Ontology-based Knowledge Management System with a Case Study on The East-West Economic Corridor

ปัทมา เจริญพร

Pattama Charoenporn

ภาควิชาวิทยาการคอมพิวเตอร์ คณะวิทยาศาสตร์

สถาบันเทคโนโลยีพระจอมเกล้าเจ้าคุณทหารลาดกระบัง

Department of Computer Science, Faculty of Science,

King Mongkut's Institute of Technology Ladkrabang

ABSTRACT – This research aims to develop a knowledge management system with an ontology case study of the East-West Economic Corridor. The operation began with data collection from a sample group using purposive sampling. The sample group consisted of 400 people living in Mukdahan, Kalasin and Khon Kaen province, Thailand with a good knowledge of tourism. The data used to create a database for tourism ontology is derived from tacit and explicit data, divided into 3 Domain classes. The domain class consists of 4 levels of class hierarchy. The relationship between the ontology is divided into 3 types. The knowledge creation process uses the SECI Model and the creation of knowledge data using Taxonomy relationship to establish relationship with the knowledge management system database. The knowledge management system created by the research can be used on both web application and mobile application. In system testing, there are two methods. One is to test the functions by using the User Acceptance Test and test the data recall by finding the F-measure level. The F-measure is 87% and the average time of the data recall is 0.11 seconds. The system is considered to have a good search performance. As for the results of the User Acceptance Test, the results passed all the criteria. The final step is to test the user satisfaction with the QUIS questionnaire. The result of the satisfaction assessment that is over level 5 in all items makes it possible to conclude that the developed knowledge management system provides satisfactory results to the users of the system. In the future, there may be additions to improve knowledge in other areas or added prediction of tourists' interest in choosing tourist destinations to cover more of the development of knowledge management systems.

Corresponding Author: pattama.ch@kmitl.ac.th

1. Introduction

Given the current situation in which the World Economy is staggering, inevitably affecting Thailand's economy as a whole. The most important thing that helps keep the economy from falling further is Thailand's emphasis on the Tourism Industry which helped stimulate the entire nation's economy. From the Tourism Authority of Thailand [1] which has assigned an economic objective to gain 10 percent growth of tourism profits from 2019 in 2020. From the World Economic Forum's report [2], there has been a ranking on the competitive potential of tourism businesses worldwide. The ranking of 2019 has ranked Thailand on 31st out of 140 countries. When compared to only ASEAN countries, Thailand is ranked 3rd, following Malaysia and Singapore. Therefore, supporting the tourism industry is a vital component for continuous development of Thailand's potential in the tourism industry's international competition.

The East-West Economic Corridor is a project to develop travel routes to connect with neighboring countries such as Vietnam, Laos, Myanmar, and Cambodia, as illustrated in Figure 1.

Figure 1. East-West Economic Corridor [3].

However, the entrepreneur confidence index survey on tourism businesses in 2019's fourth quarter [4] revealed that entrepreneurs feel greatly worried about the industry's situation in said quarter since overall profits have declined from what it was normally. The cause was assumed to be the reduced number of tourists due to several recent crises throughout the world. Therefore, to help the tourism industry handle the ever-changing worldwide context, there should be more technologies to lend a hand, increasing the potential for global competition. Knowledge creation from rural communities to urban communities becomes a way to broadcast Thailand's tourism information worldwide.

In this research, the researcher has developed an Ontology-based Knowledge Management System with a Case Study on The East-West Economic Corridor to serve as a place for exchanging and searching for knowledge about tourism, giving birth to new knowledge points through technology. In this research, a case study about economic development along the East-West Economic Corridor has been cited. The corridor consists of 3 provinces: Muk Dahan, Kalasin, and Khon Kaen. The research also utilizes the SECI Knowledge creation process, linking that knowledge to each other with ontology. After completing Development, the system operation will be assessed and all comments and instructions will be compiled to help plan Knowledge Management regarding other issues to be complete, according to each area's specific situations and the business sector's demands.

2. Background and Related Works

2.1 Knowledge Management System

The knowledge management system is a process to gather knowledge from people or documents and develop them as a system, giving organizations access to the knowledge, allowing them to educate themselves and work efficiently. The SECI Model has 4 main components [5] as the following:

1.Socialization is the process of creating and transferring one's personal knowledge to another person (Tacit to Tacit). The method of sharing one's knowledge to another is based on experience and must take into account factors of appropriate time and environment, such as information obtained from creating a discussion board system to exchange knowledge between experts and the general public.

2.Externalization is a collection of specific knowledge that is transmitted through experience in the social exchange process, transformed into explicit knowledge, which is written in the desired format (Tacit to explicit), such as the collection of documents from research or recordings, creating a research storage system related to tourism, crafting a database system that experts can enter to add or edit information.

3. Combination is the application of explicit knowledge that is gathered from both inside and outside the organization to select and synthesize it into new knowledge (Explicit to New Explicit) to increase the complexity, such as creating a system for analyzing tourism information from tourism behavior of Thai and foreign tourists.

4. Internalization is a result of hands-on learning until it becomes the specific skill and expertise of the person which becomes a new unique knowledge (Explicit to New Tacit), resulting in practices for

organizations to apply and ultimately become a culture, resulting in the process of creating knowledge and entering the social exchange process. (Socialization), such as the results of measuring the number of visits to the knowledge management system, the results of relevant video traffic statistics, and the results of statistics collected on tourist sites that users have searched for, etc.

For this research, the SECI model is used as a knowledge creation process for the data collection process. The process of data collection can be described as follows:

Step 1; Socialization uses sharing and creating Tacit knowledge from communication between each other. For this research, data collection from questionnaires is used to collect tacit knowledge. Step 2; Externalization process Creating and sharing knowledge from tacit knowledge and explicit knowledge. For this research, using the method of information dissemination on the web board to display the knowledge for the general public After that, we will go to step 3 which is the Combination method, further studying the teaching techniques from many places, then summarize and disseminate it as a new teaching technique. Which is caused by the collection of knowledge from various sources and one's own knowledge. Then step 4 is Internationalization. It is a part of studying other techniques in addition to textbooks. or existing books, then applying it to real work until the skills and expertise become their own tacit knowledge, and when knowledge comes, it exchanges with other people. Next, a process called Socialization itself is a continuous process.

