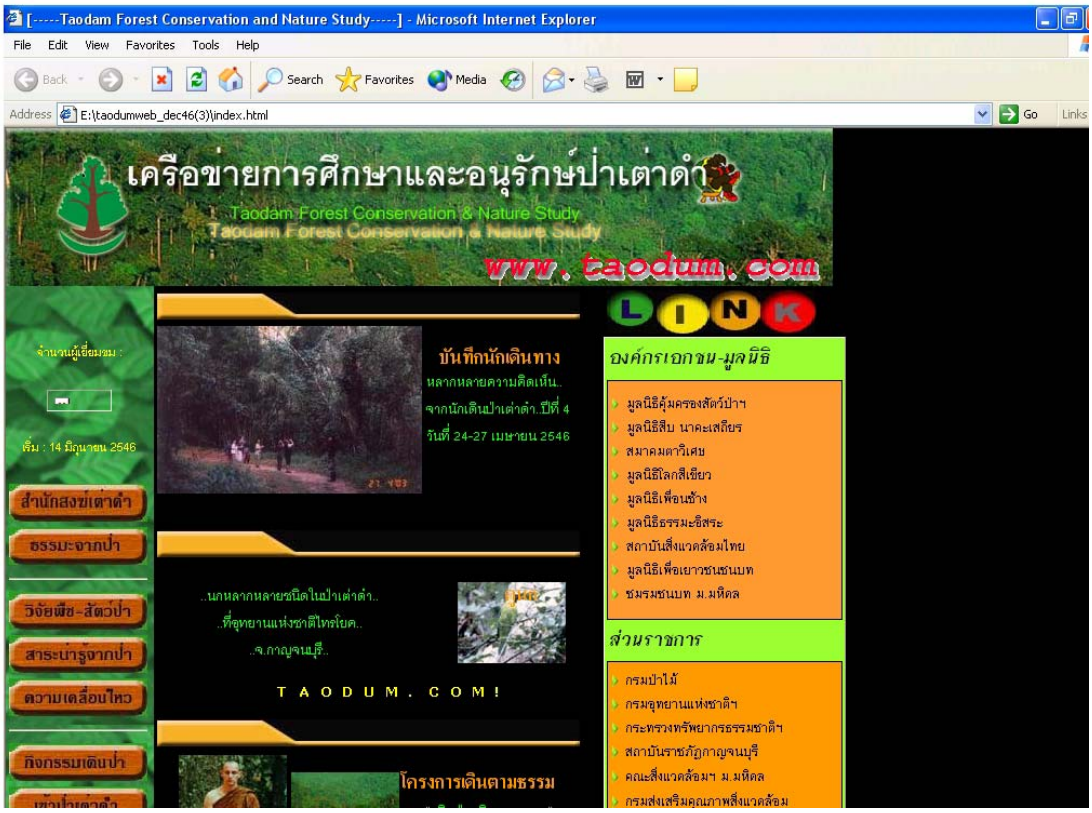


Figure 1-2 Taodum.com Home Page

Taodam Forest Conservation And Education Network was established in 2003. The purpose is to preserve Taodam Forest emphasized on the forest conservation education to public and on supporting the communication among members in the network with an information technology application in work operations, an information and news reporting, an opinion and knowledge exchange by the development of the web database on the internet system. Therefore, the development of this information system, that stores information and knowledge in Taodam Forest on the internet for the interested general public to be able to connect into the network to search for information, news, the movement and activities of Taodam Forest network and exchange their opinion and knowledge, can help supporting Taodam Forest conservation in public and expanding the network for ones,

who are interested in the forest consevation, will have an area in the cyberspace to participate whenever they want.

1.2 Research Objectives

To develop a prototype of an information system for Taodam Forest Conservation and Education Network capable of the data manipulation together with the data search through the internet network.

1.3 Scope of Study

This research focuses on the database design and the system development of the taodum.com information system on the internet network for Taodam Forest Conservation and Education Network.

1.4 Expected Results

1. An information system for Taodam Forest Conservation and Education Network whose members can input, update and delete data on-line via an internet.
2. An information system that can distribute information and knowledge on the forest conservation in Taodam Forest to the interested general public by the data search and retrieval from the database via the internet network.
3. To make the prototype of the information system available for a further improvement or to be used as a guideline for a subsequent development of the information system.
4. To develop the 2 way communication among network members who are interested in the forest conservation in the cyberspace.

1.5 Conceptual Framework

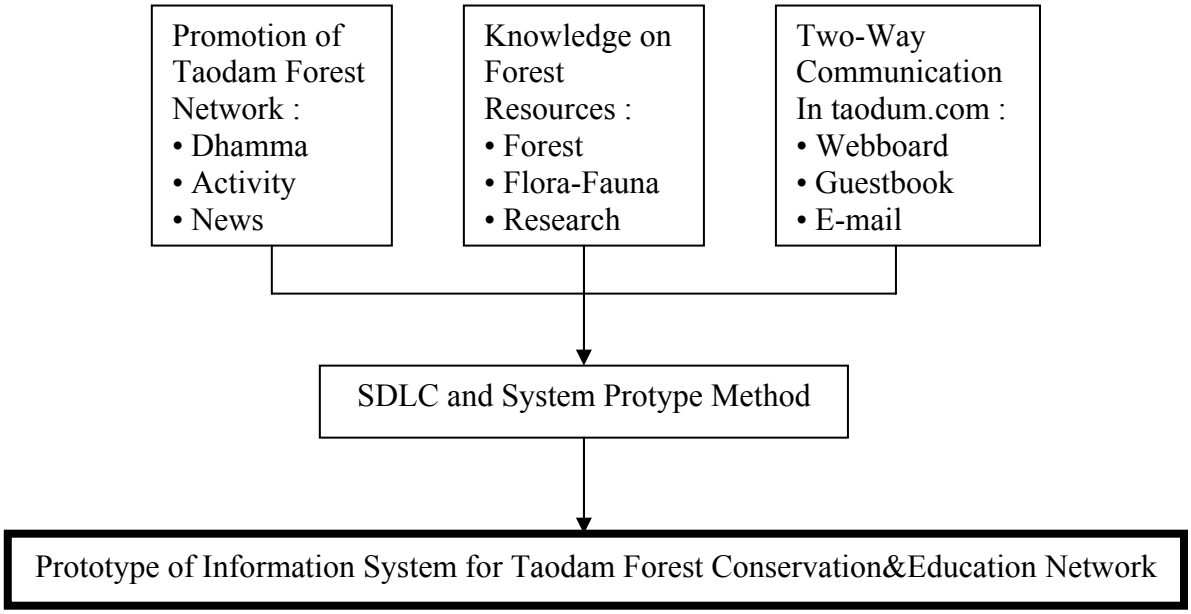


Figure 1-3 Conceptual Framework

This research on the development of a prototype of an information system for Taodam Forest Conservation and Education Network will use a Structure Analysis and Design approach of the System Development Life Cycle (SDLC) and a System Prototype method as a basic concept for the system development. This system has 3 major purposes: 1) To promote the works of Taodam Forest Network such as news, dhamma, movement and activities of the network, 2) To gather and distribute knowledge on forest resources, especially Taodam Forest resources such as forest, fauna and flora species and 3) To develop the 2-way communication in the system such as webboard, guestbook, poll, member, etc. However, this system is only a prototype, so each subsystem will gradually be developed as examples according to user requirements. Only some parts of the concept will be implemented in this system at this time. The prototype will be developed, used, tested, revised and enhanced again and again. Then it can be used as a guideline for the development of a fully functioning system later.

CHAPTER II
LITERATURE REVIEW

In this chapter, the documents and researches pertinent to the development of the information system for Taodam Forest Conservation and Education Network were studied. Essential topics cited in this section concentrate on the forest conservation concept, Taodam Forest, Taodam Forest Conservation and Education Network, the internet and related technologies together with the information system development concepts.

2.1 The Forest Conservation Concept

2.1.1 The Meaning and The Importance of Forest (4, 5)

The forest resource according to the concept of forestry is defined as the habitat of all the living beings, both plants and animals together with microorganisms, living together in the area that most consists of various types of trees standing on the ground with their roots holding under the ground. Forest can be replanted and can yield benefits to human beings.

Forest is one of natural resources that yields enormous benefits to human beings both directly and indirectly such as:

For direct benefits are those 4 basic needs of human beings: the source of food and fuel from firewood, the source of herbs which are raw materials for drug industries, wood which are used for the construction and furniture industries and other useful miscellaneous products from forest such as fiber, pigment, gum, etc.

The indirect benefits of forest are more important to the human living in their ecological values such as: supporting the natural balance; maintenance of the humidity, temperature, climate and season; the source of a river; taking the role as the

earth's largest sponge to absorb the rainfalls so preventing the flood and the drought; preventing the soil corrosion and the storm; the source of genetic resources and biodiversity. Moreover, forest is the place for recreation, travelling, researches and nature studies and also the place for Buddhistic monks to practice their peace of mind.

2.1.2 The Situation of Forest in Thailand

The area of forest in Thailand has decreased continuously and greatly. From the research reported by Apichai Phanthasain (6), the forest area in 1910 was about 70% of the area of the whole country or 224.5 million rai but in 1997 the forest area was only 80.3 million rai or 25% of the country area. Furthermore, the forest destruction rate was about 250,000 rai each year while the forest recovery rate was about 100,000 rai annually. These data indicated that the forest area had the tendency to decrease every year.

The important causes of the forest destruction (4,7,8) are: the state policy to develop the country emphasized only on the economic dimension but neglected the environmental dimension; the building of the infrastructure, the transportation and roads; the expansion of the industrial sector and the capital sector; the energy policy, the dam construction to generate electricity. The major causes of the forest destruction are the concession to work a forest by the government and the expansion of monocultured agricultural areas that have been promoted by the government for the industry or the exportation such as corn, sugarcane, cassava, jute, hemp, etc. Other causes are the eucalyptus gardening, the commercial forest culture, resorts and golf clubs in the forest area, etc.

From the huge reduction of the forest area, the Forest Department so improved the forest protection policy by cancelling the concession to work a forest all over the country in 1989. The national forest policy was created by defining 40% of the country area as the forest area consisted of 25% of the conservation forest and 15% of the commercial forest in the eighth National Economic and Social Development Plan (1997-2001). Furthermore, a large amount of national parks were declared.

Besides, from the research reported by Yongyoot Pungwongyart (9), the concept of the forest management by the local community was promoted. The community would participate in the management and benefits of forest, taking the role as the protector instead of the destroyer. The purpose of this action was that the local community could develop their own methods in the forest resource management and conservation. So men could use forest in a conserved way that was the most useful way for most men and that forest could yield benefits at the longest period of time with the least waste of the resource. Some forest conservation methods are preventing the forest destruction, the forest recovery, preventing the forest fire and the use of forest in a conserved way.

2.1.3 The Forest Resource Conservation Concept

From the problem of the continuous forest destruction, the conservation trend is campaigned to public to persuade the cooperation of the forest protection.

Conservation is more than only the preservation. It is the wisdom to make the most advantages of the resource for most men at the longest period of time with the least waste of the resource.

The forest resource conservation is the responsibility of everyone. Both the government and the private sector should share their roles seriouly and sincerely. The Forest Department (10) has concluded the forest conservation methods as below:

1. The Forest Area Definition: For the convenience in the conservation planning, the forest area is classified into 3 categories as follow:

1.1 Conservation Forest or Protected Forest is the forest area which is preserved to prevent the original ecological system from any changes by men. The use of this area is only the indirect use such as travelling, recreation, researches and studies. The direct use is not allowed such as the wood cutting, the residence in the forest area, the wildlife hunting or other activities that can cause an impact on the natural condition of forest.

1.2 Commercial Forest or Productive Forest is the forest area that can be used both directly and indirectly.

1.3 Community Forest is the forest of the community that manage their own forest in various ways depending on the area, the social, the tradition and the culture of those local community. The community forest must not overlap the conservation forest.

2. The Forest Resource Conservation Policy Definition: To reach the goal of the forest conservation operation, the policy is established to lead the action. At present, the forest resource conservation policy can be classified into 6 levels such as the royal policy, the national forest policy, the national planning policy, the government policy, the ministry policy and the Forest Department policy.

3. The Forest Resource Conservation Operation Definition: To reach the goal of the forest resource conservation operation, it must be practical and consistent with the policy. There are a lot of methods due to the suitability with the situation and places. However, the Forest Department has defined the trail of the forest resource conservation for an individual as follow:

3.1 The prevention of the forest destruction and the unlawful wood logging.

3.2 The protection of the forest invading.

3.3 The prevention of the forest fire.

3.4 The improvement of the wood cutting method according to the conservation concept.

3.5 The worthy use of wood.

3.6 The forest recovery and replanting.

3.7 The clear definition of the forest area that is the source of a river.

3.8 The protection of forest from diseases and insects.

2.2 Taodam Forest (11)

Taodam Forest is an evergreen forest abundant of natural resources and biodiversity. Its area is about 30,000 rai in Saiyoke National Park, Tambon Wangkrajae, Ampher Saiyoke, Kanchanaburi Province. Its name, Taodam, was called from an animal that is a black giant tortoise with a unique characteristic that it has 6 legs with 2 back legs sticking out when it climbs the hill. In the past, there were a lot of black giant tortoises here.

2.2.1 Taodam Forest Border

North	border with	Huay Nam Lor Stream
South	border with	Khao Pla Noy Mountain
East	border with	Huay Ploo Stream
West	border with	Mienmar

2.2.2 Topography and Flora

Taodam Forest is on the peak of the Ta-naosri Mountain. The highest point is called Khao Ror Rae which is about 1,125 meters from the sea level. There are 30% of plain areas next to the slopes of the mountain or between the valley and the channel. Most of the areas are the hills. These characteristics support the plant biodiversity.

Many kinds of forest are found in this area such as the tropical rain forest, the dry evergreen forest and the deciduous forest. The dominant species are *Dipterocarpus, Pterocarpus, Ormosia, Hopea, Lagerstroemia*, etc. Moreover, there are many kinds of bamboos, rattans, orchids, herbs, vines and climbers.

2.2.3 Climate and Weather

The weather here is not stable because it is on the high area. It is affected by the north eastern monsoon which brings the cold and dry weather and also affected by

the south western monsoon in the rainy season. There are 3 seasons: the rainy season begins in May until October with the highest rainfall in September; the winter begins in November and ends in February but the weather is coldest in December; the summer begins in February until May with the hottest weather in April. The average temperature is 26.7°C while the lowest one is 19.4°C and the highest one is 35.9°C. The rainfall is not very hard because the Ta-naosri Mountain blocks the south western monsoon. The average rainfall is 975.4 mm/year. It hardly rains in December.

2.2.4 Fauna

Because of its large forest area connecting with the forest in Mienmar, so there are many kinds of wildlife found in this area such as elephants, gaurs, tigers, bears, tapirs, deer, monkeys, langurs, gibbons, hornbills and other various kinds of bird. From the observation of Mr. Mongkol Wongkalasin, a bird expert, and other members of the Bird Conservation of Thailand in 1997-1998, there are about 171 kinds of birds. Moreover, there are fish, reptiles, amphibians and insects. The biodiversity of the species and the variety of biological resources here clearly identifies the abundance of Taodam Forest.

2.2.5 Taodam Forest Crisis

The abundance of Taodam Forest attracts some people to invade the forest by the wood logging, the wildlife hunting, the agricultural cultivation, the herb picking. There have always been urban expansion of the community around the forest into the forest area. The forest around Saiyoke National Park have been deteriorated, dry and had decreased number of wildlife since 1992. The abundance of Taodam Forest is also affected from the deterioration of the surrounding forest. The water level in the stream is lower than that in the past.

From the research studies during 1999-2003 by BRT, Mahidol University, Silpakorn University and Kasetsart University, it was found that the western forest was in a very critical condition. Activities that threatened the abundance of the forest were the unlawful wood logging, the road building project through the forest, the

expansion of the agricultural area, the expansion of the rural community both from Thailand and Mienmar, the expansion of the travelling area, wildlife hunting, herb picking, etc. These activities were under the political network and local authority from local to national levels. At present, there is only the Forest Department who takes the role to manage Taodam Forest without any help from other organizations.

The appropriate trail for the reduction and prevention of damages to Taodum Forest consists of the building of the cooperation network among individuals, groups and organizations to manage Taodam Forest as research and study materials to train youths, students, communities and civilians to encourage the sense of forest and natural resources conservation.(1)

2.3 Information System Development

An information system is a system concerned with the management of data and information arising from operations of the organization. Information systems support operations of the organization by storing and compiling data in interrelated and connected formats, inducted into analysis and processing processes to convert data into another format that is meaningful to the purpose or requirements of the work; generating easy-to-understand outputs to respective users, who are personnel in various positions within the organization structure, that is accurate, relevant, prompt, and up-to-date; to facilitate subsequent decision, control, and implementation. By which, responsibilities of dissimilar personnel require data or information in different formats. Information systems thus have diverse formats as appropriate and congruent to each person's nature of work.

An information system is therefore very crucial to the success in accordance with policies and objectives of the organization. If the current information system of the organization is no longer appropriate for an operation, the cause may be insufficient responses to users' needs. At which point, the information system development process must be initiated to build a new system that can serve users' requirement and support the organization's continuous operations.

Information system development has a characteristic of cycles analogous to that of living organisms, called "System Development Life Cycle: SDLC," comprising of 3 major stages of system analysis, system design, and implementation, which can be divided into 7 phases, thus (12):

1. Problem recognition
2. Feasibility study
3. Analysis
4. Design
5. Construction
6. Conversion
7. Maintenance

In the above system development life cycle, there are various methods of a system development; each is different in details of procedures, of which the appropriateness depends on formats or system characteristics. In this research, the researcher would present 3 major and well-known methods of system development, as follows:

2.3.1 Classical System Development Life Cycle

By this method, all processes will always proceed in relation and sequentially in steps. Each step must be completely performed before the next step can be executed. For this reason, the classical system development life cycle is thus called "Waterfall Model." In an actual system development, changes usually occur in system requirements, triggering regular reviews of the system in the initial stages of the next steps' execution. The system analysis and design view the system on a physical basis or center on physical factors, i.e. tools, materials, personnel, etc., resulting in inflexibility to change if there are any changes in tools or materials. This method views an overall system as a single system, with no division into sub-systems. Thus, system analysis, design and verification will be implemented simultaneously, causing complication, complexity, and risks of errors, making it unsuitable for the development of large-scale systems. Importantly, users cannot see the system being

developed until its final installation and life tests, creating risks of a system development that is incorrect and not satisfied for user's needs.

System development through the classical system development life cycle method is usually time-consuming and appropriate for an information system in which there are no substantial changes in users' needs –which are referred to system requirements--, which can be anticipated in advance. This method is therefore applied mostly in the development of a system with structured working characteristics, such as the transaction processing system: TPS (13).

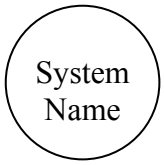
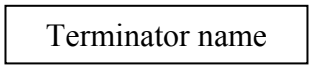
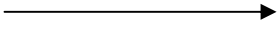
2.3.2 Structure Analysis and Design

From the problem with system development using the method of Classical system development life cycle, for the development of large, complicated, and complex systems emerged the concept of Structure analysis and design. The important characteristics are the separation of system into subordinated and related components, and the construction of system models. Both characteristics are in the processes of system analysis and system design.

In the process of system development with this method, construction of system models in document forms is important to explain the system in the study and development, for ease of understanding using figured symbols to portray various components in system structure; major tools utilized are (14):

1. Context diagram: is the preliminary diagram to be constructed in system analysis, by which this model is the topmost system model showing global depiction and scope of current system. Symbols used in construction of Context diagram are shown in Table 2-1.

Table 2-1 Symbols used in construction of context diagram

Symbol	Meaning
	Working scope of system
	Person or units outside system scope
	Flow of data

Source: Penny A. Kendall 1987

2. Data flow diagram: categorized into 2 types. Physical models are models showing how system works in real life conditions, including sequences of operations, working of personnel, processing of computer, report formats, and others. The second type of model is the Logical model, showing what the system must do, flow of data into system, and storage of required data. Hence, it is similar to the physical model, except that it does not consider physical working factors such as tools and materials, personnel, formats of forms and various reports etc. In other words, the logical models show what the system must or should perform, but do not indicate how the system works. In information system development, 4 models will be constructed:

2.1 Physical model of current system: is a visual model showing data flows within the existing present system, data processing or data conversion, and data storage, in network arrangement indicating where data or information are inputted from and outputted to, reflecting actual operating conditions as to how system works, including sequences of operations, personnel actions, computer processing, formats of various forms.

2.2 Logical model of current system: is a visual model showing required working of system indicating data flows within the existing present system, data processing or conversion works, and data storage in network arrangement indicating where data or information are inputted from and outputted to. Which is a depiction of system operation similar to the Physical data flow diagram, except

without consideration toward physical working factors such as tools and materials, personnel, formats of forms and various reports, and sequences of work, etc.

2.3 Logical model of new system to be developed: is a visual model showing data flows within the new system, data processing or data conversion, and data storage, in network arrangement indicating where data or information are to be inputted from and outputted to.

2.4 Physical model of new system to be developed: is a visual model showing data flows within the new system, data processing or data conversion, and data storage, in network arrangement indicating where data or information are to be inputted from and outputted to, by reflecting actual operating conditions as to how system works, including sequences of operations, personnel actions, computer processing, formats of various forms, and others.

The first 2 models can be constructed only after a through study and understanding to collect data about the present existing system and occurred problems. Likewise, the last 2 models can be constructed after a prior study on system requirements of the new prospective system has been completed. Symbols used in construction of Data flow diagram are shown in Table 2-2.

Table 2-2 Symbols used in construction of data flow diagram

Symbol	Meaning
Terminator name	Person or units outside system scope
File name Or File name	Data storage unit
Process Name	Processing unit
Data name	Flow of data

Source: Penny A. Kendall 1987

3. Data dictionaries: is a construction of additional details after data flow diagram construction. Because the data flow diagram shows data flows and data store in certain diagrams critical to system, but lacks details in data flow and data store regarding components of what data, types or sorts, sizes. For this reason, Data dictionaries will solve this problem, by showing structure and details within data flow and data store as relevant to the system. Symbols used in construction of Data dictionaries are shown in Table 2-3.

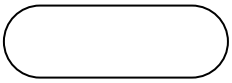
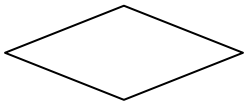
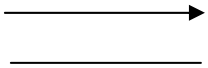
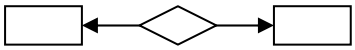
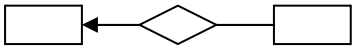
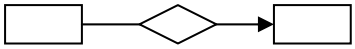
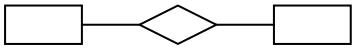
Table 2-3 Symbols used in construction of data dictionaries

Symbol	Meaning
=	Equals, comprises
+	And
[Option 1 Option 2 :]	Choose one option
$\overset{\max}{\min}\{\text{Component}\}$	Repetition of component min = minimum times of repetition max = maximum times of repetition
(Component)	Optional component
* Comment *	Encased in asterisks is notes

Source: Penny A. Kendall 1987

4. Data structure diagrams: is a diagram showing relationships of data, using E-R diagram as a tool to design structure for relational database, as graphics database design language, in which E-R diagram comprises Entity, Attribute and relationship of Entity. After E-R diagram is converted into data table and executed normalization to reduce data overlaps, will generate the Data structure diagram that can be used to construct database. Symbols used in construction of E-R diagram are shown in Table 2-4.

Table 2-4 Symbols used in construction of E-R diagram

Symbol	Meaning
	Entity sets
	Attributes
	Relationship sets
	Links
	One to one relationship
	One to many relationship
	Many to one relationship
	Many to many relationship

Source: Henry F. Korth, Abraham Silberschatz 1991,34

5. Data access diagrams: are diagrams showing additional details in each Data structure, by explaining relationships and data access between Data structures.

