



**The Connection between Visitors Behavior, Conservation Awareness
and IT Usage: A Case Study of Batu Secret Zoo, Indonesia**

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Degree of Master of Science in Environmental Management
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Thesis Title The Connection between Visitors Behavior, Conservation Awareness and IT Usage: A Case Study of Batu Secret Zoo, Indonesia

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Abstract

Information Technology (IT) are increasingly used to help zoos address emerging issues especially in terms of education, conservation and research. The use of IT in the zoos can improve visitors' experience and conservation awareness. Therefore, this study aims to explore the connections between zoo visitor behavior, their conservation awareness and IT usage in the context of Indonesia. Batu Secret Zoo is chosen as a case study, as it is considered one of the best zoos in Indonesia. This study used interviews, observation and literature review to investigate whether correlations exists between visitors behavior, conservation awareness, and IT usage also examined whether the use of IT can help to increase conservation awareness of the visitors. The results showed that there is a disconnection between the attitude and awareness of the visitors in relation to the roles of the zoo and its conservation benefits. Moreover, the findings showed that there are significant correlations between IT usage and visitors reading behavior and ability to name an idea/activity related to conservation. However, the observation showed little interaction between visitors and IT application at the zoo while the review of post-visit feedback showed low mentioning of IT as the positive feature of the zoo. In conclusion, Batu Secret Zoo could better optimize its IT application by engaging zoo staff in monitoring and evaluation of the IT application usage and incorporating human interaction to promote user adoption of IT application and usage of the interpretive signs. Technology alone will not automatically improve visitor engagement or experience with the destination, motivation and personal interaction remain an important part of effectively implemented IT application.

Keywords: Zoo, Information Technology, conservation-education, visitor behavior, conservation awareness, IT usage, Indonesia

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List of Abbreviations

2D	=	Two Dimensional
3D	=	Three Dimensional
AR	=	Augmented Reality
CEAC	=	Canadian Environment Advisory Council
E-ticket	=	Electronic ticket
IUCN	=	International Union for Conservation of Nature
IUDZG	=	International Union of Directors Zoological Gardens
IT	=	Information Technology
P-value	=	Probability value
PC	=	Personal Computer
PKBSI	=	Persatuan Kebun Binatang Seluruh Indonesia (Indonesian Zoo and Aquarium Association)
QR codes	=	Quick Response codes
WAZA	=	World Aquarium and Zoo Association
WZCS	=	World Zoo Conservation Strategy

CHAPTER 1

Introduction

This chapter contains a problem statement, research questions and objectives, scope of research, expected benefits and research plan of the study.

1.1 Problem statement

The roles and purposes of zoos have changed in the recent decades. Historically, zoos aimed to satisfy human curiosity and recreational desires. While much of the original purposes remains in the present day, zoo are becoming more focused on animals welfare (Powell and Watters, 2017), education (Marino *et al.*, 2010), conservation, and research both in-situ and ex-situ (Hopper *et al.*, 2016).

Urbanization is one of the important factors for zoos to change its role. In 2014, 54% people of the world lived in the urban area and by 2050 this number will increase into 66% (United Nation, 2015). The limitation of land by urbanization caused zoos' role as a conservation-education agent to become more critical. Central Park Zoo, for example, has a long historical value which shifts from entertainment into conservation-education agent for the people in New York. Moreover, it was also known as an identity of the city and influenced the economic, cultural and even political aspects of New York (Behre, 2014).

Despite of the changing role of the zoos, several challenges exist. Catibog-Sinha (2008) explained zoo problems which included creating well-managed captive breeding programs, maintaining the integrity of captive animals, reintroduction of threatened species, animal welfare issues, increasing the environmental enrichment, improving scientific understanding and research, providing effective educational and

interpretation programs, balancing the conservation goals with economic imperatives and collaboration with other organization especially tourism industry. Technologies are increasingly used to help zoos address these issues especially in terms of education, conservation and research. The use of technology in the zoos can improve visitors' experience and conservation awareness, increase research opportunities and enhance animal welfare (Clay *et al.*, 2010). Modern technology implemented in the zoos, such as electronic graphics or interactive computer, can increase visitors knowledge and awareness on how to resolves issues surrounding conservation (Swanagan, 2000). However, there have been few studies that evaluate the use of technology and its conservational benefits in zoos. Continuous evaluation can increase shared knowledge on how technology is used and expand possibilities for its application in ex-situ conservation (Clay *et al.*, 2010).

Worldwide, countries are developing and applying technology to improve productivity in various sectors including tourism and wildlife conservation. While zoos may reflect a small fraction of what technology could achieve in conservation and environmental education, they offer a strategic tool to raise the awareness and knowledge in the public regarding the current conditions and threats of the world's and national natural habitats and species. Indonesia, as an extremely rich country in biodiversity could use the information technology (IT) to help increase effectiveness and efficiency in conservation as well as education.

Therefore, this study aims to explore the connections between zoo visitor behavior, their conservation awareness and the IT usage in the context of Indonesia. Batu Secret Zoo is chosen as a case study as it is considered one of the best zoos in Indonesia (Pertiwi, 2014). Batu Secret Zoo was given an award as one of the best 10 zoos and aquariums in Asia by TripAdvisor in 2014. In addition, Batu Secret Zoo is known to have applied IT technology to support conservation education in its operation (Pertiwi, 2015).

This study will investigate conservation awareness of the zoo visitors. It will explore whether a correlation exists between visitor reading behaviors, an ability to name an idea/activity related to conservation, conservation awareness and attitude, and IT usage. It will also examine whether the use of IT application can help achieve success in increasing conservation awareness and zoo operation. The results from this

study will help zoos improve their effectiveness and efficiency in conservation education role, not only for Indonesian zoos but also the zoos worldwide, especially in a developing country that has similar characteristics.

1.2 Research questions

The study is guided by 3 research questions:

1. What is the conservation awareness level of the Batu Secret Zoo visitors?
2. Are there any relationships between visitor reading behavior, conservation idea and IT usage?
3. What are the roles of IT application in conservation awareness and zoo operations?

1.3 Research objectives

The research objectives of this study are:

1. To measure the conservation awareness of the Batu Secret Zoo visitors
2. To identify the relationships between visitor reading behavior, conservation idea and IT usage
3. To examine the roles of IT application in conservation awareness and zoo operations

1.4 Scope of research

The scopes of research in this study are:

a) Content:

- The study focuses on the Batu Secret Zoo visitors' behavior in reading signs and information panels, their ability to provide an idea or an activity related to conservation, and their usage of facilities and services provided by the zoo.
- IT usage refers to the use of both software and hardware for example, website, QR code, simulations, audio, video presentation, interactive computer, touchscreen panels that are used in this zoo for providing conservation education to visitors or feedback during or after the visits.
- Conservation awareness is defined as an ability to know, perceive and feel the value of conservation. The example includes the ability to provide ideas on environmental actions.

b) Method:

- Qualitative methods in this study focus on content analysis by analyzing data from visitor and staff interviews, TripAdvisor reviews and on-site observation.
- Quantitative methods in this study focus on descriptive, inferential statistics and Chi-square bivariate correlation to analyze the data from visitor interviews and TripAdvisor reviews.

c) Location:

- The study took place at Batu Secret Zoo, Indonesia.

d) Time:

- The observation and interviews data collection were conducted from January – March 2018.
- The secondary data from TripAdvisor website was collected from reviews in 29 July 2011 until 11 June 2018.

1.5 Expected benefits

The understanding of the conservation awareness, attitude and behavior of the zoo visitors and the role of IT in the zoo can be used to improve management and identify strategies to address challenges facing the zoos. This is not only relevant to zoos in Indonesia but also in the contexts where IT is widely used by the population and promoted as the future development direction. Furthermore, this study will provide recommendations for zoos to effectively engage with visitors to optimize their function as a conservation and education agent.

1.6 Research plan

The plan of the study is displayed in Table 1.1.

Table 1.1 Research Plan

Activities	Duration (Months)							
	2017				2018			
	1 – 3	4 - 6	7 - 9	10 - 12	1 - 3	4 - 6	7 - 9	10 - 12
1. Review of relevant literature								
2. Pilot survey								
3. Data collection								
4. Data processing and statistical analysis								
5. Result interpretation								
6. Preparation of dissertation and manuscript								

CHAPTER 2

Review of Literature

This chapter contains a literature review of the history of zoos, their roles and missions, current challenges for zoos, development of technology and its application in zoos. It provides a theoretical framework for the processes in education and conservation, as well as zoos in Indonesian context, and Batu Secret Zoo.

2.1 History of zoos

Historically, zoos were not open for the public but for the elites who collected unusual animals for their enjoyment. As the time passed, there was a shift from zoos as the animal collection space into a place for public visit. This was exemplified by the display of animals gathered at Schloss Scunbrunn, Vienna, Austria, which was opened for public in 1765 (Odell & Wlodarski, 2009).

Along with the increasing popularity of the zoos, the 19th century saw the appearance of the modern zoological gardens. The 19th century zoos claimed not only to educate and entertain their audiences, but also to serve science by providing a direct access to exotic animals. However, in reality the majority of biologists preferred to use the dead bodies as the materials for their morphological research rather than observing from the zoological parks (Hochadel, 2005).

With the increasing disappearance of the natural habitats, zoos can play a major role in the conservation of certain species (Ryan and Seward, 2004). In response to this issue, the World Zoo Conservation Strategy (WZCS) called for zoos to become more conservation-focused (IUDZG, 1993). The shifting strategy of zoos from recreation and entertainment to conservation and education entails a change in the design and delivery of conservation interpretation in zoos (Wijeratne *et al.*, 2014).

However, the concept of conservation is subjected to an individual interpretation and the definition of zoos' role become vague (Davidson *et al.*, 2010). Even though it is not easy to counteract the deep-rooted perception of the zoos in the public's mind, it is a necessary step to raise citizens' conservation awareness that can lead to behavioral change in real life and a participation in grass-roots conservation movements by citizens (Kawata, 2013). The evolution of the zoos over time is shown in Figure 2.1.

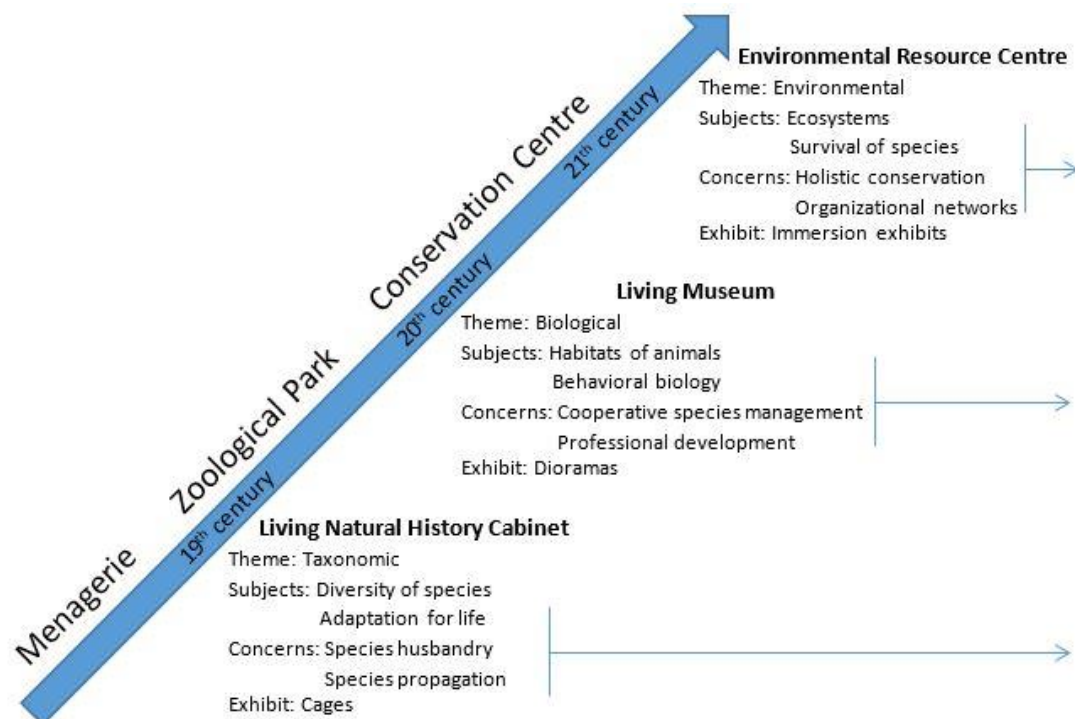


Figure 2.1 The evolution of zoos (IUDZG, 1993)

2.2 Zoo's role and mission

The change in zoo's role in animals welfare (Powell and Watters, 2017), education (Marino *et al.*, 2010), conservation, research efforts and biology, and behavior both in-situ and ex-situ (Hopper, 2017) were recognized by WAZA (World Aquarium and Zoo Association). These functions are written in their goals "to guide, encourage and support the zoos, aquariums and organizations of the world in animal

care and welfare, environmental education and global conservation” (WAZA, 2016). The need to increase zoo’s role in conservation and education is highlighted at an international level (WAZA, 2016). WAZA initiatives were successful in improving conservation status of high-profile threatened species and habitats especially in biodiversity-rich region in the world. However, the allocation of resources (including non-monetary support) that zoos allocated in in-situ conservation was relatively small and raised criticism on conservation commitment of zoos (Gusset and Dick, 2010). Despite this criticism, the zoo has been proved successful as a main ex-situ conservation in protecting some of the endangered species since some species cannot be efficiently preserved in their natural habitat (Witzenberger and Hochkirch, 2011; Blanco *et al.*, 2009).

It is debatable whether zoos provide sufficient education to the visitors. Some research have shown that zoos had a positive effect on visitor education. For example, the research done by Dür (2017) revealed that a single visit to a zoo had a significantly positive educational effect on visitors. Another study by Matiasek and Luebke (2014) showed a success of a systematic approach in educational program evaluation that engaged zoo education program staff and provided meaningful information for program environment. The strategy was known as Chicago Zoological Strategy and was implemented by a non-profit organization that operated Brookfield Zoo in USA. On the contrary, there have been studies that countered the educational values of the zoos. Marino *et al.* (2010) found no evidence to support the claim that zoos promoted attitude change, education, and interest in conservation in visitors. To justifying the positive effects of zoos on visitors, a well-structured research remains to be done (Marino *et al.*, 2010).

2.3 Current challenges for zoos

Currently, zoos are facing several challenges. These are include species challenges such as captive breeding programs management, reintroduction of threatened species, captive animal welfare management, the lack of understanding and

research in animal science. Other management challenges also exist in educational and interpretation program delivery, dilemmas between the conservation goals and economic necessities, and relationships with interest groups and key stakeholders such as tourism operators (Catibog-Sinha, 2008). Shepherdson (2003) confirmed these issues by highlighting the increasing public concern about animal welfare which heightened the public's expectations of animal well-being in the zoos. Furthermore, there is a need for zoos to design and deliver environmental education programs, support wildlife research, provide funds and manage manpower and expertise in intensive management for the conservation efforts and reintroduction (Lees and Wilcken, 2009). These challenges need to be considered by zoos especially if they are to be successful in achieving their missions as a conservation, education as well as research institution.

2.4 Application of information technologies in zoos

Technologies can help zoos achieve their goals efficiently especially in terms of education conservation and research. The use of information technology in zoos can improve visitors' experience and conservation awareness, increase research efficiency and enhance animal welfare (Clay *et al.*, 2010). Information technology (IT) tools in the zoo, such as electronic graphics and interactive computers can help zoo visitors obtain experience and learn on how to resolve issues surrounding conservation (Swanagan, 2000).

The study of technology application was mainly explained by two models of adoption (Geroski, 2000). Firstly, epidemic model, is a model with a perspective that the success of technology implementation relies on the IT application such as the information, how to use and technology implication. The second model which called the probit model, explains that the success of IT application adoption is determined by the users.

Research has demonstrated how IT can help zoos resolve their problems. The study conducted by O'Hara *et al.* (2007) examine the use of mobile camera phones

and 2D barcode to enhance the visitors experience in the zoos. Perdue *et al.* (2011) evaluated the impact of the touch-screen computer on orangutan behaviors and visitor behavior and experience. The results showed that the technology did not have any negative effect on orangutan behavior and visitors' attitudes were highly positive toward the technology. Srisuphab *et al.* (2014) implemented a technology that combined the advanced navigation system on android-based mobile devices and augmented reality (AR) to assist the zoo visitors in navigation and give information about the zoo. The study highlighted that IT could effectively attract children and teenagers to learn about wildlife and raise their conservation awareness. In 2006, WAZA even created a virtual zoo where the visitors can experience the virtual visit to the zoos through their mobile phones or computer devices (WAZA, 2015).