2.2 Concept of Ontology

Ontology [6] refers to concepts that are applied for knowledge management and the creation of groups of meanings within the scope of interest in a hierarchical style using the Web Ontology Language (OWL) to build the infrastructure. According to research by Grigoris Antoniou and Frank van Harmelen. (2004) [7] found that the Web Ontology Language (OWL) was created by the W3C (Web Ontology Working Group) organization and was developed as an extension of the Resource Description Framework: RDF. OWL was developed in the second version on 11 December 2012 [8] and has more syntax added to describe complex semantic information. And to be able to define the data structure and explain the data (Metadata) that is related in the database system better. The description is in the form of a class. Class properties and class relationships explain the relationships that occur. Examples of applying

ontology is, for example; the system of Search Engines for finding and gaining access to the information that users need by allowing the system to search for information from the ontology knowledge database so that the system can find related words with words that have the same meaning as the related words, etc.

For this research, the ontology creation method for database creation is used to group the hierarchical data consistently. The ontology work process is divided into 6 steps: 1. Document collection, 2. Word omission, 3. Word frequency count, 4. Keyword selection, 5. Creating occurrent frequency table, 6. Present the ontology in the form of Taxonomy relationship.

2.3 The Questionnaire for User Interaction Satisfaction (QUIS 7.0)

The Questionnaire for User Interaction Satisfaction 7.0 [9] is a user satisfaction survey using open-ended questions. This questionnaire is used to assess satisfaction and comments of users towards the user interface. The questionnaire consists of 5 parts: Screen, Terminology and System Information, Learning, System Capabilities, Usability and User Interface. The Likert Scale is used to measure satisfaction in 9 levels from 0, which is "hard to read" up to 9, which is "easy to read".

2.4 Related Works

1. S. Mouhim's research (2010) [10] presents knowledge management concepts and guidelines to building knowledge management systems, semantic webs, and ontologies. The data collection process, the research utilized data collection from internet users searching about tourism in Morocco. Then using the information to create relationships in the form of ontology. Data collection test subjects are chosen from various website services, such as tourism portals, websites, blogs, existing ontologies, vocabulary, and then studying patterns. Of tourist interest and Moroccan culture. Then, searching terms that are diverse and complex are created. Finally, a presentation on tourism knowledge management for Morocco and the architecture of KMS knowledge management systems for managing tourism information in Morocco. In the future, the researcher recommends investigating the complexity of the ontology by allowing experts to examine and improve their ability to respond more accurately and efficiently which may need inquiries from travelers'

international tourism data analysis and the development of research ontologies so that they can be used with other existing ontologies.

2. Prantner and others's research (2007) [11] presents the initial analysis of the OnTourism project with the objectives of (1) creating and evaluating Semantic web technologies such as creating ontologies, semantic enhancement of content and semantic searches to informationally and economically important tourism domains. (2) Creating an ontology to identify the meaning of words and structure of the development of the tourism industry with similar definitions. And (3) presenting the concept of the tourism industry in Austria with the OnTourism work model created for OnTourism. The ontology will be created by presenting the Tourism Domain with the ontology creation tools in the presentation section. OnTourism uses Web 2.0 technology and folksonomy for optimizing the search of terms in the Travel Domain.

From the above research, it is found that the ontology building for relation of definitions can be applied to knowledge management system smoothly. But there should be an increase to the process of data analysis from experts in each area to get information for creating ontology that is repetitive and suitable for in-depth search.

In terms of studying the scope of the research area, the researcher has selected the research area from the study of literature boundary, literature review to determine the area for determining the scope of information in which the researcher has conducted studies from various related research by showing details as follows

3. Phusrisom's (2004) [12] on benefits about economic growth, the research shows that Thailand will be affected by the economic stimulus from the construction of The Second Thai–Lao Friendship Bridge (Mukdahan-Savannakhet), which was found that the provinces in the northeast along the route (East-West Economic Corridor: EWEC) is Kalasin, Khon Kaen and Mukdahan, and they will benefit from the increased rate of economic growth since there are both domestic and foreign investors's increase in investment. Being the center of agricultural industry production and developing to be a center for human resource and human resource development in the Greater Mekong Sub-region. Convenient transportation will also be developed to help efficiently solve the poverty problem of the people in the northeast region along the EWEC route.

4. Apichatvullop, Y (2007) [13] has conducted research with educational objectives regarding definitions and value on the economic terrace as perceived by each stakeholder group and to cope with route changes. The data collected from sample

groups which was selected from a group of stakeholders on the EWEC route, including organizations in business operators and residents of the EWEC route area across the study. It was found that the organizations within areas that will be affected by the EWEC route include education agencies, health agency, tourism agency, Local Administration Organization, social development, transportation, and communication. For those who operate private businesses, they will be involved in an industrial unit Services for wholesale, retail, and agro-industry businesses As for the people who live in the area, it was found that business operators in the area that the EWEC route passes including 3 provinces in the north-eastern region of Khon Kaen, Kalasin and Mukdahan had an opinion and expected that the EWEC route would have a positive impact on the businesses.

From the above research, it was found that although some research findings suggest that it is expected that the EWEC route will have a positive impact on trade of various businesses, especially Khon Kaen, Kalasin and Mukdahan which will benefit from the increased economic growth rate. Due to being a neighboring province to The Second Thai–Lao Friendship Bridge (Mukdahan-Savannakhet), as well as both domestic and foreign investors are expected to invest more, it can be seen that most of the research focuses on studying the effects in Areas such as transportation, International trade, but no research has yet been studied on the impact of tourism economy. Therefore, supporting tourism through information technology, focusing on 3 provinces in the northeast, Khon Kaen, Kalasin and Mukdahan, to be model provinces for building a knowledge management system on the EWEC route that should be studied and fulfilled in terms of knowledge Information and knowledge for academic purposes and benefits in terms of bringing research results to organizational development and related agencies.

