Smart application of learning ecotourism for young eco-tourists
Supaporn Chai-Arayalert

Abstract: Ecotourism is supposed to make efficient, responsible and sustainable use of tourism resources at the destination. The aims of ecotourism can be accomplished by encouraging the appropriate activities, enhancing eco-tourist experiences, and managing tourism resources in a sustainable manner. Smart ecotourism application refers to the innovative tools and approaches to improve the ecotourism practices and experiences. The smart application focusing ecotourism aspect has emerged as a result of the rise of Information and Communication Technologies (ICTs) and the need for sustainability. This study emphasis on young people who are likely to be first-time eco-tourists or to have little experience of ecotourism. However, young people are a great capacity to spread ecotourism awareness both in the present and the future. This study was designed and developed a smart application which aimed to allow young people to learn about ecotourism. This research was conducted using a qualitative approach, utilizing a case study in Klong Noi Community in Surat Thani Thailand. The results of this study will contribute to the current ecotourism literature and broaden understanding of the ICTs-based ecotourism, particularly on the Thailand context. Moreover, they will provide suggestions for ecotourism business in Thailand to develop the smart application attractive to the targets of young people.

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PUBLIC INTEREST STATEMENT
This study aims to integrate ecotourism principle with the digital technology and young tourists’ needs. The purpose of this study is to design and develop a smart application to promote ecotourism and encourage young people to build ecotourism awareness. This study focuses on young people who are likely to be first-time eco-tourists or to have little experience of ecotourism. They are however a great capacity to spread ecotourism awareness both in the present and the future. A case study was conducted in the Klong Noi Community, where the place is well-recognized ecotourism in southern Thailand. The results will contribute to the current ecotourism literature and broaden understanding of the ICTs-based ecotourism, particularly on the Thailand context. The smart application takes the role of systematic tool for managing information, boosting learning and creating opportunities for tourists and young people to understand the environment-friendly activities and be aware of ecotourism, as well as to allow the business to advertise its attractions.
1. Introduction
Ecotourism is a form of travel involving natural attractions, which focuses on the preservation of nature, and in which the tourism activities must have the least impact on the environment as well as respecting local cultures and lifestyles (Donohoe & Needham, 2006; Fennell, 2001; Wallace, 2019). Ecotourism encourages local communities to participate in the effective management of indigenous resources by cultivating awareness of the preservation of nature. The significant features of ecotourism include the enrichment of nature as well as promoting local cultures, traditions and lifestyles in order to attract travellers to visit an area (Cobbinah, 2015; Fleischer, 2010). The rapid growth of tourism affects the environment in terms of both natural attractions and local community identities. For instance, the physical environment may deteriorate due to the destruction of geological features, erosion along sensitive trails, pollution and contamination and the extraction and overharvesting of resources (Ballantyne et al., 2013; Mkono & Holder, 2019).

Cini et al. (2015) suggested that the global trends in ecotourism have shown that eco-tourists are primarily older people. However, young travellers have become an important part of the international tourism market in recent decades. Youth tourism is a growing market that is becoming increasingly relevant in every region and there is a room for future research in the development of youth ecotourism worldwide (Richards, 2006). In recent decades, this segment has risen faster than other travel markets, accounting for 20% of the international tourism industry with a global volume increase of 3% to 5% per year (World Tourism Organization, 2010). Young visitors are a greater capacity to spread environmental awareness in the future because they are responsible for protecting the natural environment both in the present and the future. There is, therefore, a need for more studies into young people's awareness of the problems relating to ecotourism, and their perceptions and expectations of this issue must be considered as vital elements in the implementation and promotion of ecotourism (Cini et al., 2015).

It is known that the behavior and interest of young people pursued when traveling varies from that of the older generation (Han et al., 2011; Moisă, 2010), for example, young people quickly embrace modern travel technologies to find inspiration for where to travel, study where to travel and do activities during a trip. Although social media does not influence senior travelers, young travelers assume that social media is powerful (Wu & Chen, 2018). In this study, younger people are likely the first time eco-tourists with little knowledge of eco-tourism practices. They are the “information hungry” travellers, for using a search engine to schedule a journey, gathering information they need, and exchange information with others (Bai et al., 2005; Demeter et al., 2015). Consequently, the design of the smart ecotourism application is essential to understand the behaviors of the young travellers.