However, there is a lack of continuous evaluation on the use of IT and how to expand its effective applications in zoos (Clay *et al.*, 2010). As each zoo is faced with different challenges, knowledge in the way in which IT may be useful to zoos in various contexts is important for animal scientists, educationists, and zoo managers. Investigation into the implications of IT needs to be contextualized with the understanding that multiple factors contribute to the implementations and outcomes of IT in the zoos.

These issues prompted this study to examine a selected zoo in Indonesia as a case study. Indonesia is a developing country where biodiversity conservation attracts global attention. The insights into how zoos operate under the influence of global economy and international conservation trends can provide valuable management lessons for other developing countries.

2.5 Theoretical framework

Theoretical framework of this study was given in Figure 2.2. The framework was modified from Ballantyne *et al.* (2011) and Goldman and Schaller (2004). As a conservation education agent, zoos need to address the issues on learning

experience and engagement of the visitors to ensure that the visitors can get better conservation knowledge, behavior, awareness and attitude from their visits.

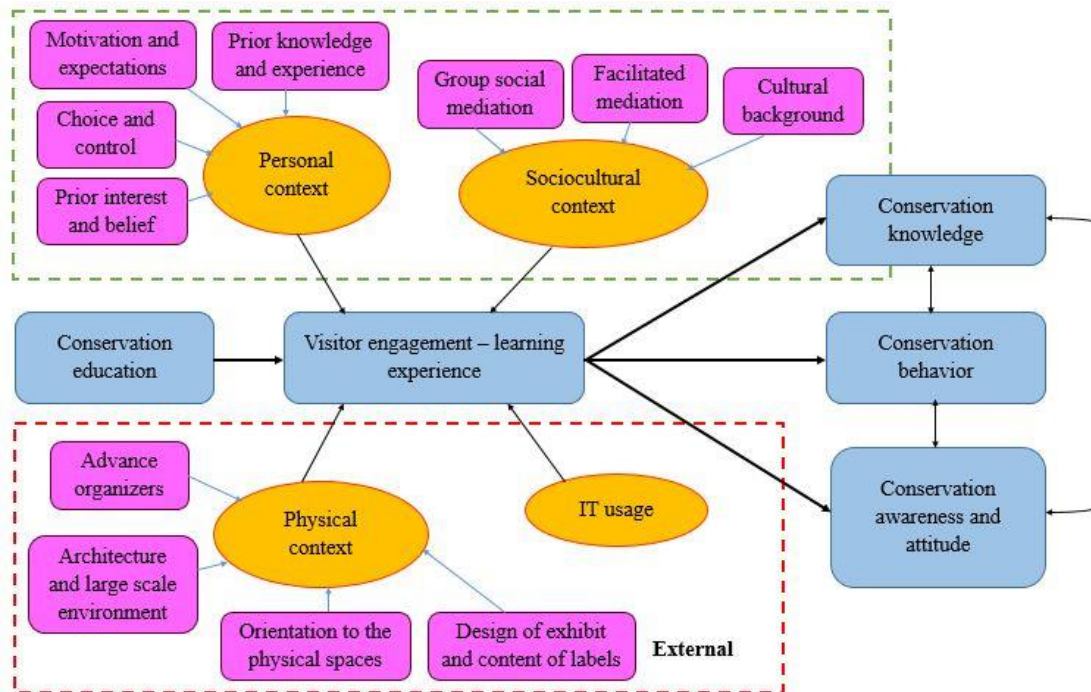


Figure 2.2 Theoretical framework

Conservation education can lead to the visitor engagement and learning experience which can be effected by internal (personal and sociocultural) and external factors (physical context and IT usage). This engagement is also expected to transform into the conservation values (knowledge, behavior, awareness and attitude).

2.6 Zoos in Indonesian contexts

Indonesia is one of the richest country in the world in terms of its biodiversity (Hutomo and Moosa, 2005; Sodhi *et al.*, 2004, 2010; Abood *et al.*, 2015). However, the Southeast Asian country is also known for its habitat loss. From 2002 – 2012, Indonesia has lost over 6.02 million hectare of its primary forest with the average increase of 47.600 hectare every year (Margono *et al.*, 2014). Therefore, habitat conservation is one of the major challenges in Indonesia.

According to the Instruction of the Minister of Home Affairs No. 35/1997, all governors and regional heads in Indonesia are responsible for the cultivation and management of the flora and fauna in their administrative areas. Meanwhile the regulatory agency for licensing procedures, criteria, requirements, rights and responsibilities of zoos is the Minister of Forestry. However, apart from obtaining the license from the Minister of Forestry, the establishment of a zoo in Indonesia must receive an approval from the local government as well as the Indonesian Zoo and Aquarium Association (PKBSI).

Currently, there are 47 zoos and aquariums in Indonesia listed with Indonesia Zoo and Aquarium Association of which more than half (26) are located in Java Island (PKBSI, 2017). Figure 2.3 shows the location and number of zoos and aquariums in Indonesia (the number in the bracket represents the amount of zoos and aquariums in each location).

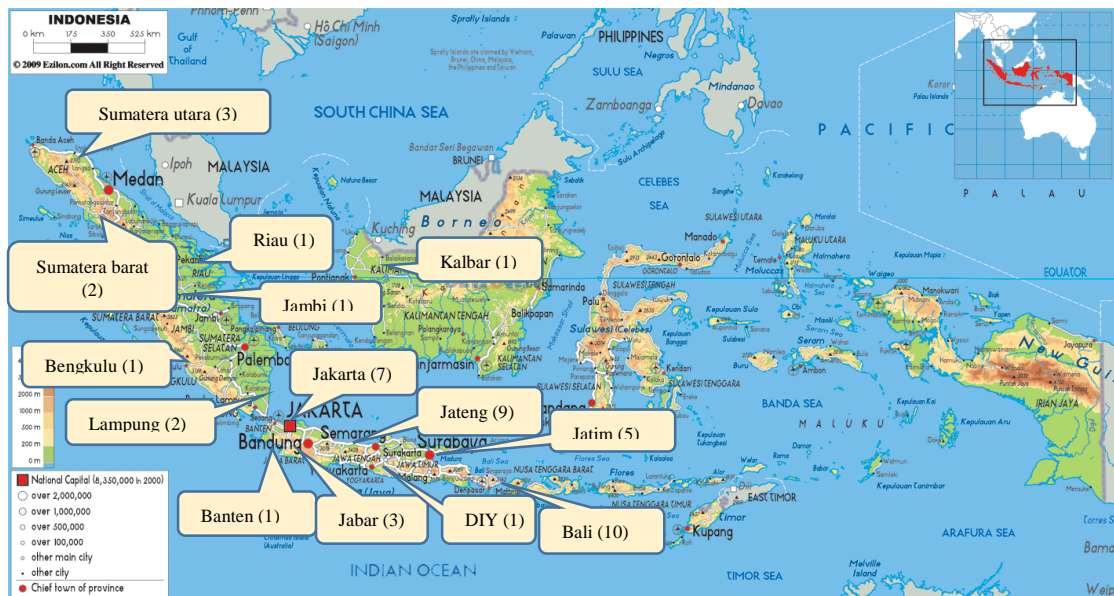


Figure 2.3 Zoos and aquariums in Indonesia (PKBSI, 2017)

PKBSI has their missions and programs which focus on:

- Conservation and animal welfare
- Coaching and ethics
- Training and research
- Cooperation between sectors at national, regional and global levels

- Fundraising and partnership
- Information system
- Organization development
- Accreditation, evaluation and member stabilization

Apart from PKBSI, the zoos often cooperate with the local government and private sectors in several aspects including IT application and technology. For example, the government supported Ragunan zoo in Jakarta, the first zoo in Indonesia, by establishing the integrated electronic ticketing (e-ticket) and mobile application (Taylor, 2016). Another example is Batu Secret Zoo which has a partnership with a private company to create the IT application system in the zoo. The cooperation includes the establishment of IT application and operation system in the zoo (personal communication, March, 2018).

2.7 Batu Secret Zoo

Batu Secret Zoo is a tourism destination and a modern animal conservation that is located in Batu City, East Java, Indonesia. The zoo has an area of 14 hectare. Its development started in 2008 and was officially opened to the public in 2010. It is operated by Jawa Timur Park Group, a private company in Indonesia.

The vision statements of Batu Secret Zoo are:

1. Continuously strive to be the zoo that is managed by good principles and conservation ethics
2. Excel as a reference for education institution, conservation development and research

The mission statements of Batu Secret Zoo are:

1. Build career paths for all of the staff through skill development and capacity by internal education (in-house) and formal training
2. Conservation of rare species through ex-situ and in-situ conservation
3. Become a sustainable zoo in regards to animal population management, staff, financial and environment

4. Create the human-nature relationship through the experience of the zoo and natural science
5. Make sure all of the animals at Batu Secret Zoo have good health and wellbeing

Batu Secret Zoo contains 132 species of mammals, 71 reptile species, 6 amphibian species, 23 bird species and 63 of fish species. It also has many facilities and attractions such as education tours, photo booths, camel ride, nocturnal house, reptile garden, secret zoo, aquarium zoo, savannah zone (Figure 2.4), water park, Fantasy Happy Land (entertainment park), baby animal zoo (where kids can feed tame animals), safari farm and modern landmarks. The map of the Batu Secret Zoo is shown on Figure 2.5.



Figure 2.4 Savannah zone in Batu Secret Zoo



Figure 2.5 Map of Batu Secret Zoo

Understanding the visitor's experiences, zoo operations, its challenges and management requires multiple research strategies. In the context of a biodiversity-rich country under the pressure of the modern development, research activities must become sensitive to the procedure and culture of the organizations in the study area. This prompts the study to adopt a culturally appropriate research design using mixed methods. The details of the research methodology will be discussed in Chapter 3.

CHAPTER 3

Research Methodology

This chapter contains descriptions of the population and sampling, data collection and data analysis used in this study.

This study uses mixed methods to obtain the data about the zoo's role in conservation awareness and education, the IT application in the zoo and the adoption of IT by zoo visitors and staff. The data collection were gathered from the interviews with the staff and visitors, observation and literature reviews. The data were then analyzed using both quantitative (statistical analysis) and qualitative (content analysis) methods. The details about the methods of this study are showed on Figure 3.1 and Table 3.1.

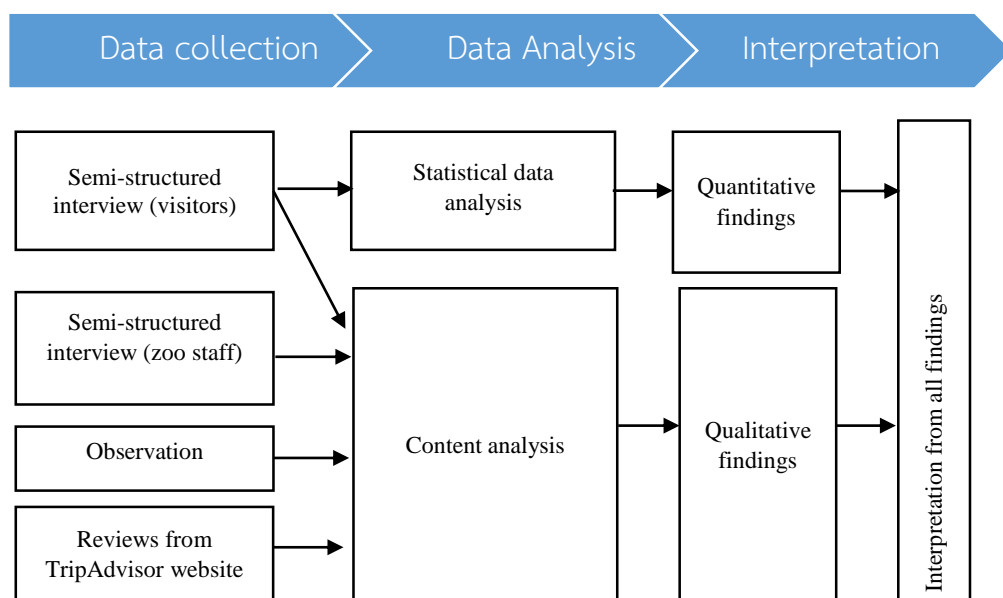


Figure 3.1 Research flow

Table 3.1 Research Methodology

Research questions	Data collection	Data type	Population/sample	Data analysis
1. What are the conservation awareness of Batu Secret Zoo visitors?	Visitors interview	Qualitative and quantitative	83 visitor groups	Content analysis
	Staff interview	Qualitative	10 staff	
	TripAdvisor reviews	Qualitative and quantitative	996 reviews	
	On-site observation	Qualitative	7 zones	
2. Are there any correlation between visitor reading behavior, ability to name an idea/activity related to conservation or environment and IT usage of the visitor?	Visitors interview	Qualitative and quantitative	83 visitor groups	Descriptive and inferential statistics, and chi-square bivariate correlation
3. What is the role of IT application in conservation awareness and zoo operation?	Visitors interview	Qualitative and quantitative	83 visitor groups	Content analysis
	Staff interview	Qualitative	10 staff	
	TripAdvisor reviews	Qualitative and quantitative	996 reviews	
	On-site observation	Qualitative	7 zones	

3.1 Data collection and sampling

3.1.1 Visitor group interview

The staff estimated that the number of zoo visitors is about less than 1000 people in non-peak (non-holiday) season (January-May, August-November), while in the peak season (June-July, December) the number is about 1000 – 2000 visitors. Based on these numbers, the researcher selected the participants for the visitor group interview by using convenience sampling. Convenience sampling, known as accidental sampling, is the type of non-random sampling where the respondents are selected by certain criteria such as places, availability, or willingness to participate (Etikan *et al.*, 2016). In this study, Happy Land was selected as a location to recruit the participants and conduct the interviews. The site selection was due to the availability of places to sit and rest where the zoo visitors can feel comfortable and not so disturbed while doing the interviews. Before being interviewed, the visitor groups were asked whether they had time and were willing to participate in this study as well as informed about the purpose of the study. The visitor groups were then interviewed using semi-structured questions with 11 prompts (Appendix I).

The interviews were conducted every day for a week (26 February – 3 March 2018), making a total 83 groups of visitors as a sample. There were 2 types of the visitor groups, a school group (kindergarten, elementary and junior high school) and a non-school group (family, couple, friend and company). In school groups, the kindergarten groups were represented by the parents and teachers who accompanied the children. This was due to the young age of the children and their lack of understanding. The interviews were typically short and non-formal due to the limitation from the regulation of the zoo.

3.1.2 Zoo staff interview

Based on the staff information, the number of the zoo staff is about 500 people. From this number, the samples for the staff interview were recruited using purposive sampling. In purposive sampling, the researcher decided on the sample by

identifying the person who was capable and willing to give information related to their knowledge and expertise (Etikan *et al.*, 2016). The initial interview was made by asking to interview the zoo managers. In this study, one department head was selected. The department head was then asked to suggest other potential informants to be interviewed based on the specific questions (see appendix II). In total, 10 staff in 6 departments were interviewed in 6 different sections.

The interview questions were designed to address the research questions about the zoo operations and the roles of IT in delivering conservation messages and the management of the establishment. The interview prompts were developed from the literature as well as from a pilot study at Phuket Aquarium and Chiangmai Zoo. The prompts (Appendix II) were refined by the consultations with two academic experts in environmental management and science education fields.

The interview was conducted in Indonesian language. This was because both the researcher and the informants are Indonesian native speakers. The use of Indonesian language makes the informants comfortable and enable them to understand the interview questions easily. The informants were identified using codes or pseudo names to protect their privacy and ensure that no negative consequences could happen to them upon giving information to the researcher. The interviews were recorded by writing and, only with a permission from an informant, by audio recording. Transcripts and notes from the interviews constituted the main qualitative data to be analyzed using content analysis (Elo *et al.*, 2014).

3.1.3 Observation

Observation was conducted to obtain additional data about visitors, exhibits, zoo staff and management. The researcher used overt observation where the people may know that they are involved in a research (Brewer, 2013). In total, 7 zones in the zoo and museum were observed in 7 days for about 4 hours from 12.00 – 16.00 pm. The selection of the zone was based on the availability of IT application in these zones. A checklist (Appendix III) for an observation was developed to ensure that key items identified during the interviews were cross-checked by the researcher during the on-site visits.