3. METHODS

There are 5 procedures in the development process. 1. Data collection, 2. Designing and Developing the Ontology, 3. Building the Knowledge Management System, 4. Knowledge Management System Testing, 5. Evaluate user satisfaction towards the Knowledge Management System. The details to each procedure are as follows:

3.1 Data Collection

This step is to collect data from 400 participants chosen by purposive sampling [14] from the

provinces in the northeast region along the East-West Economic Corridor.: EWEC), namely Khon Kaen, Kalasin and Mukdahan. The total of 400 samples must live in the research area and they must also have knowledge in tourism as well and are able to use the information to create knowledge for creating an ontology.

The class ontology is based on the reference of the Entrepreneurs Sentiment Index Quarter 1/2020 [15]. Tourism class is divided into three areas, which can be used to create relationships in Domains and scopes which can be as follows:

1.Domain of Historical tourism

2.Domain of Natural attractions

3.Domain of Tourist attractions in arts, culture, traditions and activities, and methods of exchanging data from sample groups are to be compared with the data from the Folksonomies method and the

web board obtained from the system created by the research with the steps in data collection as follows;

1. Studying information about tourism industry along the East-West Economic Corridor from the sample area of 3 provinces together by studying from documents, related research, brochures, notes, and books to collect various details for the data cleaning process.

2. Acquiring information from research, consisting of data survey about the tourism industry, using questionnaires which will consist of both open and closed-end questions. Interviews and exchanges will also happen between the researcher and the sample group, referring to SECI model for data collection, with details shown on Figure 2.

From the figure 2, it can be explained that.

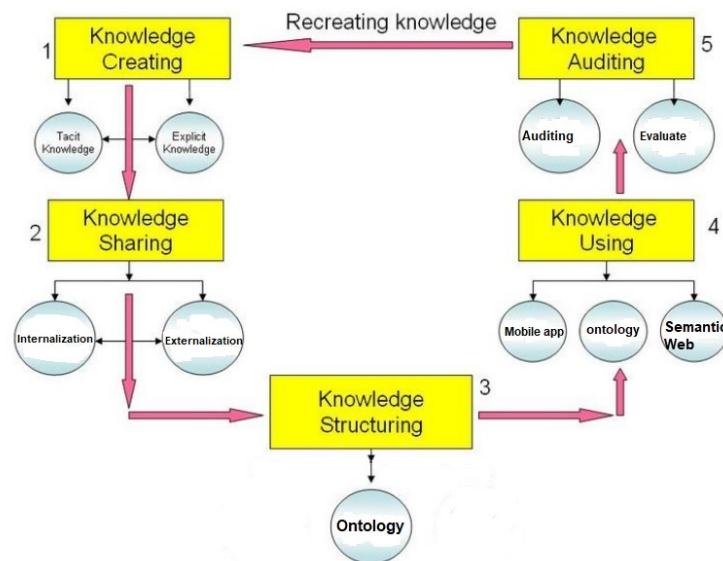Step 1: Knowledge creation; is to collect data from the sample group. The information will be in the

Figure 2. Data Analysis Method.

form of Tacit Knowledge, including data from brainstorming of respondents about community tourist attractions, historical sites, natural attractions, arts and cultural sites, traditions and activities, individual experience information about local culture. By dividing into each scope of the research area, then analyzing for comparison with external data using Folksonomies and the web board of the research. With methods to categorize by content, allowing users to share opinions based on various categories. Once the information is received, the Tacit knowledge will then be developed into Explicit knowledge.

Step 2: Knowledge Sharing. This step is to design explicit knowledge in the form of a structure that can be distributed by dividing into 2 structures:

1. Internalization: The structure is to format the knowledge that is available in the organization in a standard format, such as creating websites, documents, records

2. Externalization: It is the process of integrating tacit knowledge obtained from the extraction of knowledge with a link between internal knowledge and external knowledge.

From the study, it was found that Tourism in various forms in all 3 provinces, using external knowledge gained, such as research results, customer needs and modern technology, applied and combined with prior knowledge to improve the means of tourism to meet the needs of tourists even more. When designing explicit knowledge of tourism information, granting 3 sub nodes of

tourism in the following provinces: tourist attractions, accommodation, restaurants, accommodation types and tourist activities

Step 3. Creating a Knowledge Structure, Bringing the whole structural information from both Internalization and Externalization to design relationships between structural data using ontology methods.

Step 4. Knowledge Using; is the process of designing the ontology database and designing the knowledge management system into a semantic web format to create a mobile application for the knowledge management system that the research created. Ontology design is explained in part 4.

Step 5. Knowledge auditing is a process for auditing and validating content from knowledge management systems that are created which the system will present tourism knowledge at various structural levels by organizing it into a knowledge base, so that those who want to search for knowledge from the knowledge management system can study for information and create knowledge in the form of tacit knowledge. For the newly created information, such as from a blog or from a web board that has users filling in information, the system will lead to the next knowledge creating process.

The process model for the process of transforming tacit knowledge into explicit knowledge can be described in Figure 3.
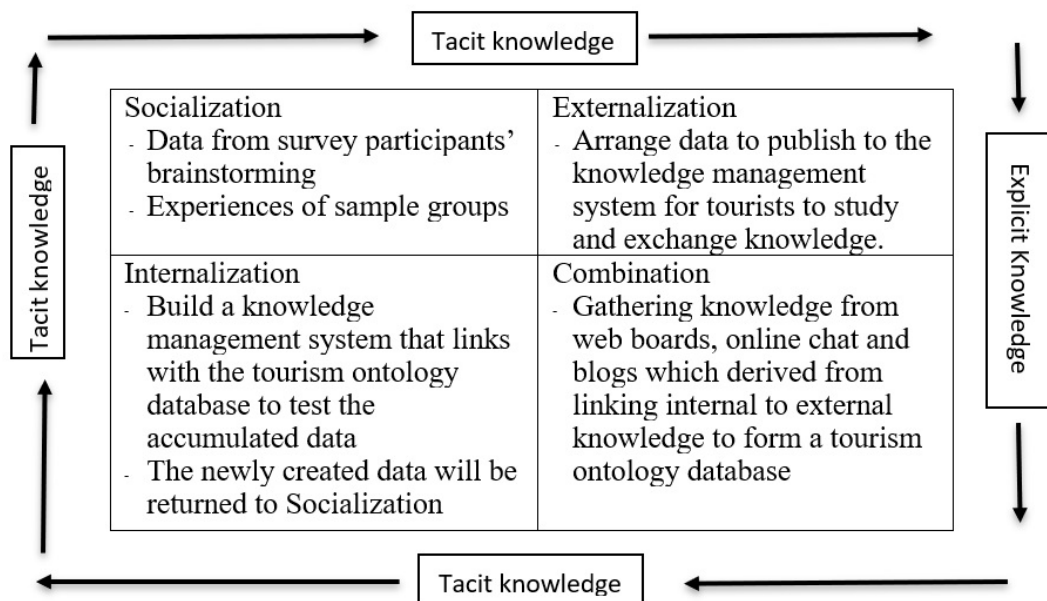