There have been only a small number of studies of ecotourism that have focused on young people, for instance, that of Cini et al. (2015), who investigated the knowledge of ecotourism of university students from South Africa, Mexico, USA, Germany, and Italy and found that the students possessed only limited knowledge although their knowledge varied between countries, and the researchers noted that activities such as field trips and attending ecotourism events and workshops were a means of boosting young people’s understanding. Kasim and Wickens (2018) studied the awareness, intentions and opinions about ecotourism among a sample of young Thais aged between 19 and 30, the age-group considered to be a key player in the growth of ecotourism, while Sangpakul and Batra (2007) investigated the ecotourism experiences of young Thais and recommended that knowledge of environmental and ecotourism issues should be
provided through both formal and informal channels, with formal channels including educational institutions like schools, colleges or universities who can provide special courses on the environment and ecotourism. Meanwhile, Kasim and Wickens (2018) noted that interest in environmental issues among young people could be generated by their own experience of travelling or knowledge gained from non-formal sources, such as television or the internet.

However, the studies by Cini and Passafaro (2019) and Sangpikul and Batra (2007) both revealed that young people generally possess limited knowledge about ecotourism, while Sangpikul and Batra found that they had positive attitudes towards ecotourism. If young people who experience ecotourism for the first time are taught and given appropriate information, it will improve their experience of travelling as well as building awareness of the need to preserve the environment. Although learning about ecotourism can nowadays be done through both formal and informal channels (Kasim & Wickens, 2018; Ramírez & Santana, 2019; Sangpikul & Batra, 2007), there are some limitations on the means by which knowledge about ecotourism can be obtained, for instance, government or private sector information sources might not provide sufficient information about a particular area, and the use of traditional media in tourism campaigns may not appeal to young people or encourage them to try to understand the issues involved in ecotourism (Buffa, 2015; Chiu et al., 2016; Cobbinah, 2015).

Klong Noi community is located in Surat Thani province, Thailand, and is known as an ecotourism destination in southern Thailand. Klong Noi is in a natural river floodplain with many natural water resources and canals, and the local flora including palms and mangroves, which support a vibrant fauna. Klong Noi community values its local resources and takes pride in its local lifestyle, traditions and culture, which it has been presenting to visitors since it began promoting ecotourism in 2006. Eco-tourists in Klong Noi can enjoy canal cruises including firefly cruises at night, observe boat making and the local fishermen’s lifestyle, buy local handicrafts, and visit the monkey school.

Understanding the obstacles faced by local ecotourism destinations in using new technology to bring their communities to the attention of potential visitors requires a detailed understanding of how travellers use digital technologies. Trends identified in the academic literature indicate that travellers are increasingly using digital technologies as their sources of information when selecting ecotourism destinations and this trend is being driven by the widespread availability of personal devices such as mobile phones. Consequently, the ability of destinations to optimize the potential competitive benefits offered by digital technologies requires them to align the technologies they employ with those used by their potential customers.

This problem leads directly to the issue investigated in this paper, how to design a smart application to promote ecotourism and encourage young people to learn about ecotourism. This study was designed to gain a better understanding of the functionality and patterns of use of new technologies employed by eco-tourists to obtain information and to communicate during the pre-travel, during-travel, and post-travel phases, in the context of a local ecotourism destination.

The immediate purpose of this research was to develop a smart application relating to ecotourism which would systematically manage information in order to boost learning and assist in the running of advertising campaigns, and thereby create understanding and awareness among young people so that they will undertake ecotourism responsibly. The smart application developed enables young people to learn about the preservation of the nature environment and the conservation of local communities. The application was developed based on in-depth information provided by the local people living in those communities.

The following section of this article reviews previous literature relating to youth travel and ecotourism and the impact of ICTs, which is followed by a review of the characteristics of ecotourism in Thailand. The research framework relating to the promotion of ecotourism destinations is then presented, followed by a description of the development and implementation of
a system to promote ecotourism and the results of an evaluation of that system, and the paper ends with discussion and a conclusion.

