HOW DOES MULTI-ATTRIBUTE DECISION-MAKING DRIVE HONG KONG INBOUND CHINESE TOURISTS' ONLINE HOTEL CHOICE? – A RANDOM FOREST ANALYSIS

QIULIN WANG

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School of Hotel and Tourism Management

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Qiulin Wang

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CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

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Qiulin Wang

ABSTRACT

Hotel choice decision is one of the most researched areas in hospitality and even business fields. Although a plethora of research has been conducted and diversified issues have been examined, several research gaps can still be identified: (1) with the rapid development of online booking channels, there is a need to systematically re-examine the influence of hotel attributes on consumers' hotel choice that existing in an online setting; (2) a hotel choice includes sequential decisions of considering different attributes at different priority levels, it is unclear how consumers prioritize attributes in the formation of the consideration-set stage and the final choice decision stage during the hotel choice process; (3) adequate number of hotel alternatives should be given to stimulate the real market instead of questioning consumers about their purchase intention directly or/and giving them only a small range of hotel choices; (4) a systematic prediction method should be used to predict hotel choice. In recognition of the research gaps mentioned above, this study aims to complement the growing stream of research on hotel choice by investigating "which and how hotel attributes affect consumers' formation of consideration set and final choice?".

This study assumes individuals are limited rational decision-makers with limited information processing capacity. A scenario-based experimental design approach was employed to simulate consumers' online hotel choice process. The Random Forest algorithm was applied to depict the relationship between consumers' online hotel choice and a set of explanatory attributes. These explanatory attributes are customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-

in and check-out time, renovated time and hotel facilities (including swimming pool, fitness center, airport shuttle, parking and restaurant). Harnessing the Random Forest algorithm, this study is designed to present a multi-stage and multi-attribute choice model based on the knowledge of information processing theory, phased decision theory and multi-attribute decision-making theory. The model is developed on the notion that consumers consider different attributes at different priority levels during their online hotel choice process.

The findings show that at the formation of the consideration-set stage, accessibility to the city center, review volume, room rate, renovated time and customer rating are the top five important attributes. At the formation of the final choice decision stage, room rate, review volume, accessibility to the city center, customer rating and location are the top five important attributes. The findings in this study contribute new knowledge to the growing hotel choice literature by adopting a machine learning approach to examine hotel attributes' importance level. Besides, hotel practitioners may benefit from improving the navigation of online booking websites and adopting relevant marketing strategies.

Keywords: decision tree, hotel attributes, online hotel choice, Random Forest algorithm

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CHAPTER 1 INTRODUCTION

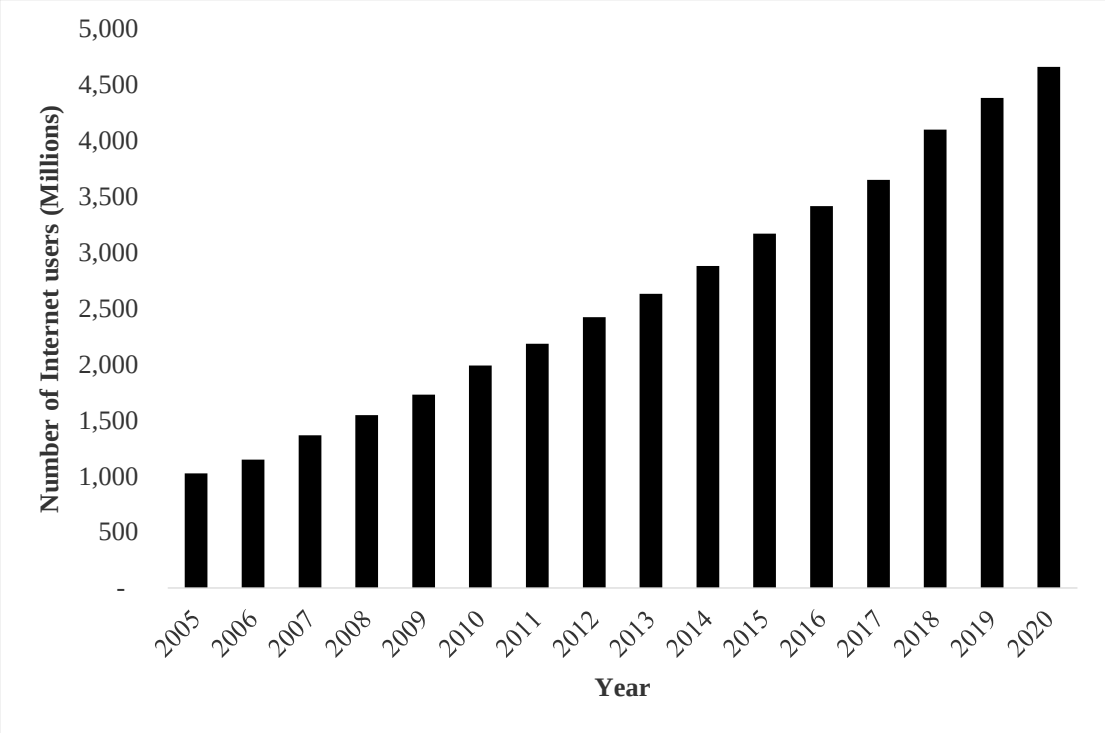
This chapter first introduces the background of this study. The problem statement is then stated, based on which the research questions and objectives are formulated. This chapter concludes by highlighting the potential theoretical, methodological, and practical contributions brought by this study.

1.1 Research background

1.1.1 Growth of online booking in hospitality

People around the world are experiencing a massive adoption in Internet usage (see Figure 1). According to the Internet World Stats (2019) and Statista (2020a), the number of worldwide active Internet users increased to 4,660 million by 2020. In 2005, it is estimated that the global online access rate was only 16.8 percent. The online access rates in developed and developing countries were 52.8 percent and 8.1 percent, respectively. The corresponding figures increased to 86.9 percent and 47 percent in the year 2019 (Statista, 2020c). Since electronic devices and Internet connection are becoming more affordable, the number of Internet users is expected to grow continuously in the coming years.

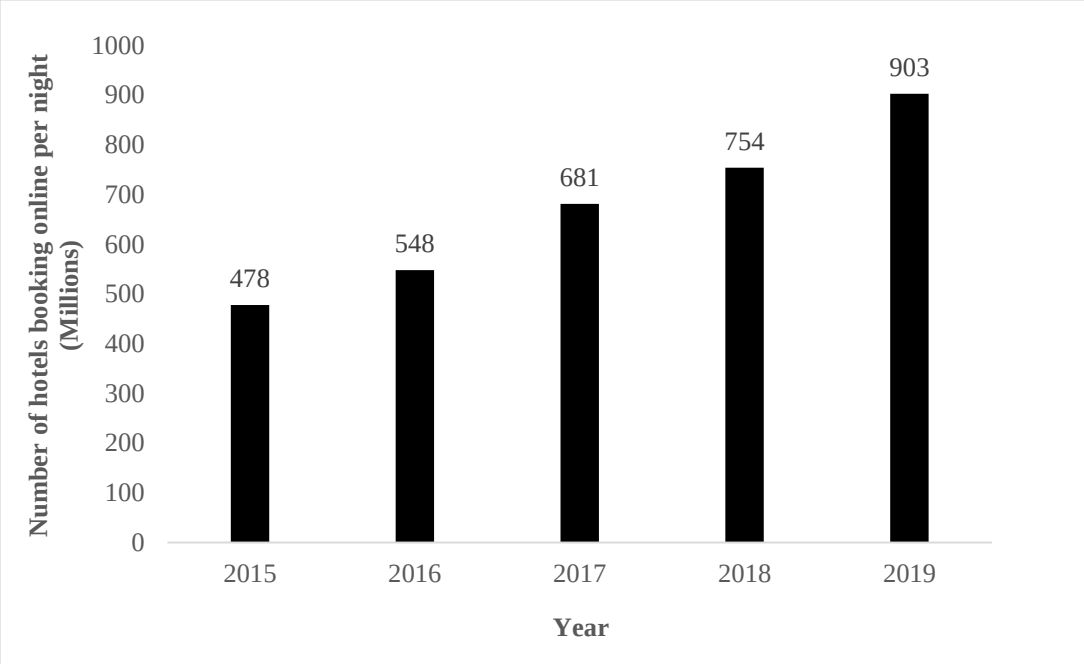
Figure 1 Number of worldwide active Internet users, 2005 - 2020



Source: Internet World Stats (2019); Statista (2020a)

With the popularization of Internet usage, the tourism and hospitality industries have been largely affected by the massive rise in the Internet use by consumers. The use of the Internet has fueled the development of online travel sales over the past decades. The online travel agent global revenue was 595.78 billion U.S. dollars in 2020, and this figure is expected to increase to 820.18 billion U.S. dollars in 2023 (Statista, 2020b). The use of the Internet has greatly affected consumer's researching behavior (e.g., how consumers search for product information) and purchasing behavior (e.g., how consumers make their buying decisions) (Gupta & Arora, 2017; Jiang, Yang, & Jun, 2013; Santos & Gonçalves, 2019). Figure 2 shows the growth of online hotel booking size of Chinese tourists.