Figure 3. Transforming tacit knowledge into explicit knowledge.

3.2 Designing and Developing the Ontology

This step is finding the data's relationship by Taxonomy Relationship, done by creating the ontology via combination which divides 70% of the data to build a model and the other 30% is going to be used as test data for the model in development. After that, the relationship will be built via the Protégé app 5.5 [16] to find the relationship of tourism groups which are classified according to content types to build the ontology. There are 3 steps to the development:

1. Building a thesaurus using text files to contain vocabularies and search for information from the sample group to be used as database for related vocabularies used to compare with words that the user types into the system, then design the ontology knowledge base which consists of the main classes such as attraction information, archaeology, images, saved as OWL files.

2. Definitive data recall has 3 working steps; 1. Keyword Selection, for example: choosing from tourism groups, adding conditions for complex searches 2. Word group selection for data return 3. Recall data from knowledge database.

3. Test data recall from the ontology knowledge database by measuring the F-measure value, measured from the relationship value between Precision and Recall values. The equation for finding F-measure value [17] is shown in Equation 1.

$$F-measure = \frac{2 \times precision \times recall}{precision + recall} \times 100 \qquad (1)$$

The Precision value is the value which measures the ability to rule out all irrelevant documents.

The Recall value is the value that evaluates the system's efficiency in pulling out relevant documents and gauges the Processing Time [18] is shown in Equation 2, which is the time elapsed from each recall to find the average recall time.

$$Processing\ Time = \sum_{i=1}^{N} elapsedTimeMin/N \qquad (2)$$

elapsedTimeMin is the time elapsed in each retrieve relevant documents return

N is the number of retrieve relevant documents returns.

3.3 Building the Knowledge Management System

This part is the design of the Knowledge Management System's infrastructure, divided into 2 sections as shown in Figure 4.
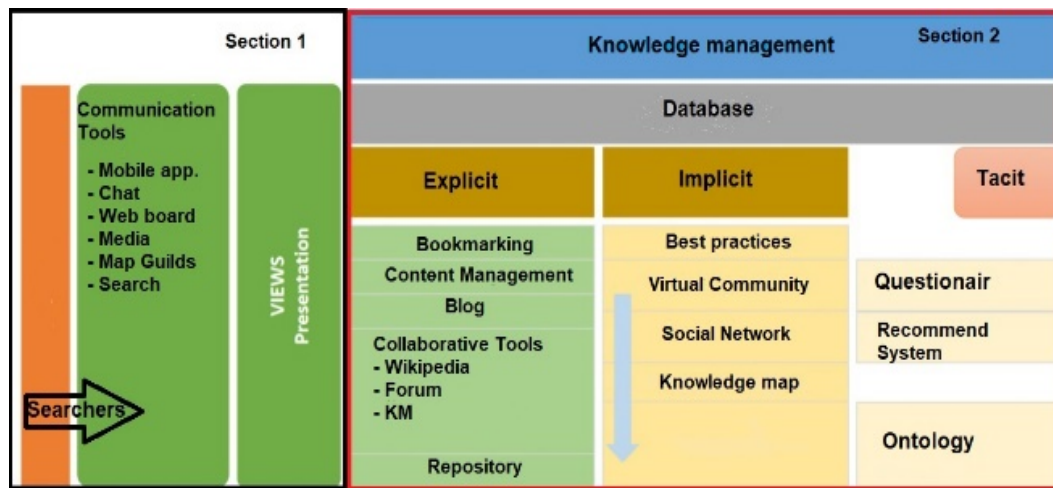

Figure 4. Infrastructure of the Knowledge Management System.

In figure 4, Section 1 is the user (searcher) interface. From here, users of both the web app and mobile app who wishes to look for information from the Knowledge Management System, for example, find routes to an attraction, which can be done by searching for information from the web board. The system's functional are as shown in Table 1.

Table 1. The system's functional

No	Functional Requirement
1	Several topics of knowledge in the database. For example, searching from the attraction name, coordinates or popularity.
2	Online chat with tourism experts
3	Web boards for each topic, allowing interested people to write posts and exchange knowledge.

Table 1. The system's functional (Continued)

No	Functional Requirement
4	Central Database for storing various types of data such as articles, photos, videos, including 3-D photos.
5	Map Guide Planning which can assign destinations from searches.
6.	Newsletters from mobile application

Section 2 is about the Knowledge Management System. This section is used to store and analyze data from building the ontology knowledge database. The system functional are as illustrated in Table 2.

Table 2. The knowledge management's functional

NO.	functional Requirement
1	A system to analyze and classify Explicit / Implicit / Tacit knowledge to build credibility for each knowledge type.
2	Access Authority Check
3	Voting and rating for knowledge from users and tourism experts.

3.4 Knowledge Management System Testing

Testing of the system will be carried out under real System Environment by testing the system parallel to outside sources such as the web service accompanying the system. The method of this test is User Acceptance Test will be used to test usage data before real use.

3.5 Evaluate User Satisfaction towards the Knowledge Management System.

This step is to assess user satisfaction by the QUIS 7.0 questionnaire, used by 400 people from the sample group with system design knowledge. Concurrent "Thinking aloud" system is used to test and assess satisfaction statistically.

