Reengineering knowledge for e-tourism and hospitality curricula

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Abstract: *E-tourism and hospitality represents the development of tourism and hospitality to integrate ICT tools and has significantly changed the industry over the last decade. In order to meet the new needs, knowledge service suppliers (i.e. the university) must meet the requirements and social developments of the tourism industry. The quality of e-tourism and hospitality curriculum depends largely on the education quality and its subsequent implementation. The research reveals that higher education is not currently meeting the needs of the industry, especially in the Greater Mekong Sub-region countries. This article focuses on two major problems, which represent a disparity between the knowledge needs of the tourism and hospitality industry and the knowledge provided by curricula in higher education. The authors leverage a knowledge engineering perspective so as to bridge the gap between knowledge demand and supply as related to e-tourism and hospitality curriculum design.*

Keywords: E-tourism, knowledge engineering, knowledge management, supply chain management, knowledge supply chain

JEL Classification: *L83, M1, O1*

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1 INTRODUCTION

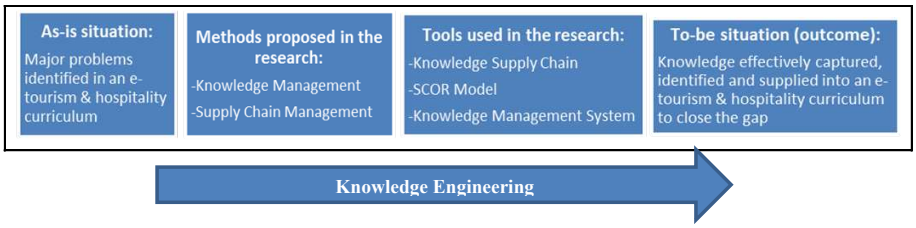
The tourism and hospitality industry has continually innovated and evolved its products and services. In particular, tourism & hospitality has taken advantage of Information and Communications Technologies (ICTs), using it as a tool to bridge tourism and hospitality suppliers, intermediaries as well as end-consumers, while simultaneously reengineering the industry towards increased customer satisfaction. It is evident that ICTs have facilitated the development and subsequent improvement of the tourism and hospitality industry by disseminating information and providing operational models for enterprises and tourist destinations around the world (Mistilis *et al*., 2014).

ICTs have been applied to the tourism & hospitality industry in Europe and America for more than 40 years; however, the e-revolution in the Asian tourism & hospitality sector has been piecemeal and *ad hoc.* In the Greater Mekong Sub-region (GMS), e-tourism & hospitality began in the early 1980s and, compared to its western competitors, the tourism & hospitality industry in these countries is facing serious challenges, such as an acute shortage of desired infrastructure and skilled human resources (Asian Development Bank Report, 2012). The result is that tourism & hospitality Revenue Leakage (TRL) occurs, causing tourism & hospitality revenue earned within a country to be 'leaked' to foreign companies and tour operators (Jenkins, 2014). This situation underlines the need to spread e-tourism & hospitality education and raise awareness among GMS countries, where tourism & hospitality education is provided mainly through higher education (HE) services. Higher education as a service industry has undergone significant changes worldwide, but has been regarded as conservative and slow in its response to market requirements (Turki *et al.*, 2007), particularly in serving high technology and knowledge intensive industries like e-tourism & hospitality.

This paper focuses on how to solve the issues associated with e-tourism & hospitality education through a knowledge engineering approach to identify and supply the knowledge for a curriculum. Specifically, Common Knowledge Analysis and Data Structuring (CommonKADS) as well as the Supply Chain Operations Reference (SCOR) model are proposed to capture the process of curriculum design. Knowledge Management Systems (KMS) are also investigated as a powerful tool to facilitate the knowledge flow between knowledge supply and demand. The research methodology is conceptualized in Figure 1, which

identifies the current as-is and desired to-be scenarios within e-tourism & hospitality curriculum design and illustrates the proposed approach within this article.

Figure 1: Conceptualization of the gap between knowledge demand and supply to the tourism & hospitality industry, along with proposed tools to close the gap



2 BACKGROUND AND LITERATURE

Based on the experience of the European Community, ten countries in Southeast Asia agreed to create a unified community known as the Association of Southeast Asian Nations (ASEAN). Aiming to establish a highly competitive single market and production base by 2015, the ASEAN Economic Community plans to promote equitable and sustainable economic development for member states, as well as the community via a free flow of services, investment, capital, and skilled labor. The signed Mutual Recognition Agreement (MRA) on tourism from the 2011-2015 ASEAN tourism Strategic Plan is expected to facilitate movement and use of skilled labor among ASEAN member countries as well as promote tourism & hospitality within the block (Association of Southeast Asian Nations). This trend of regional collaboration has significantly challenged the HE in its provision of education and labor for the tourism & hospitality sector.

In Thailand, 70% of all tourism & hospitality revenue goes to foreign tourism agencies (UNEP, 2011), mainly because local tourism & hospitality industries in Thailand are less competitive than international intermediaries such as foreign travel agencies and tour operators from developed countries. These agencies and operators meet the needs of international tourists by globally distributing their products and services through high technology and intellectual personnel. This competitiveness depends largely on the education of e-tourism & hospitality workers. To meet the needs of international tourists, GMS countries must embrace e-tourism & hospitality concepts and methodologies, and a demand therefore exists for a specific e-tourism & hospitality education.