Figure 2 The growth of online hotel booking size of Chinese tourists



Source: Huaon (2020)

The rise of online shopping promotes the emergence of online travel agencies (OTAs), a new business model. Online travel agencies offer expanding choices, allowing consumers to book from various alternatives (Law, Leung, Lo, Leung, & Fong, 2015). Such online hotel booking platforms, which are available in mobile phone, computer or pad devices) continue playing an important role in hotel distribution for consumers (Buhalis & Law, 2008; Navío-Marco, Ruiz-Gómez, & Sevilla-Sevilla, 2018). Since OTAs are becoming popular among consumers, how consumers choose hotels through OTAs should not be overlooked.

1.1.2 Complexity of hotel choice decision

Consumers' hotel choice decisions have long been a focal interest in the tourism and hospitality context. This topic has received much attention from

researchers and practitioners (Dolnicar & Otter, 2003; Mardani et al., 2016). Dolnicar and Otter (2003) searched and found that 21 articles on consumers' hotel choice behavior were published in tourism, hospitality, and business journals between 1984 and 2000. Morosan and Bowen (2018) conducted another literature review study to uncover the most critical aspects of online purchasing in the hotel context. According to their findings, as high as 85 articles on hotel choice behavior were published in hospitality and tourism journals between 2006 and 2016.

Compared with the offline booking environment, consumers need to handle a more complex hotel selection process in an online environment because much more information and alternatives are available online (see Table 1). Given these differences, having a better understanding of how consumers select hotels in the online environment becomes a matter of prime interest by researchers and practitioners.

Table 1 Differences between offline and online hotel booking

Differences	Offline hotel booking	Online hotel booking
Number of alternatives	A limited number of alternatives can be accessed by consumers.	A greater number of hotel alternatives are provided to consumers.
Information source	The word-of-mouth information only comes from consumers' close friends or relatives.	The word-of-mouth information comes from consumers' close friends and unfamiliar consumers. This electronic word-of-mouth information may therefore affect consumers' hotel evaluation and choice behavior.

Information availability	The availability of information is limited, as consumers usually obtain hotel relevant information through salesmen and promotion brochures from travel agencies.	Consumers may have a better understanding of a hotel by self-evaluating relevant information, as various information (e.g., location, room rate, hotel images, and hotel facilities) are available to consumers at any time.

Source: Cox, Burgess, Sellitto, & Buultjens (2009)

Hotel choice decision is an intrinsically complex and cognitively demanding task (Pan, Zhang, & Law, 2013). Since people usually have a limited processing capacity to complete high-level cognitive demanding tasks and complex information processing tasks (Bobrow & Norman, 1975), a hotel choice decision task is simplified as subsequently evaluating attributes and finding the most desirable alternative (Gigerenzer & Todd, 1999).

According to Payne, Bettman, and Johnson (1993), individuals have adaptive decision behavior when solving decision problems. That is, a decision-maker may have more than one decision rule available to solve a decision problem. A decision rule can be regarded as a sequence of mental and effector operations, which are used to transform an initial state of knowledge into a solved form of a particular decision problem. Individuals may apply different decision rules based on individuals' prior knowledge, experience, problem characteristics, social context characteristics.

Alike buying goods, choosing and reserving hotels is a multi-stage process. For example, Masiero and Nicolau (2016) tested a two-stage hotel choice process. They concluded that tourists usually choose a hotel by grouping hotels based on a specific criterion or using some heuristics. The hotel choice task involves not only

the stage of making a final choice but also involves the process of seeking and evaluating information sequentially. Consumers typically narrow down the choice of alternatives based on specific criteria and ultimately lead to a final decision within a "funnel-like" process (Wang & Ruhe, 2007; Yoo & Chon, 2008). Throughout this funnel-like process, many alternatives are eliminated initially to form a consideration set. The remaining alternatives in the consideration set are then evaluated more carefully to reach a final choice (Turley & LeBlanc, 1993).

This study assumes consumers make hotel choice decisions in a contingent way. As the knowledge mentioned above, during the hotel choice process, consumers may focus their cognitive evaluation on deciding which attributes should receive the highest weight and then choose the hotel that performs best on these attributes (Dyer, 2005; Kivetz, 1999). Therefore, the hotel choice decision can be regarded as a stepwise procedure by prioritizing different attributes based on their relative importance.

1.2 Problem statement

Although numerous studies have been carried out to enrich the knowledge about consumers' hotel choice decisions and hotel selection criteria, several research gaps can still be identified. These research gaps can be classified into conceptual research gaps and methodological research gaps.

1.2.1 Conceptual point of view

First, according to the theory of goods characteristics developed by Lancaster (1966), it is the characteristics of the goods from which utility or preference is derived. In this view, the process of consumer decision involves evaluating a number of alternatives on several product attributes and making the decision based on these several evaluations (Anderson, 1971; Slovic & Lichtenstein, 1971). A hotel is a mixture of various attributes, including location, price, rating, service, and others regarding the hotel choice context (Albayrak & Caber, 2015; Bodet, Anaba, & Bouchet, 2017; Lewis, 1984; Mellinas, Nicolau, & Park, 2019). Hotel alternatives can thus be considered as a multi-attribute representation system (Bettman, Luce, & Payne, 1998; Olshavsky, 1979; Payne, 1976; Svenson, 1979).

To understand online hotel choice decisions making, systematically re-examine the influence of hotel attributes that are existing in an online setting is needed. Considering hotel choice is a multi-attribute decision-making process, the needed information to understand consumers' choice criteria includes attributes and their importance weighting, which are used to measure the importance of attributes (Hwang & Yoon, 2012; Yoon & Hwang, 1995). In this study, the decision rule, which is regarded as a stepwise procedure by prioritizing different attributes based on their relative importance, is used to describe how consumers make their hotel choice decision. Numerous studies have attempted to explain which hotel attributes matter when consumers choose a hotel and examine consumers' attributes preference. However, views on the relative importance of attributes are inconclusive.

It has been recognized that follow-up hotel choice research should be carried out after relevant attributes are adequately identified (Wilkie & Pessemier, 1973). Particularly, with the development of online booking channels, both user-generated

content and hotel-related information are provided to consumers, examined attributes should be adapted in an online setting when examining consumers' online hotel choice decision.

Second, the decisions generated during the consideration-set formation stage may affect consumers' final purchasing decisions (Shocker, Ben-Akiva, Boccara, & Nedungadi, 1991). If customers do not consider a product, there are fewer opportunities for consumers to choose this product. In this view, how do consumers construct the choice criteria in the consideration-set formation stage to process information should be studied to gain a deep and elaborative understanding of the hotel choice process (McCleary, Weaver, & Hutchinson, 1993; Svenson, 1979). This understanding of hotel choice creates opportunities for hotel suppliers by developing adequate marketing strategies when consideration set can impact consumers' final purchasing decisions.

Although a plethora of research has been conducted, it is unclear how consumers evaluate hotel attributes to form the consideration set and make the final choice during their online hotel choice process. While the question of which and how hotel attributes affect an overall judgment has received a lot of scholarly attention, most studies were conducted at a particular time point (e.g., final choice). In contrast, limited studies examine how consumers prioritize attributes to form hotel choice sets for each decision stage.