2. Literature review

2.1. Ecotourism in Thailand

The focus of ecotourism is responsible travel to natural attractions taking into consideration the natural environment and the way of life of the local community. Thus, the definition of ecotourism adopted in this research is that it is a form of sustainable travel that focuses on creating awareness of the environment and caring for ecosystems within tourist attractions, which integrates support for the development of sustainable tourism with the preservation of the environment at those attractions (Cobbinah, 2015; Fleischer, 2010). This form of travel thus seeks to obviate or reduce impacts on the environment, resources and ecosystems within a location, with one of the main considerations being the impact on community members within the area in which an attraction is located (Donohoe & Needham, 2006; Fennell, 2001; Wallace, 2019). A key component of ecotourism is travel to primarily natural areas with the opportunity to learn about and understand the natural environment without causing damage to it, as well as preserving ecosystems. A further feature of ecotourism is that the tourist’s experience is mediated with the participation of the local community (Cobbinah, 2015; Kontogeorgopoulos & Chulikavit, 2010; Sangpikul, 2008).

The review of literature related to ecotourism focuses on different perspectives of ecotourism. It seems that previous studies are primarily driven by Western perspective. Researchers have yet to be explored on the other countries such as Asian setting. The research of ecotourism varies from countries to countries due to several factors such as policies, culture, social, and natural environments (Sangpikul, 2008). Sangpikul addressed the limitation of ecotourism studies in Thailand and urged further study into this important area. Thailand has been one of the most popular ecotourism destinations, particularly, the south of the country which is rich in natural resources, cultural heritage and unique lifestyles (Chittangwattana, 2014). The case study was conducted in the context of Klong Noi Community Ecotourism, located in Surat Thani province on the Gulf of Thailand, a destination rich in natural resources. Klong Noi Community Ecotourism was founded and undertaken with the participation of members of the community and involves collaboration between the local administration organization and the villagers in the area as both value their local resources and take pride in their local traditions, culture and way of life (Walter, 2009).

The proliferation of ecotourism information available over the Internet has provided the opportunity for global ecotourism (Loi & Shafer, 2005). This underlines the significance of the use of advanced ICTs and the Internet by tourists. This research study will provide suggestions for ecotourism business in Thailand to develop effective the smart application appealing to the desired targets.

2.2. Understanding youth travel

Youth travel has become one of the most significant sectors in the global tourism industry because of the number of young travellers, the frequency of their trips, and the popularity of long distant travel (World Tourism Organization, 2016). The increase in youth travel has led governments to develop tourism policies and services specific to young people as well as other related niche markets. World Tourism Organization (2010) noted that youth travel is a continuously growing market and that young people spend more money proportionately than other groups while their travel goals are gaining knowledge, having the opportunity to learn about different cultures, experiencing daily life at their destination and acting responsibly in relation to issues affecting tourist attractions, the environment and society. Youth travel is a large and growing global market, an important aspect of which is the social and cultural dimensions of the travel destination. A report from the WYSE Travel Confederation in 2016 suggested that international youth travellers comprise 30% of the world’s tourists and the report dubbed them “the internet in its pocket generation” (Chapman, 2016, p. 9).
The term youth travel relates to young people between the ages of 15 and 29 who have emerged as a niche market for particular travel products or styles and want to experience other cultures, gain life experience or benefit from learning opportunities, both formal and informal, outside their usual environment (Cavagnaro et al., 2018). Today young travellers have both a direct and indirect impact on the present and future of tourism industry. Nevertheless, despite the fact that youth travel is an important factor in future tourism strategies, its significance has not hitherto gained significant attention from other researchers although, nowadays, there is a greater focus on this topic (Bizirgianni & Dionysopoulou, 2013; Cavagnaro et al., 2018; Cini et al., 2012; Gretzel et al., 2015; Ivars-Baidal et al., 2019; Li et al., 2017; McDonald & Guechtouli, 2019).

The characteristics of young travellers are that they are information hungry and need multiple sources of information to help them to plan their trips (Richards, 2007). At the same time, they are early adopters of new travel technology (Cavagnaro et al., 2018). The challenges are how to respond to and fulfill the needs of young people by which to motivate them to be aware of and understand ecotourism (Bizirgianni & Dionysopoulou, 2013; Cavagnaro et al., 2018; Cini et al., 2012; Cini & Passafaro, 2019; Cini et al., 2015; McDonald & Guechtouli, 2019; Sangpikul & Batra, 2007).