3.1.4 Literature review

The online reviews about Batu Secret Zoo on TripAdvisor website were collected to gain additional perspectives from visitors of the zoo. TripAdvisor website was selected as a literature review because Batu Secret Zoo promoted the website to the visitors for writing the reviews. The reviews data started from 29 July 2011 to 11 June 2018 which represented the operational period of the zoo. There were 440 reviews in English and 556 reviews in Indonesian language, making a total of 996 reviews.

3.2 Data analysis

There are two research approaches within this study which required multiple analytical tools. For qualitative data gathered from the literature reviews, staff interviews and on-site observations, content analysis was used (Elo *et al.*, 2014). Interview transcripts and field notes were coded with themes and categorized according to their relationships and relevance to each other. Symbolic quotes were used to represent each theme and their implications on the research questions.

For analyzing quantitative data from the visitor interviews, descriptive and inferential statistics such as chi-square correlation were used.

Several hypothesis are constructed and tested. The bivariate correlation analysis was used to compare the samples. Using 95% confidence level, the results are consider to have a significant value if the P-value is less than 0.05. While the correlation coefficient values range from -1 to +1 where perfect positive correlation will result in +1 value, 0 for being uncorrelated and -1 for perfect negative correlation. Null hypothesizes (H_0) that were tested include:

- 1) The reading behavior has no significant relationship with the ability to name an idea/activity related to conservation or environment.
- 2) The reading behavior has no significant relationship with the IT usage.
- 3) The ability to name idea/activity related to conservation or environment has no significant relationship with the IT usage.

CHAPTER 4

Results

This chapter contains the results from data collection in the field as well as through secondary sources. The field data collection includes information about the management structure and the profile of Batu Secret Zoo's visitors and staff, visitor conservation awareness, reading behavior, the staff's perspectives towards the use of IT and its impact on visitor's conservation awareness. The analysis of the results provide an evidence whether there is a relationship between factors such as visitor reading behavior, ability to name ideas/activity related to conservation, and IT usage of the zoo visitors. The secondary data from TripAdvisor reviews were analyzed to supplement the data collected in the field. The chapter discusses the findings in relation to the roles of IT application in conservation awareness and zoo operation in Batu Secret Zoo.

4.1 Visitor and interviewee profile

4.1.1 Visitor profile

From the interview samples of 83 visitor groups, 65 were school groups (78%) and 18 were non-school groups (22%) (Figure 4.1). This pattern of the group type was influence by the time of the data collection which was in February during a non-holiday period. This pattern of visitors was typical to the zoo as supported by the statement of the zoo educator staff who stated that the type of the visitors during a non-holiday season were mainly school groups. On the contrary, in the holiday season (June, July, and December) there would be more non-school group visitors than those from school groups.

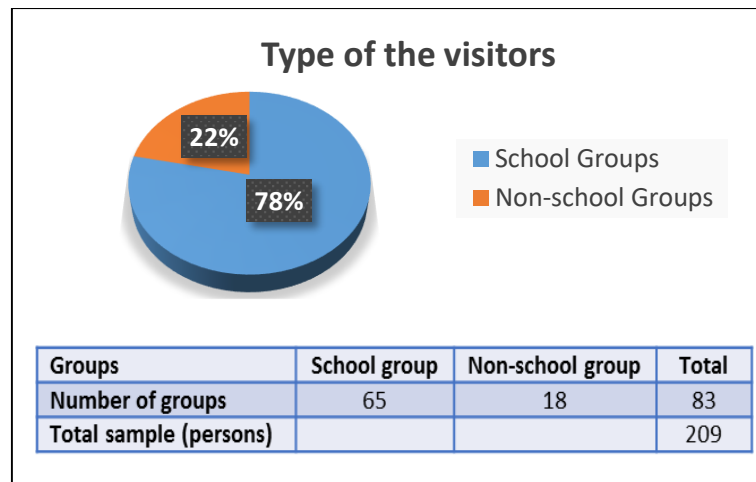


Figure 4.1 Type of the Batu Secret Zoo visitors

The majority of the school groups were kindergarten (5 – 6 years old) which made up 75.38% (49 groups), followed by elementary school or primary school (7 – 12 years old) which were 23.08% (15 groups) and junior high school or secondary school (13 – 15 years old) comprising of 1.54% (1 group). This distribution of the school group visitors (Figure 4.2) was consistent to the marketing strategy of the zoo called “Batu Secret Zoo goes to school”. The program sends Batu Secret Zoo staff to visit selected schools to introduce about the animals and the zoo attractions to encourage students to visit the zoo. This school group’s pattern determines the types of knowledge and activity given by the zoo. This also supports the role of the zoo as one of the non-formal science education agents that communicate information through the visitor experiences and engagement (Soh and Meerah, 2013).

A non-school group distribution (Figure 4.3) contributed to 22% of the total sampled visitors. The classifications of the groups were family (67%), friends (28%) and office group (5%). The family group were normally seen with at least one children as the member of the family.

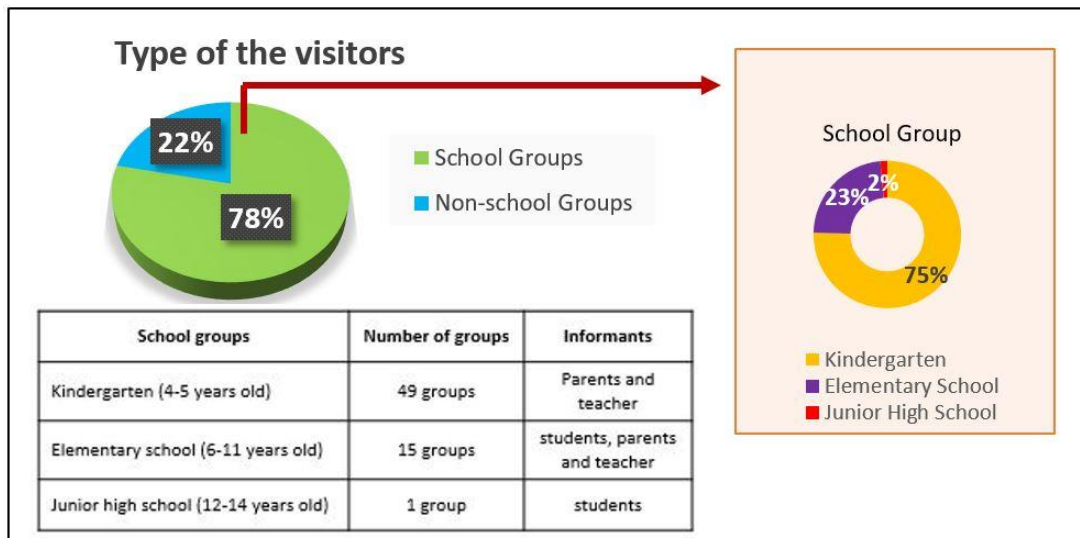


Figure 4.2 Distribution of the school group visitors

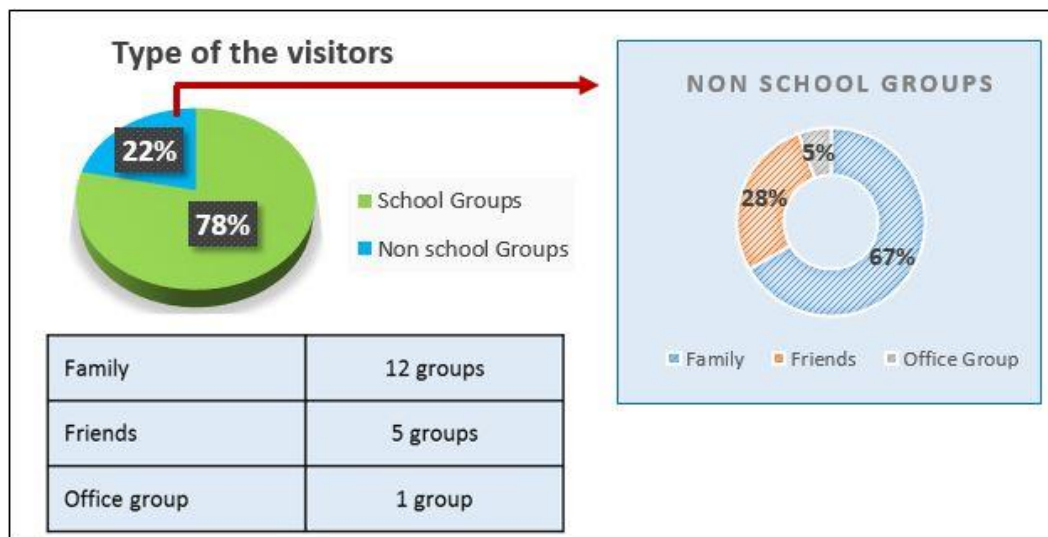


Figure 4.3 Distribution of the non-school group visitors

4.1.2 Visitor behavior

According to the visitor reading behavior (Figure 4.4), school groups paid less attention to the signs and information panels than non-school groups (read category). However, the proportion of the visitors who did not read the information and signs from the school groups (16.92%) was relatively similar with the non-school group (16.67%). The small number of the reading category in the school group was probably because of the school tour schedule which tended to have strict control on time and

activity. Students were often rushed and much time were spent on getting the groups organized. This was different for the family groups which had more relaxed schedule and more flexibility with time and activity.

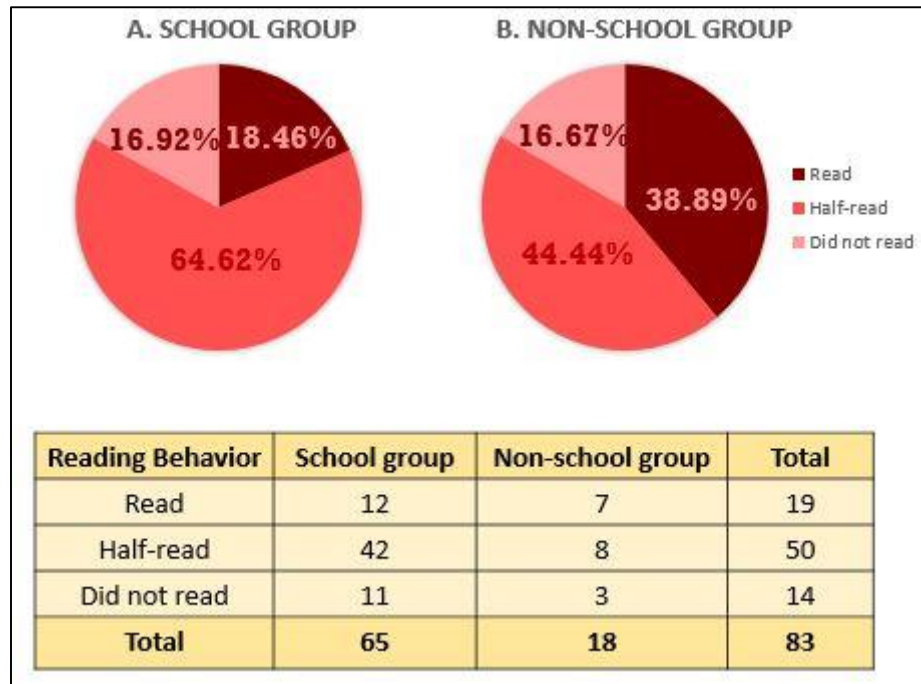


Figure 4.4 Visitor reading behavior

Different groups also showed the differences in the amount of time spent at the zoo (Figure 4.5). School groups had longer average time of stay at the zoo in comparison to the non-school groups. However, the presence of an amusement park and other recreational facilities inside the zoo made it difficult to determine whether the school groups and non-school groups spent their time learning about the animals or at the recreational facilities.

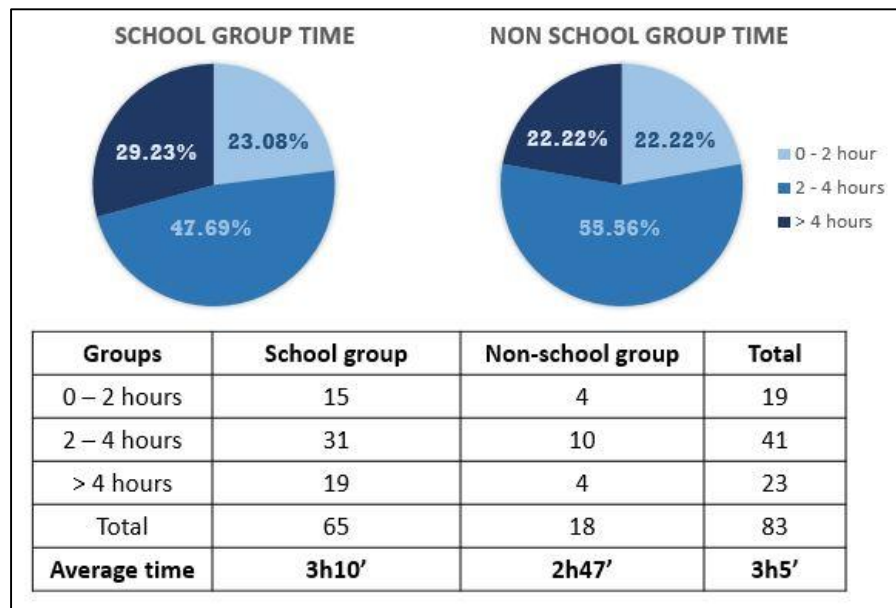


Figure 4.5 Visitor time spent at the zoo

4.1.3 Zoo staff profile

In total, 10 zoo staff and management officers were interviewed (Table 4.1). The interviewees were selected according to their roles and availability to answer the question (related to their position) and recommendations from the key informants.

Table 4.1 Interviewee profile

No.	Position	Code	Number (person)	Role
1	Department Head	DH	1	Planning and implementing education system in Batu Secret Zoo (including Animal Museum)
2	Zoo educator	ZE	2	Guiding, educating visitors about the zoo, animals
3	Animal doctor	AD	2	Management, monitoring and taking care of the animals
4	Marketing staff	MT	1	Market the product/sales, marketing strategy
5	IT staff (maintenance)	IS	1	Technicians, device maintenance
6	Museum Staff	MS	3	Guiding museum visitors, security, cleaning
Total			10	

4.1.3 TripAdvisor user profile

Data from TripAdvisor was collected from the reviews about Batu Secret Zoo from 29 July 2011 until 11 June 2018 with the total of 996 reviews both in English (440 reviews) and in Indonesian languages (556 reviews). However, this does not represent the number of the local and foreigner visitors to the zoo since some Indonesians used English to write a review in TripAdvisor website. According to the nationality, Indonesian reviewers contributed to 86.14% (858 reviews) and the international reviewers were 5.72% (57 reviews) while the rest were unidentified (8.13%, 81 reviews). In addition to the reviews based on the location, TripAdvisor website also categorized the reviews according to visitor types, including family (63.55%), friends (19.78%), couples (12.65%), individual (2.6%) and business (1.4%) (Table 4.2).

Table 4.2 Type of the reviewer based on the location in TripAdvisor website

No.	Type of the reviewer	Visitor type	Percentage	Total
1	Local	Family	55.72% (555)	86.14% (858)
		Friends	16.97% (169)	
		Couple	9.94% (99)	
		Individual	2.21% (22)	
		Business	1.31% (13)	
2	International	Family	3.21% (32)	5.72% (57)
		Friends	1.00% (10)	
		Couple	1.20% (12)	
		Individual	0.20% (2)	
		Business	0.10% (1)	
3	Unknown	Family	4.62% (46)	8.13% (81)
		Friends	1.81% (18)	
		Couple	1.51% (15)	
		Individual	0.20% (2)	
		Business	0% (0)	
Total			100% (996)	

Families were the most common type of reviewers by the local (55.72%), international (3.21%) and unidentified (4.26%) visitors while the business group showed the lowest percentage in all of the reviewer types.

Reviewers in TripAdvisor website also gave their rating of the zoo. With the average rating of 4.5, most of the local, international, and unidentified reviewers gave 5-star rating, followed by 4, 3, 2 and 1-star rating (Figure 4.6). This shows that Batu Secret Zoo is thought to provide a good experience for most TripAdvisor reviewers who have been there.