6. System structure charts: are diagrams showing sequences of controls focusing on processing in the system, to explain connecting sequences at different levels between various processing units; thus confirming which working parts are main and which are minor. Symbols used in construction of Structure charts are shown in Table 2-5.

Table 2-5 Symbols used in construction of structure chart

Symbol	Meaning
Module name	Modules or groups of instructions
	Link between module, from Calling module to Called module
 Data name	Couple or data unit sent from one module to other modules
 Flag name	Flag or data unit denoting conditionals

Source: Penny A. Kendall 1987

7. Dialog hierarchy: is a diagram showing sequences and numbers of screens users communicated with system, in which display sequences of next screens is based on selection by users.

8. System models: is a model depicting working procedures in system development.

9. Pseudocode: have writing formats similar to program coding, using general English words, but not in any specific computer languages. Which may be used in the process during and after the Physical design phase to determine program-coding structures in various parts, in the meantime when no actual computer programs have been written.

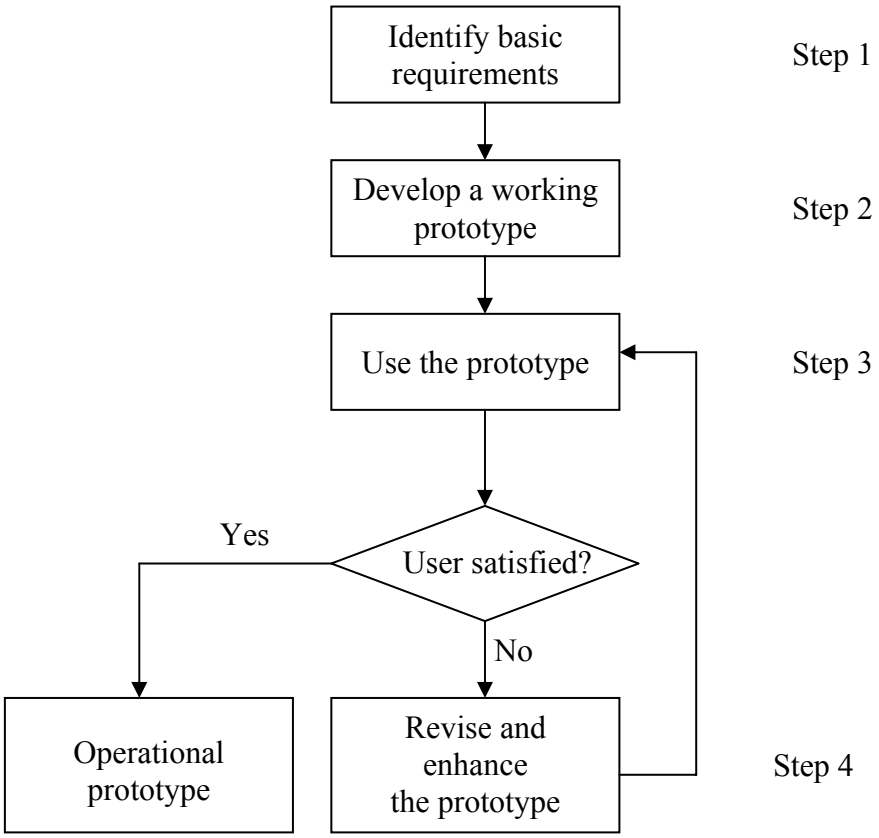
After completion of all diagrams, next is the development and system installation of computer program, in which developers will choose any computer language. Program coding and database construction will rely on those designed diagrams. After development of programs and database is completed, there must be testing to verify accuracy and comprehensiveness of system, before system installation to live usage.

The Structured analysis and design method is thus appropriate to the development of large and systematically complex system, which is explanatory for its present popularity in system development. Nevertheless, problems of diversity and complexity of system requirements, and confusion of communication between users

and analysts in the system analysis phase may still be obstacles to this method of system development (15).

2.3.3 System Prototype Method

System development by the method of system prototype construction is a technique to build small systems, or new systems with no prior development; thus users cannot clearly state system requirements, or users have very slight experiences concerning the system under development; or in cases where user requirements change constantly. In this method, users are more directly involved in analysis and design phases than in any other aforementioned methods. Steps of development by system prototype method can be depicted as in Figure 2-1 (16).



Source: Kenneth C. Laudon, Jane P. Laudon 2000,373

Figure 2-1 Steps of system prototype method system development

Step 1, Identify basic requirements: is the phase in which system designers must work by discussion and effective communication with users to gather basic requirements of users. Which is comparable to the 3 phases of general system development cycles.

Step 2, Develop a working prototype: Relying on results from user requirement studies from step 1, designers will design and develop a prototype, generally using the fourth-generation language (4GL) or computer aided software engineering (CASE) as tools to design "Mock Screens" with menus and graphic user interfaces (GUI), report screens, and display-retrieval screens. This prototype system is not complete, being only testing screens without connection to database, but will help users understand what types of data can be accessed, how data information are formatted, and which techniques to interface to other screens (13).

Step 3 Use the prototype: System designers will bring prototypes as designed in phase 2 to have users try in various system components and then evaluate the system as to which parts are satisfactory and which are not, as well as other beneficial advice on system improvements or enhancements.

Step 4 Revise and enhance the prototype: After users' recommendation, system designers will use those as guidelines for system improvements or enhancements. After which, the system is to be taken back to users' testing, or back to phase 3 again. Steps 3 and 4 will be repeated in turn until users are satisfied with tested prototype.

When the prototyping process is completed in step 4, normally there are the following possible options to proceed (17):

1. The prototype is redeveloped. Which may include completion of program coding from structure outlines of the system.

2. The prototype is implemented as the completed system. Once the prototype is effective and with sufficient interface with users, the prototype may then be implemented as the completed system.

3. The project is abandoned. In cases where feedbacks from the prototype indicate that the system cannot be developed any further, as a result of limitations from technologies, economies, and existing work operations.

4. Another prototype series is begun.

System development by the system prototype method is not the development by trial-and-error, but rather is the development by improvements and adjustments through the cooperation of system designers and users; and is a useful functional system. Users can visualize system's working in development before completion. As well, they can dispute and refine the system to their requirements, based on actual direct experiences of the users. Hence, this method of system development is proper for systems that emphasize on users needs, and usually deployed in the development of the decision support system (DSS), and the expert system. Moreover, the concept of this method can be adaptively applied to be a part of other methods of the system development.

2.4 Database

A database is an information structure comprising of many entities, all of which must be related. Compiled data are organized into a systematic relationship, enabling a simple presentation and the ease of use to targeted users. Data compilation in the database form provides utilities from the database deployment in processing as thus (18):

1. Reduce data overlaps
2. To some extent, avoid conflicts of data
3. Data can be shared
4. Can be controlled and standardized
5. Concise security system can be procured
6. Data integrity can be controlled
7. Can balance conflicts of requirements
8. Independence of data

2.4.1 Database Models

The relationship of entities in a database generates data structures of various forms. Presently, there are 3 models of the database structure (18):

2.4.1.1 Relational Model

The relational model shows details of data and data relationships in the form of tables which represent relations, in 2 dimensions of rows and columns. Data organized in each column is dependent on the key column only, i.e. data in other columns are meaningful only if the key data is available.

2.4.1.2 Network Model

The network model shows groups of records with links or pointers indicating data relationships, by which the relationship structure of records in the database is in the state of relationship grouping with no specific data definitions, which have many-to-many relationships. This model is visibly different from the relational model in that the relational model has implicit relational definitions while the network model shows explicit relations, via links or pointers (19).

2.4.1.3 Hierarchical Model

The hierarchical model is characteristically similar to the network model. The difference is that the data structure of each record in the database has one-to-many relationships, characteristically similar to the tree. The data search for required data begins at the root, and cascades via the relationship down to the child.

2.4.2 Database Management System

The Database management system (DBMS) is a program to combine various capabilities of the database construction, addition or deletion of data, the retrieval , control and maintenance of the database, without requiring users to know internal details of a database structure. The DBMS then is like a medium between users and other programs accessing the database. DBMS has the following functions (18):

1. Communication with file managers

2. Control of stability
3. Control of security
4. Generation of backups and recovery
5. Control synchronization states

From the structure of the database, we can classify DBMS into 2 main categories (19):

1. Hierarchical system
2. Relational database management system (RDBMS)

2.4.3 Microsoft Access 2000

Microsoft Access 2000 is another capable RDBMS software that is widely popular. The distinctive features of this software are its ease for learning on operations and capability to be applied toward the design of an organizational database management system -- construction of form screens, the design of reports, with the wizards helper, and the compatibility with other databases e.g. dBase, FoxPro, FoxBASE, Oracle, Paradox, SQL Server etc.; the data import and export with Word, Outlook, and Excel; and the capability to use SQL as a core language for the data query and retrieval.

Microsoft Access 2000 can support 255 concurrent database users with the maximum database size of 2 GB and with general RDBMS database management capabilities.

2.5 Internet

Internet is an extensive computer network system linking computers worldwide together in a web-like arrangement. Today, the Internet has a major role in this information era through numerous utilizations: in communication, messages, publicity, data transfers, commerce, or even school-like learning, and many others. Internet is a public network system open unlimitedly to all to share and use the

resource; the connection of networks is under the same standard called Transmission Control Protocol / Internet Protocol (TCP/IP).

The communication between computers for the cooperative sharing of resources requires interdependencies between computers. The computer that provides services to others is called "Server", while those requesting services from the server are called "Clients." In the Internet system, there are 2 modes of communication: the data upload and the data download, of which the server computer sends data to the client computers, which receive those data. This computing model is called "Client-Server System" (20).

World wide web (WWW) is a type of the client-server system, the purpose of which is the data communication of computers via the Internet. WWW services can store and retrieve data in multimedia forms: texts, graphics, sounds, movies, etc. Presently, this service is very popular, as can be seen from the publicity of countless organizations that incorporate the URL or website addresses to have interested persons to visit and pursue information and news, using web browsers for the data retrieval. On the subject of forest, there are numerous forest-related websites, with published information contents ranging from forestry knowledge, news, publicity, to forest statistics, as well as for conservation purposes.

2.5.1 Hypertext Markup Language

Hypertext Markup Language (HTML) is a document format applied with the HTTP protocol, which is an application-level protocol used for the transmission and reception of documents in the WWW. When the web browser receives data in html document format, which are files with .htm or .html extensions, the information are displayed as web pages. Inside html documents are languages whose coding attributes are texts in the ASCII standard, from which computers of all operating systems can read (20).

The features of html documents or web pages are divided into 2 formats, as:

2.5.1.1 Static HTML

The behavior of a static web page is similar to a normal paper page, in that the web browsers have no interaction with users, only act as the data requester from the server and display as a web page for the user viewing. This type of a web page has a drawback in the lack of an interest for viewing, and is a burden to the server, since all processing and error checking are server's tasks. Static web pages are appropriate for the display of general information and details, in the same way of opening up a book for reading, and data in html documents are not changed until revised.

2.5.1.2 Dynamic HTML

These are web pages with an interaction with users through the web browsers in the users' computers. For that reason, the interaction is fast, which enables gimmicks to increase an interest of the web pages. And importantly, the data verification in the database application on the Internet is possible through the addition of scripts into web pages, for benefits in calculation, displays, verification, data uploads-downloads, and also greatly reducing burdens on servers and the network. Html documents in dynamic formats can be changed in response to database search conditionals.

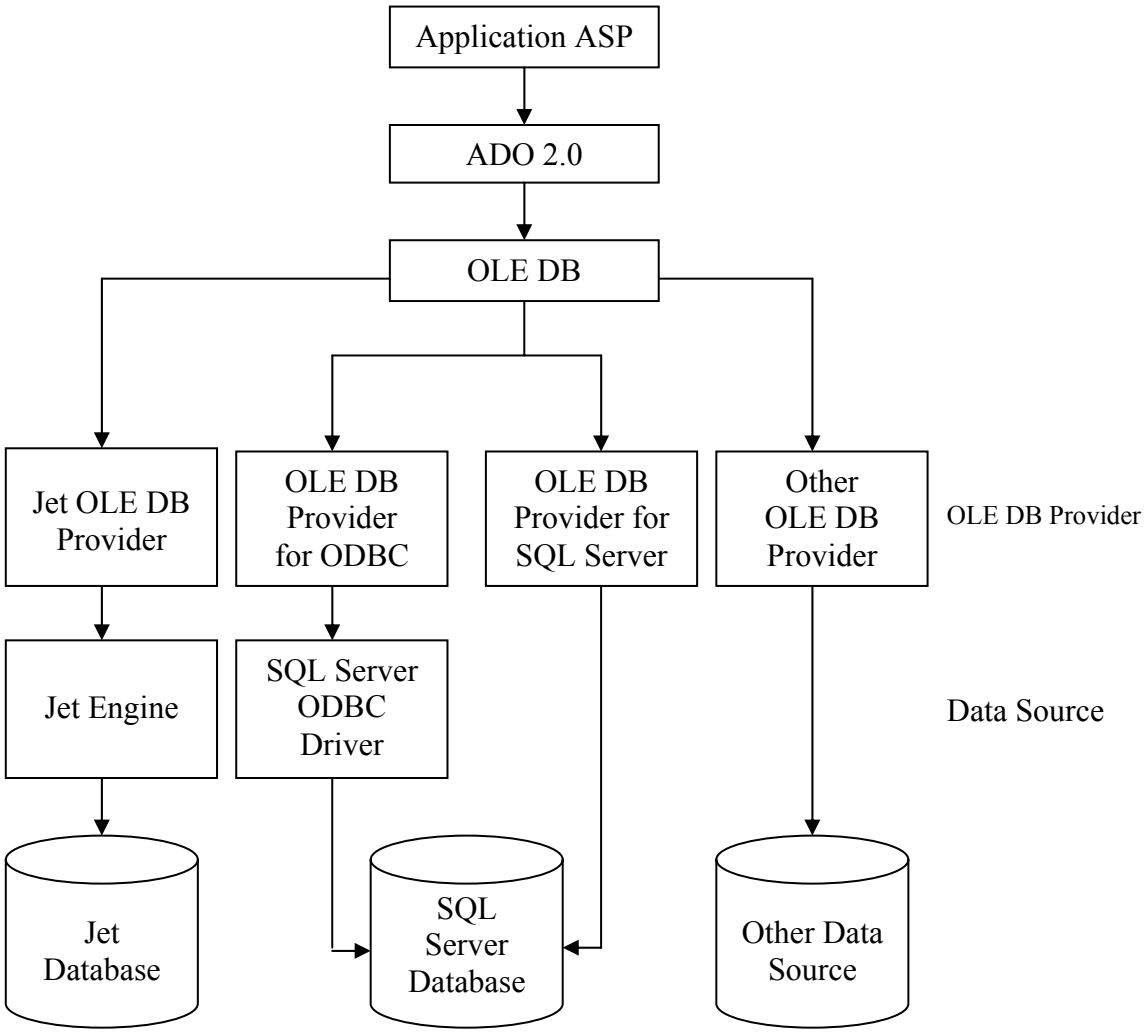
The 2 different html document formats can be utilized as formats of web pages as appropriate in various parts of Taodam Forest Network information system. In parts, where contents; knowledge; history; organization information and area maps are shown, which are not frequently revised or updated, will be in static formats. On the other hand, web pages incorporating the data upload-download or connection to databases, will be in dynamic formats.

2.5.2 Macromedia Dreamweaver UltraDev

Dreamweaver UltraDev is a program developed from Dreamweaver which is a famous webpage design-aided program like MS FrontPage. It is a program called "WYSIWYG (What You See Is What You Get)" because the web developer can suddenly see the result. The ability of UltraDev over Dreamweaver is the capability to support scripts, such as ASP; JSP; ColdFusion; PHP; etc., which are server-side scripts. Also, UltraDev has tools to help writing program connecting to the database. Furthermore, it can compile scripts and show results within its program. So it is suitable for the web developer which does not code only static HTML webpages but also uses server-side scripts which are dynamic HTML webpages.(21)

2.5.3 Active Server Page

Active Server Page (ASP) is a web page application development technology, developed by Microsoft Corporation. Features of ASP are scripts that run on the server and manage applications on that web server, using Internet Information Services (IIS) 5.0 web server application on Windows 2000 operating system, or Personal Web Server (PWS) 4.0 and IIS 4.0 on Windows 98 operating system. ASP operates as an interpreter program to interpret web pages written in VBScript, JavaScript, or Perl languages that include ASP coding that web browsers like Internet Explorer or Netscape Navigator cannot display. When ASP files formatted with .asp or .asa extensions are interpreted by the web server, results are generated as documents in HTML formats with .htm or .html extensions, to be passed on to web browsers for the later display. Users cannot see the scripts parts that were run on the server side. In addition, ASP applications are capable of the communication with server-based databases by using ADO (ActiveX Data Object) through OLE DB (Object Linked and Embedded Database) provider, which has a structure shown in Figure 2-2 (20).



Source: Thawatchai Suriyatongtam, Tharin Sititamchari, and Pricha Prukprasert, 273

Figure 2-2 ASP database connection structure through ADO

2.6 Taodam Forest Conservation and Education Network (1,2)

Taodam Forest Conservation and Education Network has developed from Taodam Forest Watch since 2003.

2.6.1 The Composition of The Network

The leaders of the social movement against environmental problems in Taodam Forest are middleclass, such as the Kanchanaburi Women society, the Kanchanaburi Conservation society, which are the civil organizations. Their protests have continuously been supported by external conservation organizations. The conflicts which were extended to public issues, could gather more associated communities out of the problem area such as school pupils, university students, academicians, teachers, monks, Buddhists, the Forest Department officers, soldiers, policemen, government officers, businessmen, company workers, organization staffs, mass mediums, individuals, etc.

2.6.2 The History of The Network

Taodam Forest is in the area of Saiyoke National Park in Kanchanaburi province. Mrs.Thiwaporn Sriworakul had the concession to work a mine in this area since 1977 but she took a role as Taodam Forest protector. The serious problem of this forest is the unlawful wood logging by the officers together with the tough guys. Mrs.Thiwaporn has acted as Taodam Forest protector for about 30 years. The first community that joined her was Taodam Monastery that is a branch of Watpahnanachat in Ubonrachathanee province. Taodam Monastery was established in 1992. After that Mrs.Thiwaporn has made the contact with BRT (Biodiversity Research of Thailand) in 1997. In 1998, Kasetsart University, Mahidol University and Silpakorn University have joined the network. Then they established Taodam Forest Watch in 2000. They have performed Taodam Forest hiking activity once a year since 2000. There have been a lot of people from various units and occupations joining them so the network members increase gradually each year. In 2002, www.taodum.com was first published and named as Taodum Forest Watch which was changed to be Taodam Forest Conservation and Education Network later.

2.6.3 The Work and Activities of The Network

The forest conservation work are the forest protection against the wood logging, the forest prevention from fire, the preservation of the forest that is the source of a river, performing Taodum Forest hiking activities for nature education and training together with making a merit at Taodam Temple once a year since 2000.

Besides, the network has worked together with the massmedia to report news and movements in Taodam Forest, collecting facts and distribution to public, forcing to solve the problem in the area in a peaceful way for advantages of all Thai nation and revealing the activities of the network members by publishing a book called "Nights in the Forest: New Value in the Western Forest Route"(11) and a website.

The www.taodum.com has been published to promote the network and communicate with anyone who is interested in the forest resource conservation.

2.7 Relevant Researches

In 2001 Pitcha Phoomchusri (22) researched in the topic of the development of the database and retrieval system of fisheries research works on internet, Department of Fisheries, Ministry of Agriculture and Cooperatives, Thailand to promote the department to interested individuals. His system enabled fisheries research works searching through Key word searching, Subject searching and Image searching. He built the system to approach the presentation on the internet using HTML and ASP to connect with the database. The database management system was based on SQL Server 7. MS Visual Basic 6.0 was used to build forms in order to facilitate additions and updates to research work data. SQL language was used to build retrieval techniques. This developed system could support easy, convenient, interactive and fast information search to users and also cover all fisheries topics. Furthermore, this system was able to show the abstract, bibliographical data and full-text documents by using Acrobat program via the web site.

In 2003 Visutthiphun Phutphoncharoen (23) developed web application for

rice insect pest control information system of Department of Agricultural Extension. The system was developed by using the Structure analysis and design approach. Visual InterDev 6 was used to aid ASP, VBScript and HTML in developing the web applications while SQL Server was used to build the database of the system. This system was easy for administrators to edit and update and for farmers to search for required information. The outbreak of rice insect pests could be predicted by the built-in feature that used climatic data. District agricultural extension officers as well as farmers could therefore disseminate news and warnings so that they could take preventive measures in advance. The researcher recommended that the system should be made easier to use and more accessible to farmers.

In 2004 Hatairat Yeeviyom (24) developed web database system of weed control method in rice farms using a relational database for managing and searching weed information on the Internet. The software used included Access 2000 as a Database Management System, Dreamweaver UltraDev 4.0 as a design tool, ASP as an interface between database server and users, and Personal Web Server (PWS) as a web server. Users could search for 25 weed species by typing keywords or selecting from comboboxes. Administrators could insert, edit and delete weed information through the Internet.

Prachya Pricharak (25) developed a research information system for living soil organisms in Thailand. This system enabled searching for research works about living soil organisms by taxonomy, researcher name, organization, research topic, published year. The system was developed by using the Structure analysis and design approach. ASP, VBScript and HTML were used in developing the web applications. Microsoft SQL server 2000 was used to construct the relational database. Internet Information Service (IIS) was used as a web server. Administrators could manage research information through the Internet. In addition, this system was able to show the abstracts and full-text documents by Microsoft Word, PDF or text files.

Nongnuch Anansophonsakul (26) researched in the topic of system design for the pharmacist community network, working in drug stores, providing efficient pharmaceutical services for patients and customers. Pharmacists could utilize this system as an easy way to access information on new drugs and diseases in real time via the internet from anywhere and at any time. Microsoft SQL Server 2000 was used

as the Database Management System (DBMS). Visual Studio 6.0, Edit Plus 2.01, ASP and JavaScript were used to develop the system. Administrators could manage the system through the Internet.

After the researcher has reviewed the document of related researches, the result can be the guideline and reason for the system development of this research. This development is based on the concept of Structured analysis and design and the System prototype method. All processes of the system analysis will be described as examples that can explain every process of the system and may support other researches in the future. Tools of this development are consisted of Access2000 as DBMS with Dreamweaver UltraDev, HTML and ASP for web applications.

The Structure analysis and design concept is chosen for the system analysis and development because this method uses system models to represent the physical and logical structure. It is flexible when system requirements are modified. If the system is developed further, system models will be important to the system analyst.

Tools chosen in the system development consist of 4 parts. The first tool is Microsoft Access2000 which reserves the database system and simultaneous users. It also composes of the efficient database management tool and the database converter into the form of other DBMS such as Microsoft SQL Server 2000. The second one is Dreamweaver UltraDev which is used to write web applications as well as user interfaces in both client and server sides. The third part is HTML chosen to build user interfaces. And the last one is ASP for better handling processes within the server side and compatibility with Microsoft operating system and also for the two-way communication modules of this web-based information system.