A gap was identified between the competencies required from Thailand's tourism & hospitality industry and those provided by universities (Fu *et al.* 2010). In filling up this gap, the "as-is" problems of current e-tourism & hospitality curriculum design were highlighted and a desired "to-be" outcome was identified, which is required to meet the needs of the industry. The authors conducted a qualitative research, diagnosing the long lead-time of curriculum implementation and the lack of knowledge provision and sharing (see Figure 1) as the two fundamental problems preventing closure of the gap between knowledge demand and supply in e-tourism & hospitality curriculum design. This paper aims to move forward from a qualitative description of the problems facing Thailand's higher education and leverage a knowledge engineering approach to capture and structure the necessary knowledge to create a sustainable e-tourism & hospitality curriculum. Chiang Mai University, among the top three research universities of Thailand was selected as a case.

Prior to a consideration of data collection strategies and analysis, there is a need to introduce the definitions and deepen the analysis of concepts used in this research through a brief description of Knowledge Engineering (KE), Supply Chain Management (SCM) and Knowledge Management (KM). The potential integration of SCM and KM will then be identified and discussed.

2.1 Knowledge engineering, supply chain management and associated tools

Knowledge Engineering (KE) is a conceptual approach to modeling knowledge in the form of computational constructs and software implementation (Schreiber *et al.,* 2000). In this research, knowledge supplied and delivered within a curriculum is approached using supply chain management and knowledge management as these computational constructs and software aspects.

Before introducing the tools of SCM, it is necessary to understand why SCM is used in this research and how it can be applied to solve the long-lead time of e-tourism & hospitality curriculum design. Supply Chain Management (SCM) is a philosophy and

management process, which emerged in the 1980s from business practices of the time, and subsequently gained academic focus during the 1990s (Houlihan, 1985; Oliver and Webber, 1991; Lamber *et al*., 1998; Svensson, 2003). There are a variety of definitions ranging from strategic and functional perspectives, to procurement and logistical points of view, but the most useful in this research is that SCM is a network used to deliver products and services from raw materials to end customers through an engineered flow of information, physical distribution and cash (Supply Chain Council).

While supply chain concepts and principles were developed in the manufacturing sector, they have been applied to the education sector (Yen, 2005). Analogous to the production of goods in the manufacturing industry, products of higher education are intellectual assets, and higher education institutes are attempting to satisfy their stakeholders through a variety of methods. Researchers from educational and manufacturing fields are leveraging tools of supply chain management to close the existing gap between the outcome of education and the needs of the job market. The notion of the educational supply chain was put forward by Yen (2005), and since then, research has built on this with the United Nations Conference on Trade and Development (2006), introducing the concept of the corporate university and O'Brien and Deans' (2006) applying a SCM model to GIS education as a framework for interdisciplinary programs. The use of SCM principles for business schools was recommended by Selen (2001) and Lau (2007) separating the educational supply chain into student and academic supply chains in order to highlight the synergy of industry involvement and the importance of customer satisfaction with higher education. More recently, research suggests that a reconfiguration of the higher education supply chain is necessary (Pathak and Pathak, 2010).

In previous decades, the education system has successfully benefited from a systems design methodology (as used in systems engineering), to analyze existing education and design new curriculum (Romepleman and Graaff, 2006). The literature has shown success in applying supply chain management principles to the manufacturing and education sectors, however very few studies have applied supply chain management techniques to curriculum design. This is because researchers within the field of curriculum design have often been reluctant to envisage knowledge as a product, and have been drawn into existing epistemological and philosophical debates about what knowledge is (Xu and Bernard, 2011). Although there is controversy about whether knowledge can be shifted and moved through a supply chain akin to physical products, the Knowledge Engineering (KE) perspective taken in this article considers that knowledge can be modeled to solve problems. Accordingly, the research argues that supply chain management techniques could be utilized to improve efficiency and close the gap between knowledge supply and knowledge demand in e-tourism & hospitality curriculum provision. Specifically, the research applies the Supply Chain Operations Reference (SCOR) model to capture the problems and processes of curriculum design.

The SCOR model was originally created by the Supply Chain Council, an independent, global corporation open to all companies and organizations interested in applying and advancing the state-of-the-art in supply-chain management systems and practices. The widespread use of the SCOR model results in enhanced customer-supplier relationships, and software systems that can more appropriately support members, with the ability to rapidly recognize and adopt best practice no matter where it originates (Supply Chain Council).

The SCOR Model is proposed in this research as it provides a globally accepted and standardized description for any management and production process to measure process performance. Once a process is captured in the SCOR model, it can be implemented purposefully to achieve competitive advantage, and to measure, manage, control, tune and re-tune to a specific purpose. The specific aspects of data collection associated with the SCOR model are described in Section 3, while the background associated with KM and its tools are described below.