To find the best option, consumers may apply one or multiple decision rules to determine the choice alternatives (Svenson, 1979). Some researchers have proposed that different decision rules can be applied at different decision stages (Crompton & Ankomah, 1993; Gensch, 1987; Montgomery, 1983). For example, at the consideration-set formation stage, a non-compensatory rule may be applied

to evaluate attributes, which means all alternatives that do not exceed the criterion on one critical attribute will be eliminated (Laroche, Kim, & Matsui, 2003; McCabe & Li, 2017). At the stage of the final choice, the trade-off will be allowed when considering various attributes (Gensch, 1987). These studies indicate that there is a need to understand whether the selection of critical attributes and whether the ranking of attributes may vary to reach the initial choice set, consideration choice set and the final choice set (Crompton & Ankomah, 1993; Hung & Petrick, 2012; Park, Yin, & Son, 2019; Woodside & King, 2001).

1.2.2 Methodological point of view

In addition to the conceptual research gaps mentioned above, there are also some methodological constraints in the existing literature. First, among those published studies about consumers' online hotel booking and hotel choice, they mostly applied three main streams of data collection methods to measure consumers' purchase intention. One stream of these studies used interviews or surveys (including offline and online survey) to capture consumers' purchase intention (Albayrak & Caber, 2015; Albayrak, Caber, & Bideci, 2016; Baek & Ok, 2017; Bodet et al., 2017; Chen & Chang, 2018; Tan & Ooi, 2018). Although these two methods are technically feasible, respondents may not feel encouraged to provide accurate and honest answers due to a lack of memory on the subject when using the survey and interview methods to collect data.

The second stream utilized experiments (supported by online surveys) to test consumers' hotel choice intention (Casaló, Flavián, Guinalíu, & Ekinci, 2015; Ladhari & Michaud, 2015; Masiero, Heo, & Pan, 2015; Masiero, Pan, & Heo, 2016).

Although the experimental design is becoming more popular and more insightful findings can be generated, those experimental studies mostly show a small number of alternatives, which is unrealistic in the real-life situation. The third stream adopted eye-tracking technology to observe a respondent's attention allocation and evaluation process (Pan et al., 2013; Park et al., 2019). However, such technology can only monitor actual online behavioral data but failed to understand respondents' decision rules during the online hotel decision-making process.

Since access to real-time sales data is feasible in theory but infeasible in practice, the question of how to improve intention's predictive capacity needs to be redressed. There is a weak correspondence between purchase intention and actual purchase behavior if lacking contextually specific materials (Warshaw, 1980). Future studies have to provide more realistic stimulus materials for consumers when using intention to predict their actual decisions. Moreover, it is highlighted that intention is more accurate in reflecting actual behavior when purchase intention is collected in a comparative mode than when they are collected without comparison among alternatives (Morwitz, Steckel, & Gupta, 2007). When exploring hotel choice decisions through experimental design, an adequate number of hotel alternatives should be provided instead of giving them only a small range of hotel choices and hotel attributes that are out of touch with reality.

Secondly, the need for a reliable, unbiased, and objective assessment of hotel attributes' importance has always been important and challenging. The emergence of machine learning has brought about a wave of excitement into the field of consumer choice prediction. As compared to statistical methods, machine learning methods are known as having better prediction accuracy (Cui & Curry, 2005; Min & Lee, 2005). By combining vast amounts of data and increasingly sophisticated

algorithms, machine learning modeling has opened new pathways for understanding consumer behavior.

Although the machine learning method's potential has been acknowledged, the machine learning approach has been rarely applied in hospitality studies. Machine learning methods are mainly used in mining hotel online reviews (Lee, Hu, & Lu, 2018; Li, Law, Vu, Rong, & Zhao, 2015; Singh et al., 2017), while few studies are conducted on predicting consumers' hotel choice. As machine learning can improve the quality of models and thereby lead to improved predictions (van Wezel & Potharst, 2007), this study attempts to propose using a machine learning method to understand consumers' online hotel choice patterns.

1.3 Research questions and objectives

The overall goal of this study is to understand which and how hotel attributes affect consumers' online hotel choice decisions. To address the gaps identified in the above section, this study attempts to complement the growing stream of research on hotel choice by investigating the following research questions:

(1) Which hotel attributes affect consumers' online hotel choice process in the consideration-set formation stage and the final choice formation stage?

(2) How hotel attributes are prioritized during consumers' online hotel choice process in the consideration-set formation stage and the final choice formation stage?

(3) Are there any significant differences between consumers' stated attributes preference and actual attributes preference?

Through applying the Random Forest analysis, this study proposes to develop a tree-based decision pattern, which can better reflect how different attributes influence consumers' hotel choices at different decision stages. To be specific, the objectives of this study are:

(1) To identify the set of key attributes used by consumers in *the consideration-set formation stage* of their online hotel choice process.

(2) To identify the set of key attributes used by consumers in *the final choice formation stage* of their online hotel choice process.

(3) To examine the decision rule applied in *the consideration-set formation stage* of consumers' online hotel choice process.

(4) To examine the decision rule applied in *the final choice formation stage* of consumers' online hotel choice process.

(5) To identify the differences between actual attribute preference and stated attribute preference in *the consideration-set formation stage* of consumers' online hotel choice process.

(6) To identify the differences between actual attribute preference and stated attribute preference in *the final choice formation stage* of consumers' online hotel choice process.

1.4 Significance of the study

1.4.1 Theoretical contributions

This study proposes a multi-stage and multi-attribute choice model by integrating information processing theory, phased decision-making theory, and

multi-attribute decision-making theory. This conceptual model attempts to advance the theoretical understanding of consumers' hotel choice behavior. By focusing on consumers' decision process, this study examines the key hotel attributes which may affect consumers' evaluation and attributes' importance in the online hotel choice process. Since limited scholarly attention has been paid to the impact of attributes on consumers' behavior in the online setting conclusively, the findings of this study could contribute new knowledge to the existing literature.

Moreover, the decision tree concept is adopted in this study to provide an effective structure to show how alternative decisions can be broken down and evaluated. This study is one of the few studies that examines consumers' hotel choice decision rules in both the consideration-set formation stage and the final choice formation stage. The individual and comparative analysis on different decision stages could provide a more detailed understanding of consumers' decision patterns.

1.4.2 Methodological contributions

Regarding the methodology part, this study will employ a hypothetical OTA booking platform with sufficient alternatives to simulate the hotel choice process. As previous relevant studies only provided 8 to 16 alternatives for respondents to choose from (Kim & Park, 2017; Masiero et al., 2015), the current study's setting is more likely to reflect the real-life situation than previous studies. As Pan et al. (2013) concluded, consumers have different decision-making patterns when facing different hotel choice sizes. Compared with other data collection methods used in

previous literature, this study provides sufficient hotel choices for respondents and examines consumers' hotel choice decisions more realistically.

Furthermore, a scientific approach is applied in the present study. This study complements the online hotel choice literature by using the Random Forest analysis to identify consumers' hotel choice decision patterns. This machine learning approach is proved to outperform performance and prediction accuracy (Chen et al., 2017). Applying a machine-learning algorithm to predict consumer behavior can be advantageous as it can improve the accuracy of results. This attempt enriches the method of understanding consumers' online hotel choice patterns.

1.4.3 Practical contributions

Besides contributing new knowledge to the growing stream of literature on hotel choice, the managerial contributions are also expected to be significant. Findings from this study will offer insightful knowledge to hotel managers with clues for guiding hotel development. For example, when considering building new hotels, hotel managers can invest in the most important hotel attribute with limited budgets. Accurate results of consumers' hotel choice preferences can guide hotels to optimize operations management, avoid common biases, and assist leaders' judgment.