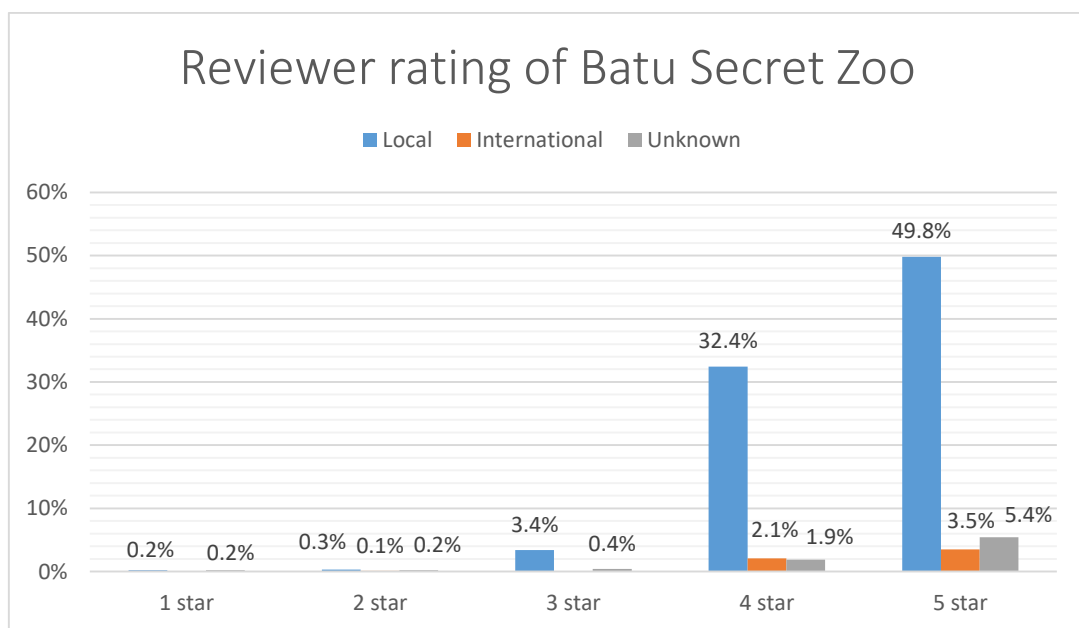


Figure 4.6 Reviewer rating of Batu Secret Zoo in TripAdvisor website

4.2 Conservation awareness of Batu Secret Zoo's visitor

4.2.1 The visitor interviews

Previous studies showed that awareness is related to visitor knowledge and perception (Aminrad *et al.*, 2013). In this study, the determination of visitor conservation awareness was divided into attitude and interpretation. The attitude was assessed from the visitors opinion whether visiting the zoo can increase their knowledge

(Figure 4.7), while the interpretation was determined from the visitors' answers to the questions on i) whether the zoo can increase their environmental awareness, and ii) an idea/activity related to conservation or environment that they can do (Figure 4.8 and 4.9).

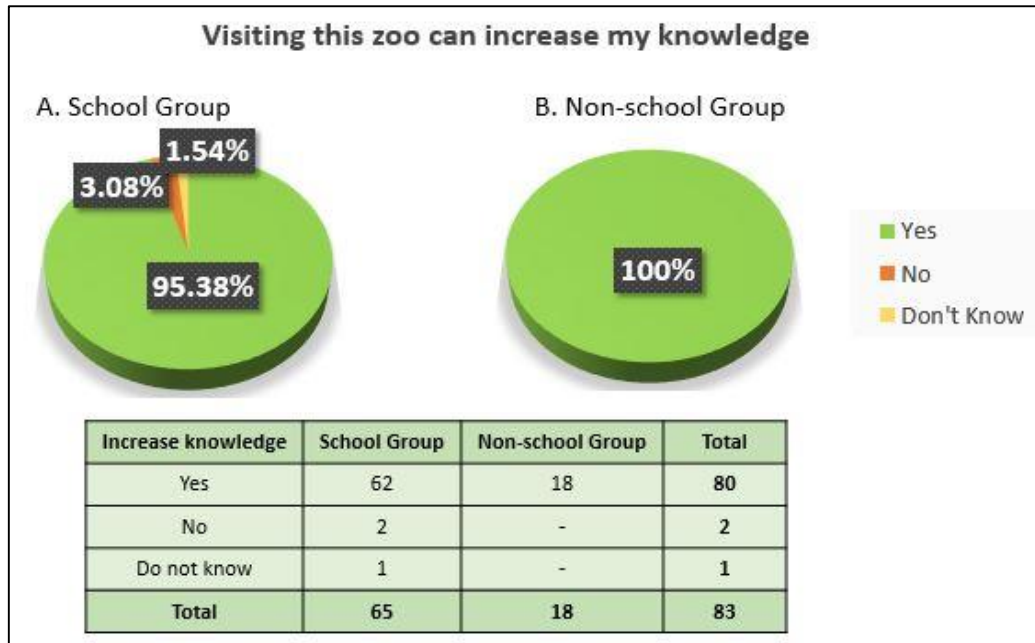


Figure 4.7 Visitor perception whether visiting the zoo can increase their knowledge

In terms of attitude, most all of the visitor both in school and non-school groups stated that visiting the zoo could increase their knowledge. It was note worthy that the visitor groups who said visiting the zoo did not increase their knowledge (2 groups) or were not sure if their knowledge were increased by the visit (1 group) came from the kindergarten group. The responses to the question about the information reading behavior showed that some of the parents from the kindergarten group said that it was difficult for children to read the information and signs in the zoo. This was due to the children behaviors who often ran and went to several spots quickly, which might be the reason why the visitors from this group said that they did not think the zoo visit had increased the children knowledge. This highlights the limitation of providing knowledge to young audience through the information panels and signs in the zoo.

In terms of interpretation, majority of the school group visitors (78.46%, 51 groups) said that visiting the zoo could increase their environmental awareness

(Figure 4.8). However, from this number, only 60.78% (31 groups) could actually name an idea/activity related to conservation or the environment. The non-school group showed a higher percentage on this matter with 88.89% (16 groups) stating a positive increase of environmental concern as a result of the zoo visit (Figure 4.9). From the non-school groups, almost all of them (87.50%) could name an idea/activity related to conservation or environment (14 out of 16 groups). The higher percentage in the non-school group who could iterate the actions/ideas related to conservation or environment suggested that the role of the zoo in promoting the environmental awareness maybe more evident to the non-school group visitors rather than the school group.

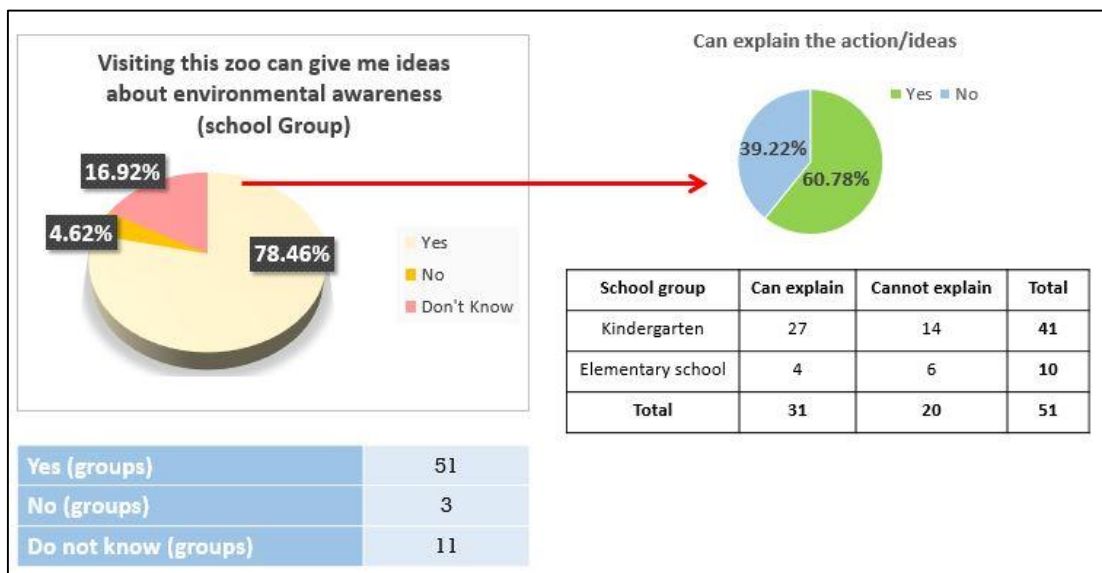


Figure 4.8 The school group response to the question whether visiting the zoo can give an idea/activity related to conservation

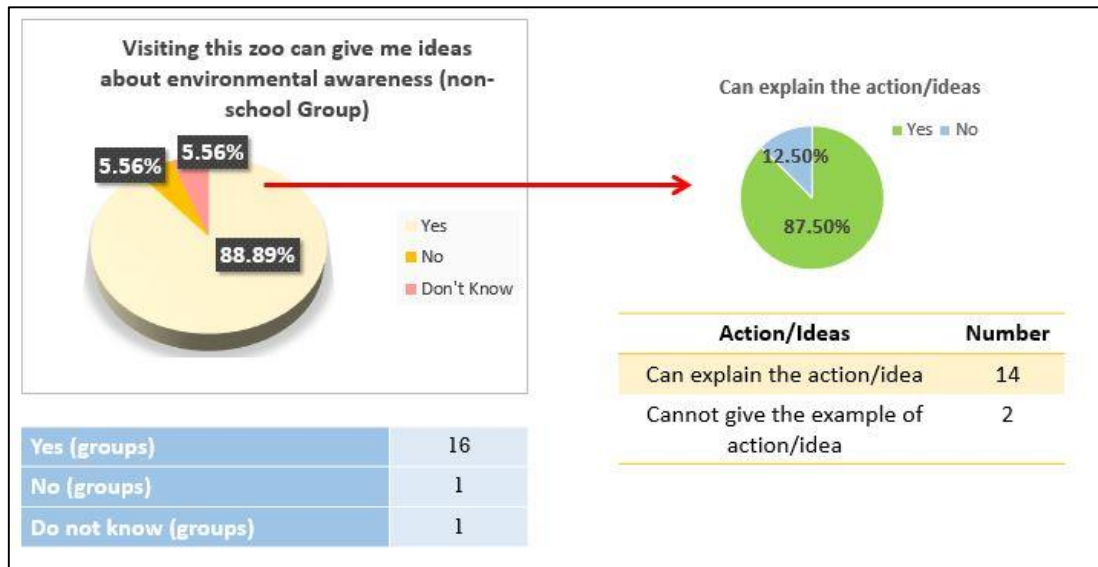


Figure 4.9 The non-school group response to the question whether visiting the zoo can give an idea/activity related to conservation

4.2.2 The zoo staff perception

The zoo staff were interviewed with a question whether the education programs in Batu Secret Zoo could increase the visitor’s knowledge, attitude and behavior towards the environment. The summary of the results is displayed in Figure 4.10.

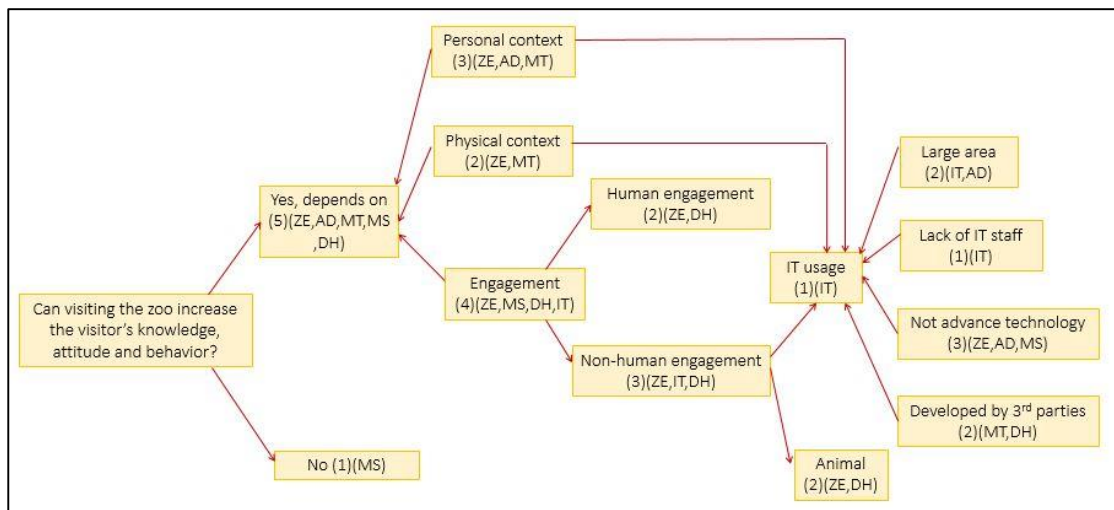


Figure 4.10 Zoo staff perception towards visitor conservation awareness

From the interview, 6 people out of 10 interviewees gave their perspective about the zoo impact on visitor's knowledge, attitude and behavior. Specifically, 3 out of 10 people mentioned that personal contexts such as mindset and motives were part of the factors that would change visitor's knowledge, attitude and behavior.

The others (4 out of 10 people) stated that engagement could possibly increase the visitor's knowledge, attitude and behavior. Better engagement can be one of the tools to increase the zoo value to the visitors, as well as increasing their learning experience and outcomes (Ballantyne *et al.*, 2018). Engagement via person (tour guide, the interaction between visitors and staff) and with an animal (animal feeding, touching, animal photo, animal show) were mentioned by 2 out of 10 people. Personal interaction and animal encounter could increase the visitor's receptiveness towards the environmental interpretation which does not only provide them the knowledge but also increase their positive emotional experiences (Powell and Bullock, 2014). The other forms of engagement can be through IT applications or interactive technology (Ciolfi and McLoughlin, 2012).

Only 1 out of 10 people said that the zoo visit without the engagement might increase visitors' knowledge but would not change their behavior or attitude. Interestingly, 1 person from the interviewee said that visiting the zoo cannot increase the visitors' knowledge or attitude or behavior.

The emphasis on the importance of the visitor engagement was similar to the findings in previous study by Waller *et al.* (2012). In their research, the public engagement had shown to induce a greater effect in increasing the visitor knowledge as well as their understanding and attitudinal change. Apart from visitor engagement, motivation also determined the visitors' value of destination (Prebensen *et al.*, 2013).

4.2.3 The TripAdvisor users

Supplementary data were retrieved by analyzing 996 TripAdvisor reviews through the counts of the keywords related to 1) conservation-education function such as a '*learn, get knowledge, educative, education*' and 2) entertainment function such as '*entertainment, pleasure, vacation, tourism*'. The finding showed 3 types of the motivations for the zoo visits (Table 4.3). These include the highlight on

conservation-education function, the focus on entertainment-leisure, and the visits for both conservation-education and entertainment-leisure functions. From 996 reviews, 124 reviews mentioned conservation-education function (12.45%), 105 reviews (10.54%) mentioned entertainment-leisure function, and 119 reviews (11.95%) mentioned both conservation-education and entertainment-leisure function.

From all visitor types, family, friend, couples, and individual showed higher mentioning of conservation – education function than leisure function of the zoo (Figure 4.11 and Table 4.3). The visitor type that was seen having a higher percentage of mentioning leisure function was those on a business trip. However, it is noteworthy that this type of reviews had the smallest sample size (14 reviews) compared to the other visitor types (Table 4.3).