CHAPTER III
METHODOLOGY

This research, on the development of the prototype of the information system on the internet network for Taodam Forest Conservation and Education Network, focuses on the study and design of the database structure of Taodam Forest Network as well as the construction of user interfaces that are appropriate and congruent with requirements of users of www.taodum.com, to ensure the convenient and expeditious data search through the internet network. After the researcher has reviewed documents, theories, research works, and system development tools in Chapter 2, the research methodology can be determined to ensure the alignment of objectives and expected results, with the following details:

3.1 Procedures

In this research, 2 system development concepts, which are the structured analysis and design, by Penny A. Kendall (12), and the system prototype method, are applied to determine the operating procedures appropriate to the research work. Procedures are:

3.1.1 Problem Recognition

This phase comprises of the study and understanding on problems with the current system, as follows:

1. Research and study from documents and research works on the web-based information system development related to an environment and natural resources to stimulate the understanding on the information system development concepts and theories.

2. Inquiry on the present description of data and works in www.taodum.com of Taodam Forest Conservation and Education Network with regards to the communication of relevant knowledge information, i.e. from where, comprise of what data, storage and dissemination methods.

3. Inquiry to the webmaster team on the direction of Taodam Forest resources conservation works; on present methods of works in the promotion and education about the forest conservation; on the arrangement of data; on the ways of the communication including with the transpired condition of problems and impediments in works.

4. Determination of problems and causes of problems, including the examination into directions to enable the support from the information system.

5. Construction of the context diagram to establish the scope of the information system, demonstrating relationships between the information system and pertinent external units.

3.1.2 Feasibility Study

In this phase, the researcher has to analyze the readiness of the previous work system to support the new system and evaluate alternatives for a feasible information system with the following steps:

1. Inquire the webmaster team of Taodam Foest Conservation and Education Network on the computer system of www.taodum.com of these details:

- Computer hardware: components and efficiency
- Software: operating system and database management system
- Computer networks
- Concerned personnel

2. Analyze and evaluate alternatives of the information system to be developed to consider of the possibility of the support and compatibility to the new system from the present system.

3.1.3 System Analysis

This is the stage of the study and analysis of the current information system of Taodam Forest Conservation and Education Network pertinent to Taodam Forest resources knowledge and information together with the communication among members in the network and examination of requirements for the new system by:

1. Examination on pertinent documents, information, and an information system compiled and stored in www.taodum.com on what data, details of data and the format of data contents.

2. Construction of the data dictionary to describe details of data in the present system.

3. Construction of the physical data flow diagram of the current work system, to explain the operating structure in the data reception, storage, and dissemination of Taodam Forest Network; as to who are involved, what type of the tool and hardware, what are the results.

4. Construction of the logical data flow diagram of the current system to show the work produced at each step to verify the system composition, sources of received information and results of the system.

5. Inquiring and interview with the users in the network to examine their needs. The inquiries are in the form of conversation in several topics related to details of information, the format and characteristics of information, methods and the solution of the search. The review also refers to samples of the system so users could clearly describe their exact opinions. The result of the interview will be concluded as the needs of users.

3.1.4 System Design

This is the phase to design the information system relying on previously prepared system specifications and system requirements or user requirements as guidelines for the design. With the following designed steps:

1. Construction of the E-R diagram,to explain data structures, which is due to the consideration of previously studied system specifications and system requirements, then the normalization will be implemented so that data structures are in easy-to-understand formats and reduced data overlaps, then data structures will be generated into table forms, together with the data dictionary construction to explain data in the database.

2. Construction of the logical data flow diagram of Taodam Forest Network information system comprising of modules that can support the system requirements by the new design and improvement on the previous system.

3. Construction of the dialog hierarchy to show sequences and a number of user interface screens.

4. Design and construction of the web page prototype, which are interfaces between users and the information system.

5. Introduction of the prototype to users for the trial usage and advice, as guidelines for the prototype improvement to match user needs then continuing with revision and improvement.

6. Construction of the process specification into the pseudo code to explain various system processes with structured english.

7. Construction of the physical data flow diagram of Taodam Forest Network information system showing system procedures that; what data are used by each module, what are the outputs, what type of tools and hardware used; which will show all structures of the new system.

The design is toward an information system in which users can serve the internet to search for data contents, relevant to the biological resources in Taodam Forest and the two-way communication in Taodam Forest Network, on the database installed in the server on the network through web browsers. Once on the system screens, users can specify the inquired data directly, e.g. plant search by type, by advantage used or by season flowering, to display details. Or in cases when users cannot directly specify the needed information, can still specify search query conditionals to have the system assist in offering lists of prospective information needed, relying on data-query techniques from the relationship in the database structure. Also, documents are in web page formats to explain details and graphic

illustrations for the additional search by users. Any new information on Taodam Forest Network, e.g. discovery of new species of plants or wildlife; an announcement of newly published researches; new topics for discussion on the web board; what's new in the month, and addition and revision of data in the system database can be made by authorized personnel or system administrators.

3.1.5 Construction

From the structure of Taodam Forest Network information system, as analyzed and designed in the system model prototype, to the construction of the system program with the steps below:

1. Construct Taodam Forest biological resources database, with Microsoft Access2000, utilizing the data structure in the table form that has been designed through the normalization process.

2. Write programs and web pages, according to the newly designed logical data flow diagram, using the Macromedia Dreamweaver UltraDev software with Active Server Page (ASP) technique to enable web pages to work with the constructed database.

3. Construct the two-way communication modules, such as the webboard and the guestbook, with ASP.

4. Test and verify Taodam Forest Network information system, by generating sample data to test system operations, and correct any deficiencies.

5. Create system operation manuals.

3.1.6 System Installation

In this phase, Taodam Forest Network information system programs are installed on the remote server in the internet network, for users and administrators to have the actual use of the system, converted previous data and imported into the database.

3.1.7 System Evaluation

The system evaluation phase comprises the steps of:

1. System evaluation. Using the questionnaire to evaluate the opinion of 2 groups of users:

- Database system administrators (the webmaster team of www.taodum.com): who are responsible for the storage, revision and system administration, by evaluating on the accuracy and appropriateness of the database structure including the convenience of the system usage.

- System users: (the network members of Taodam Forest Conservation and Education Network): who search for information from the system, by evaluating on the convenience of the system usage.

2. Evaluation analysis. Analysis of user evaluation responses by statistical means, i.e. percentage and means of questionnaires, then summarize whether the system is appropriate and how convenient the system is.

user opinion	**score**
excellent	5
good	4
medium	3
fair	2
poor	1

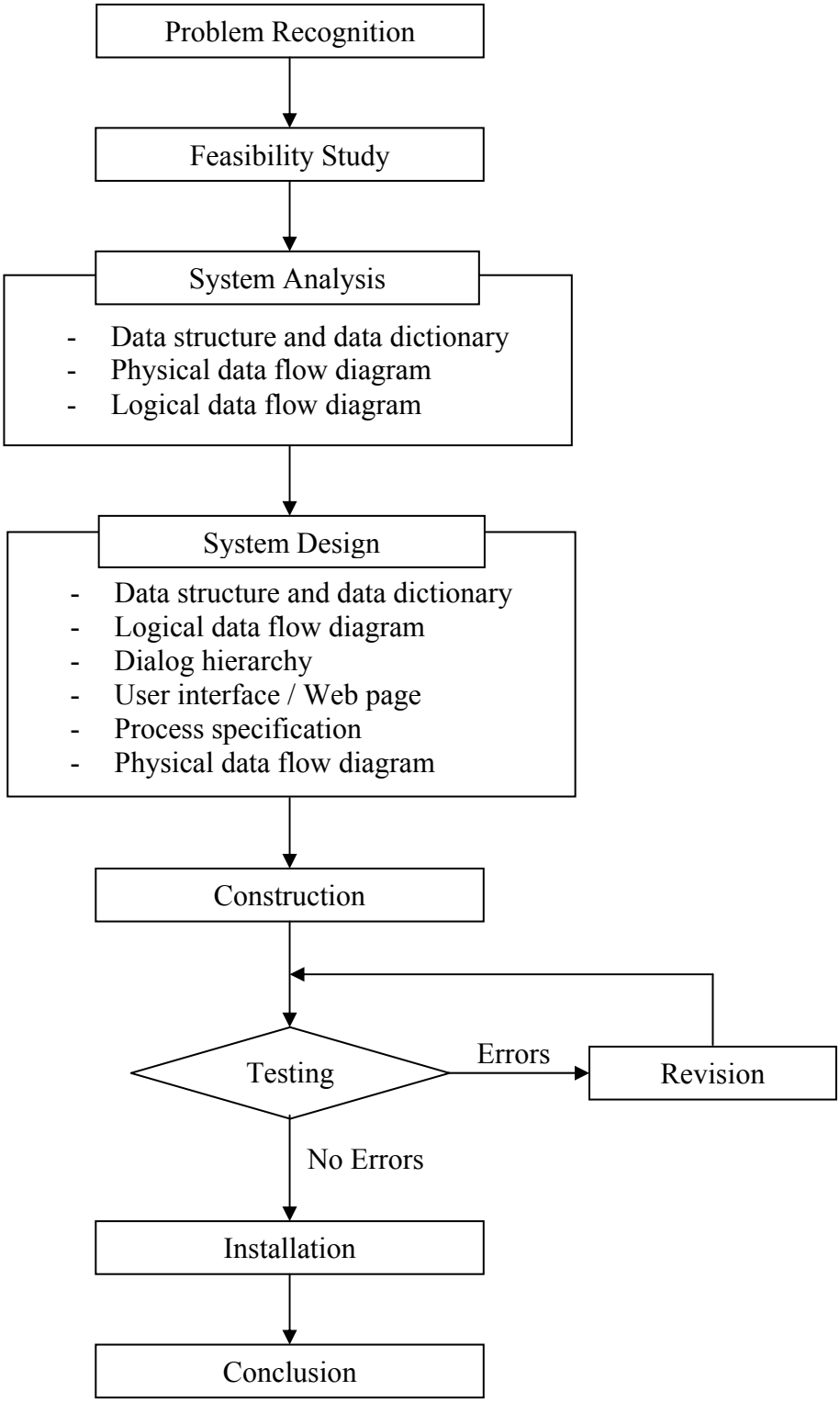


Figure 3-1 Procedure diagram

3.2 Research Materials

3.2.1 System Development Tools

1. Hardware
    1.1 Computer
        - Processor : 665 MHz Intel PentiumIII Processor
        - Memory : 256 MB RAM
        - Storage : Hard disk 40 GB IDE 7200 rpm
        - Network : Modem 56Kbps
    1.2 Printer
2. Software
    2.1 Operating system : Microsoft Windows XP Professional
    2.2 Web server : Internet Information Service (IIS)
    2.3 Developing tools : Dreamweaver UltraDev, ASP
    2.4 Upload component : WS-FTP or Cute-FTP
    2.5 DBMS : Microsoft Access2000

3.2.2 System Testing Tools

1. Server
    1.1 Computer
        - Processor : 665 MHz Intel PentiumIII Processor
        - Memory : 256 MB RAM
        - Storage : Hard disk 40 GB IDE 7200 rpm
        - Network : LAN 10/100Mbps PCI
    1.2 Software
        - Operating system : Microsoft Windows XP
        - Web server : Internet Information Service (IIS)
        - Upload component : WS-FTP or Cute-FTP
        - DBMS : Microsoft Access2000

2. Client

2.1 Computer

- Processor : 665 MHz Intel PentiumIII Processor
- Memory : 256 MB RAM
- Storage : Hard disk 40 GB IDE 7200 rpm
- Network : LAN 10/100Mbps PCI

2.2 Software

- Operating system : Microsoft Windows XP
- Web browser : Internet Explorer Version 5

3.2.3 System Evaluation Tools

1. Questionnaire for system user
2. Questionnaire for database system administrator

CHAPTER IV
SYSTEM DEVELOPMENT

According to steps of the work mentioned in chapter 3, the development of the information system for Taodam Forest Network is based on the process of the structured analysis and design. The building of models of the data flow, the relationship and user interfaces are highly important to the system development.The major parts of this process are the problem recognition, the feasibility study, the system analysis, the system design, the system construction, the system installation and the system evaluation. Details of models consist of the description and diagrams in each step.

4.1 Problem Recognition

At this procedure, the researcher has reviewed the existing system by interviewing with the webmaster team and the network members, collecting available documents including the observation of procedures taken by workers.

4.1.1 Problem of the Existing System

The data within www.toadum.com, such as news; movements; activities of Taodam Forest Conservation and Education Network and Taodam Forest resources data such as new plants or wildlife, that have never been reported in the website before, could not be updated easily because of the lack of web application knowledge of webmasters. The sources of data about Taodam Forest resources are from various mediums such as books, cameras, digital cameras and CDs that could be unavailable, lost, insufficient, outdate and cannot be uploaded onto the internet instantly. The sources of news and activities are from various groups of members in the network.

The updating of the data is a major function of the website, because it will attract the interest and initiate the cooperation among related organizations and networks. Firstly, the network members will send some new data to the network. The webmasters will inspect the data and collect other important details about that data to complete them from other documents or references then reform all the data into an HTML format and upload them onto the internet. The new updated webpages will be shown in a week or a month. According to these processes, the problems concerning data records could occur because some data may be unrecorded, unavailable, lost or incorrect. The problem of the information distribution is the delay of updated webpages instead of prompt ones.

Besides, the 2 way communication in the present system, such as the webboard and the guestbook, are from external links so the webmasters themselves cannot manage these ways of contact among the network members such as: cannot delete pornographic and unwanted links, cannot collect the statistics, cannot modify or increase other function, etc. Moreover, there are other interesting modules of the website, such as the poll, the member login, the counter, What's new?,etc. which do not exist in the present sytem.

4.1.2 Problem Solving Strategies

According to the above mentioned problems that obstruct the process of the website updating, the information were collected from various sources such as: paper documents, books, reports, shortnotes, albums or references, that could be lost, damaged, or inadequate for distribution and the losing of information concerning Taodam Forest resources due to the absence of a proper recording system, the researcher then suggested for the development of a web application information system that is able to:

1. Store and display information concerning Taodam Forest resources to users relevant to their needs with the database and the dynamic HTML. The webmasters of Taodam Forest Conservation and Education Network must be able to access the database to edit or add data via an online network system.

2. Receive news and data about Taodam Forest Network from network members or other users online then promote new articles in the area called “What’s new?” of the website.

3. Share opinions and knowledge among the network members through the 2 way communication, such as the webboard; the guestbook; the poll; etc., which are self-built within their own website.

4. Build the member login page to identify the priority of network members over the simple users in some webpages that the security should be considered.

4.2 Feasibility Study

The feasibility study step is to review the capability of the existing system and to identify possible choices for the development of the information system for Taodam Forest Conservation and Education Network. The equipment and personnel needed for the new system are identified. The researcher collected data from the webmaster team and the network members of Taodam Forest Conservation and Education Network, as well as the observation and reviewing on relevant data.

4.2.1 Hardware and Software

The researcher had examined both the hardware and the software of the network system of Taodam Forest Conservation and Education Network that are intended to install the new information system program for Taodam Forest Network.

At present, www.taodum.com contains only the simple static HTML webpages without any database. This domain, paid to www.thaidomainsave.com, is reserved with the expense of 500 baht each year. The web hosting, which provides the web server for the website, was www.uboninternet.net with the expense of 1,200 baht per year. The existing computer system, to build webpages and upload them onto the internet network, is located at the Faculty of Environment and Resources Studies, Mahidol University.

For the new system requirement, the information system for Taodam Forest Network must be installed on a server connected to the internet network. This server will support all of the information system works of Taodam Forest Conservation and Education Network. The server must have the ability to support ASP and SQL server database management system. Because Taodam Forest Conservation and Education Network is a non-profit organization, the expense should be at the least amount. So the researcher advices free web hosting services as the web server for the website and the database server for the database. At present, the free web hosting site used is www.thai.net which supports only the simple static HTML webpages. But in the future, www.watpahnanachat.org, which can support the ASP technology, will give an area in the cyberspace for www.taodum.com for free.

After comparing the hardware and the software of Taodam Forest Conservation and Education Network with the requirements, it is found that the information system for Taodam Forest Network can be installed without additional hardware or software.

4.2.2 Personnel

Personnel who are important to the system management are the groups of the webmaster and the administrator. Taodam Forest Conservation and Education Network now consists of a few webmasters. The researcher had contacted the network members of Taodam Forest Conservation and Education Network to ask for personnel who could be responsible for managing the system and 4 people were provided.

4.3 System Analysis

The researcher had gathered and studied related data in detail by interviewing with the webmasters and the network members and studying from publications. The results of the system analysis are presented below.

4.3.1 Context Diagram

Context diagram is a chart of the system that represents the boundary of the development of this information system. After studying, it was found that the important external data sources and sinks related to the system are.

1. Members of Taodam Forest Watch Fund
2. People interested in forest and dhamma

This was presented by the diagram in Figure 4-1 below.

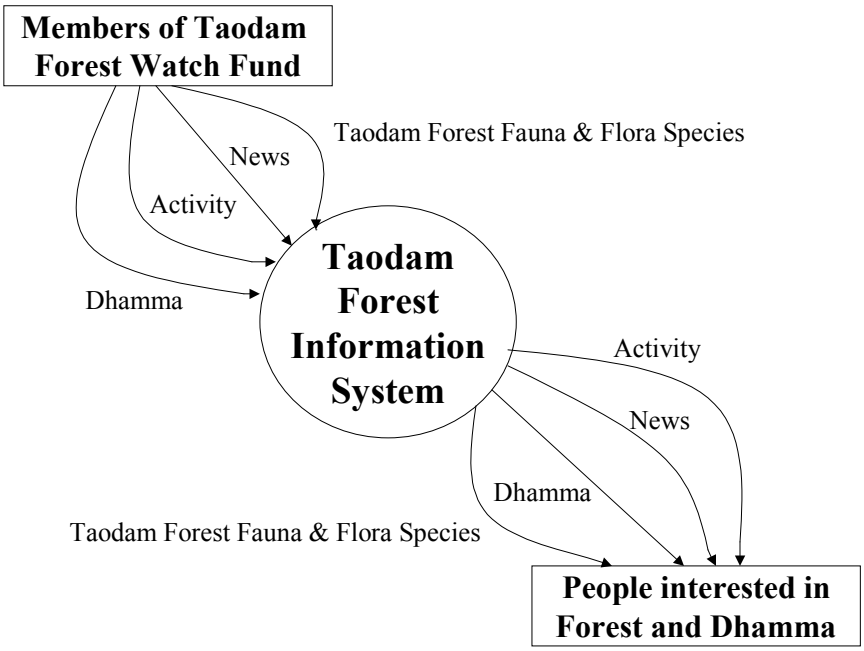


Figure 4-1 Context diagram of the current system

4.3.2 Logical Data Flow Diagram

From the above context diagram, it can be classified into subprocesses. For members of Taodam Forest Watch Fund, they will collect and arrange the information about Taodam Forest for the distributing through an internet. For people interested in forest and dhamma, they will receive information about Taodam Forest from www.taodum.com or publications on the Internet as shown in Figure 4-2.

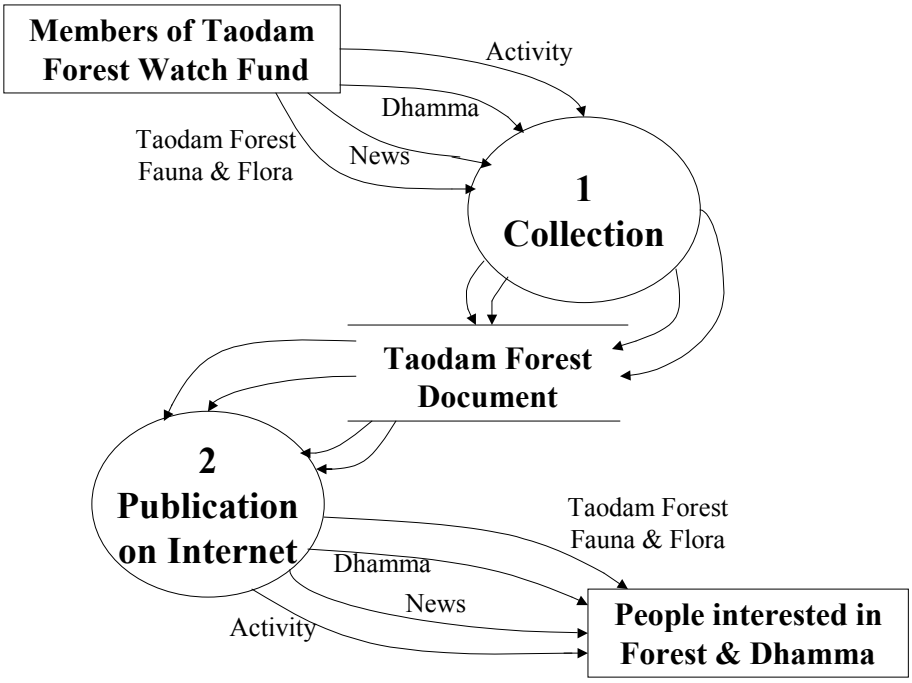


Figure 4-2 Logical data flow diagram of the current system

4.4 System Design

According to the analysis of the current system, it was found that data were published in the form of static HTML documents or publications that caused many problems. Data could not be updated conveniently. And users could not search for data relevant to their needs. Because of the network characteristic of the organization, members of Taodam Forest Watch Fund, which was renamed Taodam Forest Conservation and Education Network (TFN), were the ones who inserted, updated and deleted all system data. So dynamic HTML documents, which integrated the database management into the system, were proposed to support the onlined data manipulation and database search. The researcher also specified the concept to design the information system for TFN by starting with the context diagram, the logical data flow diagram, the database design, the dialog hierarchy and the user interface to initially build a new system.

4.4.1 Context Diagram

Context diagram is a chart to show the overall system and demonstrate external data sources and sinks related to the system.

The context diagram had to be changed because the new system effected working patterns of members and webmasters of Taodam Forest Conservation and Education Network (TFN) as mentioned above.

From the chart, there are 4 groups of users in this system: 1) people interested in forest and dhamma, 2) ecotourism tourists, 3) researchers and 4) members of TFN. First, the system will on-line receive new data from members who have logged into the system then save them into the system database. Data can be updated by administrators later. So users can search for the data with the condition relevant to their needs. Furthermore, the sysytem can generate a member account for any users who want to be a member of the network by sending the login name and password back to users by e-mail after users have registered to the system. General users can only read and search for information in the system but cannot post or give data to the system until they become members of the system as presented by the diagram in Figure 4-3 below.

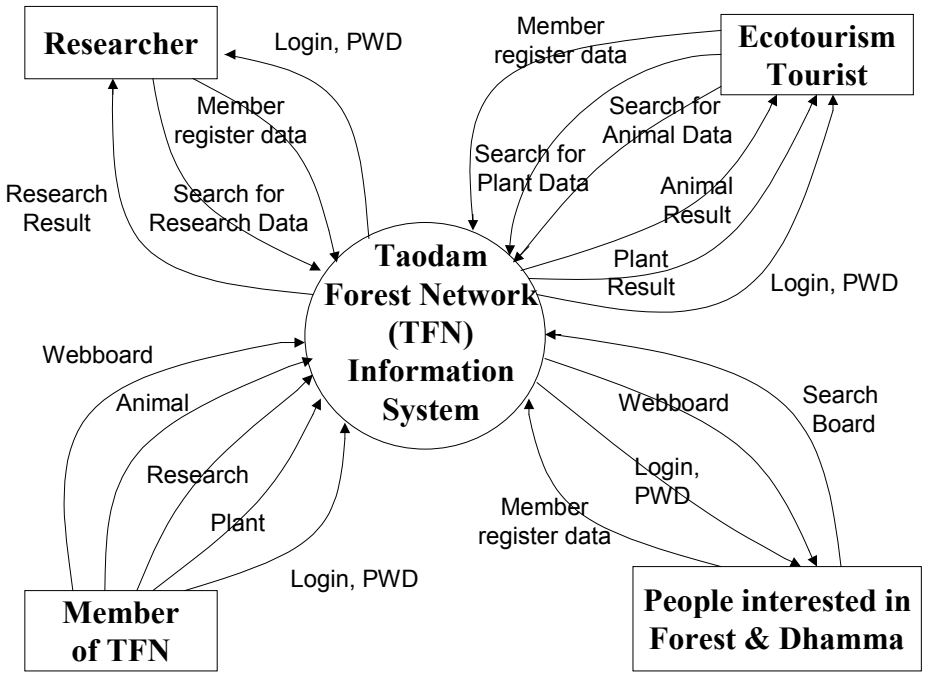


Figure 4-3 Context diagram of the new system

4.4.2 Logical Data Flow Diagram

Logical data flow diagram is the chart presenting working parts of the system in the logical implication. The design of logical data flow diagrams of the new system has changed the pattern of the former logical data flow diagram. It also effects the function style of webmasters and members of TFN, too. But their responsibilities remain the same. The newly designed logical data flow diagrams of the system are shown below.