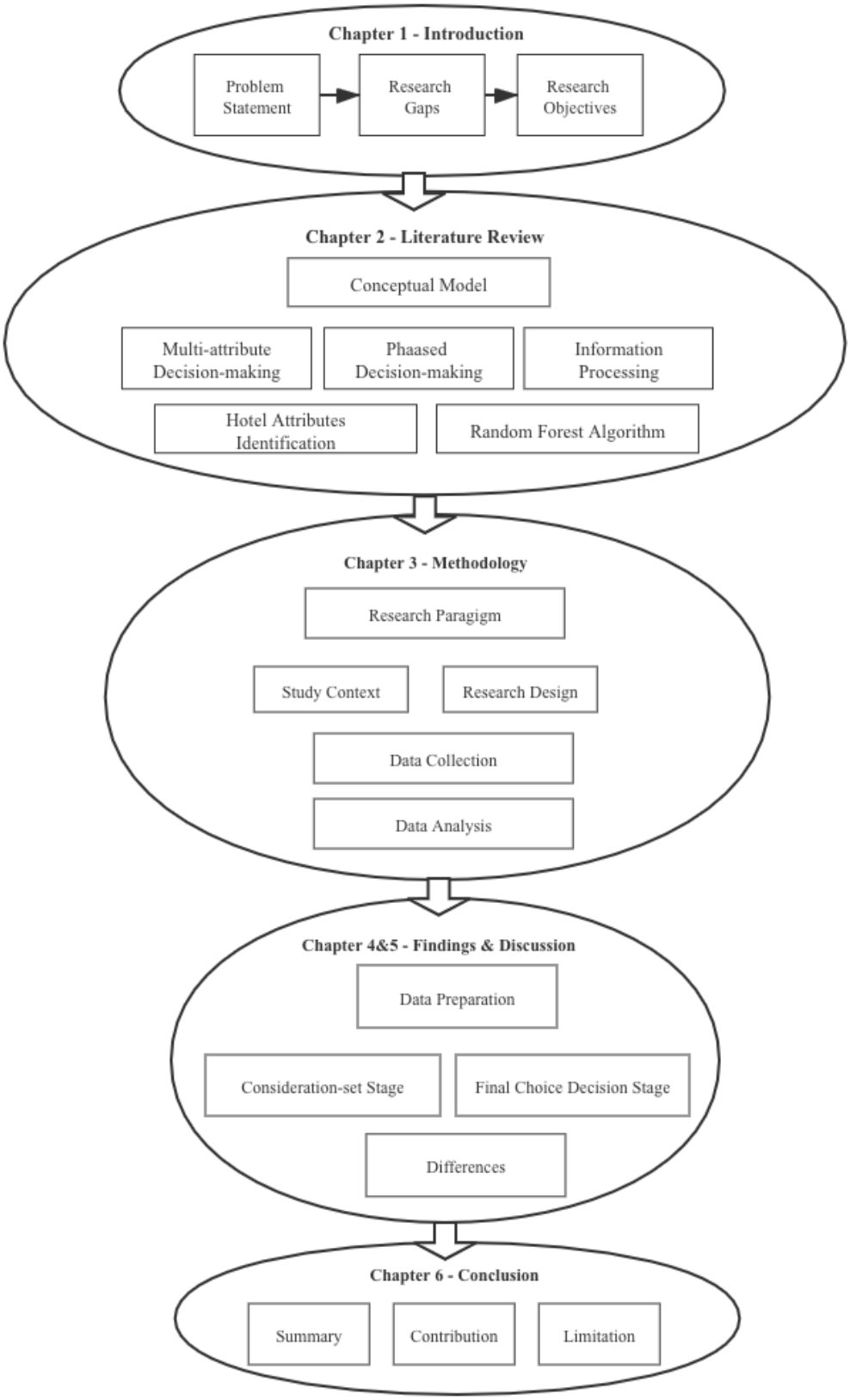
The findings can also help to improve online hotel booking website navigation and adopt marketing communications strategies. For example, OTAs could utilize the results of this study to design the website navigation to meet consumers' different decision rule patterns. For consumers with simple decision rules, a streamlined online interface could be made to suit their fast-paced decision-making

nature. For consumers with complex decision rules, since they may spend more effort on the consideration-set formation stage, the website could provide some tools to help comprehensive decision-makers efficiently form their consideration sets.

1.5 Chapter summary

This chapter is the introductory section of this study. The beginning part provided the research background of the study. Next, the problem statement has been presented, forming the research questions and objectives. Three major research questions were asked to fill the gap identified in the existing literature related to consumers' hotel choice decisions. Then, the contributions of this study have been discussed. The structure of the study is visualized in Figure 3.

Figure 3 Study structure



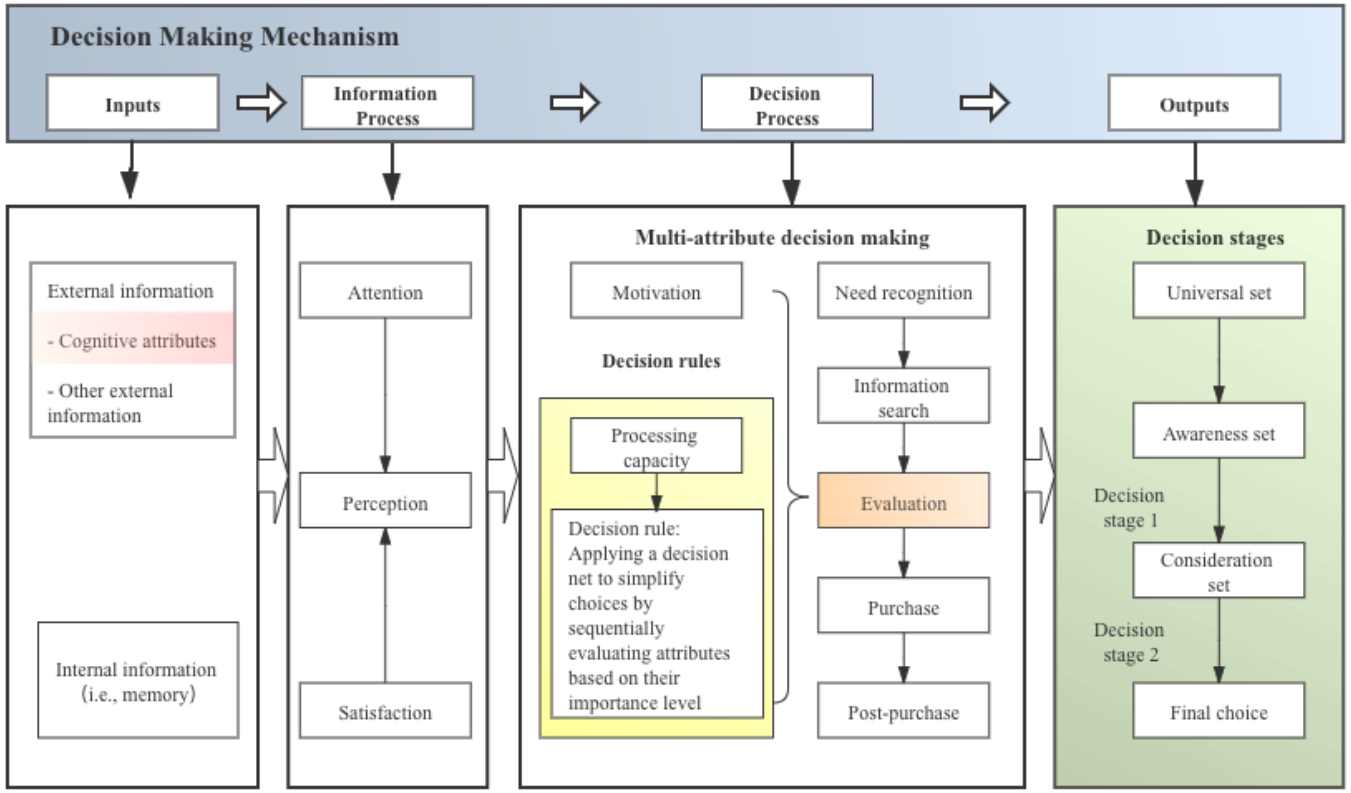
CHAPTER 2 LITERATURE REVIEW

This chapter reviews the literature about the following topics: (1) conceptual hotel choice model; (2) consumer choice behavior; (3) decision-making theories; (4) online hotel booking; (5) hotel attributes affecting consumers' hotel choice; (6) different choice stages; (7) methods used to examine attributes preference; (8) Random Forest algorithm. Based on the existing theories and research evidence, the outcome of this study attempts to propose a multi-stage and multi-attribute choice model, which illuminates how different attributes sequentially drive consumer's online hotel choice process by combing these six strands of literature.

2.1 Conceptual multi-stage and multi-attribute choice model

In line with information processing theory, this study attempts to propose a multi-stage and multi-attribute hotel choice model based on the knowledge of information processing theory, phased decision-making theory, and multi-attribute decision-making theory. The main components in this model include the decision-making mechanism, information inputs, decision stages, and simplified decision rules (see Figure 4).