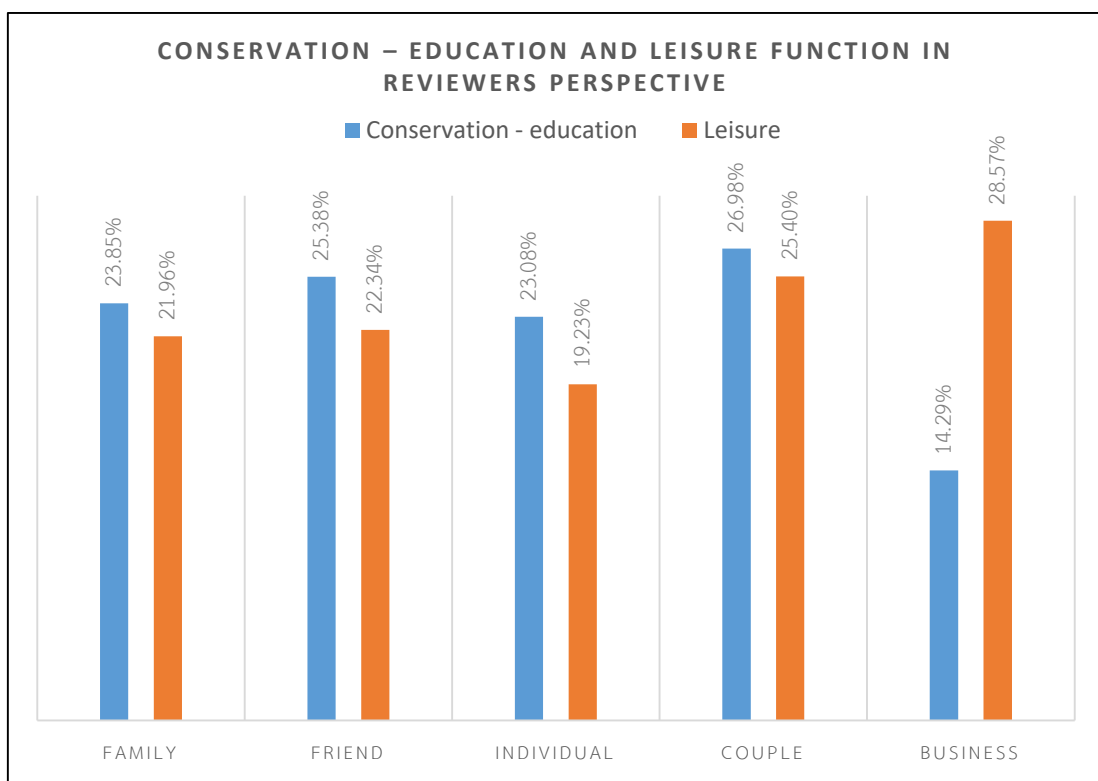


Figure 4.11 Visitor perception about the zoo function based on TripAdvisor website

Table 4.3 Number of reviews mentioning the zoo functions

No.	Type of the visitor	Conservation-education	Entertainment-leisure	Conservation-education and leisure	Total reviews
1	Family	80 (12.64%)	68 (10.74%)	71 (11.22%)	633
2	Friend	25 (12.69%)	19 (9.64%)	25 (12.69%)	197
3	Individual	3 (11.54%)	2 (7.69%)	3 (11.54%)	26
4	Couple	15 (11.90%)	13 (10.32%)	19 (15.08%)	126
5	Business	1 (7.14%)	3 (21.43%)	1 (7.14%)	14
Total		124 (12.45%)	105 (10.54%)	119 (11.95%)	996

4.3 Relationship between reading behavior, conservation idea and IT usage of the zoo visitors

4.3.1 Reading behavior versus ability to name an idea/activity related to conservation of the zoo visitor

When categorizing the visitor groups according to their reading behavior (Figure 4.12), it was found that 68.42% of the group that read the information and signs (13 groups) could name an idea/activity related to conservation or environment. Meanwhile, 50% of the group that half-read and did not read the information and signs were able to give ideas/activity regarding conservation (25 and 7 groups respectively).

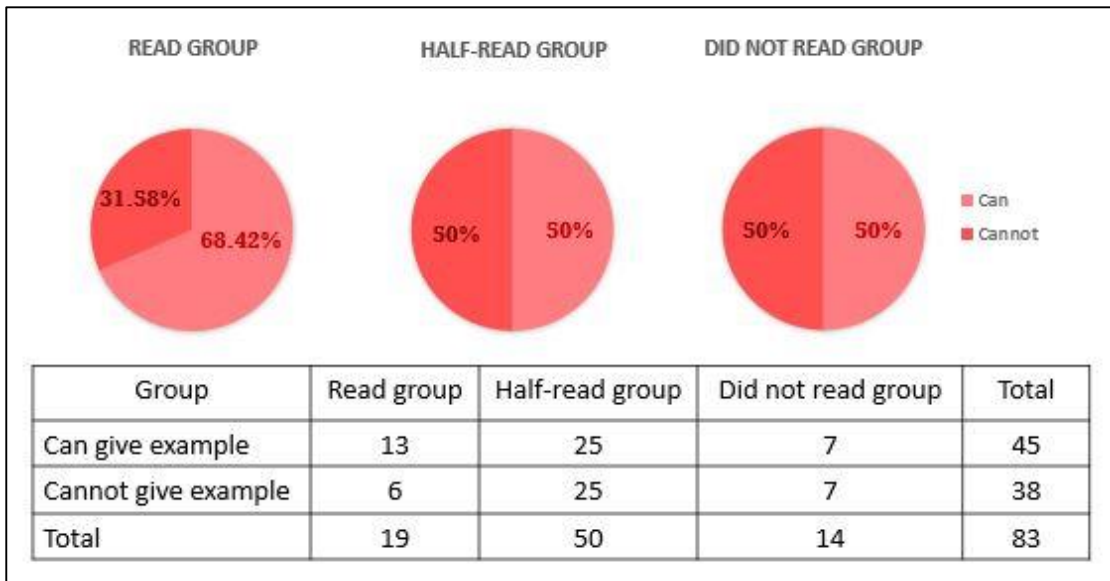


Figure 4.12 Visitor reading behavior and the ability to name an idea/activity related to conservation

This result suggests that reading behavior may have a correlation with the ability to name the idea/activity related to conservation or environment. The higher reading behavior of the visitors, the higher chance of them being able to provide suggestions on environmental conservation.

To investigate this possible correlation further, the data was analyzed from a different angle. The categories were changed into the groups that can or cannot name an idea/activity related to conservation or environment (Figure 4.13). The groups that could name an idea/activity showed that they had the higher percentage of the visitors who fully read the information and signs and fewer percentage of the visitors who did not read the information and signs when compared to the groups that could not name the idea/activity related to conservation or environment.

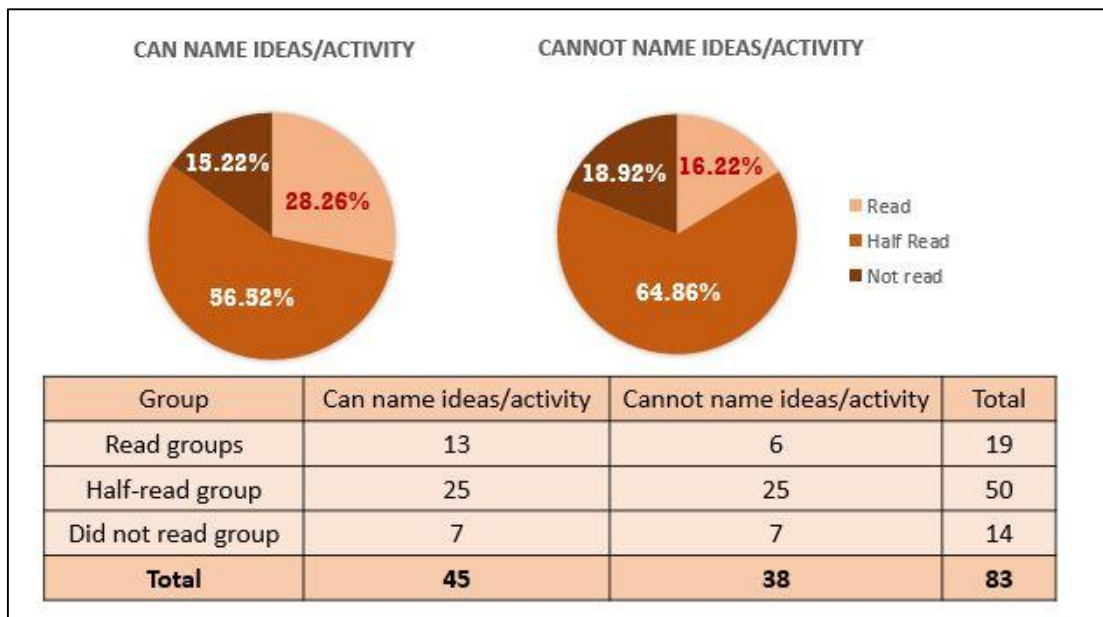


Figure 4.13 Visitor ability to name an idea/activity related to conservation and reading behavior

From the results, it is interesting that 15.22% of the people who did not read the information and signs could also name an idea/activity related to conservation. There might be a possibility that they got the idea from sources other than reading information signs at the zoo, hence further analysis must be conducted to identify if the differences in these groups were statistically significant.

Statistical analysis using Chi-square analysis was used to analyze the correlation between visitors reading behavior and their ability to name an idea/activity related to conservation (Table 4.4).

Table 4.4 Chi-square test for relationship between reading behavior and ability to name an idea/activity related to conservation

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.003 ^a	2	.367
Likelihood Ratio	2.050	2	.359
Linear-by-Linear Association	1.317	1	.251
N of Valid Cases	83		

The number of the p-value that showed on the red box is 0.367 which is more than 0.05 meaning that the relationship between reading behavior and ability to name an idea/activity related to conservation is not statistically significant.

4.3.2 Reading behavior versus IT usage of the zoo visitors

The reading behavior of the visitors was paired with the visitors' usage of IT application in the zoo (Figure 4.14). It was found that 42.11% (8 groups) of the group that read all of the information and signs used IT applications. This percentage was much higher than those who used IT from the groups that half-read or did not read the information and signs at all (10%, 5 groups and 7%, 1 group, respectively).

The visitors were then categorized by their IT usage to identify their reading behavior (Figure 4.15). It appeared that the IT user group had the higher percentage of visitors who fully read the information and signs and fewer percentage of those who did not read the information displays.

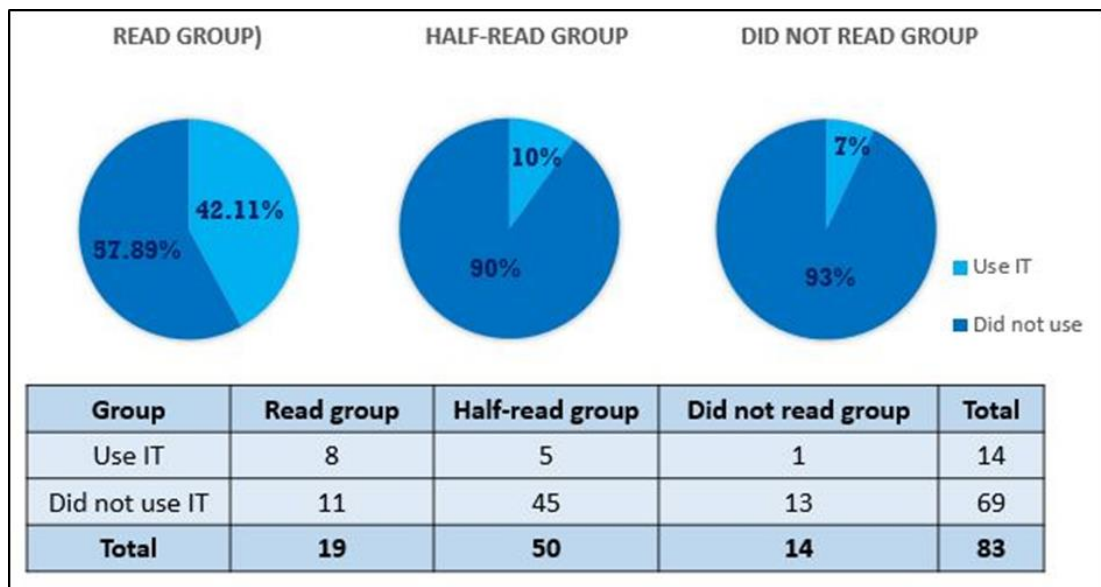


Figure 4.14 Visitor reading behavior and IT usage

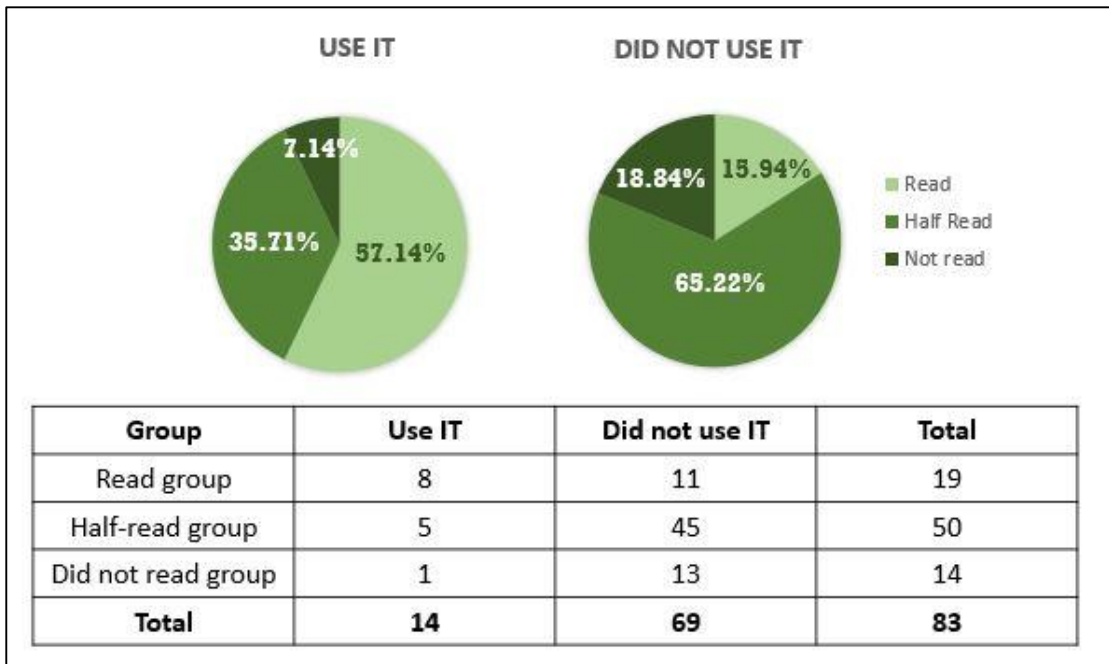


Figure 4.15 Visitor IT usage and reading behavior

The Chi-square analysis revealed that there was a correlation between reading behavior and IT usage with the p-value of 0.004 which indicated the positive and statistically significant relationship (Table 4.5). From the results, it can be inferred that the higher reading behavior of the visitor, the higher chance of them using the IT application in Batu Secret Zoo.

Table 4.5 Chi-square test for relationship between IT usage and reading behavior

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.256 ^a	2	.004
Likelihood Ratio	9.750	2	.008
Linear-by-Linear Association	8.167	1	.004
N of Valid Cases	83		

Rosen *et al.* (2013) also highlighted the relationship between IT usage and attitudinal effect for human in their research. While IT usage could have both

positive and negative impacts, this study showed that IT usage was related positively to reading behavior.

4.3.3 Ability to name an idea/activity related to conservation versus IT usage

The correlation between the conservation awareness in terms of ability to name an idea/activity related to conservation or environment and the IT usage was analyzed by categorizing the visitors into two ways. Firstly, the visitors were categorized according to their usage of IT application in the zoo (Figure 4.16). It was found that the groups that used the IT were more likely to be able to name an idea/activity related to conservation/environment (78.57%) than the group that did not use the IT (49.28%).

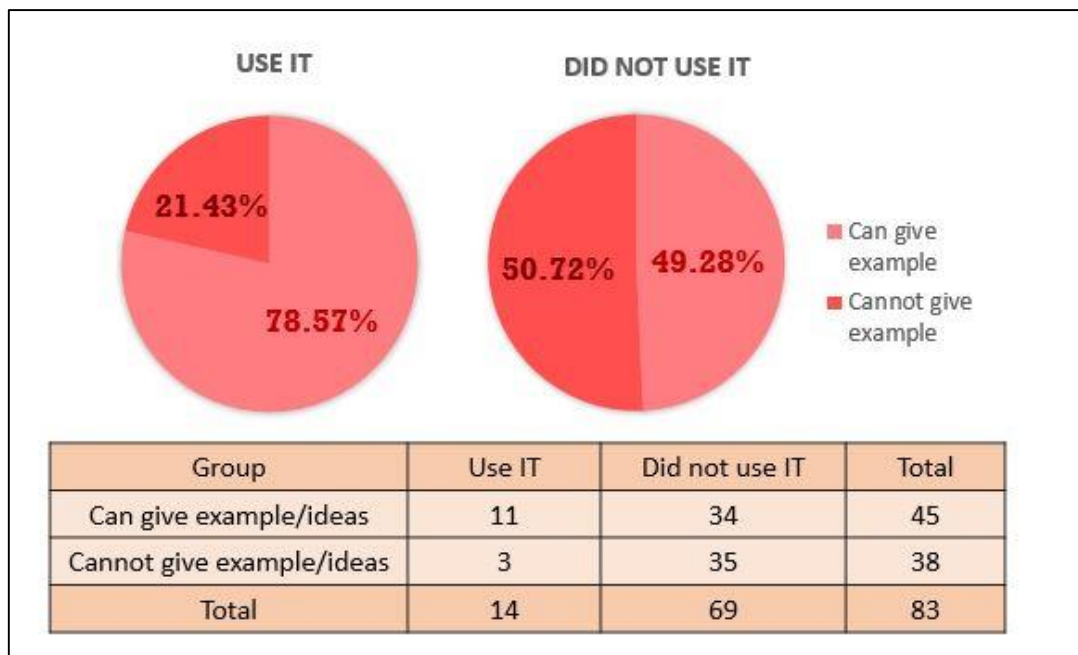


Figure 4.16 Visitor IT usage and ability to name an idea/activity related to conservation

Secondly, the category was based on the ability or inability to name a conservation idea (Figure 4.17). It was found that the group that can name an idea/activity showed a higher percentage of the visitors that used the IT while in the zoo (24.44%) compared to the group that cannot name an idea/activity related to conservation or environment (7.89%).