2.2 KM and its tools

Solving the issue of a lack of knowledge provision and sharing in e-tourism & hospitality curriculum design is a key component in closing the gap between knowledge supply and demand, which includes two aspects; the knowledge requirements and how to effectively and efficiently transfer such knowledge. Knowledge Management (KM) is recommended by many researchers as a practice to enhance the competitiveness of businesses from both industrial and educational fields. These researchers believe that KM can be used by higher education institutes to gain a more comprehensive, integrative and reflexive understanding of the impact of information on their organizations (Davenport, 1997; Petrides *et al.,* 2004). Additionally, research suggests KM should lead to better decision-making capabilities, improved academic services, enhanced industry-education alliances and reduced costs (Kidwell *et al.,* 2001). Researchers such as (Kidwell *et al.,* 2001) elaborate the opportunities and practices for colleges and universities to apply knowledge management to support every part of their objectives. In terms of curriculum, they showed that KM can bring benefits to curriculum design and development in several ways, functioning as a repository of curriculum revisions, including curriculum research, measurement of effectiveness, best practice, lessons learned, and a set of pedagogy and assessment techniques, including outcomes tracking, and faculty research and development opportunities.

A commonly used tool in KM is a Knowledge Management System (KMS), which is an IT based information system used to assist in the management of organizational knowledge. There has been a rapid uptake and diffusion of KMS by organizations, but a lack of a clear and consistent definition, and a scarcity of research evaluating KMS implementation and success (Wu and Wang, 2006). In this research, the definition of a KMS is that it is a tool to facilitate a knowledge flow and enables knowledge

provision and sharing among knowledge suppliers (professionals and experts) in the form of Communities of Practice (CoP). CoP comprise a set of people who share a concern, a set of problems, or are passionate about a topic, and strive to deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger *et al.,* 2002; Nair and George, 2016). A KMS in terms of e-tourism & hospitality curriculum design can be used as a facilitator of knowledge provision and sharing, helping to directly address these knowledge provision and sharing issues within e-tourism & hospitality curriculum provision, as well as indirectly shortening the lead-time of e-tourism & hospitality curriculum development in GMS areas. In order to solve the two fundamental problems associated with e-tourism & hospitality curriculum design, there is a need to synergistically integrate the tools of KM and SCM in order to close the gap between current knowledge provision and the knowledge demanded by the GMS tourism & hospitality industry.

2.3 Knowledge supply chain: Integrating SCM and KM

Although research has demonstrated success in applying KM tools to higher education, limitations are still found. Practitioners (Thitithananon and Klaewthanong, 2007) claim that:

- It is difficult to classify and assess knowledge in curriculum design.
- The social network and CoP for curriculum are difficult to reach.
- There is difficulty in labeling knowledge as a product which can be moved.
- The time to revise and update curriculum takes at least three to five years.
- It is both complicated and time-consuming to apply KM to the whole process of curriculum design.

Practices to improve the efficiency and competitiveness of higher education curriculum have so far been limited to a piecemeal approach using either knowledge management or supply chain management as isolated tools. A knowledge supply chain was defined by Fu *et al.* (2012) as *"the knowledge flow and management process in the cycle of e-tourism & hospitality curriculum design, implementation, and maintenance from suppliers to end-users",* which at the first time integrated KM and SCM into a KSC. Knowledge within a curriculum design is thus treated as a product, with the process of curriculum design and development simulated as a supply chain from knowledge supplier (university) to knowledge user (industry). The proposed knowledge supply chain encompasses the whole process of how knowledge is planned, supplied, made, delivered and returned in a curriculum. In addition to closing the gap between knowledge supply and demand, the ultimate aim is to meet the other, less tangible requirements associated with both the academic and practical needs of e-tourism & hospitality's social stakeholders (e.g. employers, students, tourist satisfaction). Based on the features and elements of the supply chain and the integration of knowledge management, the authors define the knowledge supply chain as, *"the knowledge flow and management process in the cycle of e-tourism & hospitality curriculum design, implementation, and maintenance from suppliers to end-users"*.

3 RESEARCH METHODOLOGY

As illustrated in Figure 1, and the previous literature review, to close the gap between knowledge supply and demand in e-tourism & hospitality curriculum design, a knowledge engineering approach is used to identify e-tourism & hospitality knowledge requirements and how to supply that knowledge in a Knowledge Supply Chain (KSC).

Four main steps were followed in the methodology to identify and solve the two fundamental problems associated with e-tourism & hospitality curriculum design. These steps are: 1: Data collection; 2: Benchmarking; 3: Case modeling; 4: Case simulation.

3.1 Data collection and structuring

Data collection and structuring was undertaken via a knowledge engineering perspective. In the 1980s, Knowledge Engineering (KE) was often regarded as a process to extract or mine knowledge from experts. It was not until recently that it was shown as an activity to model human knowledge, which addresses experts, knowledge users, and their behaviors in the workplace to solve problems. KE is defined by McDonald *et al.* (1997) as *knowledge modeled at a conceptual level, in the form of computational constructs and software implementation*. According to Schreiber *at al.*, (2000), KE focuses on the conceptual modeling of knowledge management activities. Knowledge can be complex, but not chaotic and can certainly be managed and structured by KE (Hart, 1992).