Figure 4 Conceptual multi-stage and multi-attribute online hotel choice model



Source: Bettman (1975); Crompton and Ankomah (1993); Lancaster (1966)

This choice model focuses on multi-attribute decision-making problems. In the current study, a set of key hotel attributes are considered as the information inputs for the next stage of the choice process. Consumers tend to use simplified decision rules by going through attributes sequentially based on their importance level. These decision rules can clearly describe consumers' psychological evaluation of attributes. Moreover, the choice process is not a one-off event of making a final choice. Instead, it is a process with multiple stages. This study emphasizes that consumers reach their final decisions by undertaking two decision stages - the stage of forming a consideration set and the stage of making a final choice. To understand consumers' hotel choice process, two aspects should be examined. One is that attributes are used in each stage and another one is the importance level of each attribute in the decision net.

2.2 Consumer behavior in different disciplines

Comprising the behavior of choosing, purchasing, and using products and services in everyday life (Bettman, 1986), consumer behavior has been a focal interest in consumer research for a long time. Over the past decades, a growing body of literature on consumer behavior has been conducted and published in journals from various disciplines (Holbrook, 1987; Wang & Ruhe, 2007). These disciplines, including economics, psychology, sociology, anthropology, and

philosophy, have emphasized a special type of consumer behavior. The specialization on consumer research in different disciplines also varies among each other (see Table 2).

Table 2 Specialization on consumer research in different disciplines

Discipline	Specialization in consumer research
Economic	The economic perspective in consumer research analyses how consumers maximize the utility of their consumption subject to a budget constraint.
Psychology	The psychology perspective in consumer research primarily focuses on the formation and mechanism of consumer behavior as well as consumers' acquisition through brand choice or product attributes choice.
Sociology	The sociological perspective in consumer research often considers the social context in which consumption activities are embedded.
Marketing	The marketing perspective in consumer research focuses on managerial issues pertinent to profit maximization.
Philosophy	The philosophy perspective in consumer research constructs a conceptualization of consumption morality and has opened the way to approaches that depart from the prevailing tendency toward logical empiricism.

Source: Holbrook (1987); Katona (1974) MacInnis & Folkes (2010); Ratchford (1975)

2.2.1 Consumer behavior from an economic perspective

The economic perspective attempts to understand consumer behavior by using marginal utility theory, indifference curves, or revealed preferences (Holbrook,

1987). This perspective only considers the downward-sloping demand curve and various income effects on purchases to explain consumer behavior. The main question in the economic view is how consumers maximize the utility of their consumption subject to a budget constraint. The trade-off among commodities is the critical research area in economic when studying consumer behavior problems. In classic economics research, due to the uncertainty about the outcomes and incomplete information about alternatives in the real-world, the activity of maximizing utility has been considered as rational behavior at the beginning and then as bonded rational behavior.

2.2.2 Consumer behavior from a psychology perspective

The psychology perspective adopts a microscopic view to study consumer behavior. Consumer researchers in the psychology field have contributed to consumers' preference among various brands and illuminated consumer behavior via brand choice far more than usage or disposition behavior. The psychology perspective of studies considers consumer choice behavior as an information processing procedure much in line with general problem solving (Bettman, 1979). During the information processing procedure, consumers may evaluate multiple product attributes and form their preferences based on whether a specific attribute value can meet their demand. Consumer researchers in psychology also concern

with consumers' evaluation strategies, including compensatory or non-compensatory strategy used in the preference formation process (Fishbein & Ajzen, 1977).

2.2.3 Consumer behavior from a sociology perspective

The sociological perspective in consumer research has considered the interpersonal context in which consumption activities are embedded (Holbrook, 1987). The sociological perspective regards consumers as living within the context of their consumption experience and that consumption experience helps shape their lives. From this perspective, consumers use products to support the roles they perform in their interpersonal relations and to reflect their identities. Products are used as a symbol to show consumers' social class and preferences. Take the concept of conspicuous consumption from a sociological perspective as an example. Consumers who have a purpose of conspicuous consumption view their product consumption as a symbol of their social status. Thus, their conspicuous consumption behavior may adapt to their social status characteristics.

2.2.4 Consumer behavior from a marketing perspective

Consumer behavior studies from the marketing perspective are focus on the position of marketers. These studies pay much attention to consumers' consumption

patterns, types, and segmentation (Peter, Olson, & Grunert, 1999). Recognition of the usefulness of understanding consumer behavior motivates marketing researchers to find out answers for what consumers think of products and what consumers think of competitors. Understanding how consumers evaluate a product and what influences consumers' decisions can help marketers identify the needed and obsoleted products in the market. Consumer behavior studies from a marketing perspective are much from a practical point.

2.2.5 Consumer behavior from a philosophical perspective

Philosophy studies also have made contributions to consumer behavior. From a philosophical perspective, consumer researchers mainly attempt to explain why people buy. Particularly, researchers in the philosophy field look to the philosophy of action and apply the concept of rational explanations for buying behavior to construct a consumer theory of reasoned action (Holbrook, 1987). The topics of consumers' behavior in philosophy focus on consumers' misbehavior (e.g., compulsive shopping, impulse purchases). The philosophy perspective in consumer research constructs a conceptualization of consumption morality and addresses the phenomenon of consumer misbehavior.

This study adopts the branch of psychological perceptive to investigate the consumer hotel choice process, as psychological concepts and theories play a

decisive role in consumer choice behavior (Simonson, Carmon, Dhar, Drolet, & Nowlis, 2001). Simonson et al. (2001) traced the development of consumer behavior research during the late 20th century and identified that cognitive topics had increased their importance in consumer behavior research. Research on the role of beliefs in attention, perception, information acquisition, and decision rules account for most of consumer behavior research studies (Loken, 2006; Simonson et al., 2001).

Choice behavior frequently happens in our daily life. Consumer choice behavior is characterized by conducting cognitive activities to reduce a certain number of conflicts and uncertainty among two or more alternatives (Hansen, 1976). The cognition viewpoint in the study of consumer choice behavior has been emphasized for a long time. In line with general problem solving, the philosophical perspective of literature largely considers human choice behavior as an information processing procedure (Hansen, Percy, & Hansen, 2004; McGuire, 1976).

2.3 Decision-making theories

This study is based on the knowledge of information processing theory, which is a significant paradigm for understanding consumers' behavior (Lachman, Lachman, & Butterfield, 2015). The information processing theory characterizes decision as the environment providing input of data, which is then transformed by

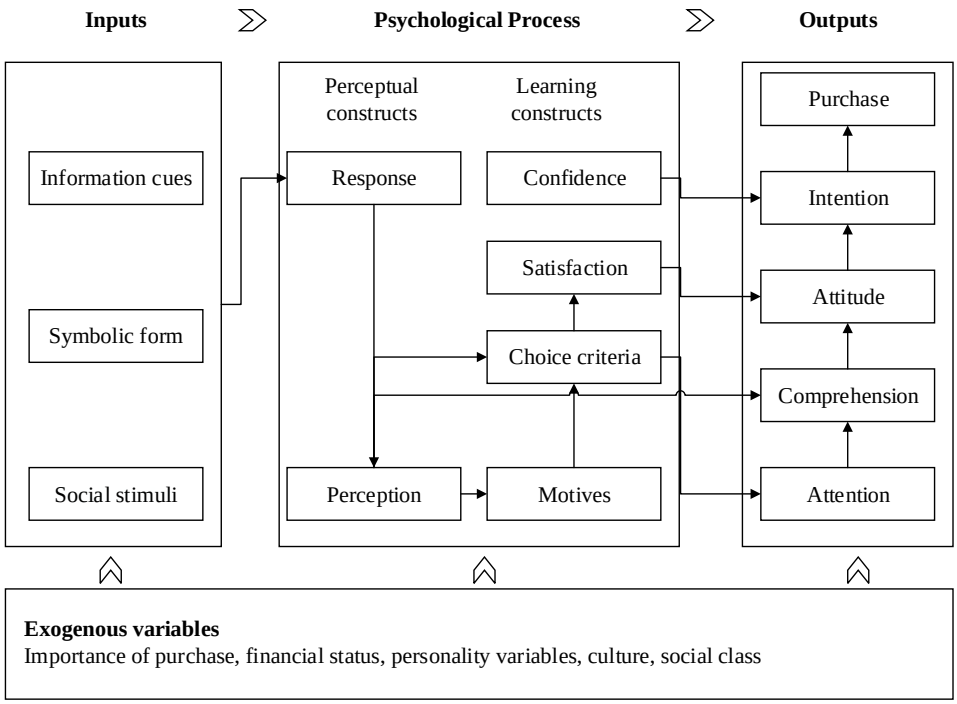
processors' evaluation. The information can be stored, retrieved, and transformed using "mental programs". The results of the mental programs are behavioral responses. Regarding consumers' choice behavior, from the information processing perspective, making choice decisions can be considered as a sequential process in which different decision strategies and rules can be used at different points during the choice process (Gigerenzer & Todd, 1999; Montgomery & Svenson, 1976). That is, consumers are the ones who interact with the choice environment, seek information from various sources, process relevant information, and then select the final choice among some alternatives (Bettman, 1979). Information processing theory presents a framework that describes how information is processed to achieve a final choice output. This viewpoint has been a growing interest in consumers' decision-making research (Simonson et al., 2001).