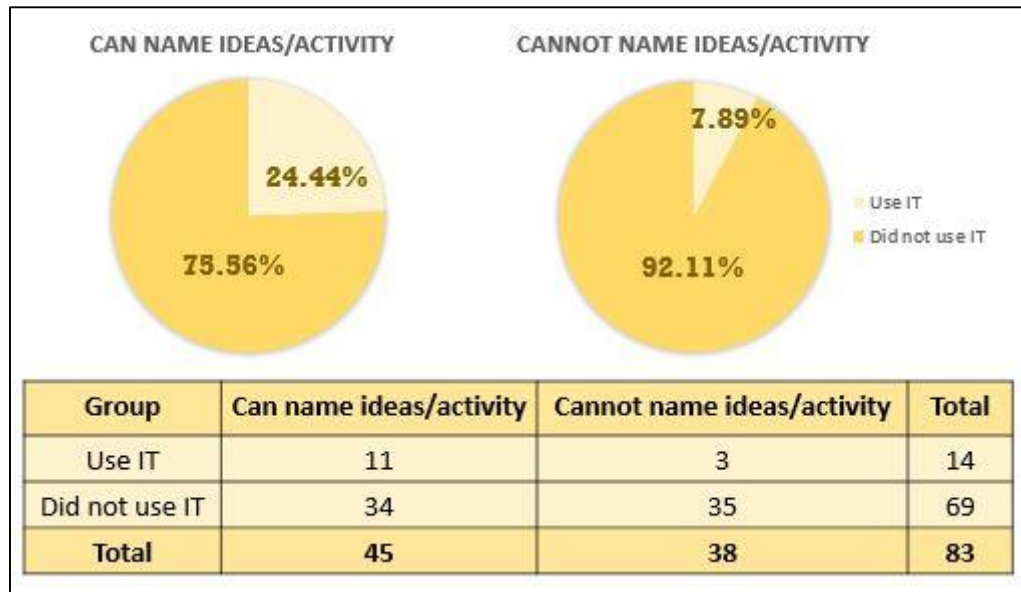


Figure 4.17 Visitor ability to name an idea/activity related to conservation and IT usage

Using Chi-square analysis (Table 4.6), the correlation between the ability to name an idea/activity related to conservation and IT usage showed a positive and statistically significant relationship (p-value shown in the red box was 0.045). This supports the inference that the visitors who used the IT application in the zoo were more likely to be able to name an idea/activity that they could do in relation to conservation or environment than those who did not use the IT application.

Table 4.6 Chi-square test for relationship between IT usage and ability to name an idea/activity related to conservation

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.024 ^a	1	.045
Continuity Correction ^b	2.930	1	.087
Likelihood Ratio	4.283	1	.038
Linear-by-Linear Association	3.976	1	.046
N of Valid Cases	83		

4.4 The roles of IT application in conservation awareness and zoo operation in Batu Secret Zoo

4.4.1 IT application usage of the zoo visitors

Batu Secret Zoo, known as the modern zoo in Indonesia and one of the best zoos in Asia by TripAdvisor (2014), has implemented several technology solutions such as video, audio, projector, touchscreen, QR codes, website, and even mobile application in its establishment.

To assess the visitor's expectation in IT facilities, the visitors were asked about the importance of the IT application in the zoo (Figure 4.18). The school group and the non-school group gave similar results which showed that IT applications were important to the visitors (84.62% and 88.89% respectively). However, the perception on the importance of IT application did not match the IT application usage, considering the low percentage of the IT usage among the sampled visitors (Figure 4.19, 4.20).

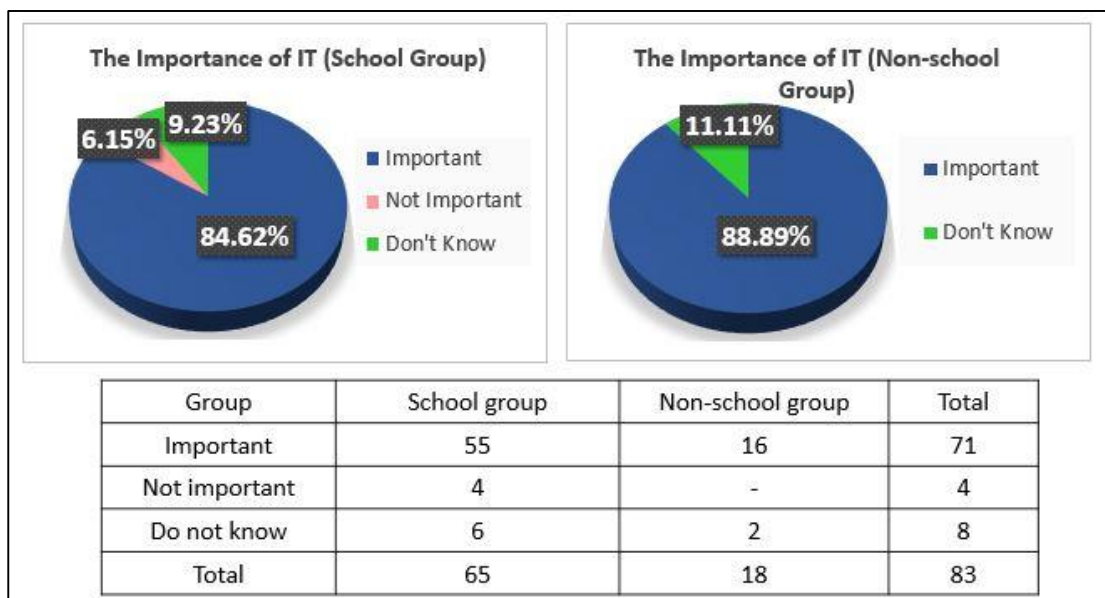


Figure 4.18 Importance of IT application in the zoo based on the visitor perspective

In total, there were 16.87% (14 groups) of the visitors who used IT application in the zoo. The IT usage of the school groups and non-school groups are

displayed in Figure 4.19 and Figure 4.20 respectively. The proportion of the IT users from the non-school group (33.33%) were higher than those from the school group (12.31%). Both groups used the same kind of applications including video, audio, and touchscreen. In addition, non-school group also said that they used the zoo website as a source of information.

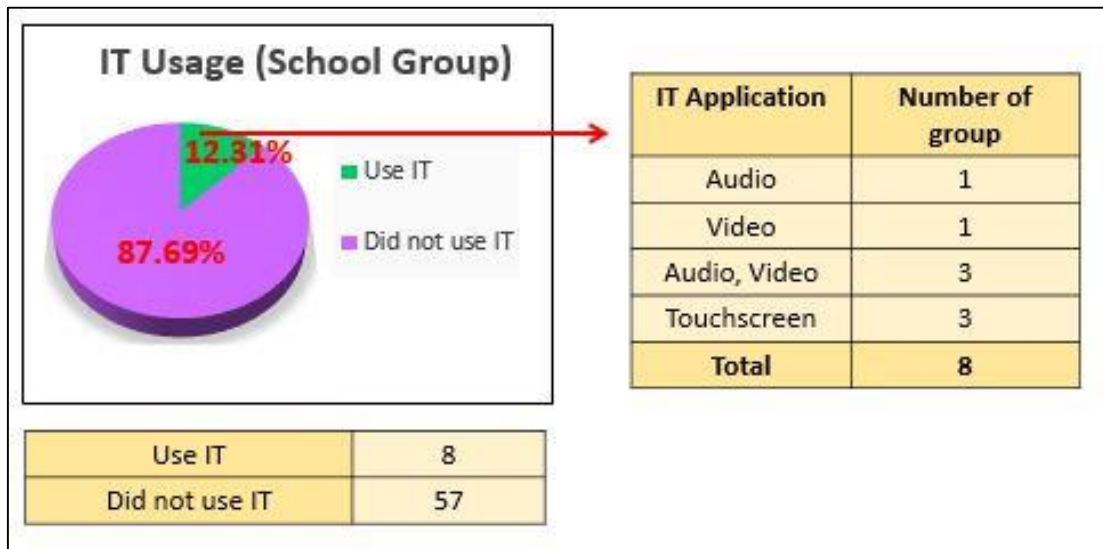


Figure 4.19 IT usage for school group visitors

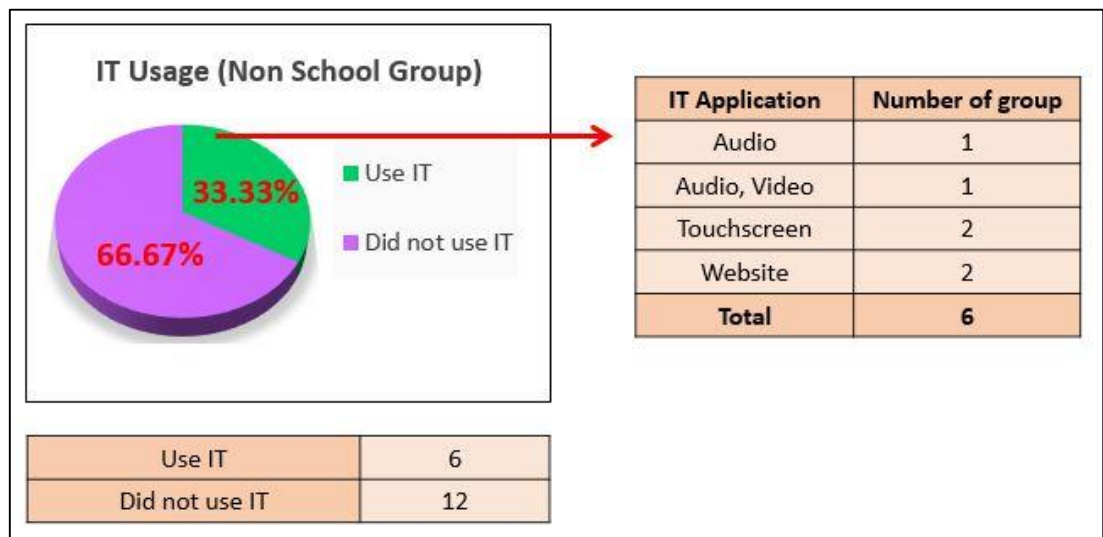


Figure 4.20 IT usage for non-school group visitors

4.4.2 IT application usage of the zoo visitor based on TripAdvisor reviews

The reviews from TripAdvisor website showed how IT was also used by the visitors to express their opinions about Batu Secret Zoo as part of the post-visit experience. From the TripAdvisor website, there was an increasing number of the reviews published through the mobile phones compared to the personal computer (PC) usage (Figure 4.21). The use of the mobile phone showed steeper increase especially since 2015. On the contrary, the reviews from personal computers began to decline as seen in late 2017.

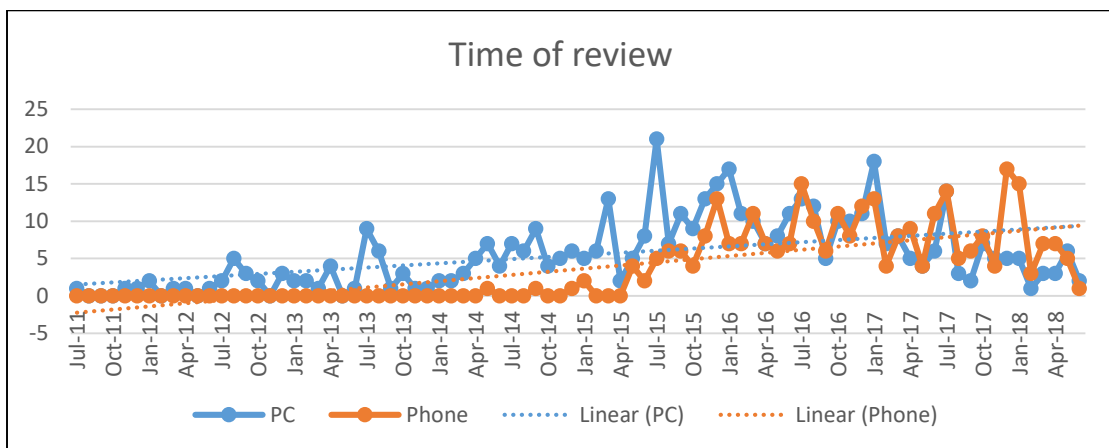


Figure 4.21 IT usage by reviewer of the zoo using TripAdvisor website

The trend in the usage of different technologies is important for a better understanding of the visitor behavior and preference. This can be used to develop strategies that enhance the visitor's interest and engagement during the visit as well as promoting conservation awareness and behavior.

Emotional response from the zoo visits were also analyzed to determine the visitor satisfaction (post-visit experience). The numbers of positive and negative reviews are displayed in Table 4.7. As a main attraction of the zoo, animals were the most mentioned topics (72.09%) followed by visitor emotions/opinions (35.04%) and theme park/rides (33.13%). Unfortunately, the reviews mentioning IT application in the zoo were very rare 0.8%. The positive reviews about IT talked about QR codes, projector, Wi-Fi, and touchscreen panel, while the only negative review about IT was that the zoo lacked technology for hearing impaired visitors. This low rate of the

reviews about IT application shows that even though the zoo have applied several technologies to enhance the visitor experience and engagement, they are not yet recognized by the majority of the visitors. This supports the findings mentioned in section 4.4.1 that only 16.87% of the sampled visitors had used the IT application in the zoo.

Table 4.7 Number of positive and negative reviews

No.	Keywords	Positive reviews	Negative reviews	Number of reviews (percentage)
1	Animal	701	18	719 (72.19%)
2	Emotion, satisfaction	348	1	349 (35.04%)
3	Theme park/rides	330	0	330 (33.13%)
4	Cleanliness	223	8	231 (23.19%)
5	Area size	199	5	204 (20.48%)
6	Design	183	19	202 (20.28%)
7	Electric bike	172	7	179 (17.97%)
8	Ticket/price/package	161	9	170 (17.07%)
9	Restaurant/food court/food stall	132	20	152 (15.26%)
10	Museum	126	1	127 (12.75%)
11	Water park/swimming pool	107	2	109 (10.94%)
12	Route/zoo track	97	9	106 (10.64%)
13	Information and signs	57	17	74 (7.43%)
14	Animal photo	70	1	71 (7.13%)
15	Animal feeding	51	4	55 (5.52%)
16	Hotel	44	1	45 (4.52%)
17	Toilet	34	5	39 (3.92%)
18	Animal show	28	1	29 (2.91%)
19	Parking	10	2	12 (1.20%)
20	IT application	7	1	8 (0.80%)

Table 4.7 show the number of positive and negative reviews according to the topics. For example, ‘*bad condition for the animals, dissatisfaction, dirty area*’ were counted to be negative reviews, while comments related to ‘*happy animals, satisfaction*’, or ‘*cleanliness*’ were counted as the positive reviews. Most of the visitors

gave the positive reviews to the theme park rides (100%), emotion/satisfaction (99.71%) and animal museum (99.21%), while the negative reviews showed visitors dissatisfied with the information and signs (22.97%), parking (16.67%) and restaurant (13.16%) (Figure 4.22).