In-depth interview was used to capture knowledge, which is one of the most extensively-used methods of data collection (Bryman and Burgess, 1994). The interviewees who are from both academia and industry in this research went through structured interviews involving face-to-face questioning, emails and telephone dialogues. Six professionals from the departments of Human Resources, IT and Marketing of tourism and hotel sectors in Thailand were interviewed face-to-face in order to determine knowledge demand from the industry, for those departments extensively dealing with the development personnel and know about industry requirements. Twelve academics of three e-tourism & hospitality relevant sections (tourism & hospitality, IT and Business sections) from both research-intensive university (e.g. Chiang Mai University) and teaching-

intensive university (e.g. Payap University) were asked about the questions of what and how knowledge is supplied in the e-tourism & hospitality curriculum which covers tourism & hospitality, IT and business area. Finally, 60 senior students from three Departments (Tourism & Hospitality, IT and Business sections) were met to identify the gap between knowledge demanded and supplied. These students are doing or have just finished their cooperative education/internship program. Once this knowledge was captured, there was a need to structure it using KE.

Many KE techniques have been used to model captured knowledge in order to solve problems. To structure the collected data with regard to e-tourism & hospitality curriculum design, the Common Knowledge Analysis and Data Structuring (Common KADS) tool was used to specify a knowledge model, including task, inference and domain knowledge. Task, inference and domain knowledge can be described as follows:

- Task knowledge: the knowledge required to complete tasks or achieve desired goals when problem solving or decision-making.
- Inference knowledge: the control of knowledge abstracted from the task that describes the steps (or reasons for the steps) in a problem-solving task.
- Domain knowledge: the conceptualization of knowledge contributing to problem solving in a particular domain. Normally, domain knowledge is derived from experts as related to their learning, working and problem solving.

A CommonKADS question template was used to elicit the effects of the questions in terms of the questioning process *(adapted from Schreiber, 2000):*
Question 1:
What is the most important inference? → (To generate assertion into a rule).
Question 2:
What is the first concept coming to your mind? → (To generate assertion into a rule).
Questions 3:
What are the important factors? → (To generate more rules).
Question 4:
Do you have some alternatives? → (To generate more rules).
Question 5:
Can you tell me more about that? → (To generate further dialogue if the expert dries up).
CommonKADS utilizes a four-step process to gather and structure knowledge. The first step is knowledge elicitation where the structured interviews are used to acquire task and domain knowledge and its relationship with inference knowledge via selected knowledge templates.

The second stage involves knowledge analysis, where the needs from industry and academia are analyzed and balanced according to the development of tourism & hospitality at global, regional and local perspectives, in addition to the requirements of higher education.
The third aspect is knowledge validation, which teaches back the acquired knowledge to experts based on the transcripts of the interview. The experts can interrupt the teach-back at any point if they disagree, or can make corrections and add on additional information or discussion. In this way, knowledge captured and analyzed is validated.
The last step involves modeling the knowledge into structured diagrams (Figures 2, 3, 4).
The data have been collected at two universities within Chiang Mai, northern Thailand, in order to assess e-tourism & hospitality curriculum provision in the GMS area, which, as described in Section 1, needs to modify its e-tourism & hospitality curriculum provision to reduce the leakage of tourism & hospitality revenue.

In-depth interview is one of the most extensively-used methods of data collection (Bryman and Burgess, 1994; *Denzin* and *Lincol, 2000)* and was used to capture knowledge from the professionals of the tourism & hospitality industry, academics, as well as students. The interviewees in this research went through structured interviews involving face-to-face questioning, emails and telephone dialogues.

- 20 professionals from the sections of Human Resources, IT and Marketing of tourism operators, travel agencies and hotels in Thailand were interviewed face-to-face in order to know knowledge demand from the industry, for those departments extensively dealing with the development personnel and know about industry requirements;
- 20 academics of three e-tourism & hospitality relevant departments (tourism & hospitality, IT and Business departments) from both research-intensive university and teaching-intensive university were asked about the questions of what and how knowledge is supplied in the e-tourism & hospitality curriculum which covers tourism & hospitality, IT and business area;
- 40 senior students from three departments (tourism & hospitality, IT and Business sections) of CMU were met to identify the gap between knowledge demanded and supplied; these students are doing or have just finished their cooperative education/internship program in the tourism/ hospitality industries.

The empirical part of this research reflects these interviews, and identified professionals, academics and students as the three actors in the design, implementation and assessment of the e-tourism & hospitality curriculum. Targeting tourism & hospitality professionals allowed an increased understanding of the changing needs of the industry, and expectations from e-tourism &

hospitality in higher education. The findings from interviews with tourism & hospitality professionals were compared with in-depth interviews conducted among academics and students in Thailand, with a focus on knowledge required for the e-tourism & hospitality curriculum and how to manage it. The interviews also investigated the experience of knowledge sharing through questions formulated from a review of academic literature, which assisted in question selection and phrasing.

Curriculum documentation (e.g. curriculum standards, requirements, philosophy, objectives) was also used during data collection, as it serves to illuminate many aspects of a curriculum's organization (*Cassell* and *Symon*, 1994). A review of documents is also an unobtrusive method to portray the values and beliefs of participants in the research setting (Marshall and Rossnan, 1991).