2.3. Role of smart ecotourism-related application
ICTs play a significant role in improving tourism businesses. ICTs can build long-term relationships with travellers, provide more flexibility in terms of service timing and destinations, improve service quality and reduce operating costs (Buhalis & Amaranggana, 2013; Jovicic, 2019; Walker & Moscardo, 2014). ICTs are now regarded as an important means by which tourists obtain information, make bookings, etc. Moreover, recent trends in its use have increased the range of activities in which it is used, for example, by using multimedia technology to gain knowledge and enhance flexible learning including learning how certain activities can negatively affect the natural environment. ICTs can thus be used to educate people and build knowledge of ecotourism attractions through the use of digital media and also replace some tourism activities which could lead to the destruction of natural resources by replicating locations which are fragile or difficult to access on virtual platform.

Smart tourism through the extensive adoption of ICTs has progressed from traditional tourism and e-tourism to encompass concepts such as the smart destination, the smart technology, and smart business. The smart destination represents the integration of advanced ICTs and innovations into the physical infrastructure and other facilities, for example, it facilitates the visitor's interaction with the location, and it increases the quality of tourist experiences at the destination, as well as improving decision-making for stakeholders (Gretzel et al., 2015; Xiang et al., 2015). The smart tourist experience focuses on ICT-mediated tourism experiences and their enhancement during a trip (including before-, during-, and after-trip) through personalization, context-awareness and real-time monitoring (Buhalis & Amaranggana, 2013; Gretzel et al., 2015). Smart tourism business refers to the digitalization of core tourism business processes, dynamic and interconnect stakeholders, and more open and technology-focused businesses (Buhalis & Amaranggana, 2013; Gretzel et al., 2015). Moreover, smart tourism is closely related to managing, processing, and exchanging information among destinations, tourists, and local communities.

The key aspects of ICTs relating to ecotourism, are concerned with (1) the conservation and minimizing the negative impacts of tourism on nature-based destination and local communities, (2) increasing awareness and educational opportunities, and (3) supporting stakeholders’ contribution to conservation (Hunter et al., 2015; Katsoni & Dologlou, 2017). The nature-based destination relates to the activities at a destination which occur primarily in natural surroundings with minimal human interference and entail a healthy ecotourism, as well as providing an opportunity for tourists to visit natural areas. In terms of environmental education, the activities involved are building ecotourism knowledge, encouraging interaction with nature and increasing awareness and understanding of the natural area.
Smart ecotourism technologies include advanced ICTs and other strategic tools used in developing solutions for ecotourism. Advanced ICTs can play an important role in facilitating ecotourism (Gretzel et al., 2015; Katsoni & Dologlou, 2017; Li et al., 2017; Nisi et al., 2019), for instance in managing destination resources, visualizing sites and attractions, providing tourism education, collaborating with local businesses at the destination, providing information to tourists and planning transport routes to protect and maintain the natural environment (Ali & Frew, 2010; Bizirgianni & Dionysopoulou, 2013; Bowser et al., 2014; Katsoni & Dologlou, 2016) and the use of social media and mobile apps to allow travellers to communicate and increase their ability to obtain information (Hunter et al., 2015; Tsai et al., 2018). For example, when people use social media or mobile phone apps to share their experiences through location-based services, other tourists and local residents also obtain information. Moreover, tourism services can use smart technology to offer their services and gain information through user feedback to ensure service sustainability. Finally, Destination marketing organizations, which are responsible for providing information to potential visitors can use smart technologies to encourage visitors to purchase destination-related products (Chao et al., 2014; Halvatzaras & Kabassi, 2016; Meiliana et al., 2017; Nitti et al., 2017; Ruíz et al., 2017).

Although a number of previous studies have focused on ICTs in tourism, there has been only limited research into the use of ICTs in ecotourism. However, the use of advanced ICTs in promoting ecotourism while preserving the local environment is an important means of developing sustainable tourism which addresses the need to conserve local ecosystems and ICTs are an important learning and educational tool which can help to create sustainable environments at ecotourism destinations. Therefore, in line with the findings of previous research that ICTs can be useful in promoting the social, economic and environmental aspects of ecotourism, and that local participation benefits the community (Ali & Frew, 2010; Dorsey et al., 2004; Katsoni & Dologlou, 2017; Misso et al., 2018; Tetiwat et al., 2019).