4.4.2.1 Logical Data Flow Diagram Level 0

The logical DFD of TFN information system at level 0 consists of 4 sub-systems as shown in Figure 4-4 below.

1) Taodam Forest research information system
2) Taodam Forest education system
3) TFN communication system
4) TFN security and manipulation system

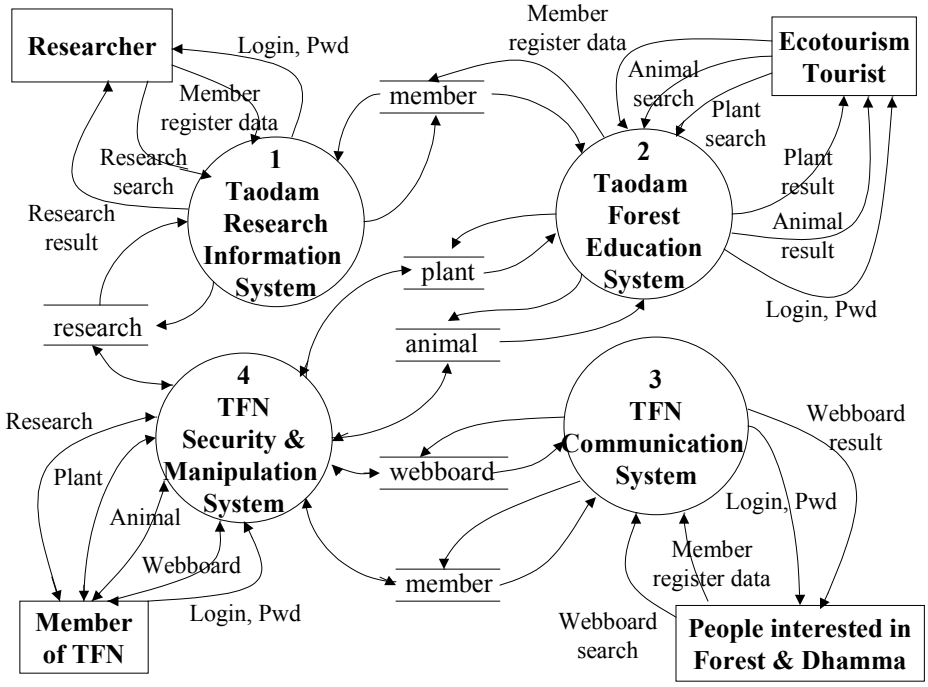


Figure 4-4 Level 0 logical data flow diagram of the new system

Sub-system1. Taodam Forest research information system: researchers can search for Taodam Forest researches by specifying keywords or conditions for the search. The system will access the database to fetch research data that coincide with search conditions. Also, they can register to be TFN members by onlined filling in the member register data form through the website. The system will generate a member account and send the login name and password back to them by e-mail.

Sub-system2. Taodam Forest education system: ecotourism tourists can search for Taodam Forest plants and animals by specifying keywords or conditions for the search. The system will access the database to fetch plant and animal data that coincide with search conditions. Also, they can register to be TFN members by onlined filling in the member register data form through the website. The system will generate a member account and send the login name and password back to them by e-mail.

Sub-system3. TFN communication system: people interested in forest and dhamma can survey TFN webboard by clicking topic links. Also, they can register to be TFN members by onlined filling in the member register data form through the website. The system will generate a member account and send the login name and password back to them by e-mail.

Sub-system4. TFN security and manipulation system: TFN member, who logins to manage the system database, can access, insert, update and delete the data stored in TFN database such as plant, animal, research, webboard and member account. The data will be stored into the system database immediately through the internet.

4.4.2.2 Logical Data Flow Diagram Level 1

The logical DFD level 1 of the new system is constructed in order to demonstrate the sub-processes in each sub-system as presented in figure 4-5.

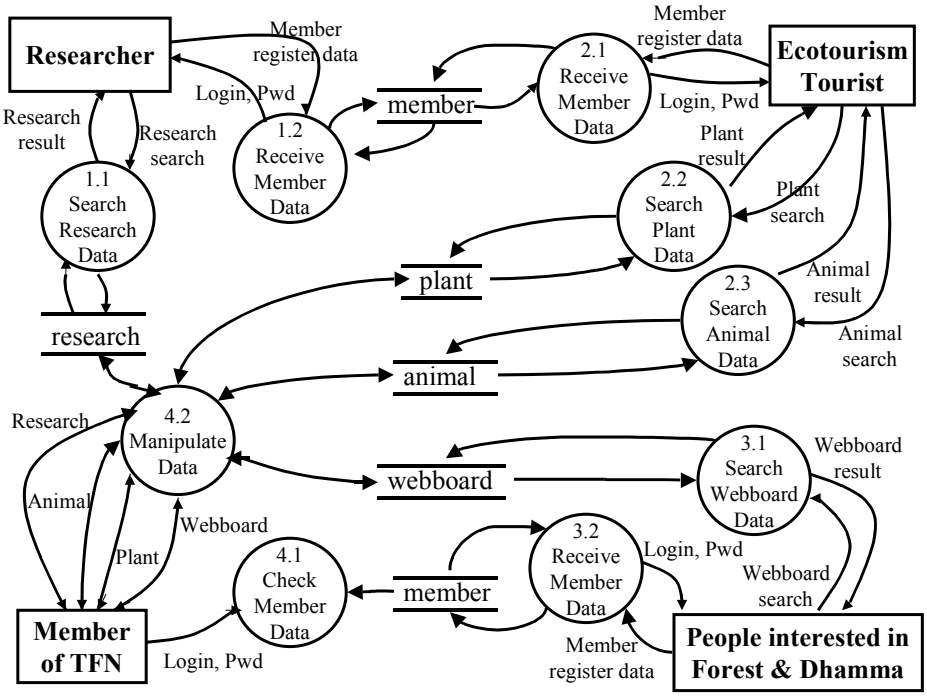


Figure 4-5 Logical data flow diagram level 1 of the new system

Subsystem 1, Taodam Forest research information system, can be divided into 2 subsystems: 1) research search system and 2) member registration system. Subsystem 2, Taodam Forest education system, can be divided into 3 subsystems: 1) member registration system, 2) plant search system and 3) animal search system. Subsystem 3, TFN communication system, can be divided into 2 subsystems: 1) webboard search system and 2) member registration system. Subsystem 4, TFN security and manipulation system, can be divided into 2 subsystems: 1) member verification system and 2) data manipulation system.

All user groups can register to the system by filling in the member registration form, the system will check user data whether the no-null fields have been completed. Then, the system will record user data into the member database. After that, the system will send the login name and password back to users.

Only members can add data into the database. First, the member verifying process will verify the the login name and password of members from the member database. Then, members will access and manipulate data in the database such as insert, update and delete data on-line via forms on screens. Next, the manipulated data will be recorded into the system database immmediately through the internet.

Then users will search the data needed by selecting conditions from system choices in list boxes or by keywords, the system will verify the choices or search conditions. Next, the system will find selected data from the database according to search conditions. Finally, the system will display search results to users on screens.

4.4.3 Process Specification

Process specifications of the information system are used to explain steps of work in the form of processes that show in logical data flow diagrams. The arrangement of process specifications into pseudo code was done by taking the processes specified in logical data flow diagrams and rearranging them in the form of the computer language using the english structure to represent commands in processes without depending on any computer languages. This made it easy for people who intended to understand the concept of the system. Details about modules of the work in pseuo code are shown below.

4.4.3.1 System 1 Taodam Forest research information system

1) Process 1.1 Search research data

```
BEGIN
        DISPLAY possible condition FROM FIELD, INSTITUTE TO user
        INPUT search condition FROM user
        SELECT record(s) that matching with condition FROM RESEARCH
        DISPLAY matching record(s) TO user
END
```

2) Process 1.2 Manage member registration data

```
INPUT name, nickname, e-mail, login_name FROM user
GET name, nickname, e-mail, login_name FROM user
BEGIN
        IF name, nickname, e-mail, login_name <> null THEN
                INSERT user data INTO MEMBER
        ELSE
                DISPLAY (“registration is incomplete”) TO user
END
```

```
GENERATE password
BEGIN
        SEND login_name, password TO user
END
```

4.4.3.2 System 2 Taodam Forest education system

1) Process 2.1 Manage member registration data

```
INPUT name, nickname, e-mail, login_name FROM user
GET name, nickname, e-mail, login_name FROM user
BEGIN
        IF name, nickname, e-mail, login_name <> null THEN
                INSERT user data INTO MEMBER
        ELSE
                DISPLAY ("registration is incomplete") TO user
END
GENERATE password
BEGIN
        SEND login_name, password TO user
END
```

2) Process 2.2 Search plant data

```
BEGIN
        DISPLAY possible condition FROM TYPE, SEASON, ADVANTAGE
        TO user
        INPUT search condition FROM user
        SELECT record(s) that matching with condition FROM PLANT
        DISPLAY matching record(s) TO user
END
```

3) Process 2.3 Search animal data

```
BEGIN
        DISPLAY possible condition FROM CLASS TO user
        INPUT search condition FROM user
        SELECT record(s) that matching with condition FROM ANIMAL
        DISPLAY matching record(s) TO user
END
```

4.4.3.3 System 3 TFN communication system

1) Process 3.1 Search webboard data

```
BEGIN
        DISPLAY possible condition TO user
        INPUT search condition FROM user
        SELECT record(s) that matching with condition FROM WEBBOARD
        DISPLAY matching record(s) TO user
END
```

2) Process 3.2 Manage member registration data

```
INPUT name, nickname, e-mail, login_name FROM user
GET name, nickname, e-mail, login_name FROM user
BEGIN
        IF name, nickname, e-mail, login_name <> null THEN
                INSERT user data INTO MEMBER
        ELSE
                DISPLAY ("registration is incomplete") TO user
END
GENERATE password
BEGIN
        SEND login_name, password TO user
END
```

4.4.3.4 System 4 TFN security and manipulation system

1) Process 4.1 Verify member data

```
INPUT member#, password FROM member
BEGIN
        COMPARE member# AND password IN TABLE MEMBER
        CASE 1 : member# IS VALID AND password IS CORRECT
                PROCESS 4.2 (member#)
        CASE 2 : member# IS VALID AND password IS INCORRECT
                DISPLAY ("password is incorrect") TO member
        CASE 3 : member# IS INVALID
                DISPLAY ("member is invalid") TO member
END
```

2) Process 4.2 Manipulate data

```
GET member# FROM PROCESS 4.1
GET record(s) FROM DATABASE
BEGIN
        DISPLAY record(s) TO member
        INPUT record#, new_data, flag FROM member
END
BEGIN
        SEARCH record# IN DATABASE
        CASE 1 : record# IS VALID AND flag <> “delete”
                REPLACE new_data INTO record WITHIN matching field
                UPDATE record# WITH record IN DATABASE
        CASE 2 : record# IS VALID AND flag = “delete”
                DELETE record# FROM DATABASE
        CASE 3 : record# IS INVALID
                INSERT record# WITH record INTO DATABASE
END
```

4.4.4 Database

The researcher had studied types, relationships and details of data in order to group them into common sets of data. This is necessary for the designing of the new database since it would be easy to search for and yield complete information. Structure of the database consisted of main data as shown in Table 4-1.

Table 4-1 Main data and details

Main data	Details
Animal data	Data of fauna species in Taodam Forest: name, habitat, feeding, breeding, general characteristics, photo and classification.
Research data	Data of research works in Taodam Forest: topic, researcher, institute, field of study, published year and summary.
Plant data	Data of flora species in Taodam Forest: name, type, ecology, Family, description, photo, advantages and flowering seasons.
Member data	Data of members of Taodam Forest Network: name, nickname, e-mail, login name, password and status.
Webboard data	Data of webboard: heading, writer, e-mail, message and date

Each main data are all related as a structure that can be represented in the E-R diagram chart. Each step of procedure will be described later on.

4.4.4.1 E-R diagram chart

E-R diagram chart was made to explain the data structure of Taodam Forest Network as shown in Figure 4-6. The attributes of each entity and relationship were put into the table and will be discussed in the next topic.

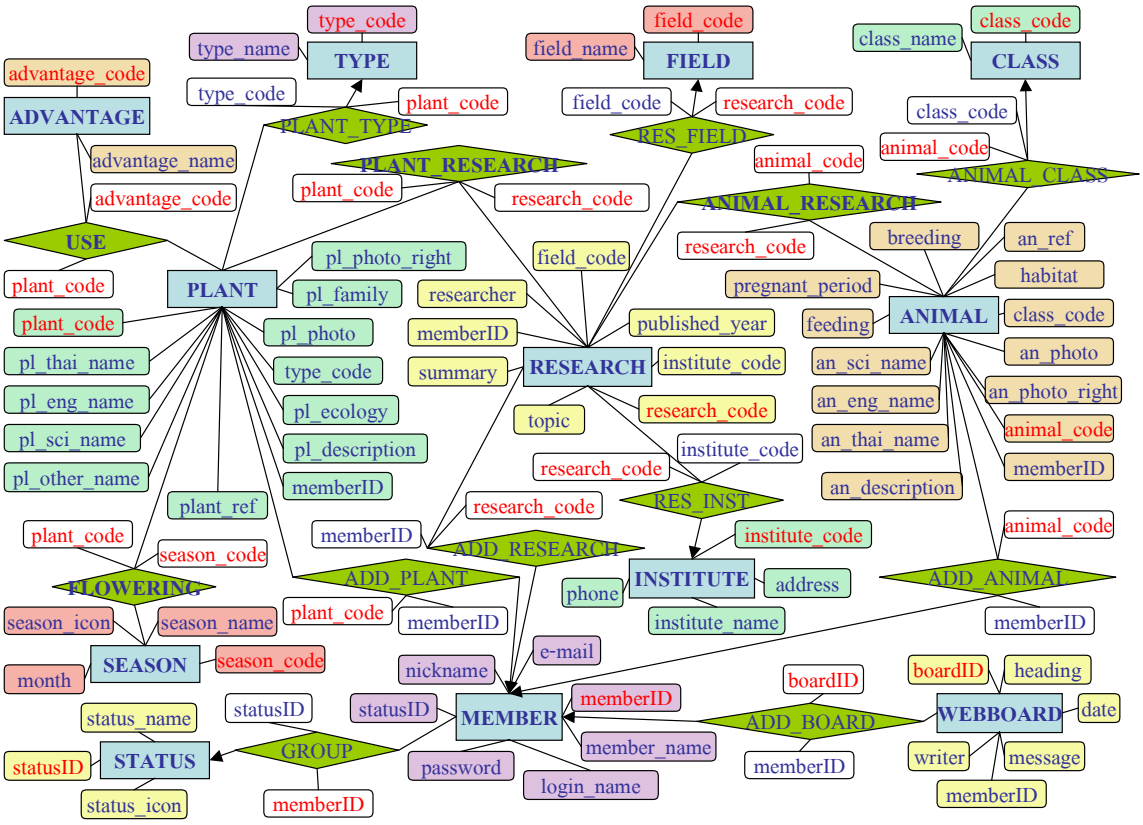


Figure 4-6 The Entity-Relationship model (E-R Diagram)

The design of E-R diagram is based on types, relationships and structure of data. The diagram was constructed to guide the database design as well as supporting required processes of the system.

4.4.4.2 Tables Transformed from E-R Diagram

The E-R diagram was then transformed into fields and tables as shown in Table 4-2.

Table 4-2 Tables and fields transformed from E-R diagram

Table	Field
Entity ANIMAL	animal_code, animal_thai_name, animal_eng_name, animal_sci_name, animal_description, feeding, habitat, breeding, pregnancy, animal_photo, animal_photo_rights, animal_ref, class_code, memberID
Entity PLANT	plant_code, plant_thai_name, plant_eng_name, plant_sci_name, plant_other_name, plant_family, plant_description, plant_ecology, plant_photo, plant_photo_rights, plant_ref, type_code, memberID
Entity CLASS	class_code, class_name
Entity TYPE	type_code, type_name
Entity SEASON	season_code, season_name, months, season_icon
Relation FLOWERING	plant_code, season_code
Entity ADVANTAGE	advantage_code, advantage_name
Relation USE	plant_code, advantage_code
Relation P_RESEARCH	plant_code, research_code
Relation A_RESEARCH	animal_code, research_code
Entity RESEARCH	research_code, topic, researcher, published_year, summary, field_code, institute_code, memberID
Entity FIELD	field_code, field_name
Entity INSTITUTE	institute_code, institute_name, address, phone
Entity MEMBER	memberID, statusID, member_name, nickname, e-mail, login_name, password
Entity STATUS	statusID, status_name, status_icon
Entity WEBBOARD	boardID, memberID, writer, heading, message, date

4.4.5 Dialog Hierarchy

Dialog hierarchy is the chart that presents steps of results providing or displaying on user monitor as shown in Figure 4-7.

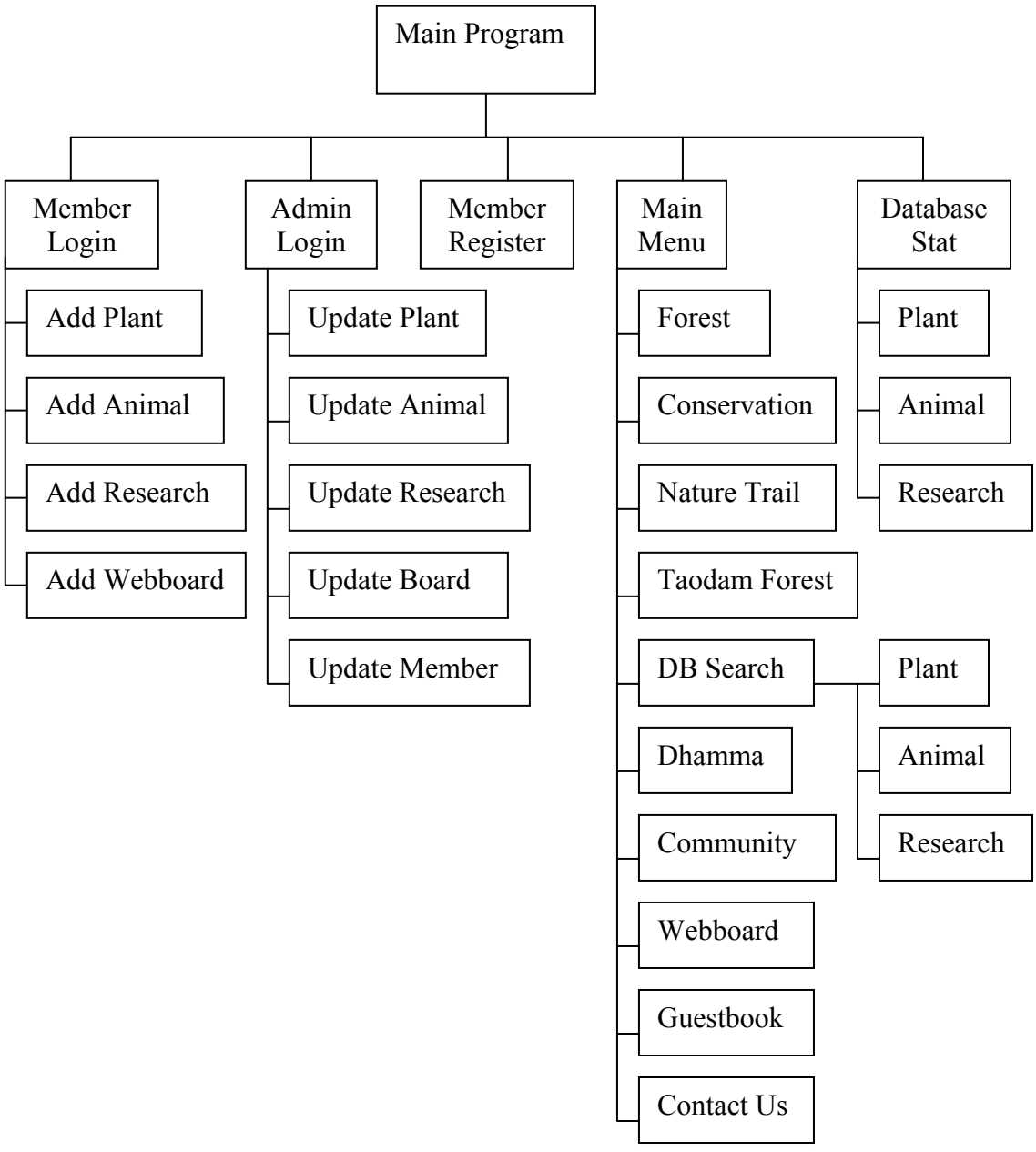


Figure 4-7 Dialogue Hierarchy

4.4.6 User Interface Design

For the user interface design of the system, the researcher highly realizes about the ease of use because users are vary of gender, age, education, occupation, etc. Some users may not be familiar with the computer. Therefore, the design of user interface is the important task. The display must not cause any confusion to users. The menu should be similar and locate at certain position in every page and independent from the input part. Users can access other pages by using menu at any time without waiting for complete loading from pressing the back button on the web browser. It is the advantage of the system that users do not need to wait for unnecessary part frequently, because this system is limited by the speed of the data transfer through the internet. The approach used to eliminate these problems has divided the user interface into three parts: the main menu located on the left side, submenu on top of the webpage and the display area on the center as shown in Figure 4-8. This would enable users to use the menu at any time.

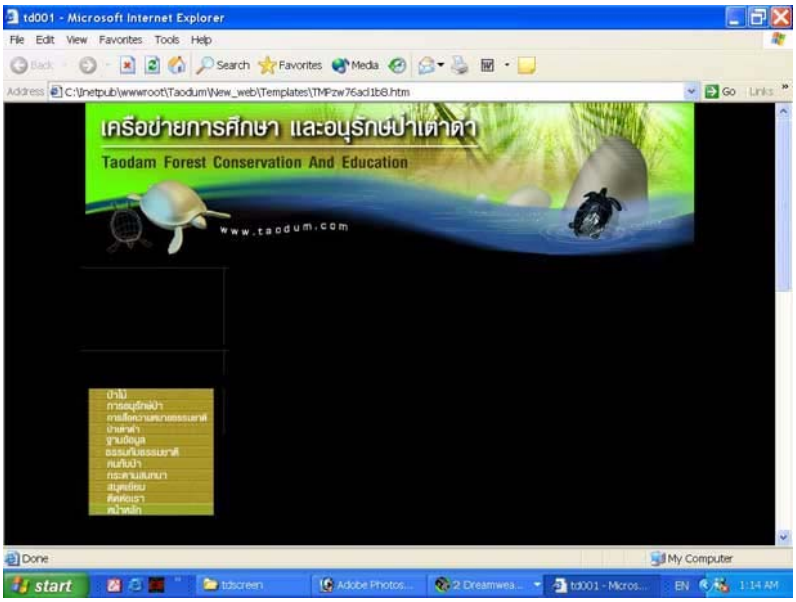


Figure 4-8 User interface

4.5 Construction

The development of Taodam Forest Network information system using tools and mechanisms as mentioned in Chapter 3 can be explained as follow.