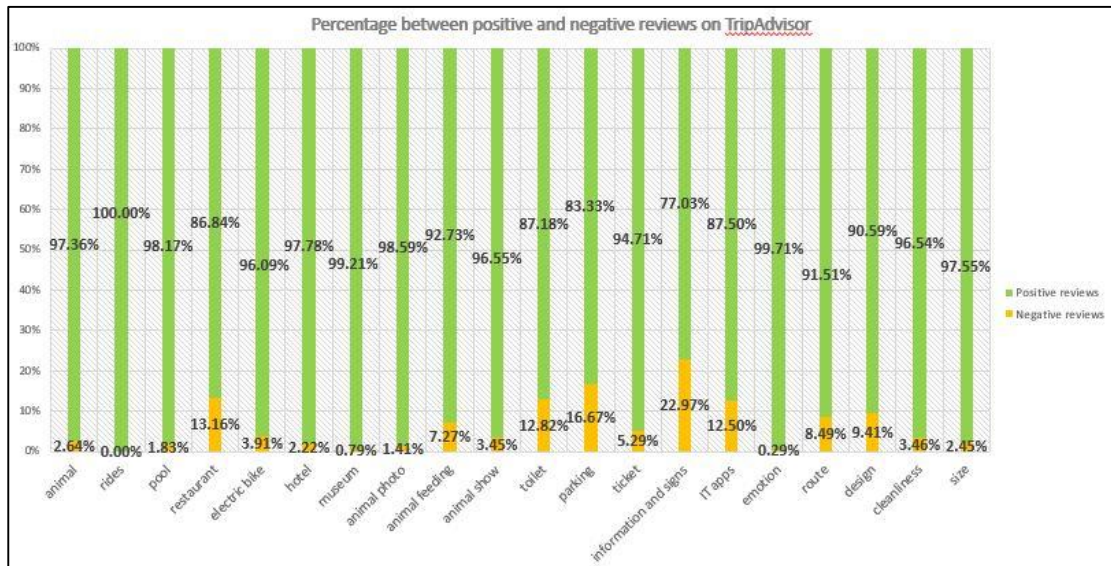


Figure 4.22 Percentage of positive and negative reviews in TripAdvisor website

4.4.3 IT application usage of the zoo visitor based on zoo staff perspective

The question about the visitor usage of IT was asked of the staff. Table 4.8 displays the response from 7 out of 10 people who provided answers to this question. The results were summarized and visualized into Figure 4.23. The brackets on Figure 4.23 represent the number or the interviewees identified in Table 4.8. Mobile application was the most mentioned IT application in which 3 of the zoo staff estimated 20 – 40% and 60 – 80% usage rate. Touchscreen panel were estimated to have 40 – 60% and 80 – 100% usage rate. Audios were perceived to have high usage rate of 80 – 100%. Only one staff mentioned the use of QR codes, video, projector, pneumatic and website with varying rate between 40 – 100%. Interestingly, one staff stated the IT usage was under 10%. The staff perspectives were very different from the actual responses of both school and non-school group visitors (16.87%) and TripAdvisor reviews about IT (0.8%). While these perspectives were not objective, they represented

the attitude of the staff which could influence the management of IT application at the zoo.

Table 4.8 The staff perspectives about IT usage of the zoo visitor

No.	Staff responses	Key phrases
1	“Much less, because many people only pass. Because of the stigma. Typical stigma of Indonesian people, recreation places...So if we can say, it’s very few, if percentage we can say less than 10% that access it.” (Zoo educator 1)	IT application, personal context effect the IT usage
2	“It is about the paradigm. Especially from the parents.” (Zoo educator 2)	Personal context effect the IT usage
3	“The video might be about 70% and touchscreen probably 50%. For the website, I do not really know about the access. For audio, it’s pretty fair, because walking people can also hear it, so like most or all use it. Mobile applications, I do not really know, but maybe the percentage is about 70%, maybe.” (IT staff)	Video, touchscreen, audio, mobile application
4	“For touchscreen, I think it’s a lot, probably 90%. Because touchscreen in here sometimes are broken, several months, they will break. Maybe a lot of people wants to know what is in the touchscreen.” (Animal doctor 1)	Touchscreen
5	“For teachers and kindergarten schools probably not really use it, maybe for people who work already may know more about it.” (Animal doctor 2)	Physical context effects the IT usage
6	“Around 25%, that is for mobile application. Maybe the ones who really access it 10%, that’s for people who enjoy it. For audio, projectors, pneumatic, that are 100%, I think. All of the visitors who enter the museum must have seen it all.” (Museum staff 1)	Mobile application, audio, projector, pneumatic
7	“For mobile application, it depends on the local visitors if they are joining, maybe around 30 – 40%. But for the information that accesses it, it is around 70 – 80%...QR codes, there are people who just want to see. So I think it is 50% of the people who have used it.” (Marketing staff)	Mobile application, website, QR codes

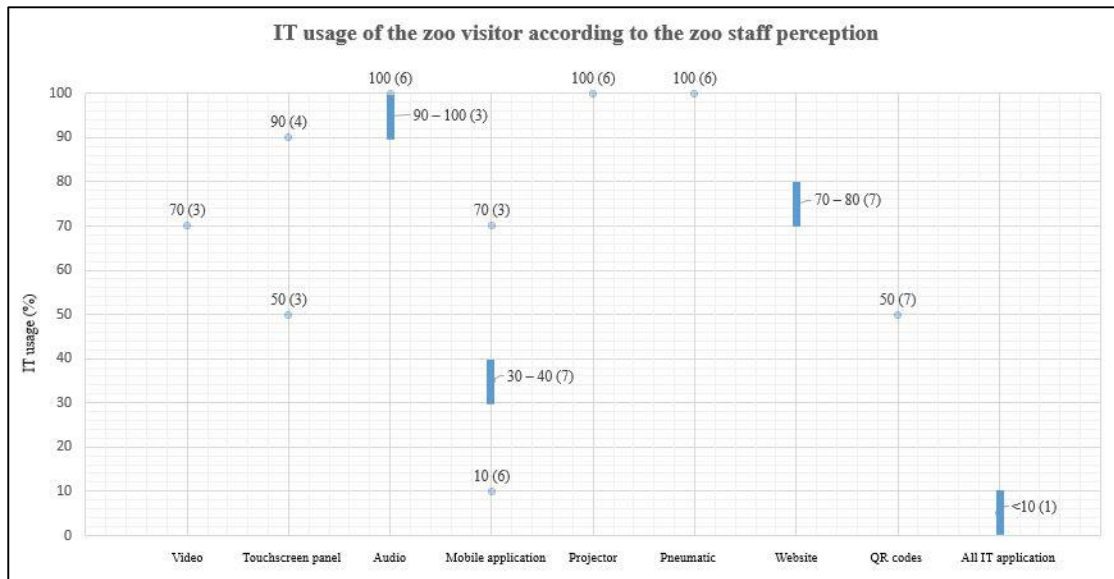


Figure 4.23 IT usage of the zoo visitors according to the zoo staff perspectives

4.4.4 IT application usage of the zoo visitors based on observation

The observation results showed the interactions between the visitors and the IT displays (Table 4.9). There were 7 zones (4 of zoo zones and 3 zones inside the animal museum) observed locations and during the period of 14 days (12 February – 25 February 2018). The observation lasted one hour in a day equating to 14 hours in total. The observation time in each day varied between 12.00 pm – 16.00 pm.

From the observation of 19 visitor groups, 1 group was attracted to IT application but did not use IT and only 2 groups used the IT application. These 2 groups were seen trying to use the touchscreen panel for less than 5 minutes. This showed that most of the visitors did not interact with the IT application provided by the zoo. Therefore, effective strategies are required to increase the visitor interest in the use of IT application.

Table 4.9 Observation of visitor behavior in the zoo

No.	Zone	Technology	Reaction/activity	Time
1	Monkey zone	Audio	a) Family <ul style="list-style-type: none"> • Kids read some of the information and signs (especially in quiz form) • Parents showed minimum interaction with kids • Kids looked happy • Kids were excited when feeding the animals and listening to the staff • Did not stop to listen to the audio 	12'09"
			b) Company group <ul style="list-style-type: none"> • Some read the information but only the name of the animals • Some did not read and give the wrong information to the others • Did not stop to listen to the audio 	29'02"
2	New Reptile	Audio, video	a) Junior high school group <ul style="list-style-type: none"> • Did not read information and signs • Mostly took pictures, the others watched the animals carefully, some just walked around • Did not watch the video or listen to the audio • Split into 2 groups 	3'22" (group 1) 5'45" (group 2)

Table 4.9 Observation of visitor behavior in the zoo (cont.)

No.	Zone	Technology	Reaction/activity	Time
2	New Reptile	Audio, video	b) Couple <ul style="list-style-type: none"> • Read the information and signs but not all • Did not watch the video or listen to the audio • Discussed with their partners about the animals 	9'54"
			c) Couple <ul style="list-style-type: none"> • Read every name of the animals (without other information) • Did not watch the video or listen to the audio 	-
			d) Family <ul style="list-style-type: none"> • Parents read the name and informed the children, children repeated the name of the animals after the parents • Did not watch the video or listen to the audio 	5'21"
3	Aquarium zone	Video	a) Family <ul style="list-style-type: none"> • Read the names of the animals • Associated animals with the cartoons (finding nemo) • Did not watch the video 	16'17"
			b) Friend group <ul style="list-style-type: none"> • Did not read the signs/information, just taking the pictures (selfie) • Did not watch the video 	5'0"

Table 4.9 Observation of visitor behavior in the zoo (cont.)

No.	Zone	Technology	Reaction/activity	Time
3	Aquarium zone	Video	c) Family <ul style="list-style-type: none"> • Read the name of the animals • Did not watch the video 	9'10"
4	Savannah zone	Audio, touchscreen panel	a) Family <ul style="list-style-type: none"> • Did not use the touchscreen or listen to the audio • Only watched the animals 	2'40"
			b) Family <ul style="list-style-type: none"> • Did not use the touchscreen or listen to the audio • Only watched the animals 	2'35"
			c) Elementary school <ul style="list-style-type: none"> • Some tried to touch the touchscreen for a while and left • Did not stop to listen to the audio 	2'52"
			d) Friends <ul style="list-style-type: none"> • Looked interested in the touchscreen panel but did not try to use it • Did not stop to listen to the audio 	3'34"

Table 4.9 Observation of visitor behavior in the zoo (cont.)

No.	Zone		Reaction/activity	Time
4	Savannah zone	Audio, touchscreen panel	e) Family <ul style="list-style-type: none"> • Father and child tried the touchscreen, however parents seemed in a rush so they did not try too much or read in details • Did not stop to listen to the audio 	-
5	Dome (museum)	QR codes (mobile application)	a) Friends <ul style="list-style-type: none"> • Did not read the information and signs • Touched glass (separator) and preserved animals, took pictures • Did not use QR codes 	3'11"
			b) Family <ul style="list-style-type: none"> • Children ran around without their parents (did not interact with their parents) • Parents took pictures • Children expressed fear with big animals, touched the preserved animals • Did not use QR codes 	9'37"
6	Insectarium	QR codes (mobile application)	a) Friends <ul style="list-style-type: none"> • Took pictures • Saw the object and had discussion after • Did not use QR codes 	2' – 3'

Table 4.9 Observation of visitor behavior in the zoo (cont.)

No.	Zone		Reaction/activity	Time
6	Insectarium (museum)	QR codes (mobile application)	b) Family <ul style="list-style-type: none"> • Took pictures • Parents gave the information about the name of some animals to their children • Did not use QR codes 	-
			c) Couple <ul style="list-style-type: none"> • The man took pictures while the girl looked at the display • Had a discussion • Did not use QR codes 	5'
7	Winter Zone (museum)	QR codes (mobile application)	a) Family <ul style="list-style-type: none"> • Took pictures in every diorama • Played the trivia quizzes (signs and information) • Did not use QR codes 	5'23"
			b) Couple <ul style="list-style-type: none"> • Just walked and looked around • Did not use QR codes 	2'45"

This study develops a model of IT engagement from the initial model and observation. The initial model was the general model of interpretation – action developed by Canadian Environment Advisory Council (CEAC) where interpretation may lead into a conservation action of the visitors (Hvenegaard *et al.*, 2016). However, in the previous study, the model focused on how the process of interpretation and emotion created the action rather than the initial process of engagement. According to the observation in Batu Secret Zoo and the CEAC’s model, a modified model of the IT engagement phase was summarized and displayed in Figure 4.24. Firstly, IT application must draw the attention of the viewers (attract), then the interaction can occur to engage with the audience or users. During the interaction, the desired message and information can be delivered. In order to create a desirable impact, the delivered message must provide an interpretation with the emotional values. Only when these emotional responses are induced, an awareness can develop and influence an action in real life (Seth, 2013)

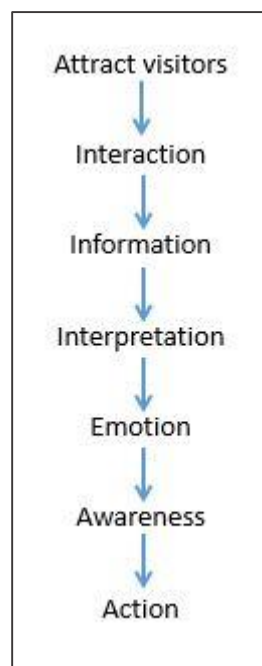


Figure 4.24 Phases of IT application engagement in the zoo

Some of the IT applications in Batu Secret Zoo such as the projector, touchscreen panel, and pneumatic can draw the attention of the visitors and potentially lead to interpretation, emotion, and awareness. The observation showed that some

interested visitors walked closer to these devices and even stopped and looked at these IT facilities. However, these interested individuals often left without trying the IT applications due to the lack of staff or sign to instruct them what to do. As shown in Figure 4.25 and Table 4.9, the visitor group number 4 c) and d) seemed to be interested in the touchscreen panels, but left without trying to use them as there was no guidance or encouragement to do so. This happened mostly with the user-activated devices such as touchscreen panel or mobile application. The other IT applications that were set to play automatically such as video or audio did not show this problem. The type and level of user interaction is one of the important things to consider when implementing IT solutions. The zoo may need to reconsider where they put automatic, semi-automatic or manual information display tools according to the nature of information and types of the visitors.



Figure 4.25 Visitor interested in a touchscreen panel and a touchscreen panel in Batu Secret Zoo

Despite IT application being a tool to engage the visitors, the execution of how they are used must be carefully designed. The lack of or too much information can make visitors feel negatively towards these tools. For example, Figure 4.26 showed the use of the projectors to visualize the condition of the forest fire that could attract the visitors' attention. However, this effort was not supported with the information about what the visitors were looking at and hence made the IT feature less valuable than what it should have been.



Figure 4.26 Projector display about forest fire without any information

Figure 4.27 showed the opposite example of how too much information could make the knowledge transfer unappealing or ineffective. As mentioned in section 4.3, only a few visitors fully read the information and signs while majority glanced at the names, locations or did not read them at all. Making signs more attractive to read with less information but more interpretation could help increase the visitor’s interaction with the information displays.



Figure 4.27 Information and signs about animals and trivia quiz in Batu Secret Zoo

4.4.5 The process on implementing IT application and information signs in Batu Secret Zoo

From the interviews and observation, the procurement of the IT application and information signs play an important part in determining what facilities are implemented in the zoo. This process is shown in Figure 4.28.

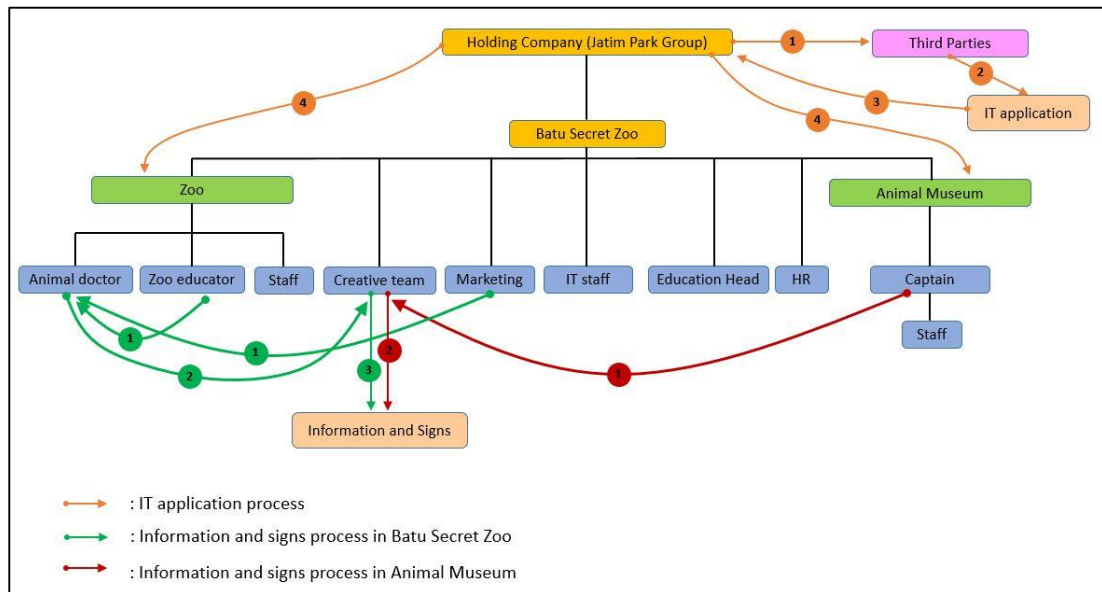


Figure 4.28 The process of IT application procurement and information sign production in Batu Secret Zoo

In this process, the decisions on IT application depend mainly on the cooperation between the holding company and the third party organizations. The development of IT applications started from the holding company which paid the third party organizations to develop the IT tools based on the content from the holding company. After the developers created the IT applications, they were handed to the holding company to be installed at the zoo and museum. The IT applications placed in different places are shown in Figure 4.29 and 4.30. These IT facilities were placed in every zone in the animal museum, while in the zoo area there were several zones that did not have any IT installation such as Happy Land, Baby Zoo and Monkey Island.



