An Innovation of Travel Information Gathering Framework

Pairaya J., Buddhagarn R., Sukree S., and Punthumadee K.

Abstract—Application of Information Technology (IT) has revolutionized the functioning of business all over the world. Its impact has been felt mostly among the information of dependent industries. Tourism is one of such industry. The conceptual framework in this study represents an innovation of travel information searching system on mobile devices which is used as tools to deliver travel information (such as hotels, restaurants, tourist attractions and souvenir shops) for each user by travelers segmentation based on data mining technique to segment the tourists' behavior patterns then match them with tourism products and services. This system innovation is designed to be a knowledge incremental learning. It is a marketing strategy to support business to respond traveler's demand effectively.

Keywords—Tourism, Innovation, Information Searching, Data Mining.

I. INTRODUCTION

THE Internet plays an important role in daily life. Entrepreneurs, marketers and manufacturers often use the Internet as a channel of communication with the targeted consumers [1], [2] because internet can be easily accessible, cheaper and friendly to user [1].

The patterns of internet usage on the computer are changed to smartphone which is capable and more versatile. Traveler behaviors tend to change when new technologies come. They will plan less and search for information at the point of activity. Previously, they would search information from PC then switch to search on a mobile device instead because it is more flexible and convenient. This is consistent with a study by Hyde (2000) [3] indicated that traveler avoids vacation planning because flexibility of action and experiencing the unknown are essential amongst the hedonic experience they are seeking.

In the tourism sector, it is vital to understand customers' needs very quickly and respond to them with adequate offers – no matter in the online or the offline business. Innovation and Information Technology, these factors support an enhancing

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organizational performance [4]. This information utilizes to plan marketing strategy such as new product development which is appropriate to consumers, pricing and public relations.

This paper was to show conceptual framework to understand the travelers' behavior, travelers' market segmentation and tourism products and services segmentation which lead to the design and development on mobile devices application for information retrieval to intelligent learning travelers' behavior continuously. The tourism firm will be able to define marketing strategies and provide more affordable products and services for tourists who have various lifestyles appropriately by using data mining as a tool to accumulate information and learned behavior in real-time.

II. LITERATURE REVIEW

A. Consumer Behavior

Consumer behavior refers to the problem recognition, searching, selection, purchase and consumption of merchandises and services for the satisfaction of their needs. There are different processes involved in the consumer behavior. In the marketing study, it is important that marketers need to understand traveler behavior to determine why customers consume or do not consume one. The tourism firm will succeed if they are able to identify customer needs and respond their demands. [4]

Kotler (1999) [5] explained the consumer behavior by S-R Theory shown on A Model of Consumer Behavior. The model shows that globalization has changed tourist consumer behavior as it has the capacity to create impacts on 1) cultural criteria (culture, subculture, social class), 2) social criteria (reference groups, family, roles and status), 3) personal criteria (age and life cycle stage, occupation, economic circumstances, lifestyle, personality and self-concept), 4) psychological criteria (motivation, perception, learning, beliefs and attitudes).

Smith (1977) [6] and King and Hyde (1989) [7] indicated that factors impacted by globalization dynamic, psychological factor of the tourists are considered to be the most important as it directly involves tourist consumer behavior. Smith (1977) [6] and King and Hyde (1989) [7] have explained classifications of persons who travel, which are proved to be very useful for tourism planning and marketing [5]

In the view of the Buhalis (2002) [8], he said that the new generation travelers are more complex and highly demanding on quality of products. These travelers have known very well about attractions and tourism products. They had many

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experiences to spend time and money to travel. The new travelers like to compare details of products and choose the suitable items for themselves and travelers use the internet to search for information by themselves more than asking agency for services [8].

Hyde (2000) [3] mentioned about new generation travelers' behavior that they liked to plan a travel trip by themselves and wanted to face the enjoyable and exciting situation which is unpredictable rather than traveled following their plan, so searching travel information step in customer's decision making process is not necessary to be put into account before making a decision step all the time.

The new travelers are not just passive consumers anymore. They do not need advice from the agency and waiting for a long time anymore. They find themselves proactive and involved in decision making process of purchasing the travel products. The nature of the decision making to purchase those services must be flexible to select [9].