4. Results

4.1 Results from data collection

After gathering data for building the knowledge management system, the next step will be building the ontology with details as follows:
1. Creating a dictionary. The researcher has created a dictionary of terms with various definitions of information to be used as a vocabulary database for use in comparison with search terms that users enter. The vocabulary in the dictionary is divided into 6 categories, namely tourism information, tourism type, tourism business, trading, support from various agencies and tourism development.
2. The concept design of the tourism ontology database in combination style consisting of Domain and scope in 3 aspects as follows:
1. Historical tourism domain
2. Natural attractions domain
3. Tourist attractions in arts, culture, traditions and activities domain
As for the super node, it is divided into types of each domain as follows.
1. Historical tourism domain consisting of 3 super classes which are 1. Province class 2. Historical sites class 3. Antiques class
Sub node class of Historical tourism domain consists of 1. Province class divided into Khon Kaen, Mukdahan, Kalasin 2. Historic Site class, which is divided into Religious, Historical Park and City Wall, Monument, Ancient Community 3. Antiques class divided into naturally occurring, artificial. Details are shown as figure 5.
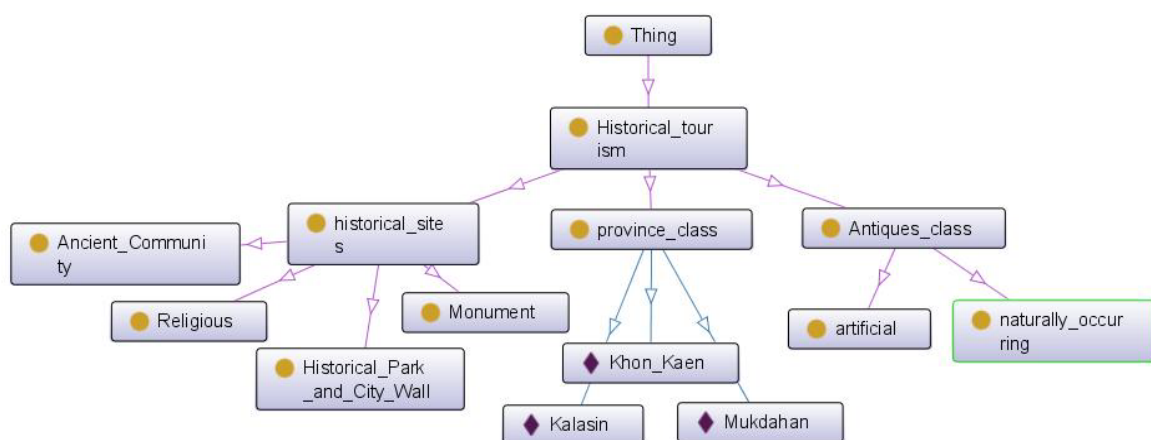

Figure 5. Historical tourism domain.

2. Natural attractions domain consists of 3 super classes which are 1. Province class 2. Naturally occurring class and Man-made attraction class
Sub node class of the Natural attractions domain consists of 1. Province class divided into Khon Kaen, Mukdahan, and Kalasin. 2. Naturally-occurring class are divided into Mountain, Forest, Waterfall, Beach, Cataracts 3. Man-made attraction class in divided into park, dam, reservoir with details shown figure 6.
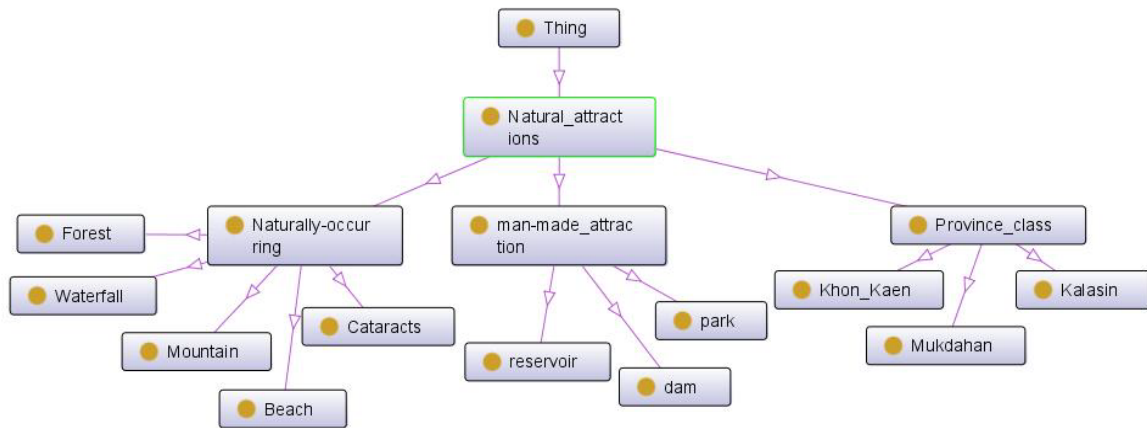

Figure 6. Natural attractions domain.

3. Tourist attractions in arts, culture, traditions and activities domain consists of 6 super classes; 1. Province class 2. Rural lifestyle tourism class 3. Recreational attraction class 4. Arts and culture class, 5. Traditional class, and 6. Activities class.
Sub node class of Tourist attractions in arts, culture, traditions and activities domain consists of 1. Provinces class, divided into Khon Kaen, Muk Daharn and Kalasin. 2. Rural lifestyle tourism class is divided into Village and Community, Cultural Center, Markets and Farms. 3. Recreational attraction class is divided into parks and stadiums 4. Art and culture class divided into ways of life 5. Traditions class divided into Traditional Festivals. 6.Activities class are divided into cultural exhibitions and welcome participants. Details shown in figure 7.
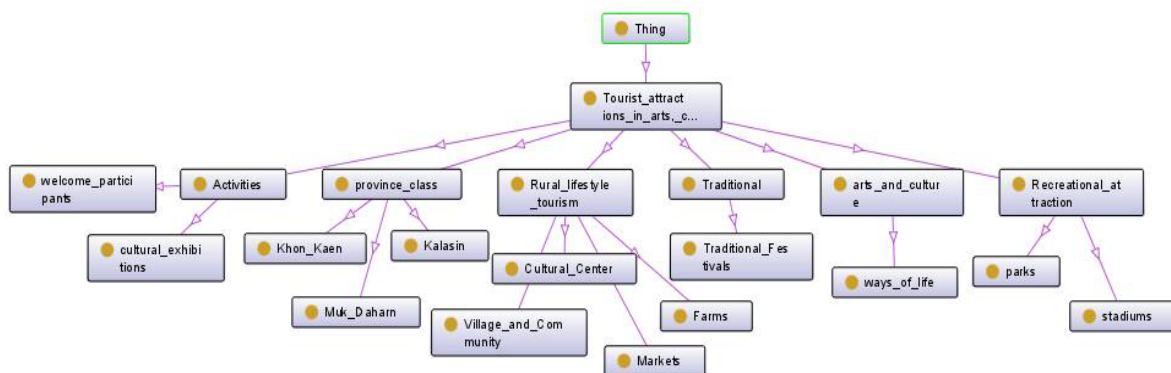