3. Research framework
The research framework illustrated in Figure 1 was organized based on Cohen et al. (2014) and Gretzel and Fesenmaier (2009) with the purpose of the study aimed to develop an understanding

![Figure 1. Research framework adopted in designing and developing the smart ecotourism system (Adapted from Cohen et al. (2014), Gretzel and Fesenmaier (2009), Li and Wang (2010)).](image-url)
of tourists’ behaviors in the pre-travel, during-travel, and post-travel phases of the travelling period. In addition, Li and Wang (2010)’s ideas were also applied in assessing the effectiveness of the ecotourism application developed based on its content, and the efficiency of its communication, functionality and technology dimensions.

In the pre-travel phase, the system can be used in planning an eco-tour prior to travelling to the destination (Cohen et al., 2014; Gretzel & Fesenmaier, 2009) and potential tourists can use the system to learn about ecotourism attractions, with the information included being directly provided by the local community (Chafe, 2007; Fesenmaier et al., 2011; Kang et al., 2019). In the during-travel phase, the system provides information related to the local environment, accommodation, tourist attractions and activities, community stores, etc., to ensure that travellers are able to experience the most interesting features of the areas (Chafe, 2007; Cohen et al., 2014; Fesenmaier et al., 2011; Gretzel & Fesenmaier, 2009; Kang et al., 2019). Finally, in the post-travel phase travellers can contribute reviews including both photographs and written evaluations of the quality of the local services and any goods they purchase while in the area (Cohen et al., 2014; Gretzel & Fesenmaier, 2009). The information obtained from the post-travel phase can be used to improve the local services and to disseminate information to future visitors as well as encouraging further visits, since it has been found that information obtained from users in this phase has an effect on repeated travel (Katsoni & Dologlou, 2016; Miller et al., 2019; Ruhanen, 2019).

The development of an efficient smart system was based on Li and Wang (2010)’s study which evaluated website efficiency in managing tourist attractions. Firstly, the virtual information dimension was developed by determining the pattern of the digital content to be used in the system, during the three travel phases. The design of the digital content was based on the behaviors, needs and interests of young people, and digital content was developed as a relational database system. Secondly, the virtual communication dimension was designed to be appropriate for young people including both online and offline communication channels, the ability to accommodate a number of languages, and clear contact information. Thirdly, the virtual functionality dimension was used to organize the ecotourism application’s public relations and learning-source management capabilities, as well as creating awareness and shaping attitudes towards environmental preservation. All the functions covered pre-travel, during travel, and post-travel activities. Fourthly, the virtual relationship dimension sought to create relationships with travellers to encourage them to re-visit or to share their experiences in the form of reviews, comments, ratings, or recommendations, which could then be disseminated to other users. Finally, the technology dimension utilized appropriate ICTs including web applications, a database system and social media to create a smart system designed to support and promote local ecotourism activities based on the needs of young travellers, from both Thailand and other countries (Li & Wang, 2010; Wang & Russo, 2007).

The relationship between four virtual dimensions of smart application and young traveler’s behavior discusses as followed. Based on the research framework, this study focused on how the four dimensions of the smart application can support young travellers’ behavior in the three phases of travelling. Young travellers are likely to use their mobile phones (technology dimension) to make travel arrangements, and to use travel applications (functional dimension) far more than would be used by people from older generations (Barton et al., 2013). Further, young travellers are more likely than other age groups to use their mobile phones to show travel pictures to friends, to share travel photographs on social media, to use blogs or other on-line means to recount their travel experiences, and to post travel reviews (communication dimension). They also report conducting more travel research and comparisons over the internet and making greater use of search engines for travel purposes (information dimension). Thus, they are far more likely than other age groups to upload travel information and report much more reliance on user reviews, experiences, and online contents when they make travel arrangements. Moreover, they are less cautious about sharing personal information online. The four virtual dimensions of the smart application, information, communication, functionality, and technology, thus, play an important role in the young traveller’s behaviors.
Four virtual dimensions of the smart application including information, communication, functionality, and technology play an important role in the three phases of traveller’s behaviors. Cavagnaro et al. (2018) studied the experiences of young travellers before travelling and divided the components of their decision-making into the meaning given to travel and the motivation to travel. Search engines provide young travellers with a convenient tool to look for the information needed to plan travel, form expectations, weigh up alternatives, and compare and select what interests them most (Barton et al., 2013). The during-trip aspects of travel relevant to young travellers include the possibility of taking holidays, having new experiences, changing their lifestyle, visiting new places and acquiring new knowledge (UNWTO and WYSE Travel Confederation, 2016). When they travel to a destination, they may request more information from the internet to help them make the most of their travel experiences. They are likely to connect to websites to find detailed information about specific activities or resources to add to information they have already obtained or to access new services (Sigala et al., 2016). In the post-travel phase after their travel activities have been accomplished, young tourists’ are likely to share experiences about activities, products and information sources used through the internet and web technology. They will thus evaluate their experiences online and record their satisfaction about the services they used and the purchases they made as well as evaluating the sources of information they used on which they based their decisions made during the travelling process (Briandana & Dwityas, 2018). They are likely to share experiences about activities, products and information sources used through the Internet and web technology.