B. Data Mining

Data mining is defined as a business process for exploring large amounts of data to discover meaningful patterns and rules [10]. Data mining is an information filter process in a large database using a machine learning, statistical methods, mathematical methods, database method and executes data in various forms [11] which can result in improvements in the understanding and use of the data.

Data mining discovers patterns and relationships hidden in data [12], and actually is a part of a larger process called "knowledge discovery" which describes the steps that must be taken to ensure meaningful results.
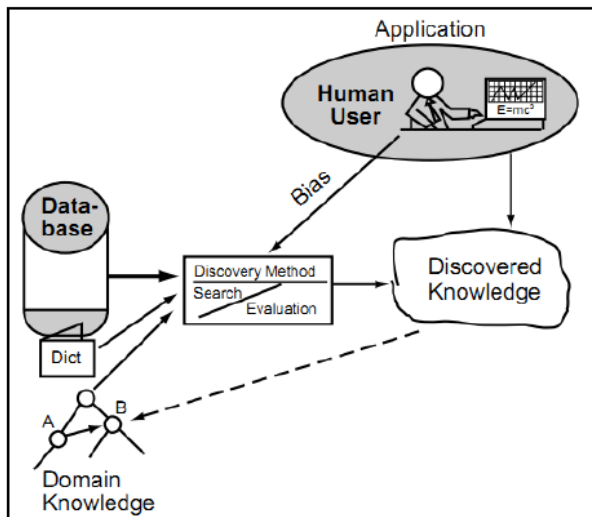

Fig. 1 A Framework for Knowledge Discovery in Database [13]

Figure 1 illustrates the main components of prototypical system for knowledge discovery in databases. The core of the system is the discovery method, which computes and evaluates patterns on the way to becoming knowledge. The input to the discovery method includes raw data from the database, information from the data dictionary, additional

domain knowledge, and a set of user defined biases that provide high-level focus. The output discovered knowledge that can be directed to the user or back into the system as new domain knowledge.

This Knowledge Discovery in Databases (KDD) process consists of a sequence of the following steps [14].

1) Data cleaning – to remove noise and irrelevant data

2) Data integration – where multiple data sources are combined

3) Data selection – for retrieving from the database only the relevant data for the analysis

4) Data transformation – where data are transformed or consolidated into appropriate forms for mining

5) Data mining – the phase where the algorithms are applied in order to extract data patterns

6) Pattern evaluation – to find the interesting patterns which represents new knowledge

7) Knowledge presentation – when the visualization techniques are used to present the mined knowledge to the user

Data mining techniques such as association rules, clustering, decision trees etc. have been widely used for successfully segmenting and targeting customers across various industries. It provides an effective approach to discover and understand patterns in customer behavior thereby helping the decision maker to better group customers [15]. The on-line travel agency has growth over the past ten years. It is estimated that more than 50% of all travel bookings happen on-line in the USA and Europe. The migration towards on-line travel agency continually grew and large online agency like booking.com, hotel.com, expedia.com, etc. are expanding fast to supply to the emerging demand.

In the tourism industry, knowing about guests - where they are from, how much they spend, and when and on what they spend it- can help a company to formulate marketing strategies and maximize profits. Due to technological development, touristic companies have accumulated large amounts of customer data, which can be organized and integrated in databases that can be used to guide marketing decision [16]. Since identification of important variables and relationships located in these consumers -information systems can be a difficult task, some companies have attempted to raise the power of information by using data mining technologies. For example in hospitality area, information systems have been used to assist the delivery of hospitality services. Some of the key ways are [8]: improved capacity management and operations efficiency, central room inventory control, last room available information, yielding management capability, marketing, sales and operational reports, tracking frequency flyers and repeat hotel guests, internal management of operations from transactions to human resources. Most of the items on the above list apply only to hotels and accommodation providers. In order to make high-quality marketing research and planning, data mining technology allows hotel companies to predict consumer behavior trends, which are potentially useful for marketing applications.