4.5.1 Database

The tables transformed from the E-R diagram were used as the basis for the construction of the database on Microsoft Access2000. The relationships of all tables in the database are shown in figure 4-9 below.

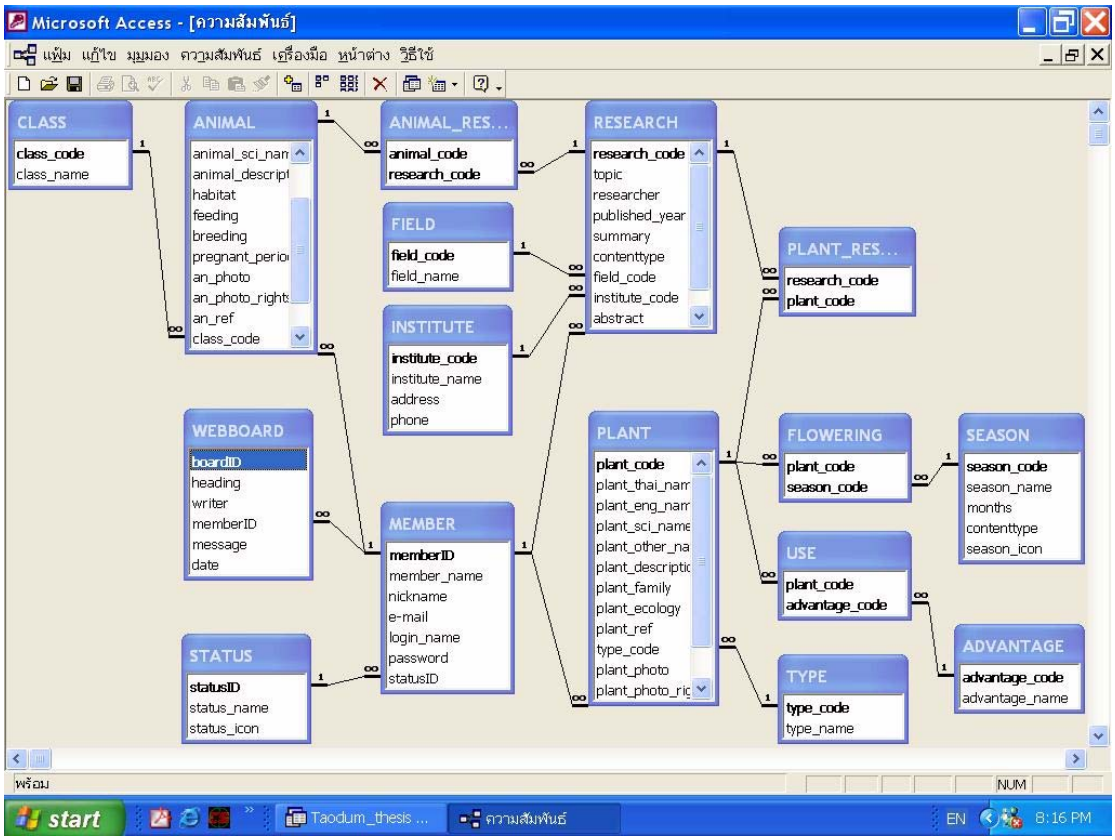


Figure 4-9 Relationships of tables in the database

4.5.2 Web Applications

For the web applications, user interfaces were developed with Dreamweaver UltraDev. The system was developed with ASP for specifying the processing on the server with SQL language designed for the database search and recording. The process specification was a guideline for the system creation. WS_FTP and Cute-FTP programs were used to handle the files uploading. The followings are samples of webpages in the new system:

4.5.2.1 Home Page

The home page is the first page of the website. Usually, it contains links to the overall webpages in the site. It is shown in figure 4-10 below.

Figure 4-10 Home page of www.taodum.com

4.5.2.2 Administrator Manipulation Page

The administrator can access the admin page then select the tables in the database to input, edit or delete records as shown in figure 4-11.

Figure 4-11 Administrator manipulation page

4.5.2.3 Database Search Page

This page is an example for the animal search as shown in figure 4-12.

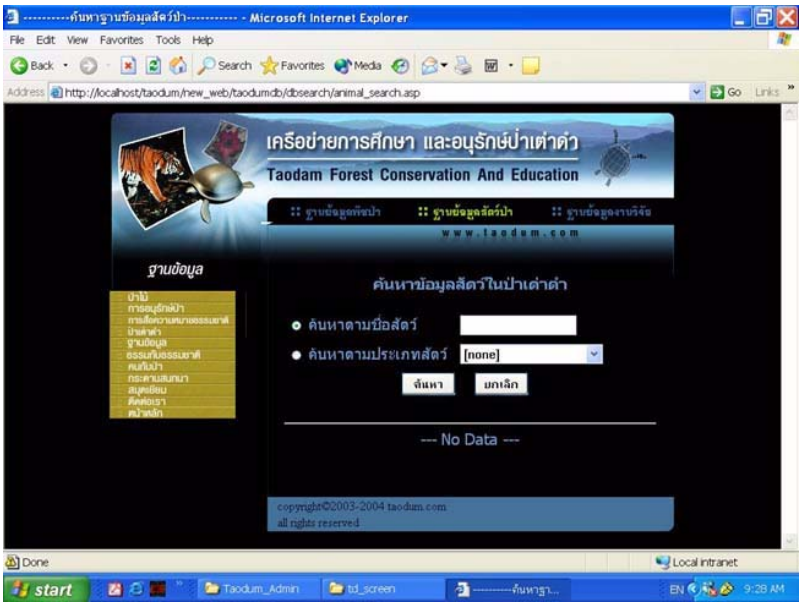


Figure 4-12 Database search page

4.5.2.4 Site Map

The site map is the website planning. They will show all folders or directories of the website. This helps managing the website efficiently. It is shown in figure 4-13.

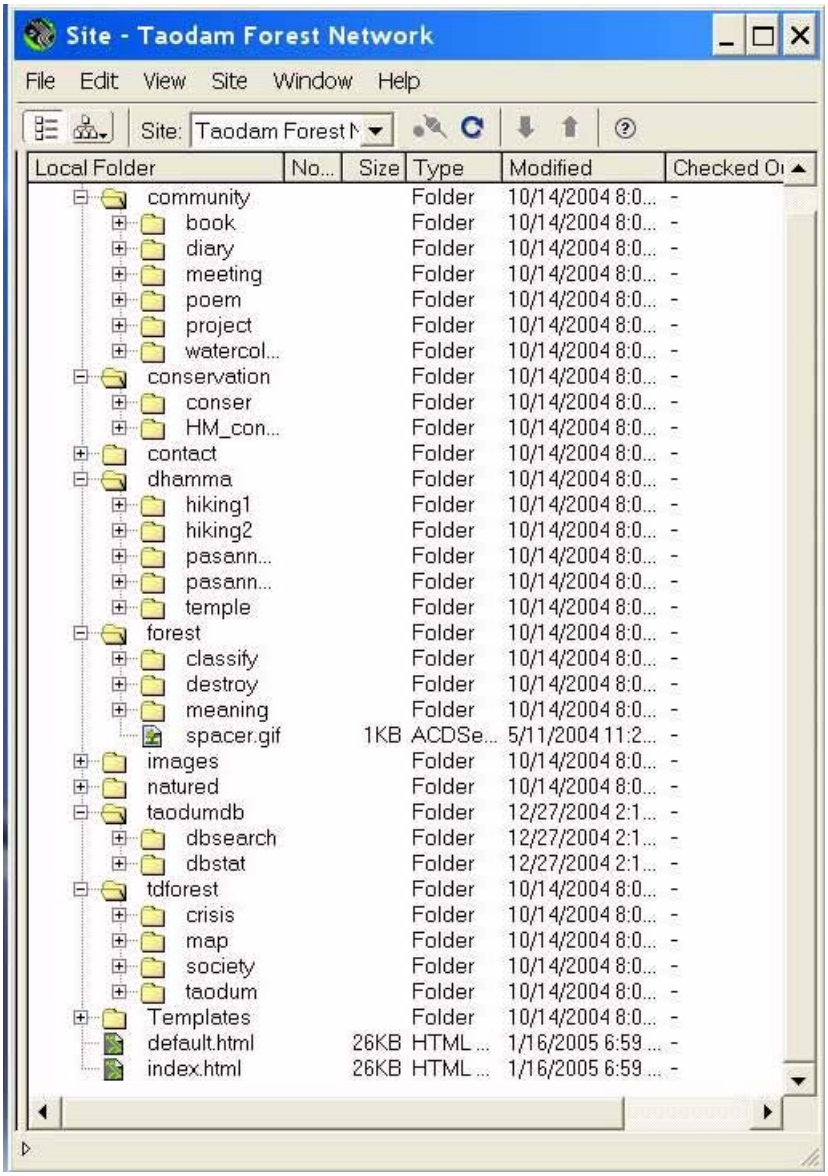


Figure 4-13 Sitemap of Taodam Forest Conservation and Education Network

4.5.3 System Test

The system test will indicate errors, that might occur, and correct the system for the perfect result.The test of the information system for Taodam Forest Network is consisted of 2 important parts.

4.5.3.1 Test by Test Data Input

Test data are entered into the system for live test data. This test is done by the input of actual data that are both real data occurred in usual situation and artificial test data that are the abnormal data that might occur such as typing prohibited symbols or leaving blanks in some necessary fields. The reason of this trial is to check if the system can work properly at any conditions for both correct and incorrect data input.

4.5.3.2 Test of Results Display

This test will determine about the system search if it agrees with conditions specified by the researcher. The errors were fixed for the completion of the system and the readiness for use.

4.5.4 Arrangement of Operation Manual

The operation manual will support the work of the webmasters to manage the database. This manual is shown in appendix.

4.6 System Installation

When the system had completely been developed, the researcher submitted the information system for Taodam Forest Network to install onto a server. At present, the webhosting of www.thai.net can support only the static HTML webpages of the

new system but cannot support the database installation and access to the information system without upgrading because it does not support ASP language. So a new and free webhosting should be signed up. The researcher had signed up for www.websamba.com. Then all files were uploaded onto the remote host through the internet network by WS_FTP or Cute-FTP.

4.7 System Evaluation

The system evaluation was considered after the installation and the normal use of the new system. The system evaluation was divided into 2 parts according to groups of users.

1. Evaluation by the webmasters and the workers of Taodam Forest Conservation and Education Network, who manage the system database, based on the questionnaire for “Database system administrator”.

2. Evaluation by network members and internet users based on the questionnaire for “Network Members and Internet Users”.

The evaluation of system administrators was started after the system had been completely installed for 1 week. This period is enough to determine the real work of webmasters by inputting real data into the system. Then, the group of network members and internet users could evaluate the system as well.

Both questionnaires consisted of questions which were divided into 3 parts i.e.

1. Personnel data of the evaluator: It consisted of questions about the name, the position and function, the gender and the education of these persons, together with the computer and the database knowledge.

2. Data of opinions on the system: This part related to the opinions on the system. The specifying of score levels for the characteristic of the information system can be divided into 5 levels as follows.

5-scores level = very good
4-scores level = good
3-scores level = medium
2-scores level = fair

1-scores level = should be improved

3. Suggestions: It is the part that persons answering the questionnaire can express their opinions and additional suggestions.

The results of the evaluation by both user groups are as follows.

4.7.1 System Evaluation by Administrators

Administrators are most concerned with the system operation. Their major responsibilities are updating and deleting data in the system database such as flora, fauna, research, webboard and member. They have to examine the data added by members whether they are suitable or correct or not. And usually, data added are not completed, so they have to update the data later after member adding. There are 4 administrators in the new system. They are staffs of Taodam Forest Conservation and Education Network, too. The result of the evaluation is shown in table 4-3.

Table 4-3 System evaluation by database system administrators

Questions	Satisfaction level					Sum	Average
	5	4	3	2	1	Σ	
Beautifulness of GUI	2	1	1	-	-	17	4.25
Simplicity for use	-	3	1	-	-	15	3.75
Suitability of nevigation	-	3	1	-	-	15	3.75
Rapidity in data search	2	2	-	-	-	18	4.50
Completeness of data	-	2	2	-	-	14	3.50
Reliability of data	1	1	2	-	-	15	3.75
Relevancy to user need	1	-	3	-	-	14	3.50
Convenience in data input	-	4	-	-	-	16	4.00
Convenience in data update-deletion	1	2	1	-	-	16	4.00
Helpfulness in work operation	-	3	1	-	-	15	3.75

The evaluation result from database system administrators who scored on the characteristic of the information system, it was found that most of them gived medium to good leveled score for the design of graphic user interface (GUI), the design of data

manipulation processes, the simplicity of the system utilization, the completeness of detailed information which were provided by the system and supporting the work of webmasters. The result can be concluded in the graph in figure 4-14.

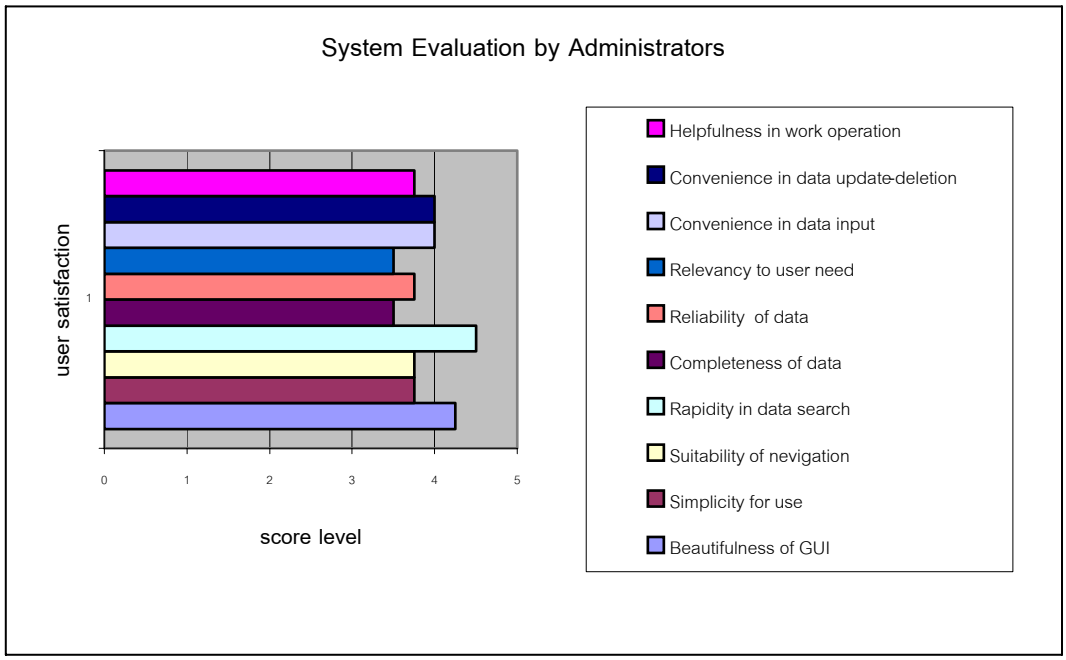


Figure 4-14 System Evaluation by Administrators

4.7.2 System Evaluation by Users

Users are anyone who are interested in the forest conservation and education and serve the internet to find forest information. Or anyone who want to search for Taodam Forest resources such as flora, fauna and research works related to Taodam Forest. On the other hand, anyone who want to share an opinion or a discussion in the topic of forest. Otherwise, anyone who want to follow or participate in the movement and activities of Taodam Forest Conservation and Education Network. They have tried on and evaluated the system how satisfied they were with the system presentation and convenience. There were 36 users participated in the system evaluation througt an internet system via www.taodum.com . The result of the evaluation is shown in table 4-4.

Table 4-4 System evaluation by members and users

Questions	Satisfaction level					Sum	Average
	5	4	3	2	1	Σ	
Beautifulness of GUI	5	22	7	2	-	138	3.83
Simplicity for use	4	23	8	1	-	138	3.83
Suitability of nevigation	1	23	8	2	-	125	3.68
Rapidity in data search	3	22	11	-	-	136	3.78
Completeness of data	2	17	14	1	-	122	3.59
Reliability of data	3	20	9	1	-	124	3.76
Relevancy to user need	8	11	13	1	-	125	3.79
Convenience in data input	-	20	11	2	-	117	3.54

The evaluation result from internet users and network members group, who scored on the characteristic of the information system, it was found that most of them gived medium to good leveled score for the attractiveness and interest, the meaning of components in web pages, the facility on the information viewing and search, the completeness of detailed information obtained from the system and the accuracy of data. The result can be concluded in the graph in figure 4-15.

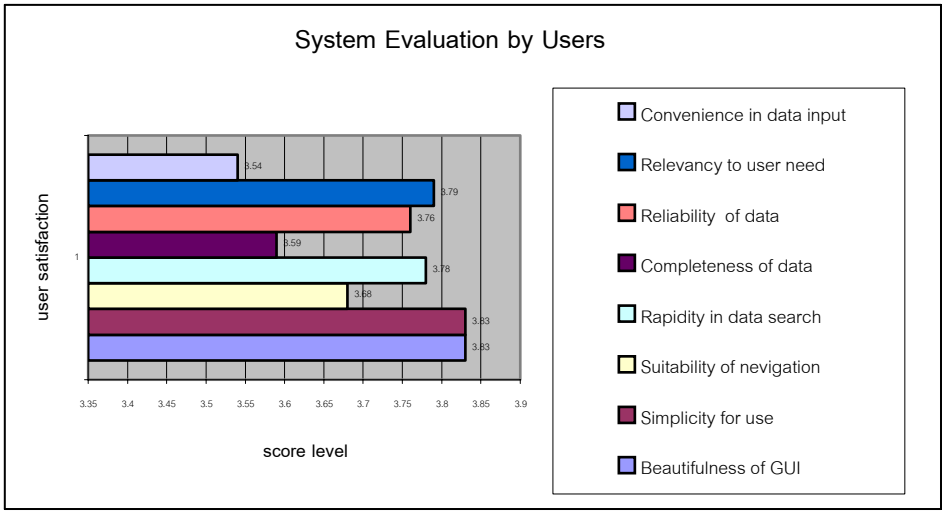


Figure 4-15 System Evaluation by Users

The additional opinions on other aspects to the system from the internet users and the network members could be concluded that the database search system was rather difficult to use. It should be developed to be easier to use. At present, the system could search data in the database with only one condition each time. The search system should be developed to be able to search with several conditions each time. Another was the content of the website, it was in an academic characteristic so it was rather hard to understand and less attractive for young people. This should be developed by adding more interesting contents such as animations and multimedia or developing more colorful webpages. Some people do not like the black background of the webpage, too. Some people would like to know some details about an organization or the network. This might be responded by building the “About Us” page. The less amount of data, data were not relevant to users need such as there were no data about mushrooms, and some webpages were difficult to read because the font was so small were also mentioned. The 3 least scored evaluation results were the convenience to input data, the completeness of data and the suitability of the navigation. These problems were from the incomplete development of the new system. Because this system was a prototype, some modules have not been finished yet, so users could not access some links. But most of them were satisfied, had the good attitude and expected that this system could provide their required information. So this prototype of Taodam Forest Network information system for Taodam Forest Conservation and Education Network should be developed further with user requirements.

CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In this research, the prototype of Taodam Forest Network information system was developed for the task of Taodam Forest Conservation and Education Network. It is one of the web-based application models applying the internet technology to distribute and share knowledge via the internet network. It is also very useful for streamline work processes of TFN webmasters. With this system, webmasters could manage the data in the system more conveniently as well as users could easily get the information of Taodam Forest Network via an internet. The prototype consists of 4 major processes as follows:

- Member registration: Receive users data and create user account to set an authority to members who can input data into the system.
- Data entry: Initiate the gathering of data into the database then distribute them to users via an internet network. Data in the system can be inserted on-lined by filling in data input forms on computer screens via the internet. The data will be stored into the database server immediately so the data will always be updated. These processes have been done by members who have logged into the system with username and password so the security of the system is supported. This system can also help supporting the work of TFN webmasters in the data input process because members will do this instead.
- Data manipulation: Manipulate data later by authorized administrators who have an authority to prove, delete and update data in the system. Webmasters, whose duty-load are reduced, will become administrators who will take the role as data QC instead.

- Database search: Receive condition for data search relevant to user needs by ComboBox or typing words. At present, main data in the database of the prototype are consisted of flora, fauna, research, webboard and member. In the future, all of the system, such as news; activity; dhamma; etc., will be developed into the web-based database system, too.

Users of this system are divided into 3 levels: Database administrators, members and general users. All levels can access the database search menu. The data manipulation menu can only be accessed by database administrators. The data entry menu can only be accessed by members. They access the system through the login window which will verify login name, password and access level.

Furthermore, with the webboard, the internal communication and dissemination of information between TFN members can be improved. In addition, knowledge and experience sharing can be supported. This characteristic can support the work of all other organizations with the network characteristic.

The System Development Life Cycle (SDLC) approach and the System Prototype method are used as the basis of the research methodology. Web architecture is chosen for multi-user database management system that can be applied on the internet network. Microsoft Access 2000 is used as DBMS to manage the relational database. Macromedia Dreamweaver UltraDev with Active Server Page (ASP), which is a Server-Side Script language, are used to develop interfaces of this prototype. ASP makes dynamic webpages by executing commands in the server-side and sending results to the client-side.

The system evaluation by administrators and users can be concluded that both groups of users are satisfied with the new system especially in the simplicity for use, the design of webpages and the relevancy to user needs. However, the system should be developed in the convenience of the data input, adding more data and details and improvement on navigation and data classification.

5.2 Recommendations

From this prototype development, the recommendations for an applied concept and the guideline for the futured development of the information system are shown below:

1.This system is just a prototype. It is not yet a complete system. In the future, it should be further developed to a fully functioning system.

2. The additional report function should be developed: data from the database can be selected and created new reports in many formats.

3. Enable alternative search methods such as the thumbnail image index.

4. To prevent the error that might happen, the administrator should backup data at a certain period of time.

5. To prevent computer viruses, the anti-virus software should be installed at the server and client computers to check and clean viruses periodically.

6. This application should be added up more data.

7. For flora and fauna species data in the database, IUCN code, status-in-law and other standards should be considered.

8. References should be built as indexes for the keyword search as in the library system.

9. The expense of the webhosting service will be higher than the former system according to the requirement of ASP supporting of the new web-based database sysem. But this problem can be solved by registering for the free webhosting instead.