The research framework was therefore based on the author’s current understanding of the use of ICTs and other aspects of new technology in respect of the provision and purchasing of ecotourism services. A smart system to support the education of young travellers and the promotion of ecotourism destinations, both in Thailand and other countries, was then designed and developed based on that framework.

4. Methods
This research was conducted using a qualitative approach, utilizing a case study to design and develop a smart ecotourism application in Klong Noi Community, Surat Thani Thailand.

The methodology comprised data collection, system design and development, and system evaluation. The methods of data collection comprised content analysis and in-depth interviews while the smart application was designed and developed and, finally, the proposed system was evaluated.

Data collection was conducted during field trips to obtain information relating to Klong Noi Community Ecotourism, including details of local attractions, ecotourism methods, activities, accommodation, food availability, etc., which were obtained using document analysis, and interviews with various sources, such as local community members, local business owners and staff, tourists, and local government officers. The data collected were digitized into multimedia formats to enable it to be used as the ecotourism information content of the system, which potential travelers can plan their trips prior to travelling, as well as in the during-travel phase. Moreover, the information enables visitors to understand how to properly conduct themselves while at the destination and thus reduce their impact on the local community, the environment and the local ecosystem.

A pilot system was designed in line with the perceptions of young tourists’ behaviors (Cohen et al., 2014; Gretzel & Fesenmaier, 2009). The system was designed and developed as a web-based application incorporating a web responsive design. This study focused on young travellers as it is possible to predict changes and trends in tourism behavior by explaining their present behavior (Carr, 2003; Cavagnaro & Staffieri, 2015; Leask et al., 2013). Previous research into this segment of the tourism market has however been restricted and fragmented (Richards & Wilson, 2003). The pilot system was evaluated from October to December 2019 among Thai university students between the ages of 18 and 23, the typical age of young travellers. The study’s scope was limited to university students since they are easy to access in terms of location and availability during the university semester, and all are familiar with the use of mobile phones and the internet. All the participants were given the opportunity to offer additional feedback on what they thought could be improved in the smart application.
5. Results
In this section, the system developed will be described and the result of the evaluation of both its front-end and back-end systems, as well as its ability to be used on a variety of electronic devices will be presented.

5.1. The smart application for learning ecotourism
The front-end system is comprised of the functions dealing with multimedia learning of ecotourism knowledge, information about the ecotourism destination, and communication. The multimedia learning of ecotourism knowledge aspect is illustrated in Figure 2.

In this part of the smart ecotourism system, information and methods of environmental preservation are presented in the form of definitions and principles, significant facts, impacts, related activities, and rules and regulations at the location. The information about the ecotourism destination aspect serves a number of different functions. The first is to provide information about the destination, e.g., accommodation, transportation, natural-based attractions, local food, local handicrafts, the cost of the trip, eco-trip routes and itineraries, etc., which provide accurate and up-to-date information to travellers so that they are able to plan their trips and activities. The information is visualized in the form of highlights of ecotourism attractions, recommended trips and trip experiences. The second function is to give news and information about events, ceremonies and festivals relating to ecotourism with information about their timing. The third function is the provision of an interactive guide map which shows the location of attractions and activity routes to help users to plan their visit. The communication aspect serves the following functions: customer features, e.g., member management, contact details, FAQs, and community features, including reviews, comments, and ratings, as well as recommendations for new ecotourism attractions. Users can also upload and share files/videos in this section of the system.

Meanwhile, the back-end supporting system manages the entire system and data management, and emphasizes ease-of-use since some users might have less skills and experience of ICTs. The back-end system also covers content management, events management and security management.