Over the past few decades, various researchers introduced different models to explain how consumers make choices. These include, but are not limited to, (1) Howard and Sheth model, (2) Hansen model, (3) Engel-Kollat-Blackwell (EKB) model, (4) Bettman model, and (5) Phased decision-making models. These choice models concern cognitive feeling and regard consumer choice behavior as an information processing procedure.

Howard and Sheth Models

Howard and Sheth model is a comprehensive model that explains consumers' brand choice behavior over a period of time by applying a stimulus-organism-response concept. As shown in Figure 5, there are five major components in this model. They are input variables, output variables, perceptual constructs, learning constructs, and exogenous variables (Howard & Sheth, 1969; Jisana, 2014).

Figure 5 Howard and Sheth model



Source: Howard and Sheth (1969)

Specifically, the inputs are the environment's information, and they include information cues, the symbolic form of a product, and social stimuli. Information

cues (e.g., hotel price, hotel location) are attributes of a product or service, which can affect consumers' buying behavior directly. The symbolic form of a product (e.g., linguistic symbol， pictorial symbol) means how providers present their products in the advertisement or other promotional channels. Social stimuli (e.g., electronic word of mouth) are influences derived from family, friends, and other reference groups. The perceptual constructs refer to the way individuals perceive and respond to the input variables. The learning constructs refer to the way individuals motivate themselves to identify their satisfactory choice. The outputs consist of five variables. They are attention, comprehension, attitude (i.e., evaluating the satisfying potential of a product), intention and purchase sequentially. The purchase intention and behavior are an outcome of the interplay of consumers' motivation, choice criteria, attitude, comprehension, and satisfaction with the products. The model also includes exogenous variables (e.g., social class, culture, personality), which can significantly affect consumers' choice decisions.

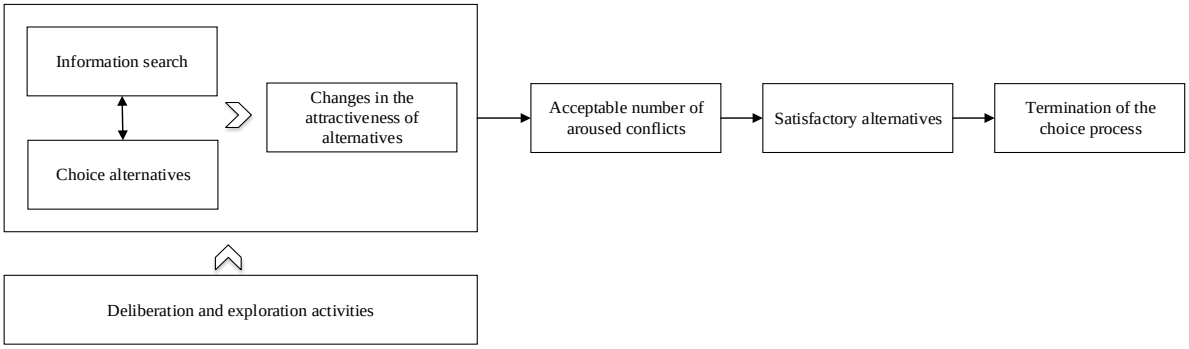
The most critical concept from Howard and Sheth model is that consumers' decision-making process consists of three components, including inputs, psychological process, and outputs. This study adopts the three components from Howard and Sheth' decision-making model and believes that consumers' hotel choice decisions include inputs component, psychological process component, and outputs component. In view of these three components, understanding consumers' hotel choice decisions should recognize the information inputs for consumers when

choosing a hotel, how consumers evaluate these inputs, and what actions consumers do after their psychological process.

Hansen Model

Hansen' model mainly describes how individuals try to assess available alternatives and then choose an acceptable one. Exploration and deliberation are two major activities involved in consumers' choice process. The scope of these two activities depends on evaluating the exploration and deliberation alternatives and the number of aroused conflicts. During the choice process, either an alternative will be selected, or the exploration and deliberation activities will continue. If the exploration and deliberation activities continue, consumers will adjust their cognitive structure and a new evaluation process will be performed. As the choice proceeds, the possibilities of exploration and deliberation are exhausted and a choice will be made (Hansen, 1972). Figure 6 shows the components of the Hansen model.

Figure 6 Hansen model



Source: Hansen (1972)

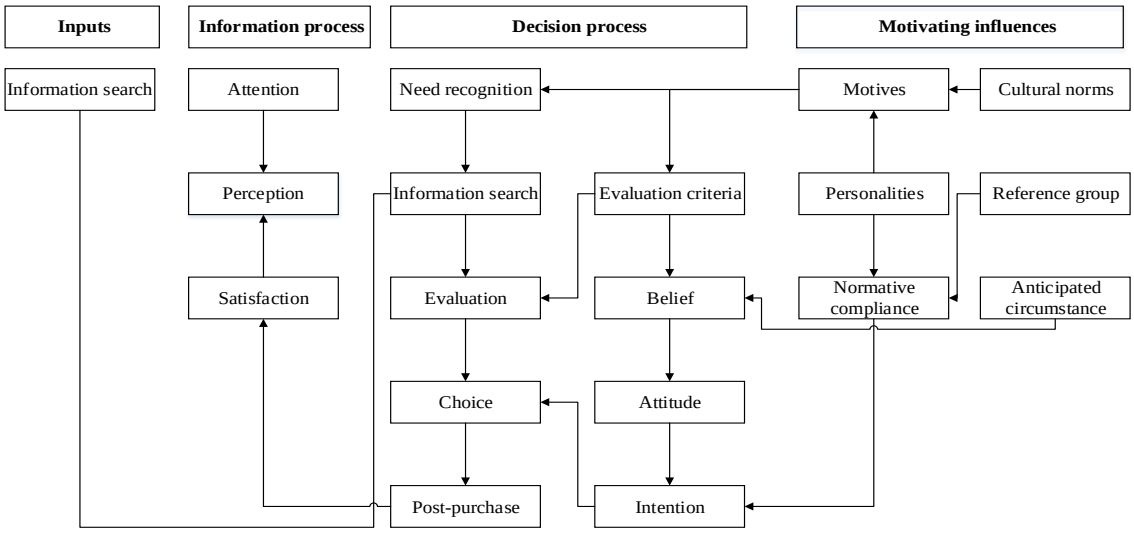
Hansen' model suggests that consumers have to deal with conflicts when facing many alternatives. When dealing with the conflicts, consumers may conduct several rounds of information search and build their evaluation criteria to make the decision. Based on Hansen model's idea, this study believes that when consumers face many hotel alternatives during the hotel choice process, consumers may use their hotel evaluation criteria to perform several rounds of the evaluation process and choose the hotel they are satisfied with.