Figure 7. Natural attractions domain.

The final of sub node class level 4 is organized into every sub class, divided into 7 classes which are 1. accommodation, 2. festival, 3. district, 4. route, 5. subdistrict, 6. restaurant, 7. shops and souvenirs, respectively. Details shown in figure 8.
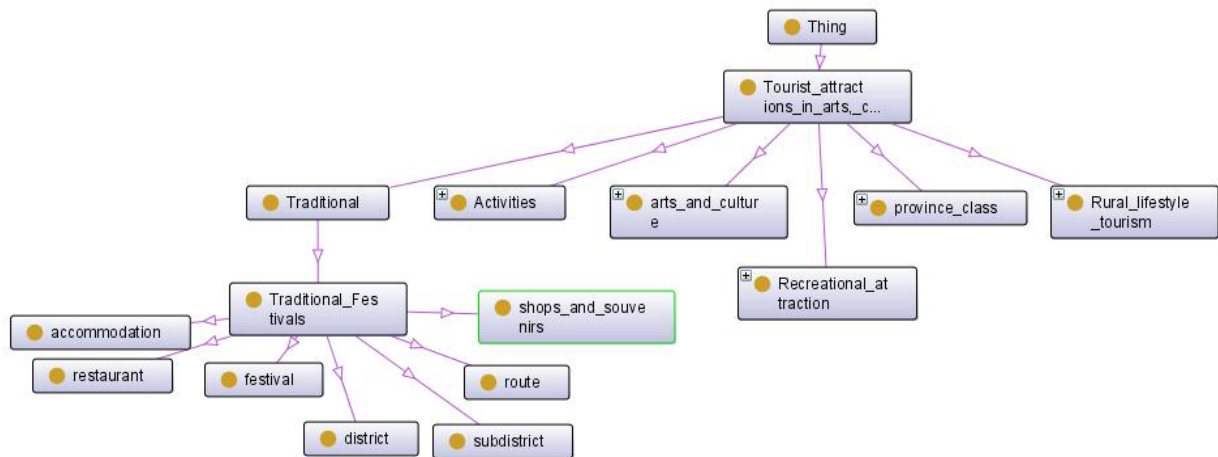
Figure 8. The final sub node class level 4.

The relationship between ontology is divided into 3 types as follows:

- Is - a refers to a relationship classified as
- Part-of (p / o) means "is a component of"
- Attribute-of (a / o) means "the attribute of"

The design of the tourism ontology database consists of 3 Domain classes, 4 levels of class Hierarchy and the relationship between ontology divided into 3 types. The researcher describe the data in the OWL (Ontology Web Langrage) and connected the database of the knowledge management system to the tourism ontology database using the Ontology Application Management program (OAM) Framework [19] to enable the knowledge management system that the research created to find the definition of terms according to the research objectives.

For example, the relationship between tourism ontology database and knowledge management system database can be seen in the table 3.

Table 3. Relationship between tourism ontology database and knowledge management system

Tourism ontology database	Relation	Knowledge management system database
Accommodation Class	a/o	Accommodation_Type Acc_ID Acc_Name
District Class	a/o	District _Type Dist_ID District _Name
Festival Class	a/o	Festival_Type Fest_ID Fest_Name
Route class	a/o	Route_Type Route_ID Route_Name

4.2 Results of analysis data

In the efficiency test by assessing the precision of data searching, the researcher has assigned basic conditions regarding the data and search words by randomizing data from the database and having 400 users recall data with 50 different search words, 50 times each. From the experiment, it can be seen that the precision has 87% F-measure value and average processing time of 0.11 seconds since the ontology's infrastructure is built to be the combination time, which is very repetitive, resulting in longer search times but yields better results than building the ontology with "Top down, Bottom UP" method.

By allowing users to search for tourist attractions, activity types and choose the relationship as a component of Khon Kaen province. The program will extract the information from the tourism ontology database and display the data as in the figure 9(a) searching page and figure 9 (b) the detail of searching page.
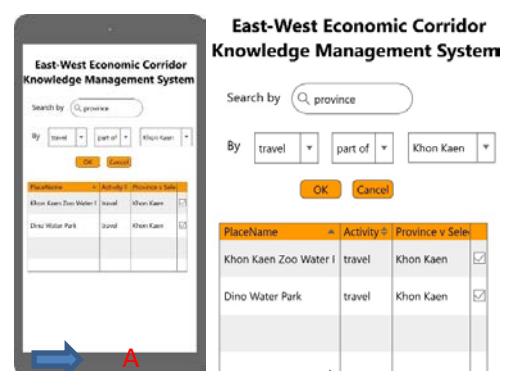

Figure 9. (a)(b) Searching page.