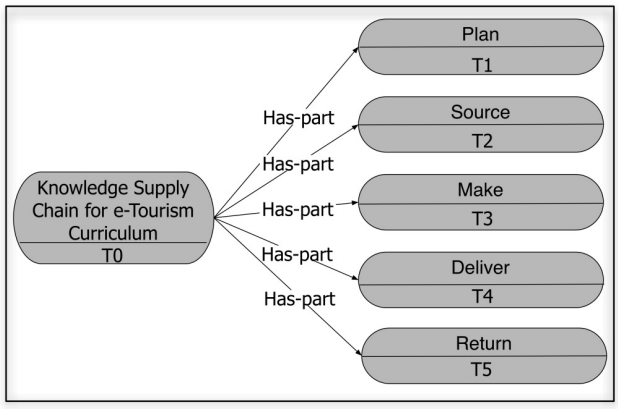
4 FINDINGS AND DISCUSSION

Once data had been collected, structuring took place using CommonKADs. To characterize the current knowledge flow from knowledge suppliers to users in curriculum design required consideration of both tacit and explicit knowledge. The domain knowledge from the experts was managed according to the stimuli-response in the interviews. Based on this, software requirements of the knowledge management system (KMS) were specified in preparation to model the domain knowledge into a knowledge package to share among the three key actors of e-tourism & hospitality curriculum design.

According to the SCOR model, the process of curriculum design was divided into five processes, which are Plan, Source, Make, Deliver and Return, aiming to achieve the creation of a knowledge supply chain for e-tourism & hospitality curriculum design. The templates of the CommonKADS used in this research provide faster and more effective method in task (Figure 2) and inference knowledge (Figure 3) modelling, which corporate tacit knowledge explicit as well as to make use of explicit knowledge. By using knowledge templates, it directly supports systematic and structured modelling, which generate a graphical representation from the knowledge captured in the interviews and documentations. In such a structured interview, the authors only focus on capturing domain concepts and their relationships with inference roles and inference steps contained within the inference structure of the selected templates.

Figure 2 shows the separation of the curriculum design task into these five SCOR processes using CommonKADS.

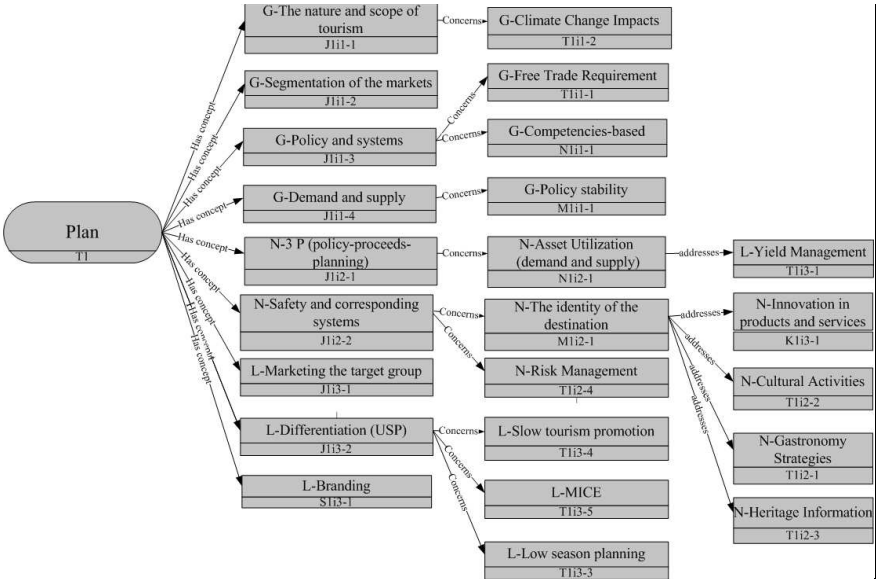
Figure 2: Task knowledge modelling



Based on the in-depth interviews with experts and professionals, the structured CommonKADS template was used to sort transcripts according to the priority of the inferences in the stimuli-responses. Taking 'Plan' as an example, questions were asked in three groups, namely; why (e.g. the most important issues when designing an e-tourism & hospitality curriculum from a global view, and *why* are they important?), what (e.g. *what* is the nature of the tourism & hospitality of Thailand/Chiang Mai?) and how (e.g. *how* knowledge can be implemented in a computer system?)

Figure 3 illustrates for the example of 'Plan', how questions were asked and how the resulting data were structured using a CommonKADS framework. The knowledge captured was coded and structured according to different knowledge providers (the interviewees), e.g. for the same question, the code J1i1 means the knowledge captured from a tourism professional J, which concerns the knowledge from a tourism curriculum designer T, coded as T1i1-2. In this way, it is easier to analyze and validate the knowledge from different experts for further knowledge modelling.

Figure 3: Example of inference knowledge modeling



The captured domain knowledge further explained the steps and reasons contributing to solving the e-tourism & hospitality curriculum design issues.