EKB model

EKB model was first introduced in 1968 and it is one of the most well-known models in consumer behavior research (Rau & Samiee, 1981). This model describes the process of seeking information and evaluating alternatives. EKB model

considers consumer choice behavior as a decision process and identifies five major components in the decision process (Figure 7). These five components are problem/need recognition (i.e., recognize differences between the actual state and ideal state), information search (i.e., solicit information both from memory and external environment), alternatives evaluation (i.e., set the evaluation criteria based upon consumers' goal, motives, and personality), choice (i.e., make the final choice based on influenced consumers' intention, attitude and normative compliance) and post-purchase evaluation (Engel, Kollat, & Blackwell, 1978; Jisana, 2014).

Figure 7 EKB model



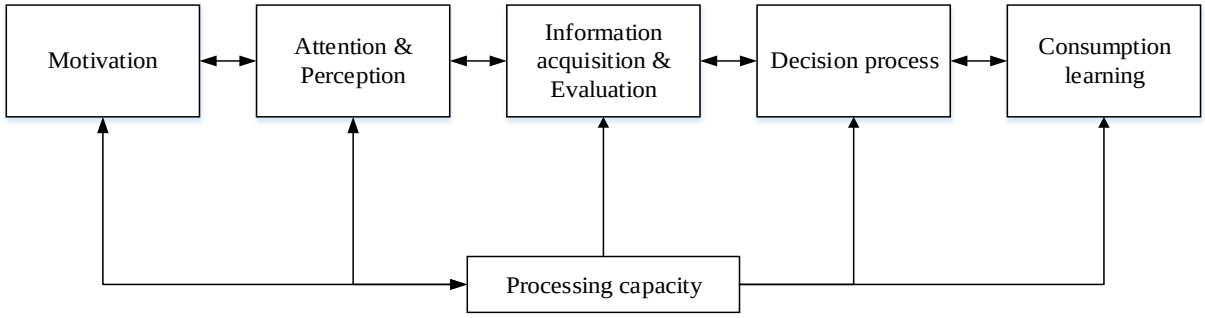
Source: Engel et al. (1978)

Similar to Howard and Sheth model, the EKB model suggests that consumers may search for information, evaluate the information, and then make their choice. EKB model extends Howard and Sheth model and emphasizes the details in the information process and the decision process. This study adopts the EKB model by believing that consumers may focus on the information which can catch their attention during the information process and build their evaluation criteria based on their need and preference in the evaluation step.

Bettman Model

Bettman model develops an information processing theory of consumer choice, inspired by Newell and Simon (1972) and Payne (1976). This model attempts to explicate how consumers obtain and use information. Figure 8 presents an overview of this model. The six basic elements of this model are processing capacity, motivation, attention and perceptual coding, information acquisition and evaluation, decision processes as well as consumption learning. Besides, individual differences, situational influences, and different types of stimuli can influence consumers' choice decisions.

Figure 8 Bettman model



Source: Bettman (1975)

In line with Simon (1972) theory of bounded rationality, Bettman (1975) model theorizes that decision-makers have limited capacity for processing information. This limitation affects consumers' decision processes because consumers may turn to adopt simple decision rules, allowing them to easily deal with complex choice situations. For example, consumers often limit the number of attributes considered to simplify their choice (Bettman, 1975). As a set of mechanisms, motivation can guide the choice process to move from the initial state to the desired state (Newell & Simon, 1972). The motivation helps consumers go through some goals/sub-goals in making a choice, which can be regarded as a goal hierarchy. In the choice behavior context, consumers have goals, like determining which attributes are important, evaluating alternatives on these attributes and obtaining a satisfying alternative set. This goal hierarchy constructs and proceeds consumers' choice process (Gigerenzer & Todd, 1999).

Consumers' attention and perceptual coding can have a significant influence on choice. Information can be obtained from both external and their memory and actively evaluated by consumers. Consumers may use different decision heuristics/rules to determine choice goals, select information, and evaluate alternatives throughout the choice process. Decision heuristics and rules describe how information is combined when comparing alternatives and how information interacts (Bettman & Zins, 1977). The element of consumption and learning happens after a purchase is made, the experience of consuming the product can become a source of information to the consumers. There are many interactions among each element and each element can be interrupted and modified during the choice process (Bettman, 1971, 1979; Bettman et al., 1998).

This study applies the Bettman model by suggesting that consumers have a limited capacity to perform information processing during their hotel choice decision. Due to this limitation capacity, consumers may adopt simple decision rules to evaluate hotel alternatives and deal with complex choice situations.

Phased decision-making model

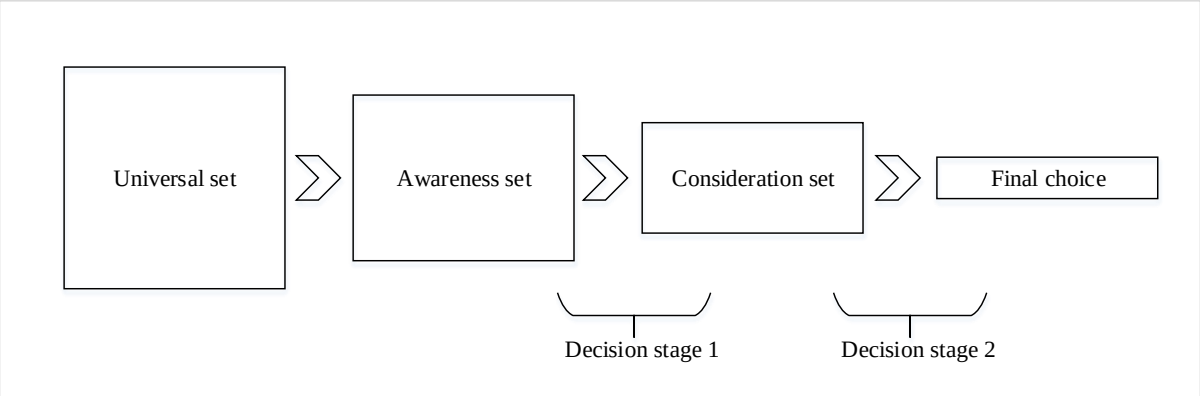
Consumers' choice process can be regarded as a phased process with a series of interrelated sub-decisions. When there are many alternatives or product attributes to evaluate, consumers often use the consider-then-choose decision process. This

process suggests that consumers choose products by first forming a consideration set and choosing among considered alternatives (Hauser, 2014; Paulssen & Bagozzi, 2005; Payne, 1976; Shankar, Smith, & Rangaswamy, 2003).

The concept of consideration set was initially studied under the analysis of the evoked set, which was introduced by Howard and Sheth (1969). Since the term "evoked set" was used with several different meaning empirically, from "brands the consumers would consider" to "brands acceptable to the consumers", Wright and Barbour (1977) used the term "consideration set" to describe the brands that a consumer will consider. A number of consumer behavior studies supported the concept of consideration set. This concept suggests that a consumer is likely to employ a phased decision-making process when confronted with complex decisions or multi-alternative choice problems (Bettman, 1979; Wright & Barbour, 1977).

As Figure 9 shows, the understanding of the phased decision-making process can be described by a simplification framework (Crompton & Ankomah, 1993; Shocker et al., 1991). The hierarchical framework of the decision process helps focus attention on the formation of each decision stage of the phased decision-making process (Shocker et al., 1991). Consumers may undertake a two-stage process, first narrow down their aware alternatives into a consideration set (Schwartz, 2000) and then undertaking a detailed analysis of the reduced set. In these two stages, consumers make decisions all the time to reach a final choice (Erasmus, Boshoff, & Rousseau, 2001).

Figure 9 Decision stages



Source: Crompton and Ankomah (1993); Shocker et al. (1991)

Based on the knowledge mentioned above, this study suggests that consumers' choice process is a phased process that consumers go through all decision stages and finally make a choice. A greater emphasis should put on the formation of each decision stage rather than study the final stage.

According to the above decision-making theories review, this study concludes that consumers' choice process consists of three components, including inputs, psychological process, and outputs. Considering the inputs, consumers usually engage with many information searching activities before making decisions. Information can be obtained from external (i.e., information cues, social influence) and internal (i.e., memory) sources. This information will be used as inputs for the next stage of the consumers' choice process. This study focuses on hotel attributes

as information inputs and attempts to identify the key hotel attributes when consumers make hotel choice decisions. Information process and decision process constitute consumers' psychological process when making choices. Due to consumers' limited information processing capacity, this study applies the idea that consumers may turn to adopt simple decision rules to simplify their evaluation activities. The outputs of the decision process can be considered as phased responses. That is, the behavioral responses of the decision process can be subdivided into the formation of the consideration set and the result of a final choice. A multi-stage and multi-attribute online hotel choice model was conceptualized in this study (see Figure 4 in section 2.1).