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C. Innovation

Innovation has become an important role in service sector [17]. The concept of Dorf and Byers (2008) [18] indicated that businesses can create a competitive advantage. Organizations should pay more attention to innovation or the ability for innovation which innovation can play an important role in the tourism industry as well [19]. Innovation in term of economics is meaningful to new products, new processes, new markets, acquisition for new sources and operation organization in new ways [20]. Innovation is about bringing new ideas transformed to new products, processes and services which create value.

In the view of Amabile [21], creativity is the production of novel and useful ideas in any domain, In order to be considered creativity, a product or an idea must be different from what has been done before. (Few creativity theorists hold the strong position that a creative idea must be completely unique.) But the product or idea cannot be merely different for difference's sake; it must also be appropriate to the goal at hand, correct, valuable, or expressive of meaning. Innovation is the successful implementation of creative ideas within an organization. Rogers [22] defined an innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little whether the idea is "objectively" new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his or her reaction to it. If the idea seems new to the individual, it is an innovation. For the purposes of this paper, innovation is defined broadly as an organization's development and implementation of new products and services or new ways of doing things.

Literature review on innovation in tourism sector found that the tourism industry rather has not been very innovative while innovation is an important driven factor to increase the competitiveness [9]. In general, tourism research is likely to use qualitative research rather than quantitative research because it can reflect the phenomena observed and explained various aspects more than quantitative which has less flexibility. However, the studies of innovation in tourism also run quantitative research in parallel. The mainstream of the research is to find the intensity of innovation compared to other industries or compared with other countries or internationality [23].

Later on, innovation has been created into new products to the travel industry which internet is a key factor to drive the tourism economy. From the past used e-commerce to Radio Frequency Identification (RFID), Location Based Services (LBS), Web 2.0, mobile application which is a tool to link relationships between customers and tourism organizations [24], [25], [26]. Several studies showed that the application of information and communication technology (ICT) has changed the companies and tourism organizations.

For the scope of this paper, the conceptual framework presents a system innovation to provide travel information on mobile which uses data mining technique to select the best item for users. The diffusion of this system innovation enables consumers to interact directly with the tourism service providers, leading to the reduction of the transaction costs. This is also a process which supports new service and new process via new product on mobile application forms.

III. METHODOLOGY

The study of An Innovation of Travel Information Searching System on Mobile Devices has 4 phases (Fig 2): phase 1 travelers' behavior and segmentation, phase 2 categorization of tourism products and services, phase 3 the relationship between the travelers' behavior and tourism products and services, phase 4 the development of application for travel information searching on mobile devices. Each phase has the following methodology.

A. Phase 1: The study of Travelers' Behavior and Segmentation

This research is quantitative research which uses questionnaire as a research tool to collect data on Thai travelers aged between 18 to 40 years who live in Bangkok, Thailand and have ability to pay and make a decision independently by themselves. Sample size 1,200 persons.

The questionnaire provides a content validity and reliability by collecting information from journals and theories in the field of travelers' behavior, market segmentation and application of technology for travel information searching to design questionnaire. There are 4 parts contained in the questionnaire which are 1) demography 2) travelers' behavior 3) tourism products and services searching behavior 4) the expectation on new travel information searching application on mobile devices.

This conceptual framework collects travelers' profile and behavior from questionnaire and executes a market segmentation of travelers identified by association rule and decision tree method of data mining technique which is grouping a similar behavior pattern without pre-selected data sample. The result of phase 1 is knowledge discovery in database call KDD1.

B. Phase 2: Clustering Tourism Products and Services

The populations in phase 2 are the tourism products and services data which include tourist attractions, accommodations, restaurants, souvenir shops in Chiang Mai province. Chiang Mai is one of the most popular destinations for Thai tourists and has variety of travel products and services. Chiang Mai Province is not too short distance from Bangkok (700 km.) which travelers have to plan before going to the destination and Thai travelers comfort to spend money during a trip more than the most popular destination like Phuket province for where Thai people quite highly spend.