Figure 4 shows an example of this domain knowledge modeling. Among all the inference knowledge captured and analyzed within the SCOR model's 'Plan' step of e-tourism & hospitality curriculum design, the scope and nature of tourism & hospitality was the first factor considered by the professionals who were interviewed. This was then separated into the three components of tourism & hospitality (3As: attraction, accommodation and amenities; tourists; and how to meet tourists' needs). Therefore, when planning the curriculum, these inferences must be considered as a priority.

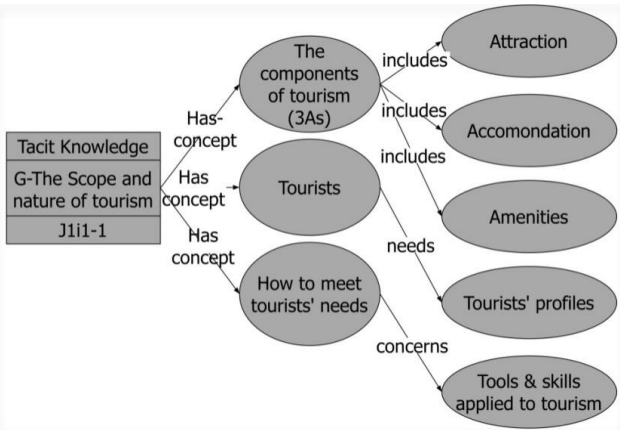
Structuring the data using CommonKADS identified three main problems with e-tourism & hospitality curriculum design and how they might be solved.

- Problem one is a lack of knowledge provision and sharing and is believed to directly influence problems two and three.
- Problem two is the long lead-time for the process of curriculum design and implementation and directly results in the mismatch between society needs and curriculum provision.
- Problem three is that a disconnection lies between the curriculum designer and curriculum operator, which separates the planning of curriculum content from industrial requirements (Forrest *et al.,* 2006).

As the three problems identified above, the lack of knowledge provision and sharing is the most-often mentioned issues when designing an effective curriculum. Long lead-time is another important reason, which results in the gap between society needs and curriculum provision. The disconnection between curriculum designers and operators was identified by four senior lecturers/curriculum designers.

Following the data collection and analysis, there was a need to benchmark the existing e-tourism & hospitality curriculum in the case study against other e-tourism & hospitality curricula, both inside and outside of the GMS area.

Figure 4: Captured domain knowledge modeling



4.1 Benchmarking

Curriculum comparison and analysis was conducted by collecting best practice information regarding e-tourism & hospitality curriculum from literature and the Internet and comparing among 11 universities in America, Europe and Asia. These universities were selected based on their comparatively good reputation (determined by citations in research papers), which are:

- *Universities in Thailand*: Chiang Mai (North), Payap (North), Prince Songkla (South), Mahidol (Central), Kasetsart (Central), Silapakorn (Central), Suan Dusit Rajabhat (Central), and Khonken (Northeast);
- *Universities outside Thailand*: Cornell (US); Denver (US), Florida International (US), Hawaii (US), Temple (US), New York (US), Bournemouth (UK), Nottingham (UK), Surrey (UK), Module Vienna (Austria), and Hong Kong Polytechnic (China).

Through data collection and benchmarking, it was found that no universities in Thailand provide e-tourism & hospitality curriculum as an independent discipline. Although much progress has been made in America (e.g. Temple University), Europe (e.g. Bournemouth University) and Asia (e.g. Hong Kong Polytechnic University), the two problems identified in this research (the lack of knowledge provision and sharing and the long lead-time) have not yet been solved. Therefore, this research continued to utilize Chiang Mai University (CMU) as a case study to model the "as-is' situation based on current tourism & hospitality curriculum design, and then simulate the desired 'to-be' framework for e-tourism & hospitality curriculum design at the College of Arts, Media and Technology, CMU.

4.2 Understanding the "as-is" situation

CMU, Thailand is one of the top three Thai universities and is a research-intensive university with the aim of becoming a comprehensive institution in northern Thailand for the sake of social and economic development of the region and the country as a whole. Through the interviews and subsequent structuring of data using CommonKADS as well as the benchmarking with other universities in Thailand, the existing way of curriculum design at CMU starts from the requirements of higher education (Thailand Quality Framework) with a consideration of the available resources of lecturers and some information from the industries. Then a curriculum design committee is set up with senior lecturers of tourism and hospitality to decide the program objectives and program plan. The program is then to be implemented.

Structured interviews with a set of prepared questions in a form of knowledge template were conducted to conceptualize and identify problems. From the interviews with industry experts, curriculum designers and senior lecturers, it is evident that curriculum design begins from the Thailand Quality Framework (TQF), a requirement of the Ministry of Education, Thailand. The university balances requirements of industry and the existing resources of lecturers, and sets up a curriculum design committee consisting of senior lecturers and at least two experts outside of the university. Senior lecturers act as the course owners and outline the draft philosophy, objectives and program plan. Finally, lecturers are assigned to the course and conduct their teaching syllabus according to the philosophy, goal and objectives of the program, as made by the senior lecturers. Many issues were found, but, this research focuses on the two major problems (illustrated in Figure 1, Section 1), which are:

- The long lead-time of the curriculum, which often takes four years to achieve a complete turnaround in design and delivery, with slight changes after two years.
- The implementation of curriculum is a one-way flow, which shows a clear disconnection between curriculum designers and curriculum operators, which make knowledge provision and sharing difficult.