5.2. System evaluation
We conducted a usability evaluation to assess and modify the system prior to further study and deployment between October and December 2019.
5.2.1. Procedures
The evaluation phase consists of two stages: the pilot study (October—December 2019), and the main study (due to begin October 2020). The pilot study was conducted among 108 participants in order to determine the form of the final version of the smart application. The main study, which will be improved based on the findings of the pilot study, will be conducted among participants from different counties and exposed to the beta version of the system. The pilot study began by introducing the smart application to the participants and providing them with an overview of the system, as well as showing them the operational manual of the smart application, which occupied at least 30 minutes. They were then allowed to gain practical experience of the system and to provide feedback related to the system’s usability. Upon completion of the tasks, each participant also completed the assessment questionnaire divided into four dimensions: information, communication, functionality, and technology, which contained 20 items relating to the system’s capabilities and efficiency which were answered based on a 5-point Likert scale (1—strongly disagree to 5—strongly agree).

5.2.2. Results of the system evaluation
As shown in Table 1, ten of the participants (9.26%) were aged between 18-20 years while 98 (90.74%) were aged between 21-23 years. In addition, 49 of the participants (45.37%) had been using the internet for more than 10 years. Moreover, 63 (58.33%) had learned about ecotourism from various media with social media being the largest source, followed, respectively, by websites, TV/radio and newspapers/magazines. Of the participants 18 (16.67%) had no travel experience while 62 (57.41%) had travelled 1–5 times; and, 28 (25.93%) had travelled more than six times.

The overall mean response score relating to the system’s efficiency and capabilities showed that users’ satisfaction with the system’s ability was at a high level ($\bar{x} = 4.04$) indicating that this system is capable of managing the four dimensions well and that the smart application for ecotourism has been successful in satisfying the needs of young travellers.

The evaluation of the system’s efficiency and capability in regard to the information dimension (as shown in Figure 3) was at a high level ($\bar{x} = 4.07$) with the rating results from the highest to the lowest, respectively, being for (a) the guide map showing interesting attractions or activity routes; (b) the system displaying relevant information relating to attractions contributed by community members;

![Table 1. Profiles of the participants in the system assessment (n = 108)](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAI0AAADcAQMAAAB14s9JAAAAGXRFWHRTb2Z0d2FyZQBBZG9iZSBJbWFnZVJlYWR5ccllPAAAAy5JREFUeNrs7zv1MUgDAwAnwA2NzA0GvAAIYyCjYIeAAAIamwBMACMAAAAAASUVORK5CYII=)
(c–d) the system being designed to suit young people, e.g., users can enjoy learning easy to understand content and can employ the system to boost their learning about ecotourism outside the classroom; (e) the system presenting suitable information which aids users’ understanding of ecotourism, for example, activities which do not have a negative impact on the environment, the local culture and rules for travellers in a particular area, all of which build awareness about ecotourism, the preservation of the local environment, and enable users to plan their visit to the ecotourism site; (f) the system providing information about events, and festivals as well as fostering good public relations; and, (g) well-organized information structure.

The evaluation of the system’s efficiency and capabilities in regard to the communication dimension (as shown in Figure 4) was also at a high level ($\bar{x} = 4.01$) with the rating of the results, from the highest to the lowest, being, respectively: (a) the ability for users to download/upload content; (b) the ability for users to review, comment about and rate features of the destination; (c) users being able to make recommendations/share experience to other users about attractions or activities; (d) optimized and clear connection of the multi-communication channels; (e) the system allowing the use of more than one language; and, (f) preparing answers to frequently asked questions.

The evaluation of the system’s efficiency and capabilities in regard to the functionality dimension (as shown in Figure 5) was also at a high level ($\bar{x} = 4.00$) and the ratings from the highest to
the lowest, respectively, were as follows: (a) the ability to use the system as a travel tool throughout an entire trip; (b) the provision of a visual map to illustrate the information; (c) the ability to exchange and express ideas; (d) the provision of learning tools; (e) the internal search function; and, (f) the navigation system with clear and easy-to-understand functions.

Finally, the evaluation of the efficiency and capabilities of the system in regard to its technology (as shown in Figure 6) was also at a high level (\( x = 4.00 \)) and the rating scores from the highest to the lowest, respectively, were as follows: (a) the system being able to be used on various devices (responsive design); (b) the multimedia being suitably designed with the content visualized using a variety of techniques; (c) the technology selected being suitable for young learners; (d) ease of use; (e) suitable system security; and, (g) consistent user interface design.