In phase 2, there is using data mining to process and analyze a huge data by clustering method. The knowledge discovery and database of this phase is called KDD 2.
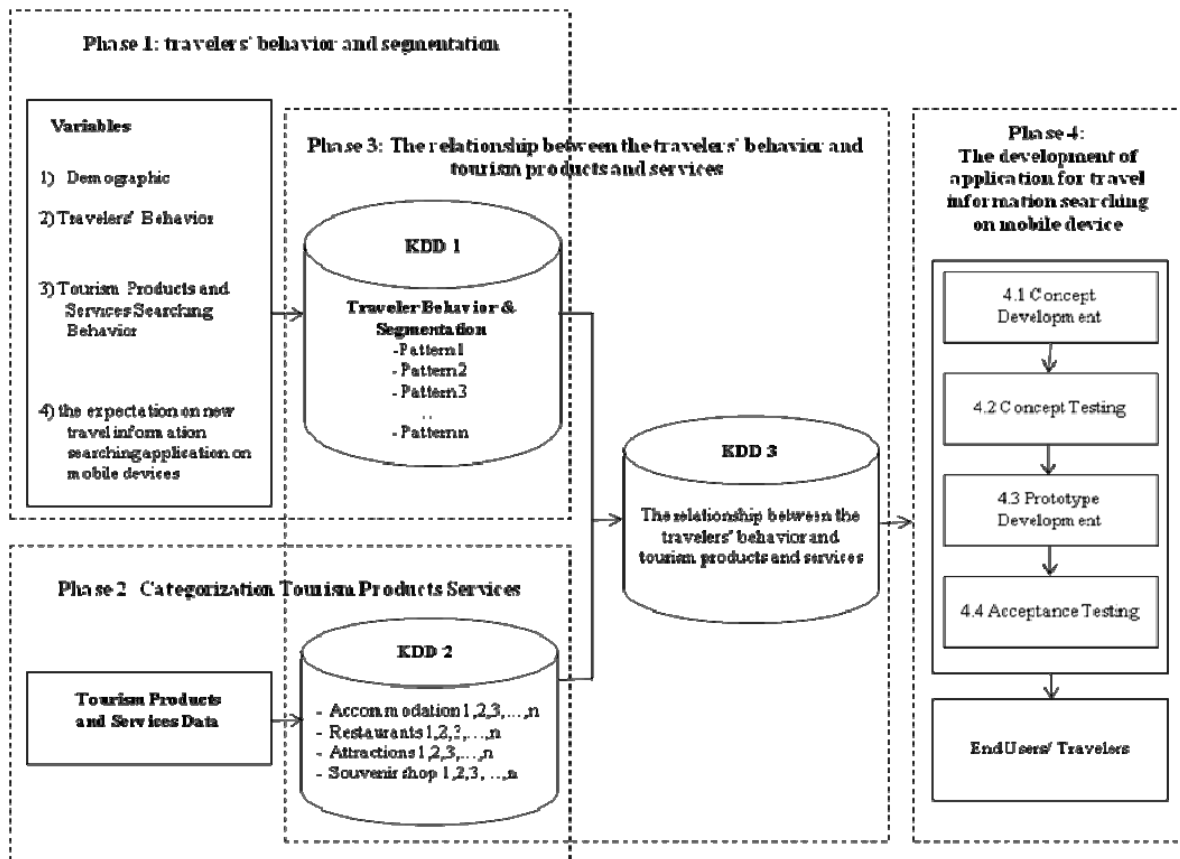
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Fig. 2 A Conceptual Framework of an Innovation Travel Information Searching System on Mobile Devices

C. Phase 3: The Relationship between the Travelers' Behavior and Tourism Products and Services

The third phase study is about the relationship between travelers' behavior (KDD1) and tourism products and services (KDD2). It will be matched by data mining which is used for associated rules to find out frequent patterns, associated event and correlation among the items in database. Data mining is analyzed by association rules and classification method to determine the behavior of travelers and tourism products and services which are appropriate for that pattern. The outcome of phase 3 will get the knowledge discovery and database called KDD3 which will utilize in phase 4.