The data collection in 3.1 and benchmarking in 3.2 along with the structured data in Figures 2, 3, 4 define the "as-is" situation of e-tourism & hospitality curriculum design at CMU and more generally in Northern Thailand. The determination of the "as-is" situation in turn allows the simulation of the desired "to-be" situation and ultimately the design of a Knowledge Supply Chain (KSC) to close the gap.

4.3 Simulating the desired "to-be" situation

The College of Arts, Media and Technology (CAMT) at CMU has been involved in e-tourism & hospitality practices and KM research since 2003. Moreover, CAMT participates in the Erasmus Mundus Action 2 "A sustainable e-tourism & hospitality project (2010-2014). In 2009, CAMT started an e-tourism & hospitality elective program for undergraduates who majored in Modern Management and Information Technology (MMIT). With sound knowledge of business management, competencies of technology and intense training in e-tourism & hospitality, this batch of students, termed 'e-tourism & hospitality electives', are regarded as possessing the most comprehensive and complete body of knowledge about e-tourism & hospitality in CMU.
A KMS was established in CAMT in 2004, and has been run as a platform for knowledge provision and sharing. This system was then developed specifically and utilized in e-tourism & hospitality curriculum design and development in 2012 by creating Ten Communities of Practice (CoPs), which have been set up as a knowledge warehouse to share, store, retrieve and communicate knowledge from knowledge suppliers to users.

According to Purvis *et al.* (2001) and Barnes (2002), a KMS is not a single technology, but a collection of indexing, classifying and information-retrieval techniques, coupled with methodologies designed to enable content and workflow management, which categorizes knowledge and directs it to workers, allowing them to look for relevant knowledge, as well as to collaborate and share their knowledge. In CAMT, the KMS provides a mechanism to manage the tacit and explicit knowledge of 10 CoPs. Knowledge provision and sharing will significantly improve the development of an e-tourism & hospitality curriculum among

professionals from industries, and academics from universities, as well as other e-tourism & hospitality experts and researchers. These ten CoPs can be categorized into three main groups (Saint-Onge and Wallace, 2003), including:

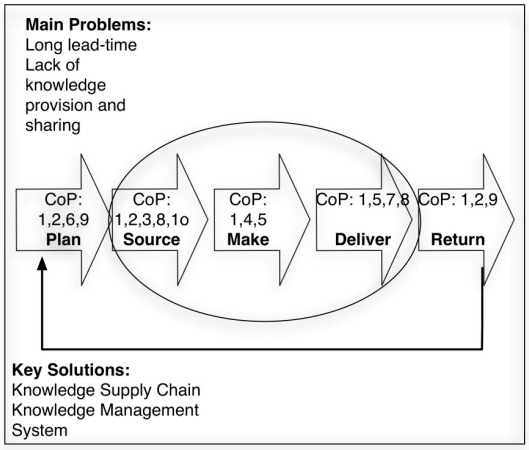
- *A community for knowledge creation*, which is a small community of experts or researchers (less than 20 people) assigned membership by pooling disparate knowledge to look for new ideas and new knowledge through discussion and dialogue;
- *A community for practice*, which consists of a core of experts who cover reasonably well established knowledge with assigned roles to build assets, define standards, and seek best practice; and,
- *A community of capability stewardship*, which has a few subject matter experts, assigned to the community to maintain and update the standards by training, including coaching as well as monitoring how standards are applied.

These CoPs can link members to the strategic knowledge domains, develop core competencies through collaboration and learning, provide common development needs, distribute functional expertise, and facilitate cross-generational and cross-functional exchange of knowledge sharing (Saint-Onge and Wallace, 2003). During the structured interviews, the priority of knowledge in problem solving indicated the inference and domain knowledge that experts employed as desired solutions in problem solving. Knowledge structured and modeled through CommonKADS provided knowledge and filled up the gap between industry needs and curriculum provision. A KMS of e-tourism & hospitality curriculum design functions as a platform of knowledge provision and sharing for 10 CoPs to contribute and communicate their domain knowledge. The 10 CoPs identified in this research and their corresponding components are described as:

1. *COP of CAMT e-Tourism & Hospitality Research Group*: five e-tourism & hospitality researchers in CAMT with research ranging from tourism & hospitality industry to education;
2. *COP of Customer Knowledge*: researchers investigating customer knowledge to understand industry & tourists' needs;
3. *COP of Knowledge Supply*: researchers investigating how knowledge is supplied to curriculum;
4. *COP of Cooperative Education/Internship*: researchers with partner industries/cooperative education & internship programs;
5. *COP of Curriculum Development*: researchers investigating in curriculum development;
6. *COP of e-Tourism & Hospitality Researchers outside CAMT:* researchers & communities around the world;
7. *COP of Technology*: researchers & professionals investigating e-tourism & hospitality technology;
8. *COP of Learning Resources:* resources for knowledge, e.g. journals, e-books, websites;
9. *COP of Quality Assurance*: researchers & auditors of quality control/curriculum assurance; and
10. *COP of Erasmus Mundus and the International SKIMA Conference*: researchers of 11 partner institutions (Erasmus Mundus Action 2- a Sustainable e-Tourism & Hospitality Project along with its annual related international conferences).