Figure 4.29 Map of Batu Secret Zoo and IT application inside

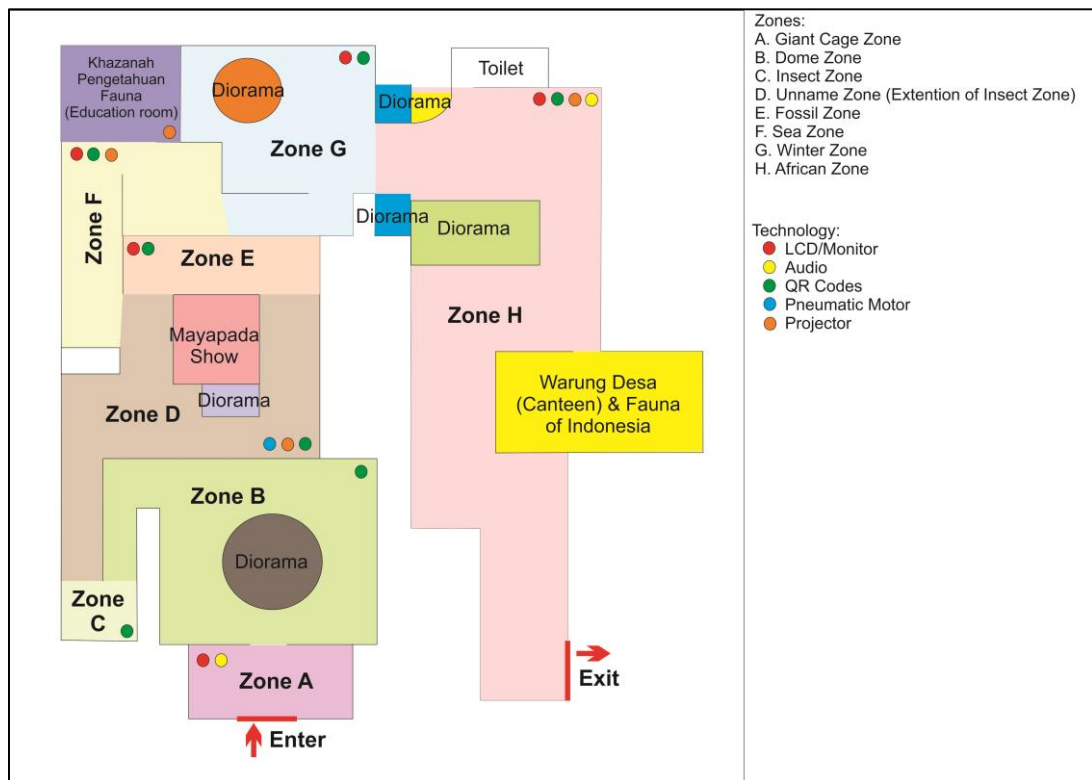


Figure 4.30 Map of the animal museum and IT applications

Even though the IT applications were handed to the museum and the zoo through the holding company, the operations were still managed by the third party organizations, for examples, the zoo website and mobile application. There was no information whether the third party organizations monitored or provided regular updates to the holding company regarding the user feedbacks or trouble shooting. One issue regarding this IT management system mentioned by the staff was the inability to address the problems related to the IT applications developed by the third party organizations as the zoo and museum staffs did not have access to these projects.

Information sign production process revealed how a decision was made in the zoo and museum. The information sign production process in the museum involved only the captain of the museum as a team leader to create the content and an external creative team to make the design. On the other hand, information sign production process in the zoo required the involvement of marketing staff and zoo educator as the sources of the information, animal doctors as quality checkers, and a creative team to make the design of the information signs. In other words, the zoo

process in creating the information signs involved more diverse people from different departments compared to the museum process. It is noteworthy to consider whether the participation of the diverse groups of staff could be related to the efficiency of the information signs and IT application used in different parts of the zoo.

CHAPTER 5

Discussion and Conclusion

This chapter explains the limitation of the study, summarizes the findings and discusses the results of the study in relation to the research questions. In addition, it provides suggestions to the stakeholders and practitioners related to the study.

5.1 Conservation awareness of Batu Secret Zoo's visitors

The conservation awareness of the visitors at Batu Secret Zoo were low based on their ability to provide the conservation ideas. From the visitor perspectives, almost all of the visitor groups were inclined to say that visiting the zoo could increase their knowledge. However, when the visitors were asked whether visiting the zoo could give them ideas about conservation awareness, the number of the visitors who agreed with this statement was lower than the response to previous question. Furthermore, among the visitors who stated that visiting the zoo could give them an idea/activity related to conservation, not all of them could provide further details on the example of an idea/activity.

This shows a disconnection between the attitude and awareness in the visitors in relation to the roles of the zoo and its conservation benefits. The notion that information and knowledge about the animals do not automatically increase the visitor awareness, attitude and behavior in conservation must be highlighted.

The zoo staff also noticed this disconnection. However, many of them stated that the conversion rate of information and knowledge into the better visitor awareness, attitude and behavior can be improved through the visitor engagement.

Visitor engagement is necessary to ensure the positive environmental outcomes from the zoo visits, therefore an effective and carefully designed engagement activity is needed.

Although IT is used as an engagement tool, the zoo focusses more on animal and human as the main engagement agent. This needs to be improved by optimizing the use of IT application in order to provide diverse channels of engagement and create effective strategies to deliver conservation messages successfully to the visitors (Wijeratne *et al.*, 2014).

The use of IT application as an engagement tool is not restricted to during the visit at the zoo location but can help visitors engage with each other to form a post-visit experience. This can be seen through how the visitors used TripAdvisor website to express their experience and impression after their visits. From the review, the education-conservation function of the zoo had a much higher mention than the reviews about leisure function. Despite the zoo being an education-conservation organization, it mainly uses its recreation-entertainment images to attract the visitors. While the recreation-entertainment images may attract visitor attention better than education-conservation function, there should be an appropriate balance in the marketing image of the zoo to ensure that visitors have a better understanding of conservation and environment after their visits.

5.2 Relationship between visitor reading behavior, ability to name an idea/activity related to conservation, and IT usage

Both descriptive statistics and Chi-square analyses were used to determine whether there is a relationship between visitor reading behavior, ability to name an idea/activity related to conservation and IT usage. The results are summarized in Table 5.1.

Table 5.1 Relationship between variables

Variables	Reading behavior	Ability to name an idea/activity related to conservation	IT usage
Reading behavior	-	0.367 (not significant)	0.004 (significant)
Ability to name ideas/activity related to conservation	0.367 (not significant)	-	0.045 (significant)
IT usage	0.004 (significant)	0.045 (significant)	-

Between the three variables, there is a statistically significant correlation between reading behavior and IT usage and the ability to name an idea/activity related to conservation and IT usage. This shows that people who read signs and displays were more likely to use IT application than the people who did not read or half-read the information and signs. Also, people who used IT application were more likely to be able to name an idea/activity related to conservation than those who did not use IT application.

The previous study by Thompson (2013) also presented similar result that the use of technology for students especially in terms of book reading habits had positive effects towards productive learning. While current situation suggested that technology can influence people's lifestyle including self-sufficient learners, there is a critical role of the human encouragement or guidance. This was shown through the lack of interaction with the IT application when there was no signage or guidance from the zoo staff.

5.3 Roles of IT application in conservation awareness and zoo operation in Batu Secret Zoo

From the sample of the zoo visitor groups, both school (84.62%) and non-school (88.89%) groups showed positive response towards the importance of IT application in the zoo. However, the number of the visitors who used IT application in the zoo from both non-school and school groups were very low (33.33% and 18.07% respectively) compared to their opinions on its importance. This might be because of several conditions. Firstly, IT applied in Batu Secret Zoo may not be attractive enough for the visitors. The evidence was from the low rate of reviews mentioning about IT application from the TripAdvisor website. IT has a potential to engage the visitors better especially since the digital technology has become an important part of human life. However, the investment of IT application in the zoo requires carefully executed strategies to maximize its functions and usage. Making the visitors use or become interested in these tools remains a challenge. If the zoo aims to use IT application to engage and enhance the visitor learning experience and satisfaction, user adoption is a major issue that needs to be addressed.

Secondly, the observation revealed that some IT applications which run automatically such as projector, pneumatic in the musical drama, or touchscreen panel could draw the attention from the visitors. However, there is still a lack of encouragement or instruction on how to use them. This made the visitors leave without trying them out. The role of guided actions is highlighted in the successful adoption of IT by users. This is especially important for children since they behave and respond differently to adults (Whitehouse *et al.*, 2014). The previous study by Jensen (2014) showed that children would have more positive learning when guided. Unfortunately, the results from the observation showed that some of the children were unguided due to the limitation of the staff. Therefore, the parents and teachers should be informed to take a role of an agent to stimulate their children to interact with the learning facilities in the zoo including IT applications. The zoo might need to develop their programs to involve teachers and parents or provide tool kits to use before or during the visits to

increase their participation. This will also help complement the zoo function as a conservation-education institution.

Lastly, the IT applications should create emotional and interpretative values to the visitors. The information needs to be designed to accommodate and suit the characters of the visitors, such as being easy to read, memorable and creating an emotional sense that leads to an environmental awareness and action in their everyday life.

This study highlights that using IT application as an engagement tool needs a lot of attention to detail and effective communication strategies in addition to the financial investment. Financial capital alone will not increase the positive outcome from IT application in zoos especially in a developing country. This is because people in developing countries generally are less likely to engage with technology on their own than those from developed countries (Iqbal and Qureshi, 2012; Leidner and Kayworth, 2006). Human interactions remain an integral part of the IT adoption whether in the zoos or other learning environment. The IT and education strategies need to be integrated and developed by all of the stakeholders including the users, the zoo staff, management company and the third party organizations. In this study, it was found that a gap existed between the holding company as a strategy and policy planner and the Batu Secret Zoo as the implementation agent. This highlights the role of organization governance and culture and its influence on the effectiveness of the IT solutions. It needs to be emphasized that an implementation agent might have a better understanding of their operational contexts and therefore needs to have more inputs in the development of any technology that will be installed or implemented. The involvement of stakeholders from the planning step until the implementation and evaluation is a crucial factor in creating a successful environment for an effective and optimal use of IT application for better visitor experience and conservation values from the zoo visits.

In conclusion, for Batu Secret Zoo to effectively use IT to engage the visitors, they need to consider not only the technology factors but also the human capital factors. As mentioned in the previous study by Geroski (2000), diffusion technology such as epidemic model which focused on technology factor and probit model which focused on human capital factors have their own positive and negative impacts.

Therefore, understanding both technology and human factors is needed for zoos to optimally use IT as one of their engagement agents.

5.4 Limitations

This study exhibits some limitations. Firstly, the research initially aimed to use the questionnaire to measure the visitors' conservation awareness. However, the regulation of the zoo did not allow the questionnaire distribution due to the perception that the survey might irritate the visitors. Therefore, the researcher used the short and non-formal type interview as a substitution, resulting in the omission of the respondents' demographic data.

Secondly, the visitors and staff were interviewed as groups or pairs rather than an individual. This was necessary to allow the respondents to feel comfortable and willing to participate in the study. Consequently, the results are inclined to represent qualitative data and insight of exploratory nature.

Thirdly, some of the visitor's observation results did not include time duration or their demographic profiles. This was due to the several conditions including crowded visitation and technical complication from the time keeping device.

Lastly, the regulation of the zoo forbid the staff or management to give the statistical data and report. Therefore, some of the information relating to the visitor number and the organization structure were based on the observation and staff's description.

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Appendices

Appendix I
Visitor interview questions

Visitor interview questions

- 1) Where do you come from?
- 2) Who you are going here with?
- 3) What time that you arrived in the zoo?
- 4) Where did you know the place from?
- 5) Do you read the information and signs?
- 6) Do you think by visiting the zoo can increase your knowledge?
- 7) Do you think by visiting the zoo can increase your environmental concern or awareness?
- 8) If no 7 is yes, can you name one of the idea/activity as part of your environmental concern?
- 9) What IT application that you used from the zoo/museum (also mentioning all of the application: audio, video, mobile apps and QR codes, touch screen, and website), which one is the most useful?
- 10) Do you think IT application is important in the zoo?
- 11) If no 10 is yes, why is it important?

Appendix II
Zoo staff interview questions

Zoo staff interview questions

The main objectives of this interview is to identify on how Batu Secret Zoo engage the visitors in **conservation education** and the roles of **IT application*** in conservation awareness and zoo operations.

1. How many people are working at this zoo? What are their roles?
2. How many people visit this zoo each day (weekdays and weekend)? Are there any specific targets for this zoo?
3. Is there any program related to conservation education in this zoo? Do you think the conservation education activity that Batu Secret Zoo doing is enough and increase the visitor's knowledge, behavior and attitude?
4. How is the funding system of this zoo? Is it enough only by ticket payment? What is the proportion of the budget allocation for the IT application* of this zoo?
5. What are the IT application* used in this zoos and how IT application* can help Batu Secret Zoo to achieve the goals and missions?
6. How many people are responsible for IT application* in Batu Secret Zoo? Who is responsible for writing the content to show on the IT application*?
7. Does the content that you put in the IT application* suffice? Do you think Batu Secret Zoo need to improve current information?
8. How many percentage of the visitors access IT application* both for on-site and off-site such as website/Facebook?
9. What are the challenges faced by this zoo in implementing IT application*?
10. What is the plan for IT application* in this zoo in the future?

*IT application refers to both software and hardware e.g. website, QR code, simulations, audio, video presentations, interactive computer, touchscreen panels that are used in this zoo for providing conservation education to visitors

Appendix III
Observation checklist

Observation Checklist

Place (zone) :

Time :

Category	Description
1. Visitors	
a) Activity	
b) Number of person in a group	
c) Age (approximate)	
d) Interaction with exhibit	
e) Interaction with each person in a group	
f) Expression	
g) Response	
2. Exhibit	
a) IT application	
b) Size of the information sign	
c) Content (knowledge and interpretation)	
d) Time length (for video)	
e) Design	
f) Access	
g) Species	
h) Location	
i) Number of information sign	
3. Staff and management	
a) Interaction to visitors	
b) Information that give to visitors	
c) Activity	

Appendix IV
Observation pictures

Observation pictures



Wi-Fi access sign inside
the museum



Visitors attracted to the
theatrical show



Projectors inside the
museum



Diorama



Information using child-
friendly design



QR code



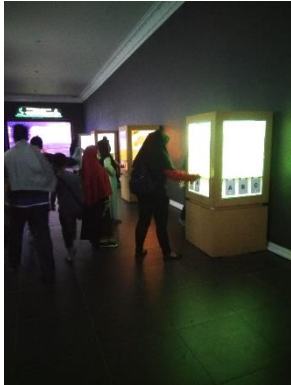
Educator guided
kindergarten students



A children used the QR
codes (mobile apps)



Projector to visualize
forest fire



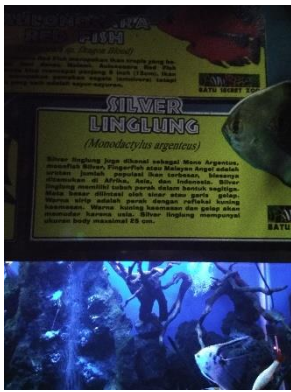
Children trying trivia quizzes



Insectarium zone



Aquarium zone



Information in aquarium zone



Information about tiger



Company visitor trying the trivia quiz



Animal feeding



Environment of the animal



Children without teacher or parents guidance



Audio device in Savannah zone



Touchscreen panel in Savannah zone



Viewing platform for White tiger



Animal show



Audio device in monkey zone



Video about baboon



Zoo educator guided the kindergarten students



Junior high school students



Video inside the museum

Vitae

Name Wahyu Catur Prakoso

Student ID 5930222005

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Engineering (Urban Regional Planning)	Gadjah Mada University, Indonesia	2015

Scholarship Awards during Enrolment

The scholarship Awards for Master and Ph.D. Studies Thailand's Education Hub for Southern Region of ASEAN Countries (TEH-AC), January 2017 – December 2018, Prince of Songkla University, Thailand

Third Place in the Three Minutes Thesis Competition entitled "Conservation Awareness and Technology Usage of the Zoo Visitors and Role of IT Application: Case Study of Batu Secret Zoo, Indonesia" at Prince of Songkla University Phuket on 25 April 2018