D. Phase 4: The Development of Application for Travel Information Searching on Mobile Device

The purpose of this study is to create system innovation for travelers to search information on mobile devices. The new product development of this study is a prototype of a mobile application on android operating. There are 4 processes in the fourth phase:

1) *conceptual development – collect data from part 4 of the questionnaire which interviewed users' need and expectation 1,200 units and validates testing by in depth interview 5 experts opinion from tourism, marketing and software engineering field.*

2) Software concept testing – testing by focused group 2 times 8 units each

3) Prototype development - software validates testing by in depth interview experts' opinion, software engineering 3 units

4) Acceptance testing – test a technology acceptance and interview users' opinion by questionnaire 400 units and in depth interview tourism suppliers 30 units**.**
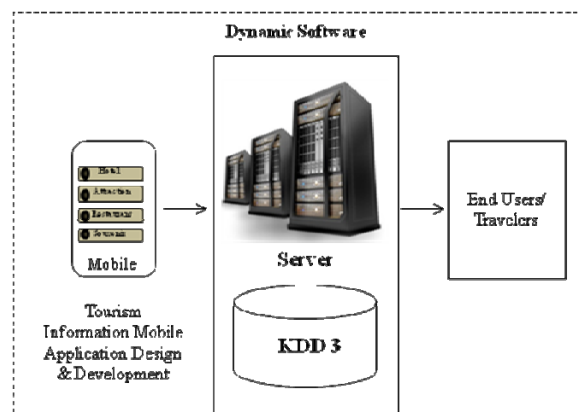

Fig. 3 An Application Of Data Mining In Travel Information Searching System On Mobile Devices

The KDD3 will plug onto a server when the user registered to the system his profile will collected in KDD1 and the system will select the suitable pattern for him and when he clicks to search any item, the system will deliver the alternative items which are related to the first selected (Fig 3). User will get many alternatives choices and suppliers like hotels, restaurants, tourist attractions and souvenir shops also have more chance to promote their products and services.

Knowledge Incremental Learning Loop
1. Original Knowledge (from questionnaire)
2. User input new data
3. System:
    1) Data Collection
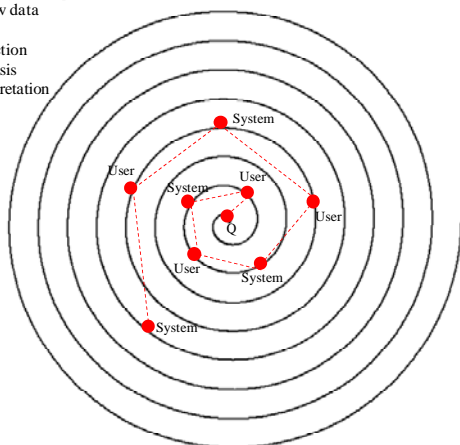   2) Data Analysis
    3) Data Interpretation

Fig. 4 Knowledge Incremental Learning Loop

The development of An Innovation of Travel Information Searching System on Mobile Devices will lead new knowledge to tourism academic which is the travelers' segmentation by data mining technique. The result will contribute knowledge to marketers in tourism organization about how many travelers' pattern there are, each pattern likes to go anywhere, buys anything and spend any time. For instance, the accommodation module can generate the most suitable accommodation searching by type of accommodation, theme, star rating, overnight stay, pricing, person per unit, landmark, choice of facilities in an accommodation etc. The restaurant module can generate types of restaurant, food nationality, menu, pricing, physical evidence, meal time, landmark etc. These will generate the likely items for users via mobile devices. The knowledge gained will benefits to National Tourism Organization (NTOs) and private sector to plan and formulate the effective marketing strategies.

Moreover, this conceptual framework also contributes new knowledge which gathers increasingly on KDD3. In fig 4, Q is an original knowledge from questionnaire which is surveyed from 1,200 units. While new user is searching for travel information on mobile devices, the system will learn user behavior from user registration and transaction items which user clicks. The system will collect new data and analyze them then interpret to user.

The system will learn increasingly when several users click more on mobile application the system will collect more and more, analyze more and more, interpret more and more. It presented that the knowledge discovery in database will get bigger and bigger. This framework implies to increase learning model. If the travelers' behavior changes, the pattern in KDD1 also changes. The same as tourism products and services changed, the knowledge in KDD 2 will change to new cluster as well. Therefore, the KDD3 developed in this study will accumulate new knowledge and update all the time. The system will operate more accurate and work effectively along with the dynamics of the world.

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