Through the integration of this KMS with the SCOR model, a knowledge supply chain of e-tourism & hospitality curriculum design is proposed to solve the two fundamental e-tourism & hospitality curriculum design problems, and is shown in Figure 5.

Figure 5: A SCOR model KSC operated on a KMS



As Figure 5 shows, the model is organized around the five primary processes of *Plan, Source, Make, Deliver* and *Return* which incorporate all interactions from knowledge supplier to knowledge user in the process of curriculum design, implementation and development. For each of the *Plan, Source, Make, Deliver* and *Return* steps in the knowledge supply chain, CommonKADS can be utilized as described in 3.1 and shown in Figures 2, 3 and 4 to structure knowledge, so that it can be effectively modeled and delivered via the KSC. In order to solve the problem of long curriculum lead time, CoPs are then allocated to one of these five KSC steps. Some CoPs may overlap, for example, the CoP of e-tourism & hospitality research is rooted in each step of the knowledge supply chain. Another example is the CoP for Customer Knowledge, which is split and rooted in three steps, namely *Plan, Source* and *Return.* This is to avoid the disconnect between industry requirements and university knowledge provision.

From the KSC, knowledge suppliers such as curriculum designers, experts and researchers, as well as professionals will be more aware of the holistic process of knowledge flow and the interactions between each of the five processes identified in Figure 5. The KMS implementation was supervised by the knowledge managers (e.g. the Dean of CAMT, and e-tourism & hospitality

curriculum chief designer), who will help to facilitate the information flow to shorten the lead-time of the curriculum. In this way, the lack of knowledge provision and sharing can be solved by communication and activities of the CoPs within the KMS. The validation of KMS was conducted among the experts of the 10 CoPs through questionnaires with a focus on user friendliness and satisfactions, 8 out of 10 points were given as the highest scores, which showed that the KMS system of e-tourism & hospitality curriculum design can help reducing the knowledge gap of the key actors within the curriculum.

The introduction of this article (Figure 1) conceptualized three main stages to improve e-tourism & hospitality curriculum design. In order to solve the three identified problems in e-tourism & hospitality curriculum design in this research, which are lack of knowledge provision and sharing, long lead-time, and disconnection between curriculum design and operators (the as-is situation), tools and methods were proposed correspondingly in Section 3 as the innovations of this research. The expected outcomes (to-be situation) of this article are summarized below:

- SCOR model captures and divides the process of curriculum design into five steps; and KMS connects lecturers, researchers and professionals in a form of CoP and allocates these CoPs to the five steps.
- Knowledge is planned on the basis of customer knowledge through close communication and interaction among CoPs of lecturers, researchers, professionals as well as policy and quality audits.
- Knowledge is captured and recorded through CommonKADS method from contribution of CoPs on KMS functioning as a knowledge warehouse where updated knowledge can be provided, shared in a sustainable way.
- With the communication, interaction and cooperation among CoPs of researchers, lecturers and professionals on KMS, knowledge can be effectively made, delivered and updated.
- Knowledge feedback will be brought to KMS and curriculum planners by CoPs of researchers, customers and quality audits to shorten the lead-time of the update and renewal of the curriculum to meet both the academic and industrial requirements.

It is indicated that the innovations and synergy of KM tools with SCM can significantly enhance e-tourism & hospitality curriculum design to reach the desired "to-be" situation.

5 CONCLUSIONS

The evolution from tourism & hospitality to e-tourism & hospitality requires higher education to adjust its intellectual outputs to match market and society needs. Curriculum, as the core factor in the quality of educational outputs, is therefore a key part of this transformation. Practices of knowledge management or supply-chain management have been applied to enhance the efficiency and effectiveness of higher education, but still cannot fill the gap between higher education and society needs. This research has proposed knowledge engineering approach to develop a knowledge supply chain, defined as, "*the knowledge flow and management process in the cycle of design, implementation, and maintenance from suppliers to end-users*". In running this knowledge supply chain, knowledge management and supply chain management are integrated for the first time. This knowledge supply chain is standardized via the use of the Supply Chain Operations Reference (SCOR) model into the five essential processes of plan, source, make, deliver and return. The case study, Chiang Mai University, Thailand in the Greater Mekong Sub-region (GMS) was chosen and investigated.

To solve the two major problems in previous e-tourism & hospitality curriculum research, namely, the long lead time of the curriculum and the lack of knowledge provision and sharing, a knowledge engineering approach was applied as a powerful way to model and facilitate the knowledge flow in the knowledge supply chain of e-tourism & hospitality curriculum. This research is the first step in using a knowledge supply chain in e-tourism & hospitality curriculum development and also presents opportunities for further research. Such further research could assist GMS developing countries in matching the knowledge needs in the tourism & hospitality industry, with that supplied by higher education and could ultimately increase tourism & hospitality revenue by preventing tourism & hospitality revenue leakage.

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