4.3 Designing Knowledge Management System with Ontology

In the design of knowledge management systems, we can describe the system in 2 parts.
1.Explaining the process of knowledge management system using a Flowchart diagram as shown in Figure 10.
2. Explaining the operation procedures of system users with the Use case diagram as shown in Figure 11. The details are as follows:
From Figure 10, the knowledge management system can be described as follows: When the system receives data from the data admin or data science, the system will be group Explicit and Tacit data by considering data recall from the management system database. Then, the data will be stored in the store data. When the user enters the keyword into the system, the system will retrieve the data from the store data to create data modeling. At this stage, the system will check the accuracy of

finding words from the tourism ontology database which has set the search accuracy to be more than 80% to pass the validation process. In the process of data management, Tacit data will start from Expert user filling in the system in the web board section. Then, the tacit data is stored in the tourism ontology database and will be connected to the knowledge management system database to be used for creating a database of research knowledge management systems. As for the explicit data from the user, gained from filling in the information on the web board and online chat. The data will enter the Content Management System database so that the system can help manage the content and data related to the key words that need to be stored. After that, all information will be sent to link to the tourism ontology database.
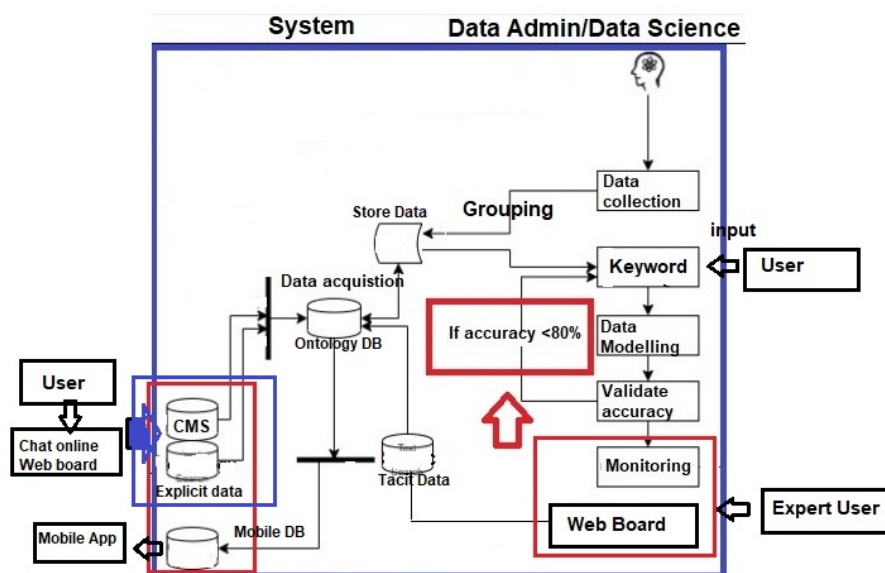

Figure 10. Flow of Knowledge management system.

In Figure 11 illustrates the use case diagram, consisting of users which is broken down into 4 parts, user, expert user, data admin and data science. The user's duty is to find knowledge and information and communicate online with tourism experts and provide web boards for tourism-related topics for interested users to post in and exchange.

Data admin and Data science will take care of central database and storage according the ontology pattern. Lastly, the expert user adds information and answers the questions in the web board. They also keep track and add new knowledge by processing them under the SECI Model.
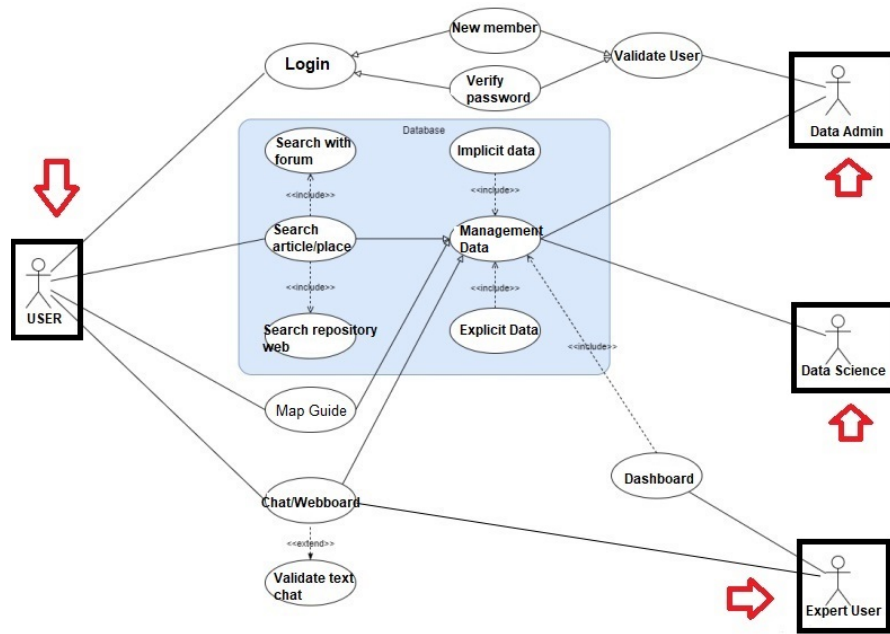
Figure 11. Use case diagram

4.4 Knowledge Management System Design

The designed Knowledge Management System can be used on both web apps and mobile apps, with the login screen and main menu shown in Figure 12(a) and 12(b)
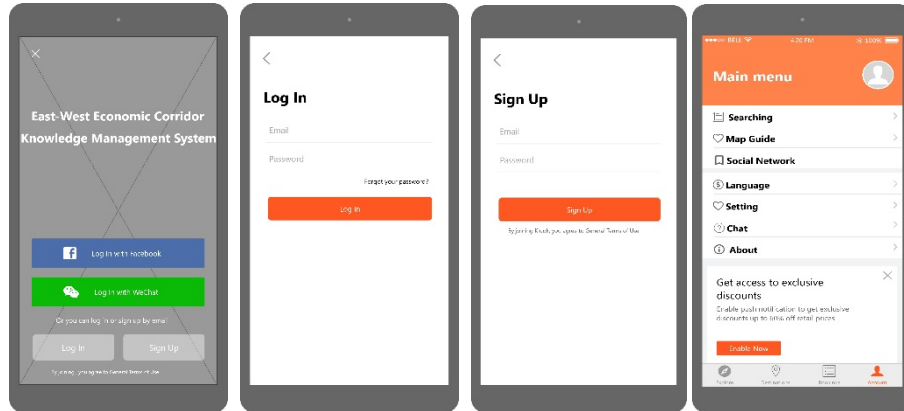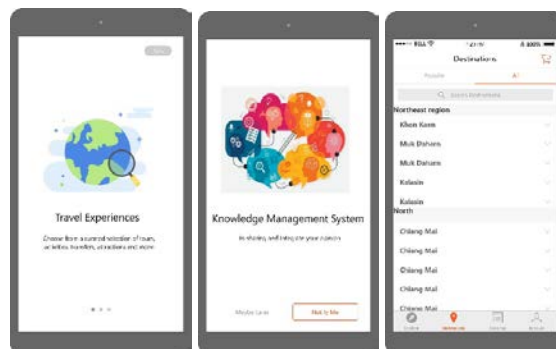