10. Multimedia, such as sound; 3D and animation, will make the website more attractive and interesting.

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APPENDIX

แบบสอบถามทัศนคติผู้ดูแลระบบ

เรื่องระบบสารสนเทศเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ

http://www.taodum.com

ส่วนที่1 ข้อมูลเกี่ยวกับผู้กรอกแบบสอบถาม

ทำเครื่องหมาย / หน้าข้อความที่เลือก

1. ชื่อ-นามสกุล.....อายุ.....
2. เพศ ☐ หญิง ☐ ชาย
3. การศึกษา ☐ ต่ำกว่าป.ตรี ☐ ปริญญาตรี ☐ สูงกว่าป.ตรี
4. ความรู้และการใช้งานอินเตอร์เน็ต ☐ น้อย ☐ ปานกลาง ☐ มาก
5. การใช้งานโปรแกรมฐานข้อมูล ☐ ไม่เคย ☐ เคย

ส่วนที่ 2 ทัศนคติที่มีต่อการใช้งานระบบ

กรุณาขีดเครื่องหมาย / ลงในช่อง ในหัวข้อที่ท่านเลือก

	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยที่สุด
1. ความสวยงามน่าใช้งาน					
2. ความง่ายในการใช้งาน					
3. ความเหมาะสมของการจัดหมวดหมู่					
4. ความรวดเร็วในการค้นหาข้อมูล					
5. ความครบถ้วนของข้อมูล					
6. ความถูกต้องของข้อมูล					
7. ข้อมูลที่ได้ตรงตามความต้องการ					
8. ความสะดวกในการป้อนข้อมูล					
9. ความสะดวกในการแก้ไขข้อมูล					
10.การช่วยให้ทำงานได้ง่ายขึ้น					

ส่วนที่ 3 วิจารณ์และข้อเสนอแนะ

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แบบสอบถามทัศนคติผู้ใช้ระบบ

เรื่องระบบสารสนเทศเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ

http://www.taodum.com

ส่วนที่1 ข้อมูลเกี่ยวกับผู้กรอกแบบสอบถาม

ทำเครื่องหมาย / หน้าข้อความที่เลือก

1. ชื่อ-นามสกุล.....อายุ.....
2. เพศ ☐ หญิง ☐ ชาย
3. การศึกษา ☐ ต่ำกว่าป.ตรี ☐ ปริญญาตรี ☐ สูงกว่าป.ตรี
4. ความรู้และการใช้งานอินเตอร์เน็ต ☐ น้อย ☐ ปานกลาง ☐ มาก
5. การใช้งานโปรแกรมฐานข้อมูล ☐ ไม่เคย ☐ เคย

ส่วนที่ 2 ทัศนคติที่มีต่อการใช้งานระบบ

กรุณาขีดเครื่องหมาย / ลงในช่อง ในหัวข้อที่ท่านเลือก

	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยที่สุด
1. ความสวยงามน่าใช้งาน					
2. ความง่ายในการใช้งาน					
3. ความเหมาะสมของการจัดหมวดหมู่					
4. ความรวดเร็วในการค้นหาข้อมูล					
5. ความครบถ้วนของข้อมูล					
6. ความถูกต้องของข้อมูล					
7. ข้อมูลที่ได้ตรงตามความต้องการ					
8. ความสะดวกในการป้อนข้อมูล					

ส่วนที่ 3 วิจารณ์และข้อเสนอแนะ

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Data Dictionary

ชื่อตาราง : ANIMAL				
คำอธิบาย : สัตว์ป่าที่พบในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	animal_code	หมายเลขสัตว์	Auto Number	-
	an_thai_name	ชื่อสัตว์ภาษาไทย	Text	100
	an_eng_name	ชื่อสามัญภาษาอังกฤษ	Text	50
	an_sci_name	ชื่อวิทยาศาสตร์	Text	100
	an_description	ลักษณะทั่วไป	Memo	-
	habitat	ถิ่นที่อยู่	Memo	-
	feeding	อาหาร	Text	100
	breeding	จำนวนลูกต่อครอก	Text	50
	pregnancy	ระยะเวลาตั้งท้อง	Text	50
	an_photo	ภาพสัตว์	OLE object	-
	an_photo_rights	ช่างภาพ/เจ้าของลิขสิทธิ์ภาพ	Text	50
	an_ref	เอกสารอ้างอิง	Memo	-
🗝	class_code	หมายเลขประเภทสัตว์	Number	Auto
🗝	memberID	รหัสสมาชิก	Number	Auto
	contenttype	ประเภทข้อมูล	Text	30

ชื่อตาราง : CLASS				
คำอธิบาย : ประเภทสัตว์ แบ่งเป็น สัตว์เลี้ยงลูกด้วยนม สัตว์ปีก ปลา เป็นต้น				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	class_code	หมายเลขประเภทสัตว์	Auto Number	-
	class_name	ประเภทสัตว์	Text	30

ชื่อตาราง : ANIMAL_RESEARCH				
คำอธิบาย : งานวิจัยเกี่ยวกับสัตว์ป่าในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	animal_code	หมายเลขสัตว์	Number	Auto
🗝	research_code	หมายเลขงานวิจัย	Number	Auto

ชื่อตาราง : INSTITUTE				
คำอธิบาย : สถาบันวิจัย ได้แก่ มหาวิทยาลัย และหน่วยงานภาครัฐ เอกชนที่ทำการวิจัย				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	institute_code	หมายเลขสถาบันวิจัย	Auto Number	-
	institute_name	สถาบันวิจัย	Text	100
	address	สถานที่ตั้ง	Text	250
	phone	หมายเลขโทรศัพท์	Text	20

ชื่อตาราง : FIELD				
คำอธิบาย : สาขาการวิจัย แบ่งตามสิ่งมีชีวิต คือ มนุษย์ สัตว์ พืช และสิ่งมีชีวิตอื่น				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	field_code	หมายเลขสาขาการวิจัย	Auto Number	-
	field_name	สาขาการวิจัย	Text	30

ชื่อตาราง : RESEARCH				
คำอธิบาย : งานวิจัยในป่าเต่าดำ อ.ไทรโยค จ.กาญจนบุรี				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	research_code	หมายเลขงานวิจัย	Auto Number	-
	topic	หัวข้องานวิจัย	Text	200
	researcher	ชื่อผู้วิจัย	Text	100
	published_year	ปีที่ตีพิมพ์ผลงานวิจัย	Text	4
	summary	สรุปย่องานวิจัย	Memo	-
	abstract	บทคัดย่อ	OLE object	-
🗝	field_code	หมายเลขสาขาการวิจัย	Number	Auto
🗝	institute_code	หมายเลขสถาบันวิจัย	Number	Auto
🗝	memberID	รหัสสมาชิก	Number	Auto
	contenttype	ประเภทข้อมูล	Text	30

ชื่อตาราง : PLANT_RESEARCH				
คำอธิบาย : งานวิจัยเกี่ยวกับพันธุ์พืชในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	plant_code	หมายเลขพืช	Number	Auto
🗝	research_code	หมายเลขงานวิจัย	Number	Auto

ชื่อตาราง : PLANT				
คำอธิบาย : พันธุ์พืชที่พบในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	plant_code	หมายเลขพืช	Auto Number	-
	plant_thai_name	ชื่อพืชทางการไทย	Text	50
	plant_eng_name	ชื่อสามัญภาษาอังกฤษ	Text	50
	plant_sci_name	ชื่อวิทยาศาสตร์	Text	100
	plant_other_name	ชื่อพื้นเมืองอื่นๆ	Text	100
	plant_family	วงศ์พืช	Text	50
	plant_description	ลักษณะทั่วไป	Memo	-
	plant_ecology	นิเวศวิทยา	Memo	-
	plant_photo	ภาพพืช	OLE object	-
	plant_photo_rights	ช่างภาพ/เจ้าของลิขสิทธิ์ภาพ	Text	50
	plant_ref	เอกสารอ้างอิง	Memo	-
🗝	type_code	หมายเลขชนิดพืช	Number	Auto
🗝	memberID	รหัสสมาชิก	Number	Auto
	contenttype	ประเภทข้อมูล	Text	30

ชื่อตาราง : TYPE				
คำอธิบาย : ชนิดพืช เช่น ไม้ยืนต้น ไม้พุ่ม ไม้ล้มลุก ไม้เถาเลื้อย เป็นต้น				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	type_code	หมายเลขชนิดพืช	Auto Number	-
	type_name	ชนิดพืช	Text	20

ชื่อตาราง : SEASON				
คำอธิบาย : ฤดูกาลที่พืชออกดอก แบ่งเป็น ฤดูร้อน ฤดูฝน ฤดูหนาว				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	season_code	หมายเลขฤดูกาล	Auto Number	-
	season_name	ฤดูกาล	Text	20
	months	ช่วงเดือน	Text	50
	season_icon	สัญญลักษณ์แทนฤดูกาล	OLE object	-

ชื่อตาราง : FLOWERING				
คำอธิบาย : การออกดอกของพันธุ์พืชในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	plant_code	หมายเลขพืช	Number	Auto
🗝	season_code	หมายเลขฤดูกาล	Number	Auto

ชื่อตาราง : ADVANTAGE				
คำอธิบาย : การใช้ประโยชน์พืช เช่น ใช้ในการก่อสร้าง ใช้เป็นอาหาร สมุนไพร ฯลฯ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	advantage_code	หมายเลขการใช้ประโยชน์พืช	Auto Number	-
	advantage_name	การใช้ประโยชน์พืช	Text	50

ชื่อตาราง : USE				
คำอธิบาย : ประโยชน์ของพันธุ์พืชในป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	plant_code	หมายเลขพืช	Number	Auto
🗝	advantage_code	หมายเลขการใช้ประโยชน์พืช	Number	Auto

ชื่อตาราง : WEBBOARD				
คำอธิบาย : กระดานสนทนา				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	boardID	หมายเลขกระดานสนทนา	Auto Number	-
	heading	หัวข้อการสนทนา	Text	50
	writer	ผู้เขียน	Text	20
🗝	memberID	รหัสสมาชิก	Number	Auto
	message	ข้อความ	Memo	-
	date	วันเวลา	Date/Time	-

ชื่อตาราง : MEMBER				
คำอธิบาย : สมาชิกเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	memberID	รหัสสมาชิก	Auto Number	-
	member_name	ชื่อ-นามสกุลสมาชิก	Text	50
	nickname	นามแฝงสมาชิก	Text	20
	e-mail	อีเมล์แอดเดรส	Hyperlink	-
	login_name	ชื่อผู้ใช้ระบบ	Text	10
	password	รหัสผ่าน	Text	8
🗝	statusID	รหัสระดับสมาชิกภาพ	Number	Auto

ชื่อตาราง : STATUS				
คำอธิบาย : ระดับสมาชิกภาพ แบ่งเป็น admin กับ member				
PK	ชื่อฟิลด์	คำอธิบาย	ชนิดข้อมูล	ขนาด
🗝	statusID	รหัสระดับสมาชิกภาพ	Auto Number	-
	status_name	ระดับสมาชิกภาพ	Text	20
	status_icon	สัญญลักษณ์ระดับสมาชิกภาพ	OLE object	-

คู่มือการใช้งาน
ระบบสารสนเทศเพื่อสนับสนุนเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ
Information System Development for Taodam Forest Conservation and Education Network

ระบบนี้ประกอบด้วย 4 ระบบย่อย ได้แก่ ระบบทะเบียนสมาชิก ระบบรับข้อมูล ระบบจัดการข้อมูล และระบบสืบค้นฐานข้อมูล เมนูระบบมีรายละเอียดดังแสดงในตารางแสดงเมนูหลักและเมนูย่อยของทั้งระบบ ดังตาราง

เมนูหลัก	เมนูย่อย	
หน้าแรก	ป่าไม้	คุณค่าและความหมาย
		การจำแนกประเภทป่าเขตร้อน
		สาเหตุและผลกระทบจากการทำลายป่า
	การอนุรักษ์ป่าไม้	การอนุรักษ์ป่าตามแนวพระราชดำริ
		วิธีการอนุรักษ์ป่าไม้
	การสื่อความหมายธรรมชาติ	ความหมายของการสื่อความหมายฯ
		การสื่อความหมายฯในป่าเต่าดำ
	ป่าเต่าดำ	แผนที่ป่าเต่าดำ และป่าตะวันตก
		สังคมพืชในป่าเต่าดำ
		ที่มาของชื่อป่าเต่าดำ
		สถานการณ์ป่าเต่าดำยังน่าเป็นห่วง
	ฐานข้อมูล	ค้นหาข้อมูลพืชในป่าเต่าดำ
		ค้นหาข้อมูลสัตว์ในป่าเต่าดำ
		ค้นหาข้อมูลงานวิจัยในป่าเต่าดำ
	ธรรมกับธรรมชาติ	สำนักสงฆ์เต่าดำ
		บันทึกคำสอนท่านชยสาโรภิกขุ 2543
		สนทนาธรรมกับท่านชยสาโรภิกขุ
		โอวาทท่านปสันโนภิกขุ
		ทอดผ้าป่าสำนักสงฆ์เต่าดำ
	คนกับป่า	โครงการเดินตามธรรมสู่ผืนป่าตะวันตก
		สรุปรายงานการประชุมเครือข่ายฯ
		หนังสือค่ำคืนในผืนป่า

		บันทึกจากผู้ร่วมโครงการเดินตามธรรม
		บทกวี
		ภาพสีน้ำ
	กระดานสนทนา	อ่านกระดานสนทนา
	สมุดเยี่ยม	เซ็นสมุดเยี่ยม
	ติดต่อเรา	อีเมล์ผู้ประสานงานเครือข่ายฯ
ลงทะเบียนผู้ใช้	กรอกข้อมูลผู้ใช้เพื่อสมัครสมาชิกเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ	
สมาชิกล๊อกอิน	เพิ่มข้อมูลพืชที่พบในป่าเต่าดำชนิดใหม่	
	เพิ่มข้อมูลสัตว์ที่พบในป่าเต่าดำชนิดใหม่	
	เพิ่มข้อมูลงานวิจัยในป่าเต่าดำเรื่องใหม่	
	เพิ่มข้อมูลกระดานสนทนาหัวข้อใหม่	
ผู้ดูแลระบบล๊อกอิน	ข้อมูลพืชที่พบในป่าเต่าดำ	เพิ่มข้อมูลใหม่
		แก้ไข/ลบข้อมูล
	ข้อมูลสัตว์ที่พบในป่าเต่าดำ	เพิ่มข้อมูลใหม่
		แก้ไข/ลบข้อมูล
	ข้อมูลงานวิจัยในป่าเต่าดำ	เพิ่มข้อมูลใหม่
		แก้ไข/ลบข้อมูล
	ข้อมูลสมาชิก	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลกระดานสนทนา	ลบข้อมูล
	ข้อมูลประเภทสัตว์	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลชนิดพืช	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลฤดูกาลที่พืชออกดอก	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลการใช้ประโยชน์พืช	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลสาขาการวิจัย	เพิ่ม/แก้ไข/ลบข้อมูล
	ข้อมูลสถาบันวิจัย	เพิ่ม/แก้ไข/ลบข้อมูล
สถิติจากฐานข้อมูล	สถิติพืชที่พบในป่าเต่าดำแบ่งตามชนิดพืช	
	สถิติสัตว์ที่พบในป่าเต่าดำแบ่งตามประเภทสัตว์	
	สถิติงานวิจัยในป่าเต่าดำแบ่งตามสถาบันวิจัย	

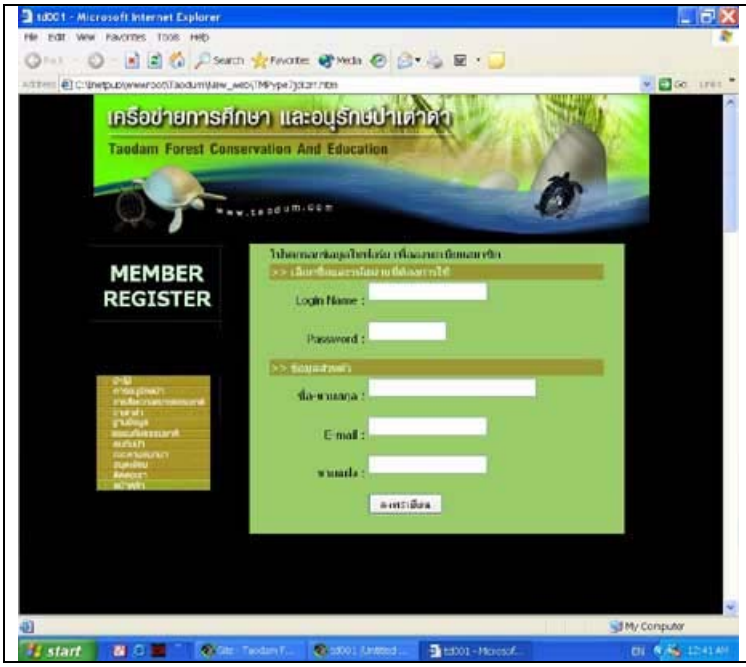
1. ระบบทะเบียนสมาชิก

ผู้ใช้เข้าสู่ระบบทางอินเทอร์เน็ตที่ www.taodum.com จะพบกับหน้าโฮมเพจดังรูป

1.1 ลิงค์ไปสู่หน้าจอรับลงทะเบียนสมาชิก

สำหรับผู้สนใจสมัครสมาชิกเครือข่ายการศึกษาและอนุรักษ์ป่าเต่าดำ สามารถคลิกลิงค์ “ที่นี่” หน้าต่างการรับลงทะเบียนสมาชิกจะถูกเปิดขึ้นมา ดังภาพถัดไป

1.2 หน้าต่างการรับลงทะเบียนสมาชิก



- Login Name
- Password
- ชื่อ - นามสกุล
- E-mail address
- นามแฝง
- คลิกปุ่ม “ลงทะเบียน”

เมื่อผู้ใช้กรอกข้อมูลการลงทะเบียนสมัครสมาชิกเรียบร้อยแล้ว ก็จะมีชื่อผู้ใช้และรหัสผ่านประจำตัว สำหรับล็อกอินเข้าสู่ระบบรับข้อมูล คือจะสามารถใส่ข้อมูลเข้าสู่ระบบได้

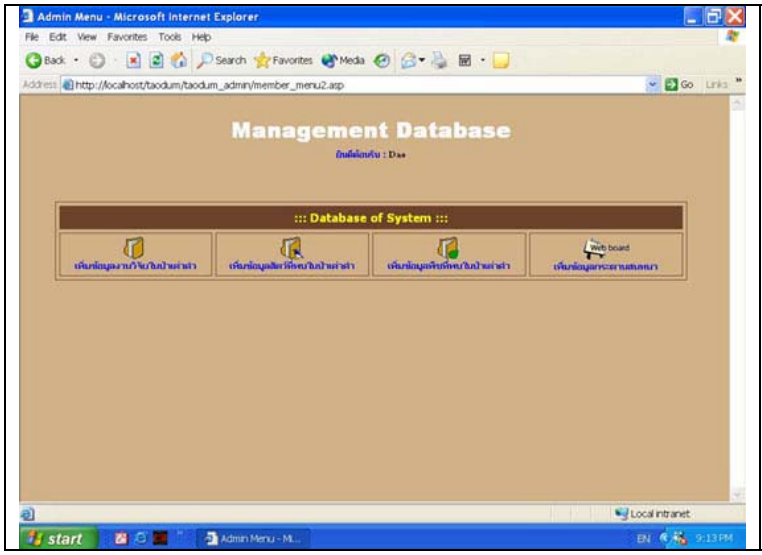
2. ระบบรับข้อมูล

2.1 ระบบตรวจสอบข้อมูลสมาชิก

เฉพาะสมาชิกเท่านั้นที่ระบบจะยอมให้ใส่ข้อมูลเข้าสู่ระบบได้ โดยระบบจะตรวจสอบชื่อผู้ใช้ และรหัสผ่านจากข้อมูลในฐานข้อมูลสมาชิก ดังรูป

2.2 เมนูการใช้ระบบสำหรับสมาชิก

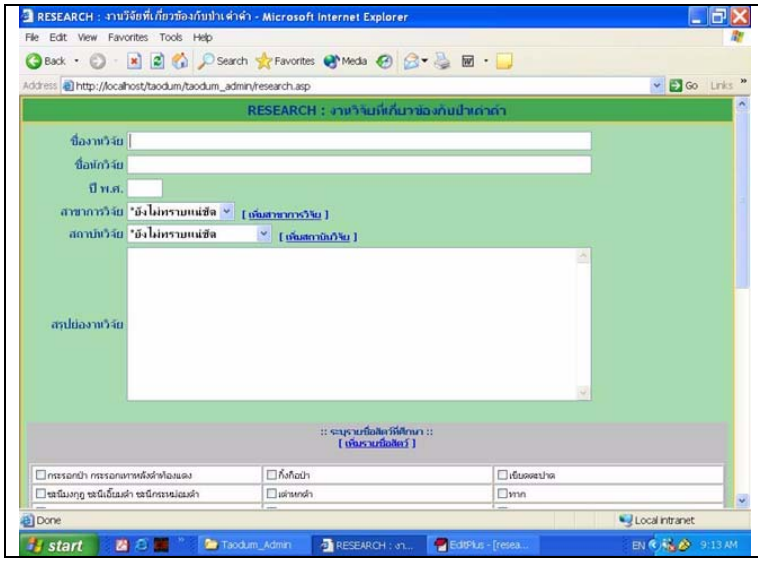
เมื่อสมาชิกกรอกชื่อผู้ใช้ และรหัสผ่านถูกต้อง ก็จะเข้าสู่หน้าจอเมนูของระบบรับข้อมูล ในปัจจุบันมีเมนูให้สมาชิกได้ใช้ในการเพิ่มข้อมูลเข้าสู่ระบบ 4 เมนู ดังรูป



- เพิ่มข้อมูลงานวิจัยในป่าเต่าดำ
- เพิ่มข้อมูลสัตว์ที่พบในป่าเต่าดำ
- เพิ่มข้อมูลพืชที่พบในป่าเต่าดำ
- เพิ่มข้อมูลกระดานสนทนา

2.3 เพิ่มข้อมูลงานวิจัยในป่าเต่าดำ

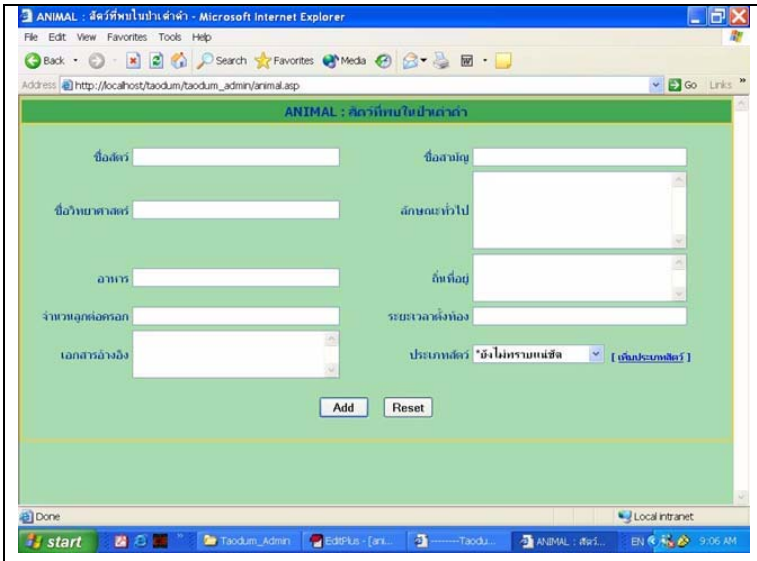
เมื่อสมาชิกคลิกเลือกเมนูเพิ่มข้อมูลงานวิจัยในป่าเต่าดำ หน้าต่างเพิ่มงานวิจัยจะถูกเปิดขึ้นมา เพื่อรับข้อมูลผ่านทางแบบฟอร์มเข้าสู่ฐานข้อมูลระบบ ดังรูป



- ชื่องานวิจัย
- ชื่อนักวิจัย
- ปี พ.ศ.
- สาขาการวิจัย
- สถาบันวิจัย
- สรุปย่องานวิจัย
- คลิกปุ่ม “Add”