Results from this evaluation indicate adequate efficiency of the system and high levels of satisfaction, and yielded specific feedback regarding ways to improve the user experience. Aspect of the four dimensions, they suggested the information structure should be well organized in order to easy to use system and its navigation. The user interface should be designed consistency. Moreover, the efficiency of internal search functions and system security should be improved. Regarding to young travellers’ behaviors, the application system should be included
more than one language and prepare the frequently asked questions and the other channels to quickly respond to queries from users.

These results represent the first step to develop and refine the pilot system. Feedback from the pilot study will be used to make improvement in the system prior to larger-scale testing. The main study in the further step will be conducted among participants from different counties and exposed to the beta version of the system.

6. Discussion and conclusion

This research developed a smart application to support lifelong learning relating to ecotourism, which systematically manages information, boosts learning and creates opportunities for young people to understand and be aware of ecotourism, as well as allowing a destination to advertise its attractions. The system was designed so that users can plan their eco-trips and activities are introduced along with information about the preservation of the environment and the local community’s culture. The system also includes in-depth information provided by members of the local community to its users.

The previous literature revealed that there has been little research attention devoted to the study of ecotourism emphasizing young people although the topic is significant in terms of the impact on future ecotourism (Chao et al., 2014; Halvatzaras & Kabassi, 2016; Meiliana et al., 2017; Nitti et al., 2017; Reisinger & Mavondo, 2002; Ruiz et al., 2017; World Tourism Organization, 2010). Nevertheless, the studies by Cini et al. (2015), Kasim and Wickens (2018), as well as the study of Sangpikul and Batra (2007) relating to ecotourism and young Thais suggest that ecotourism is a new and important trend in tourism. Young people may be first-time eco-tourists or may have limited experience or knowledge of ecotourism. Therefore, gaining knowledge and experience of ecotourism using ICTs will enhance travellers understanding of the possible negative environmental effects of ecotourism and its impacts on local ecosystems by raising their awareness of environmental and cultural considerations.

The result of the study supports the promotion of ecotourism at destinations and provides an opportunity for its users to learn about ecotourism at those locations through the use of modern media in a smart-learning application. This smart application, therefore, removes obstacles to young people understanding about ecotourism by providing an online learning channel appropriate to their needs, thus combatting the general lack of information on-line about ecotourism noted by previous researchers (Cini & Passafaro, 2019; Cini et al., 2015; Sangpikul & Batra, 2007).

The system was designed to allow users to learn about ecotourism destinations based on information provided and managed by the local community and focuses on the creation of a sustainable tourist ecosystem. The use of ICTs in ecotourism management will improve public relations and the dissemination of information, as well as providing sources of learning, as mentioned by previous researchers (Ivars-Baidal et al., 2019; Li et al., 2017; Xiang et al., 2015), especially among young Thai people, who are conversant with new media channels. Moreover, learning through digital media can occur at any time or place and is a potent means of spreading knowledge (Sangpikul & Batra, 2007; Tetiwat et al., 2019). Thus, the smart application developed in this study is able to promote Klong Noi Community Ecotourism and provides an opportunity to learn about ecotourism based on information provided by the local people who have first-hand experience of the destination and its community. The system was developed to facilitate ecotourism based on the perceptions of young travellers’ behaviors and represents a source of information which allows travellers to virtually experience the destination, thus creating understanding and awareness among young people, not only in Thailand but also internationally.

This study contributes to the current ecotourism literature and broaden understanding of the ICTs-based ecotourism, particularly on the Thailand context. Moreover, they will provide suggestions for ecotourism business in Thailand to develop the smart application attractive to the targets of young people.
The limitations of this study should be acknowledged, which may provide guidance for future research. Firstly, this is the pilot phase of the development of the smart ecotourism application and the results described relate only to the prototype system, which will be further developed into a final system, which will then be evaluated by potential users. Secondly, the findings described in this paper are specific to the case study of Klong Noi Community Ecotourism in the southern Thailand and it would be difficult to apply them to other contexts. Thirdly, the study’s limited resources only allowed for the inclusion of university students as sample and a convenience sampling was used to evaluate the smart application, which may limit the generalizability of its research findings. Further research is necessary to investigate more diversified young tourists from different countries and to extend the study to include tourists from other generations will respond to evaluate the performance of the smart application.

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