Figure 12(a) Login and Main page

Figure 12(b) Writing Information and searching

Figure 12(a)(b) Illustrates the mobile app's user interface with 7 pages: main page, Login page, sign in page, create travel experiences, sharing information, searching destination

4.5 Knowledge Management System Test Results

As for the testing process, the testing utilizes the User Acceptance Test, with a total of 400 system testers showing the test percentage. By referring to the method from the Descriptive Statistics [20]. The test values can be shown in Table 4.

Table 4. Showing test results from user acceptance

Method	Requirement	UAT Checklist	Results	
			% pass	% Not pass
1	Provides a search system which covers a variety of knowledge, such as attraction names, coordinates or popularity	- Can search from a variety of information, such as attraction info, coordinates or popularity - Cannot Input Numerical information	95%	5%
2	Provides online chat via messaging for communication with tourism experts	- Capable of group and personal online chat - Has a system for checking online chat users	100%	0
3	Provides a web board for interested people to post and exchange knowledge	- Capable of posting, editing, adding to the posts and comments - Capable of verifying users in the comment section	100%	0

Table 4. Showing test results from user acceptance (Continued)

Method	Requirement	UAT Checklist	Results	
			% pass	% Not pass
4	Includes a central data storage system to store different types of data including data, articles, pictures, videos, and 3-d pictures.	- Articles, pictures, videos, and 3-d pictures can be added, edited or deleted.	100%	0
5	Includes Map Guide Planning that can pinpoint the location from the search	- Able to connect to Google maps to find travel routes	100%	0
6	Includes newsletters for interesting news on mobile application	- Users can send and receive news on mobile applications.	100%	0
7	Includes a knowledge analysis system to classify Explicit and Tacit data	- Able to classify users and expert users when user login in the system - Present username in the top of page	100%	0
8	Includes a system to check for usage rights	- Able to log in and check for usage.	100%	0
9	Includes a system to vote and rate knowledge for users and tourism experts	- Data classification can be rated on web boards.	100%	0

From the table, you can see that A total of 400 system testers tested the system from 9 functional requirements of the system. There were 1 item that 95% of the participants answered because some testers did not understand the process of filling the data into the search menu due to the complicated

process. Therefore, the researcher has redesigned the user interface by presenting the user interface as in section 4.2. As for the remaining test results, all system testers can test out every function.

4.6 Evaluating User Satisfaction Towards the Knowledge Management System with QUIS 7.0

User Satisfaction Assessment with QUIS 7.0 from 400 users are illustrated in Table 5. It presents in percentage.

Table 5. Results of satisfaction assessment with Quis 7.0

Question / Scale	1	2	3	4	5	6	7	8	9
Q1 Screen							5	95	
Q2 Terminology and system information							6	94	
Q3 Learning								15	85
Q4 System Capabilities								5	95
Q5 Usability and User interface								5	95

From Table 5 shows the average result of each question. Out of 400 respondents, the results show that the Q1 questions about the Screen, 95% of the users answered "easy to read" level 8 and 5% on level 7. Question Q2 on Terminology and system information, 94% of the users' answers are consistent at level 8, leaving Level 7 at 6%. Q3 on Learning, 15% of the users answered at easy-Level 8 and 85% for Level 9. Q4 questions about System Capabilities; 95% of users answered Reliable level 9, 5% Level 8. Questions Q5 Usability and User interface, 95% of users answered good level 9, 5% level 8, respectively, based on the average of each question. It shows that the result of the satisfaction assessment over level 5 in all items makes it possible to conclude that the developed knowledge management system provides test results that are satisfactory to the system users.

5. Summary, Suggestions and Discussion

5.1 Summary

In this research, the objective is to develop a knowledge management system using an ontology method with a case study on the tourism industry based on the EWEC economy corridor. By using an ontology database management method, users can search for tourist information, Meeting the needs for the data used in creating the knowledge management model, namely tourist information, divided into 3 domains: 1. Historical tourism domain 2. Natural attractions domain3. Tourist attractions in arts, culture, traditions and activities domain. The work process of knowledge management system is divided into 2 parts which are (1) creating a database of the knowledge management system by importing data from users and expert users (2) the creation of tourism ontology database which is the part that creates the relationship between data created in the form of ontology, then analyzing for data accuracy from the users' search. In this section is the use of tourist information separated by various criteria obtained from experts and tourists that have used the system. The results of the knowledge management system analysis concluded that when the knowledge management system was tested with 400 system users, data retrieval was performed by specifying different search terms. The test found that the F-measure level is 87% and the average time of data recall is 0.11 seconds. The system test using the User Acceptance Test gives the total test result value at 100%. With the QUIS 7.0 questionnaire, the result of the satisfaction assessment is over level 5 in all items thus making it possible to conclude that the developed knowledge management system provides test results that are satisfactory to the test users.

5.2 Suggestions and Discussion

Developing a knowledge management system using an ontology in the next research comes with suggestions as follows.
1. Adding factors that affect the selection of tourist attractions of both domestic and foreign tourists to help the system more clearly identify the various types of tourism needs based on personal characteristics.
2. More study should be conducted on the data for tourist groups forecasts based on personal characteristics to better predict interest in selecting destinations and supporting the tourism industry.
3. Additional vocabulary from Thesauruses should be studied in the tourism domain of the World

Tourism Organization (WTO) [21] for the e-library that has collected synonyms, autonyms, and other word forms

4. More study should be conducted on tourism behavior of tourists that changes according to time to add more functionality to the system.

6. ACKNOWLEDGMENT

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