2.4 เพิ่มข้อมูลสัตว์ที่พบในป่าเต่าดำ

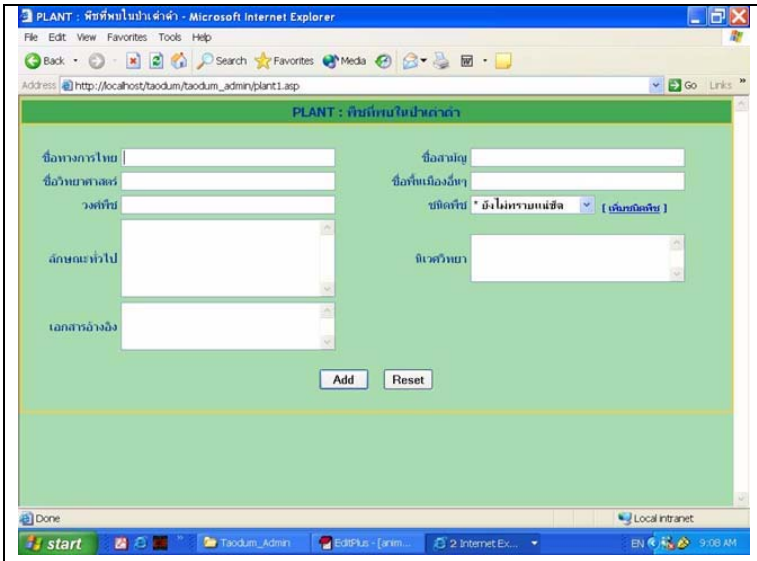
เมื่อสมาชิกคลิกเลือกเมนูเพิ่มข้อมูลสัตว์ที่พบในป่าเต่าดำ หน้าต่างเพิ่มสัตว์ป่าจะถูกเปิดขึ้นมา เพื่อรับข้อมูลผ่านทางแบบฟอร์มเข้าสู่ฐานข้อมูลระบบ ดังรูป



- ชื่อสัตว์
- ชื่อสามัญ
- ชื่อวิทยาศาสตร์
- ลักษณะทั่วไป
- อาหาร
- ถิ่นที่อยู่
- จำนวนลูก/ครอก
- การตั้งท้อง
- เอกสารอ้างอิง
- ประเภทสัตว์
- คลิกปุ่ม “Add”

2.5 เพิ่มข้อมูลพืชที่พบในป่าเต่าดำ

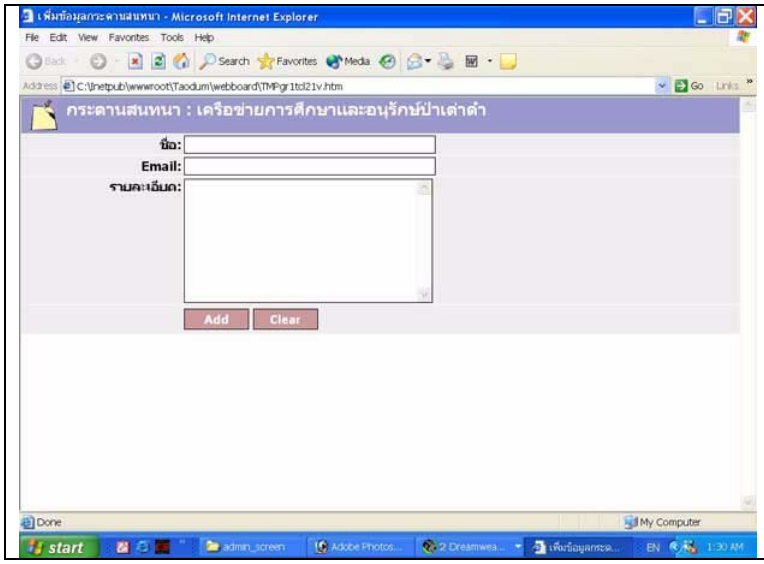
เมื่อสมาชิกคลิกเลือกเมนูเพิ่มข้อมูลพืชที่พบในป่าเต่าดำ หน้าต่างเพิ่มพันธุ์พืชจะถูกเปิดขึ้นมา เพื่อรับข้อมูลผ่านทางแบบฟอร์มเข้าสู่ฐานข้อมูลระบบ ดังรูป



- ชื่อทางการไทย
- ชื่อสามัญ
- ชื่อวิทยาศาสตร์
- ชื่อพื้นเมืองอื่นๆ
- วงศ์พืช
- ชนิดพืช
- ลักษณะทั่วไป
- นิเวศวิทยา
- เอกสารอ้างอิง
- คลิกปุ่ม “Add”

2.6 เพิ่มข้อมูลกระดานสนทนา

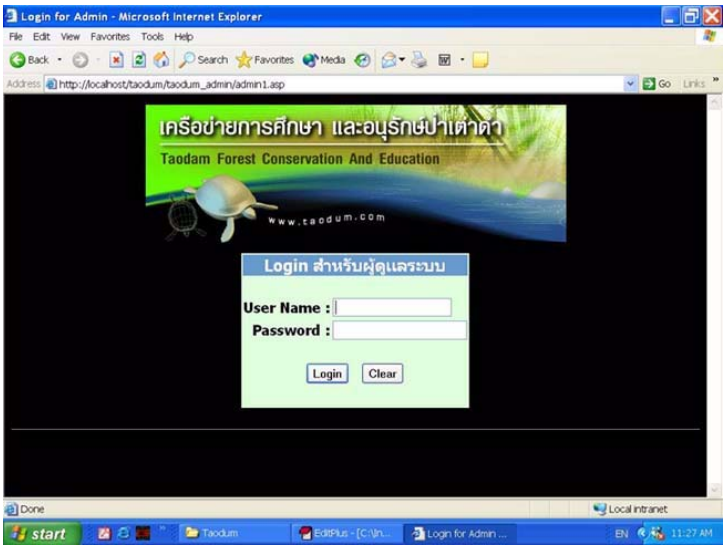
เมื่อสมาชิกคลิกเลือกเมนูเพิ่มข้อมูลกระดานสนทนา หน้าต่างเพิ่มกระดานสนทนาจะถูกเปิดขึ้นมา เพื่อรับข้อมูลผ่านทางแบบฟอร์มเข้าสู่ฐานข้อมูลระบบ ดังรูป



- ชื่อ
- Email
- รายละเอียด
- คลิกปุ่ม “Add”

3. ระบบจัดการข้อมูล

ผู้ดูแลระบบ เข้าสู่ระบบการจัดการข้อมูล เพื่อแก้ไข หรือลบข้อมูล ผ่านทางเครือข่ายอินเทอร์เน็ตที่ http://www.taodum.com/admin1.asp จะพบกับหน้าล็อกอิน ดังรูป



3.1 ระบบตรวจสอบข้อมูลผู้ดูแลระบบ

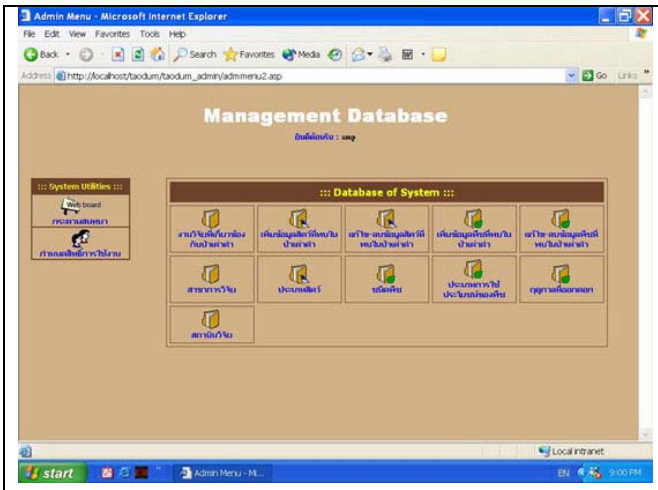
ให้ผู้ดูแลระบบกรอกชื่อผู้ใช้ และรหัสผ่าน เพื่อเข้าสู่ระบบการจัดการแก้ไขและลบข้อมูล ดังรูป การจัดการข้อมูล ประกอบด้วย การป้อนข้อมูลเข้า, การปรับปรุงแก้ไขข้อมูล และการลบ

ข้อมูล เพื่อให้ข้อมูลในฐานข้อมูลของระบบมีความถูกต้องและทันสมัยอยู่เสมอ หน้าที่ดังกล่าวมีเพียงกลุ่มผู้ดูแลระบบเท่านั้นที่สามารถดำเนินการนี้ได้ โดยเข้าสู่เมนูการจัดการระบบ ซึ่งภายในเมนูมีหน้าจอการทำงานที่เกี่ยวข้องกับการจัดการข้อมูลทั้งหมดของระบบ มีข้อมูลหลักที่สำคัญหลายชุดที่ต้องได้รับการจัดทำ “ข้อมูลประกอบ” ซึ่งในที่นี้หมายความถึง ข้อมูลที่จะนำไปใช้เป็นเพียงส่วนประกอบสำหรับข้อมูลหลัก จึงจำเป็นต้องจัดเตรียมก่อนที่จะทำการป้อนข้อมูลหลักต่อไป โดยแสดงในตาราง

ข้อมูลหลัก	ข้อมูลประกอบ
1. งานวิจัย	1. สถาบันวิจัย
	2. สาขาการวิจัย
2. สัตว์	1. ประเภทสัตว์ (Classification)
3. พืช	1. ชนิดพืช (Classification)
	2. ฤดูกาลที่ออกดอก
	3. การใช้ประโยชน์พืช
6. สมาชิก	1. ระดับสมาชิกภาพ
7. กระดานสนทนา	-

3.2 เมนูการใช้ระบบสำหรับผู้ดูแลระบบ

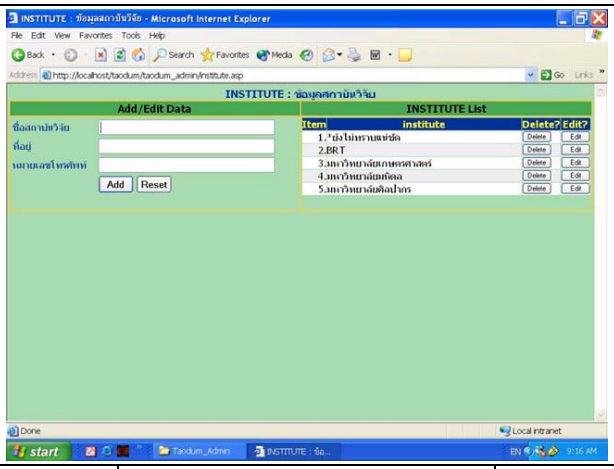
เมื่อผู้ดูแลระบบกรอกชื่อผู้ใช้ และรหัสผ่านถูกต้อง ก็จะเข้าสู่หน้าจอเมนูการจัดการระบบ ดังรูป



- แก้ไข-ลบข้อมูลงานวิจัย
- เพิ่ม-แก้ไข-ลบสถาบันวิจัย
- เพิ่ม-แก้ไข-ลบสาขาการวิจัย
- เพิ่มข้อมูลสัตว์
- แก้ไข-ลบข้อมูลสัตว์
- เพิ่ม-แก้ไข-ลบประเภทสัตว์
- เพิ่มข้อมูลพืช
- แก้ไข-ลบข้อมูลพืช
- เพิ่ม-แก้ไข-ลบชนิดพืช
- เพิ่ม-แก้ไข-ลบฤดูกาลที่ออกดอก
- เพิ่ม-แก้ไข-ลบการใช้ประโยชน์พืช
- ลบข้อมูลกระดานสนทนา
- เพิ่ม-แก้ไข-ลบข้อมูลสมาชิก

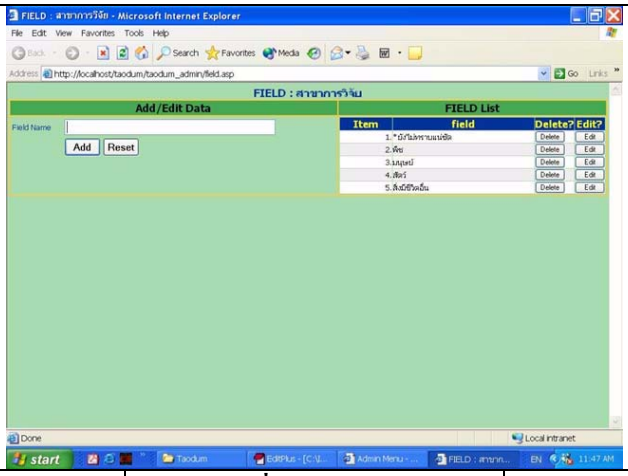
3.3 การจัดทำข้อมูลประกอบ

3.3.1 สถาบันวิจัย (Institute)



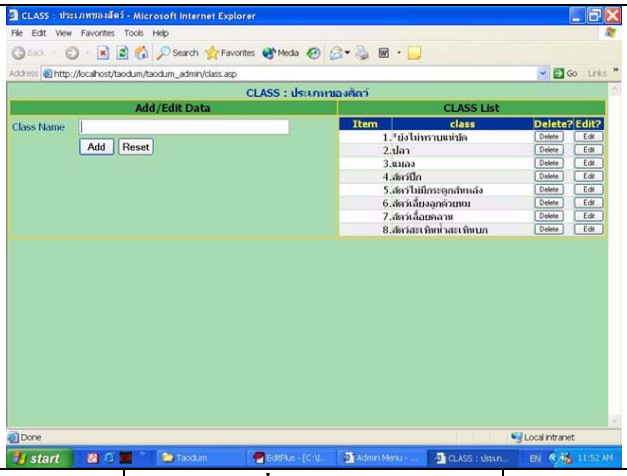
เพิ่มสถาบันวิจัยใหม่	แก้ไขสถาบันวิจัย	ลบสถาบันวิจัย
1. ป้อนชื่อสถาบันวิจัย	1. เลือกสถาบันวิจัย	1. เลือกสถาบันวิจัย
2. ป้อนที่อยู่สถาบันวิจัย	2. คลิกปุ่ม “Edit”	2. คลิกปุ่ม “Delete”
3. ป้อนหมายเลขโทรศัพท์	3. แก้ไขข้อมูลสถาบันวิจัย	3. ยืนยัน
4. คลิกปุ่ม “Add”	4. คลิกปุ่ม “Add”	

3.3.2 สาขาการวิจัย (Fieid)



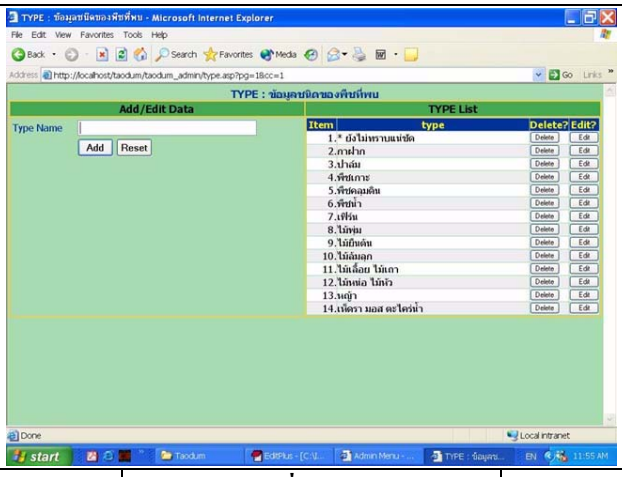
เพิ่มสาขาการวิจัยใหม่	แก้ไขชื่อสาขาการวิจัย	ลบสาขาการวิจัย
1. ป้อนชื่อสาขาการวิจัย	1. เลือกสาขาการวิจัย	1. เลือกสาขาการวิจัย
2. คลิกปุ่ม “Add”	2. คลิกปุ่ม “Edit”	3. คลิกปุ่ม “Delete”
-	3. แก้ไขชื่อสาขาการวิจัย	-
	4. คลิกปุ่ม “Add”	

3.3.3 ประเภทสัตว์ (Class)



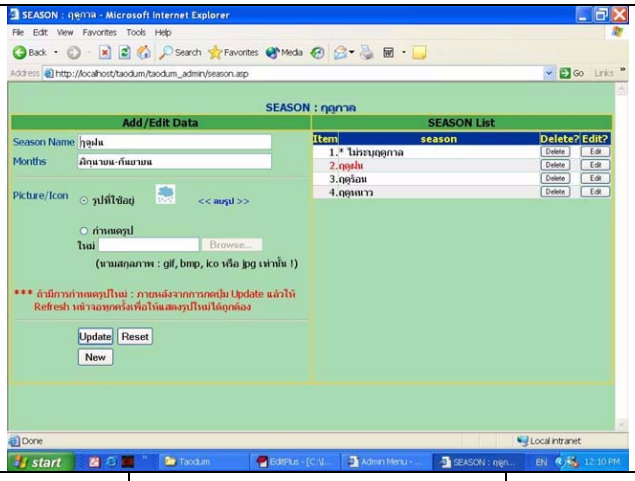
เพิ่มประเภทสัตว์ใหม่	แก้ไขชื่อประเภทสัตว์	ลบประเภทสัตว์
1. ป้อนชื่อประเภทสัตว์	1. เลือกประเภทสัตว์	1. เลือกประเภทสัตว์
2. คลิกปุ่ม “Add”	2. คลิกปุ่ม “Edit”	3. คลิกปุ่ม “Delete”
-	3. แก้ไขชื่อประเภทสัตว์	-
	4. คลิกปุ่ม “Add”	

3.3.4 ชนิดพืช (Type)



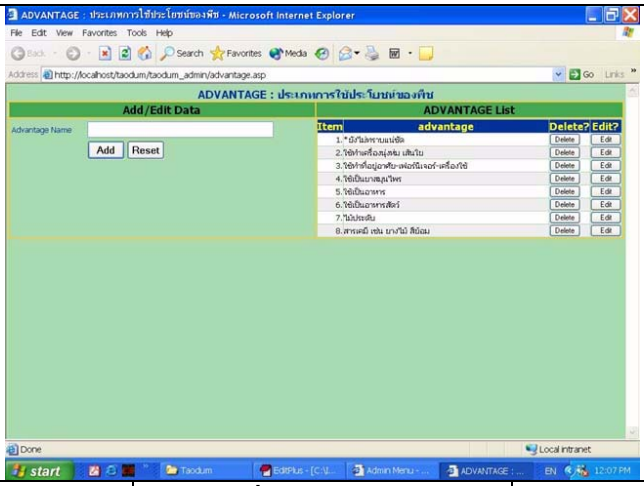
เพิ่มชนิดพืชใหม่	แก้ไขชื่อชนิดพืช	ลบชนิดพืช
1. ป้อนชื่อชนิดพืช	1. เลือกชนิดพืช	1. เลือกชนิดพืช
2. คลิกปุ่ม “Add”	2. คลิกปุ่ม “Edit”	3. คลิกปุ่ม “Delete”
-	3. แก้ไขชื่อชนิดพืช	-
	4. คลิกปุ่ม “Add”	

3.3.5 ฤดูกาลที่พืชออกดอก (Season)



เพิ่มฤดูกาลใหม่	แก้ไขฤดูกาล	ลบฤดูกาล
1. ป้อนชื่อฤดูกาล	1. เลือกฤดูกาล	1. เลือกฤดูกาล
2. ป้อนช่วงเดือน	2. คลิกปุ่ม “Edit”	2. คลิกปุ่ม “Delete”
3. เลือกไฟล์ภาพฤดูกาล	3. แก้ไขข้อมูลฤดูกาล	3. ยืนยัน
4. คลิกปุ่ม “Update”	4. คลิกปุ่ม “Update”	

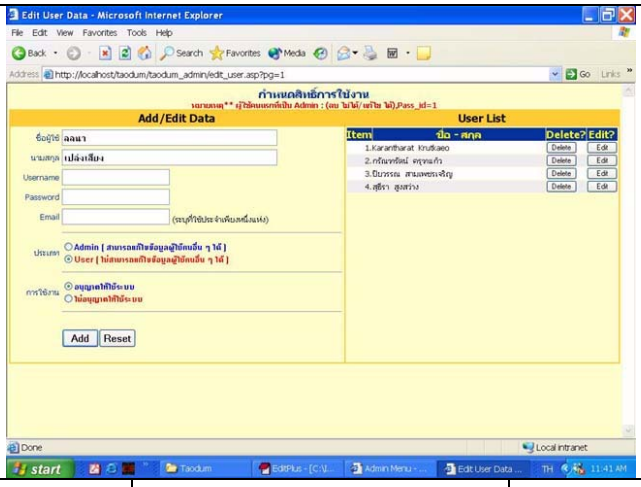
3.3.6 การใช้ประโยชน์พืช (Advantage)



เพิ่มการใช้ประโยชน์ใหม่	แก้ไขชื่อการใช้ประโยชน์	ลบการใช้ประโยชน์
1. ป้อนชื่อการใช้ประโยชน์	1. เลือกการใช้ประโยชน์	1. เลือกการใช้ประโยชน์
2. คลิกปุ่ม “Add”	2. คลิกปุ่ม “Edit”	3. คลิกปุ่ม “Delete”
-	3. แก้ไขชื่อการใช้ประโยชน์	-
	4. คลิกปุ่ม “Add”	

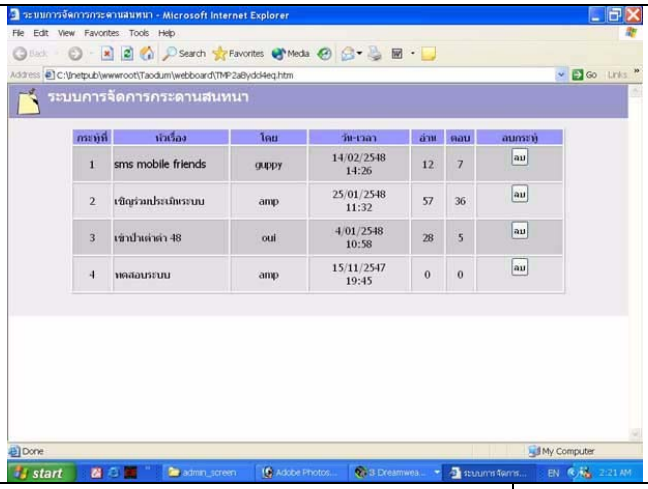
3.4 การจัดทำข้อมูลหลัก

3.4.1 การกำหนดสิทธิ์การใช้งานระบบ



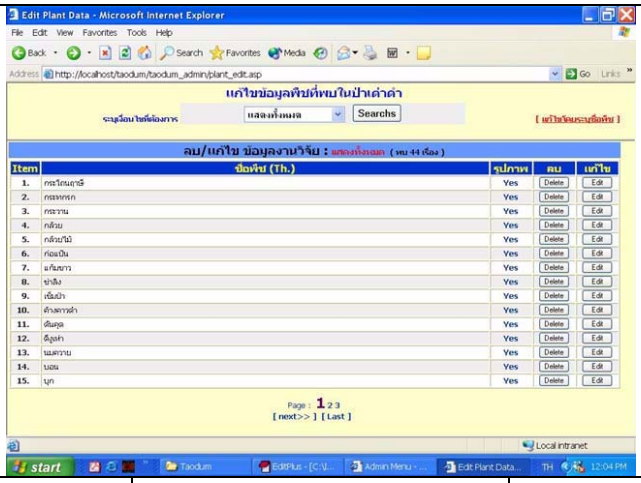
เพิ่มสมาชิกใหม่	แก้ไขข้อมูลสมาชิก	ลบชื่อสมาชิก
1. ป้อนชื่อ-นามสกุล	1. เลือกชื่อสมาชิก	1. เลือกชื่อสมาชิก
2. ป้อนชื่อผู้ใช้-รหัสผ่าน-Email	2. คลิกปุ่ม “Edit”	2. คลิกปุ่ม “Delete”
3. กำหนดสิทธิ์การใช้งาน	3. แก้ไขข้อมูลสมาชิก	3. ยืนยัน
4. คลิกปุ่ม “Add”	4. คลิกปุ่ม “Add”	

3.4.2 การลบกระดานสนทนา



-	ลบกระทู้
	1. เลือกกระทู้
	2. คลิกปุ่ม “ลบ”
	3. ยืนยัน

3.4.3 การแก้ไขและลบข้อมูลพันธุ์พืช

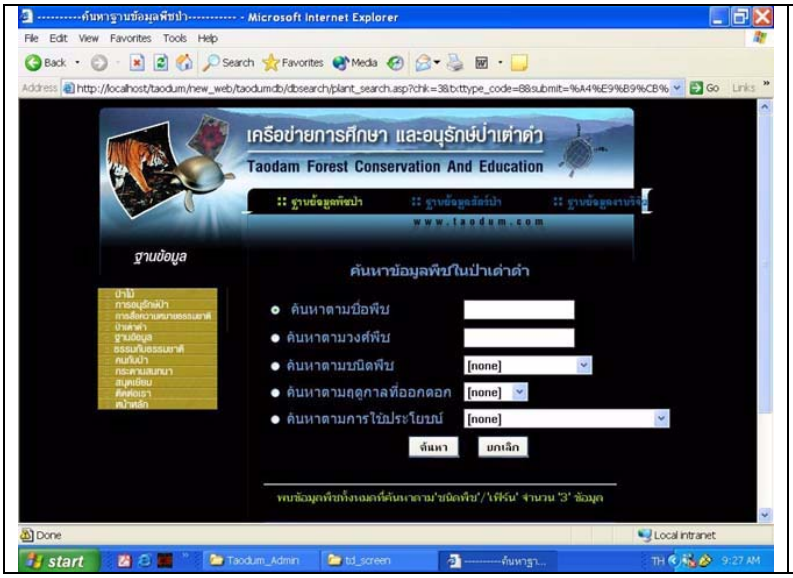


-	แก้ไขข้อมูลพืช	ลบข้อมูลพืช
	1. เลือกชื่อพืช	1. เลือกชื่อพืช
	2. คลิกปุ่ม “Edit”	2. คลิกปุ่ม “Delete”
	3. แก้ไขข้อมูลพืช	3. ยืนยัน
	4. คลิกปุ่ม “Add”	

4. ระบบสืบค้นฐานข้อมูล

4.1 การสืบค้นข้อมูลพืชที่พบในป่าเต่าดำ

มีทั้งการสืบค้นแบบ keyword ด้วยการพิมพ์คำที่ต้องการค้นหาลงไปโดยตรง และแบบเลือกจากเงื่อนไขที่ระบบจัดกลุ่มไว้แล้วใน ComboBox ดังภาพ

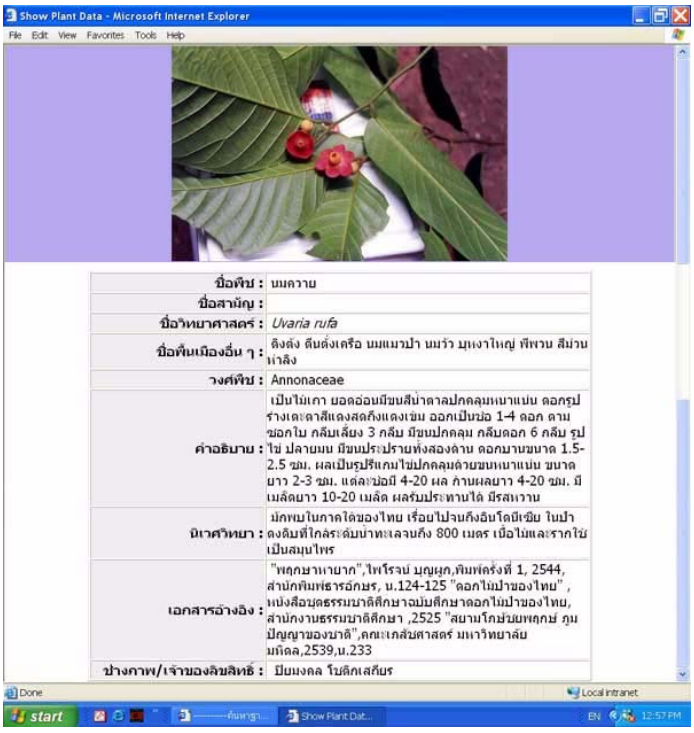


- ค้นตามชื่อพืช
- ค้นตามวงศ์พืช
- ค้นตามชนิดพืช
- ค้นตามฤดูกาล
- ค้นตามประโยชน์
- คลิกปุ่ม “ค้นหา”

(ค้นได้ครั้งละเงื่อนไขเดียว)

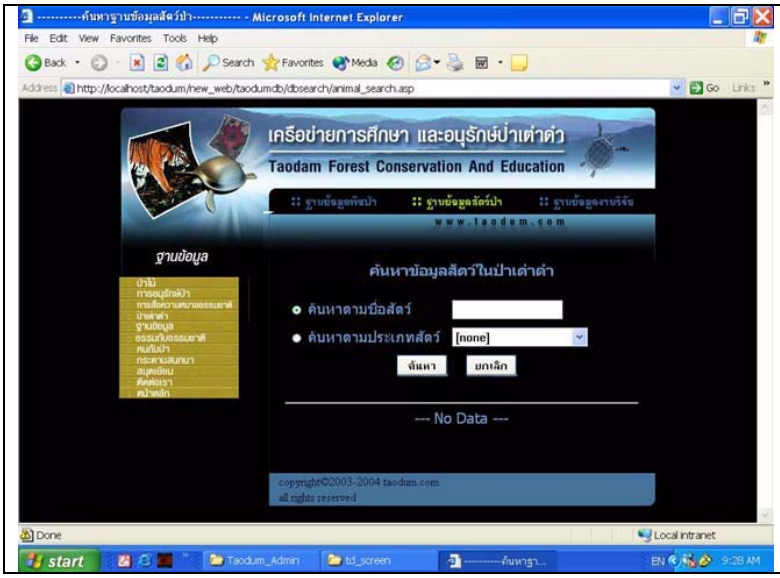
ผลการสืบค้นข้อมูลพืช

เมื่อคลิกที่ชื่อพืชซึ่งเป็น hyperlink จะเปิดหน้าต่างขึ้นมาแสดงรายละเอียดพืช ดังภาพ



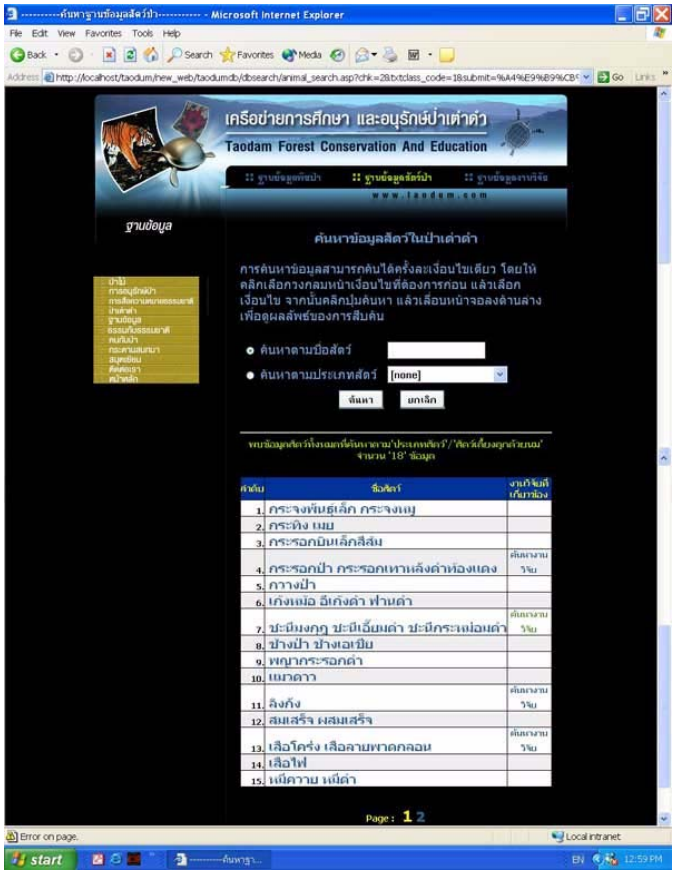
4.2 การสืบค้นข้อมูลสัตว์ที่พบในป่าเต่าดำ

มีทั้งการสืบค้นแบบ keyword ด้วยการพิมพ์คำที่ต้องการค้นหาลงไปโดยตรง และแบบเลือกจากเงื่อนไขที่ระบบจัดกลุ่มไว้แล้วใน ComboBox ดังภาพ

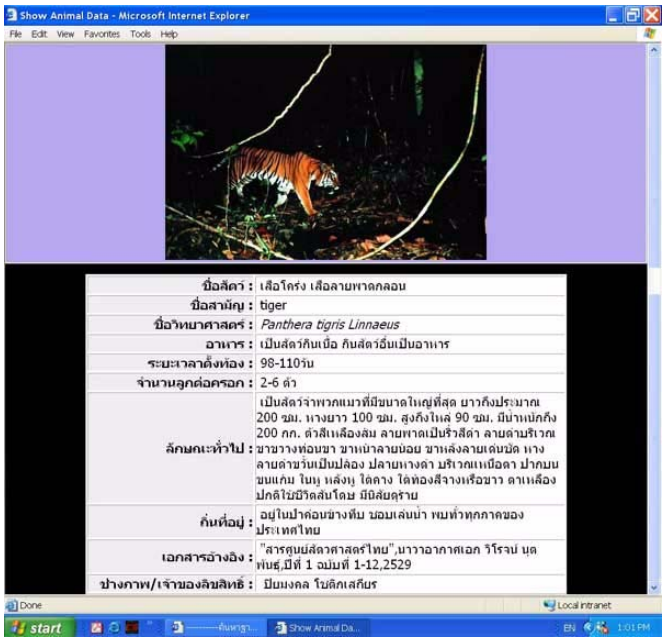


- ค้นตามชื่อสัตว์ (Keyword Search)
- ค้นตามประเภทสัตว์ (ComboBox)
- คลิกปุ่ม “ค้นหา” (ค้นได้ครั้งละเงื่อนไขเดียว)

ผลการสืบค้นข้อมูลสัตว์

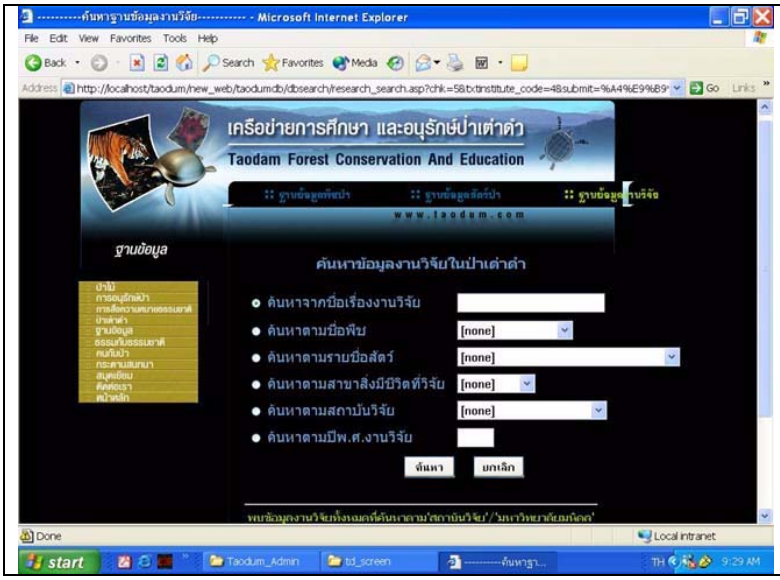


เมื่อคลิกที่ชื่อสัตว์ซึ่งเป็น hyperlink จะเปิดหน้าต่างขึ้นมาแสดงรายละเอียดสัตว์ ดังภาพ



4.3 การสืบค้นข้อมูลงานวิจัยในป่าเต่าดำ

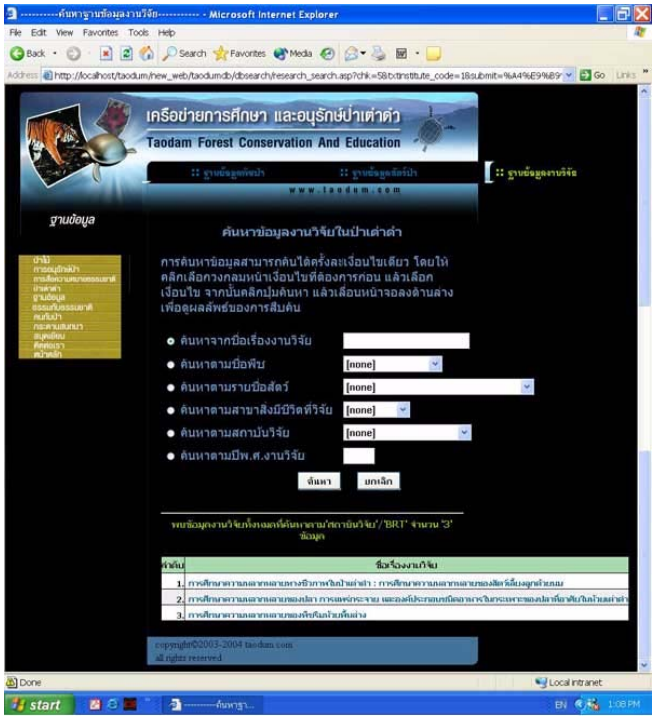
มีทั้งการสืบค้นแบบ keyword ด้วยการพิมพ์คำที่ต้องการค้นหาลงไปโดยตรง และแบบเลือกจากเงื่อนไขที่ระบบจัดกลุ่มไว้แล้วใน ComboBox ดังภาพ



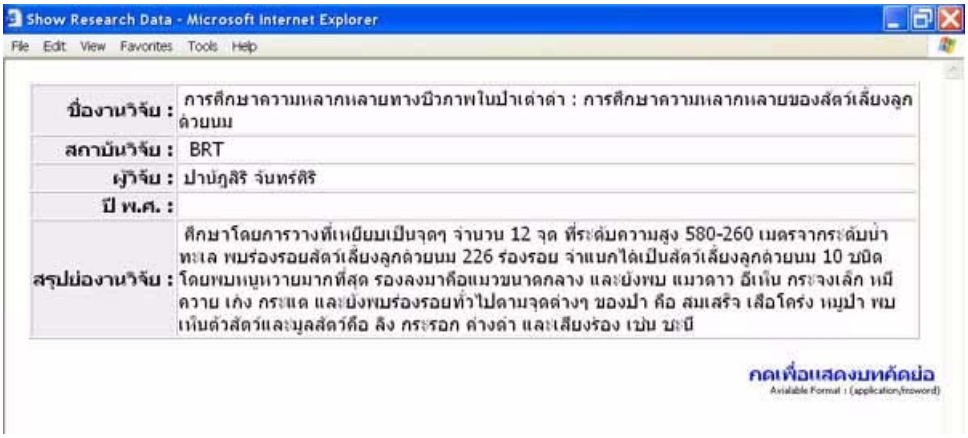
- ค้นตามชื่อเรื่องงานวิจัย
- ค้นตามรายชื่อพืช
- ค้นตามรายชื่อสัตว์
- ค้นตามสาขาการวิจัย
- ค้นตามสถาบันวิจัย
- ค้นตามปี พ.ศ.
- คลิกปุ่ม “ค้นหา”

(ค้นได้ครั้งละเงื่อนไขเดียว)

ผลการสืบค้นข้อมูลงานวิจัย



เมื่อคลิกที่หัวข้องานวิจัยซึ่งเป็น hyperlink จะเปิดหน้าต่างขึ้นมาแสดงรายละเอียดงานวิจัย ดังภาพ



5. สถิติสารสนเทศในป่าเต่าดำ

เก็บสถิติพืช สัตว์ และงานวิจัยในป่าเต่าดำ มาแสดงให้เห็นชัดด้วยรูปกราฟ โดยสามารถคลิกที่ลิงค์ “STAT” ดังภาพ

5.1 สถิติพืชที่พบในป่าเต่าดำแบ่งตามชนิดพืช

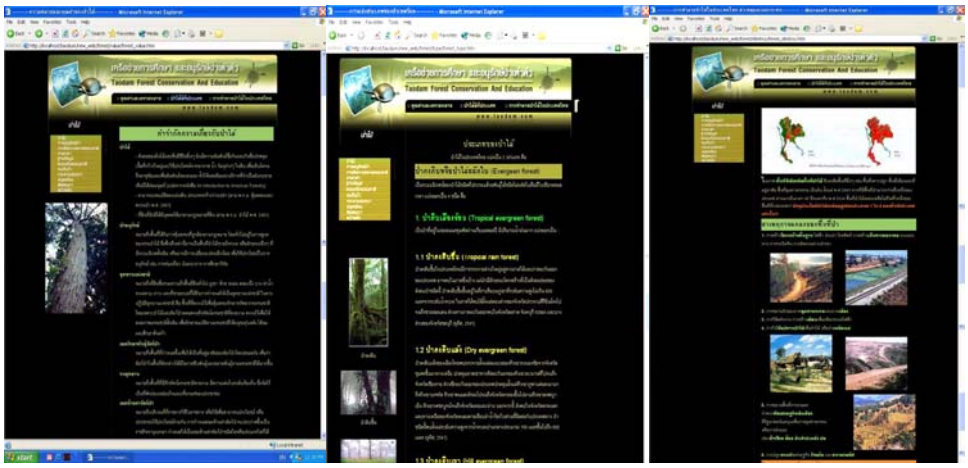
5.2 สถิติสัตว์ที่พบในป่าเต่าดำแบ่งตามประเภทสัตว์

5.3 สถิติงานวิจัยในป่าเต่าดำแบ่งตามสถาบันวิจัย

6. เมนูหลักของเว็บไซต์

6.1 ป่าไม้

สำหรับเมนูย่อยของป่าไม้ มี 3 หัวข้อย่อย คือ ความหมายและคุณค่าของป่าไม้ การจำแนกประเภทของป่าเขตร้อน และ สาเหตุและผลกระทบจากการทำลายป่า ซึ่งแสดงในภาพ

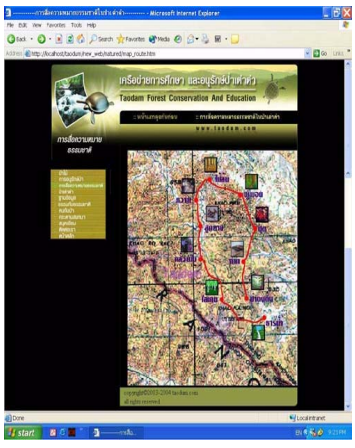


6.2 การอนุรักษ์ป่าไม้

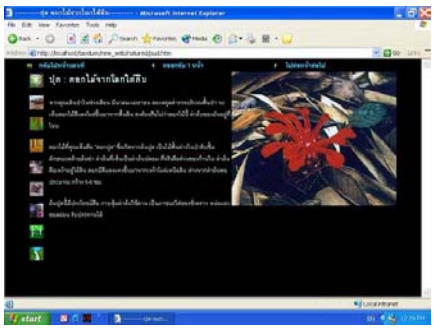
การอนุรักษ์ป่าไม้ประกอบด้วยหน้าย่อยอีก 2 หน้า ได้แก่ การอนุรักษ์ป่าตามแนวพระราชดำริ และ วิธีการอนุรักษ์ป่าไม้ ดังภาพ


6.3 การสื่อความหมายธรรมชาติ

ประกอบด้วยหน้าย่อย 2 หน้า ได้แก่ ความหมายของการสื่อความหมายธรรมชาติ กับแผนที่การสื่อความหมายธรรมชาติในป่าเต่าดำ ดังภาพ

นอกจากนี้ การสื่อความหมายธรรมชาติในป่าเต่าดำ ใช้เทคนิค image map คือเมื่อคลิกบนจุดต่างๆ บนแผนที่ จะมี link เชื่อมโยงไปยังเว็บเพจหน้าอื่นๆ ต่อไป ในแผนที่ได้สร้างจุดศึกษาธรรมชาติไว้ 10 จุด ซึ่งเมื่อคลิก เว็บเพจหน้านั้นๆ ก็จะถูกเปิดขึ้นมาในหน้าต่างใหม่ ดังตัวอย่างภาพ ปุด ดอกไม้จากโลกใต้ดิน



6.4 ป่าเต่าดำ

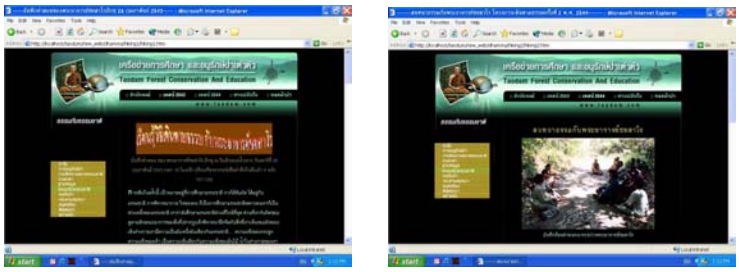
ประกอบด้วยหน้าย่อยอีก 4 หน้า ได้แก่ แผนที่ป่าเต่าดำ สังคมพืชในป่าเต่าดำ ที่มาของชื่อป่าเต่าดำ และวิกฤติการณ์ป่าเต่าดำ ดังภาพ

6.5 ฐานข้อมูล

สามารถสืบค้นข้อมูลพืช ข้อมูลสัตว์ที่พบในป่าเต่าดำ และงานวิจัยในพื้นที่ป่าเต่าดำ ซึ่งได้กล่าวถึงอย่างละเอียดไปแล้วในหัวข้อ 4.1 - 4.3

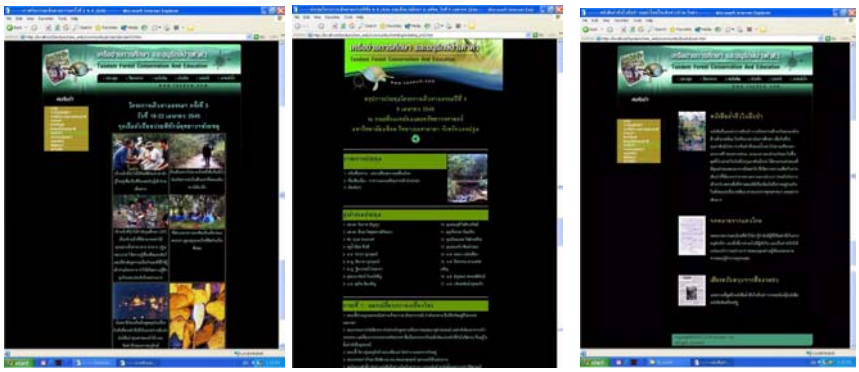
6.6 ธรรมกับธรรมชาติ

ประกอบด้วยหน้าย่อยอีก 5 หน้า ได้แก่ สำนักสงฆ์เต่าดำ โอวาทท่านปสันโนภิกขุ งานทอดผ้าป่า บันทึกคำสอนจากการเดินตามธรรมครั้งแรก และ สนทนาธรรมกับท่านชยสาโรภิกขุ ดังภาพ



6.7 คนกับป่า

ประกอบด้วยหน้าย่อยอีก 6 หน้า ได้แก่ โครงการเดินตามธรรม สรุปรายงานการประชุมเครือข่าย หนังสือค่ำคืนในผืนป่า บันทึก บทกวี และภาพสีน้ำจากผู้ร่วมโครงการเดินตามธรรม ดังภาพ



6.8 กระดานสนทนา

6.9 สมุดเยี่ยม

6.10 ติดต่อเรา

6.10.1 ติดต่อผู้ประสานงานเครือข่ายทางอีเมล์

6.10.2 ติดต่อทางจดหมาย

6.10.3 รายนามองค์กรร่วมกับเครือข่าย

BIOGRAPHY

NAME	Miss Karantharat Krutkaeo
DATE OF BIRTH	September 5, 1971
PLACE OF BIRTH	Krung Thep, Thailand
INSTITUTIONS ATTENDED	King Mongkut's Institute of Technology, Ladkrabang (KMITL), 1993: Bachelor of Science (Applied Microbiology in Biotechnology) Second Class Honors Mahidol University, 2005: Master of Science (Technology of Information System Management)
HOME ADDRESS	151 Moo 3, Sukhumvit Road, Tambon Bansuan, Ampher Muang, Chonburi E-mail : karantharat@hotmail.com