2.4 Online hotel booking

In this sub-section, extended studies on online hotel booking are reviewed to understand the development of online hotel booking and identify factors that affect consumers' hotel choice decisions.

2.4.1 Development of online hotel booking

With the development of reservation systems in the 1970s, global distribution systems in the late 1980s, and the Internet in the 1990s enables consumers to

complete hotel booking on the Internet anytime and anywhere (Ip, Leung, & Law, 2011).

Given that researching and purchasing travel products using online platforms are becoming the mainstream trend, online travel purchasing has attracted attention from scholars and practitioners over the past decades (Baek & Ok, 2017; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Gavilan, Avello, & Martinez-Navarro, 2018; Liu & Zhang, 2014; Rong, Li, & Law, 2009). For recent examples, drawing on the survey responses provided by 832 hotel bookers from Mainland China, Wu and Law (2019) found the behavioral differences between e-bookers and m-bookers in online hotel booking. Harnessing the experimental design approach, Guillet, Mattila, and Gao (2020) demonstrate the joint effects of choice set size and information filtering mechanisms on consumers' online hotel booking decision-making confidence.

Online hotel booking has several advantages when comparing with offline hotel reservations. First, booking online is more convenient. As there is no need for consumers to visit offline travel agencies, consumers can save transportation time and waiting time (Christou & Kassianidis, 2002). Second, with the development of the Internet, booking hotels are not limited by space and time. Third, consumers can get a wider range of choices through online hotel booking systems. Consumers can therefore choose from a larger hotel set when they book hotels at home (Christou & Kassianidis, 2002; Marcussen, 2001). In this way, more comparisons

between alternatives and more cognitive efforts are needed. Last, more supporting information can be acquired during the online booking process. The development of the Internet has offered a more significant opportunity for individuals to share their views, and consumers are more likely to seek information from other previous consumers (Furner, Zinko, & Zhu, 2016). Besides, hotel-related information can be obtained through hotel images, interactive maps, and online ratings (Bogdanovych, Berger, Simoff, & Sierra, 2006). Hence, it is more likely that consumers can make a better and more informed booking decision in the online context.

2.4.2 Critical factors affecting online hotel choice decision

A considerable amount of literature has been published on online hotel booking. Among those published studies, one central topic is identifying crucial factors affecting consumers' online hotel choice decisions. A certain number of studies have paid attention to consumers' intention to choose a hotel. These studies provide important insights into the factors affecting consumers' online hotel choice decisions.

These influencing factors can be categorized as consumer characteristics, company characteristics, product characteristics, and social characteristics. Table 3 presents critical characteristics that affect consumers' online hotel choice decisions.

Table 3 List of critical factors affecting online hotel booking decisions

Characteristics	Sub-characteristics	References
Customer characteristics	☐ Demographic factors (e.g., age, country, gender)	Qi, Law, & Buhalis, 2013; Tan & Ooi, 2018
	☐ Personality (e.g., experience, involvement, innovativeness)	Kim & Kim, 2004; Murphy & Chen, 2016
	☐ Attitude (e.g., trust)	Liang, Choi, & Joppe, 2018; Lien, Wen, Huang, & Wu, 2015
Company characteristics	☐ Reputation	Bilgihan, 2016; Phelan, Christodoulidou, Countryman, & Kistner, 2011
	☐ Brand familiarity	Casaló et al., 2015
Product characteristics	☐ Tangible factor (e.g., price, location, cancellation policy)	Chen, Schwartz, & Vargas, 2011; Liu & Zhang, 2014
	☐ Intangible factor (e.g., hotel design, service perception)	Chen, Xie, & Wang, 2017; Kirillova & Chan, 2018
Social influence characteristics	☐ Review valence	Sparks & Browning, 2011; Torres, Singh, & Robertson-Ring, 2015
	☐ Review volume	Cezar& Ögüt, 2016; Rianthong, Dumrongsiri, & Kohda, 2016
	☐ Reviewer characteristic	Chan, Lam, Chow, Fong, & Law, 2017; Zhao, Wang, Guo, & Law, 2015

Consumer Characteristics

A number of studies have examined the influence of consumer characteristics on online hotel booking. Some researchers find and report that consumers' demographic factors, such as gender and age, would affect consumers' online booking decisions. For instance, Qi, Law, and Buhalis (2013) found that visitors who booked five-star hotels via online channels were young and middle-aged, college degree, high-income leisure tourists from Asian regions, especially Mainland China and Hong Kong. There are statistically significant differences in gender, educational level, income, and region between online and offline consumers. Chen, Phelan, and Jai (2016), Essawy (2013), Rong et al. (2009), and Tan and Ooi (2018) showed gender, country, and age differences existed in consumers' purchasing behavior.

Consumer personalities, such as information needs, experience, involvement, and innovativeness, are also found to have some impacts on consumers' motivation toward booking hotel deals (Agag & El-Masry, 2016; Herrero & San Martín, 2012b; Kim, Ma, & Kim, 2006; Liu & Zhang, 2014; Murphy & Chen, 2016; Noone & Mattila, 2009; Rianthong et al., 2016). For example, Consumers' previous online booking experience has also been proved to influence their reservation intention (Kim & Kim, 2004).

Besides, consumers' attitudes play an important role in their online hotel booking decision. For example, Lien et al. (2015) noted that consumers' trust in a hotel could positively influence their perceived value and purchase intention. In another study conducted with Airbnb users, Liang et al. (2018) verified that customers' trust in Airbnb hosts would positively influence their repurchase intention.

Company Characteristics

Some studies considered and confirmed the influence of company characteristics. One company-related characteristic that may affect consumer booking intention is company reputation. Curras-Perez, Ruiz, Sanchez-Garcia, and Sanz (2017) argued that reputation is an important determinant in explaining the consumers' online purchase decision. Brand loyalty is also proved to positively affect consumers' online booking decisions (Bilgihan, 2016; Phelan et al., 2011).

Brand familiarity is another characteristic that influences consumers' online booking decisions. One study conducted by Casaló et al. (2015) mentioned that for booking intention, the impact of well-known online travel communities on booking intention is asymmetric. Hotels on the best hotels list are more attractive than those on the worst hotels list.

Product Characteristics

Previous studies also highlighted the influence of product characteristics on consumer online booking decisions. Room price, cancellation policy, star rating, brand image, and hotel facilities are major studied factors that significantly influence consumers' booking decisions. As consumers have different preference on hotel attributes, these attributes may have varying degrees of influence on purchase intention (Chen et al., 2011; Herrero & San Martín, 2012a; Lien et al., 2015; Liu & Zhang, 2014; Pan et al., 2013; Rianthong et al., 2016; Rong et al., 2009).

In addition, hotel design affects consumers' booking intentions (Baek & Ok, 2017). In short, aesthetics and symbolism may shape consumers' booking intentions by influencing emotional arousal and quality expectation. The functional design only influences consumers' booking intention through quality expectation. For example, Chen et al. (2017) and Kirillova and Chan (2018) drew our attention to the important effect of hotel aesthetic value on consumers' online hotel booking decisions. In an online setting, product characteristics also include how products are presented on an online platform. Ert and Fleischer (2016) concluded that online hotel booking is sensitive to mere position effects and hotels listed at the top and bottom of a list were more likely to be chosen than those listed in the middle.

Social Influence Characteristics

Given that travelers are becoming increasingly reliant on social media and electronic word-of-mouth (eWOM) to support their decision-making, unsurprisingly, many studies discussing social influence characteristics emerged in the past few years.

Review valence, which is defined as the positive or negative orientation of information, is a content-related cue of online reviews which has proven to invoke some influence on consumers' online travel purchase decisions. Sparks and Browning (2011) stated that consumers likely reserve a hotel online if positive reviews about that hotel are presented. Drawing on the analysis of sales and review data, Rianthong et al. (2016) also noted that hotels with a high review rating have a high possibility to attract many online bookings. By contrast, consumers less likely to make online bookings if shortlisted hotels have many negative online reviews (Zhao et al., 2015). Similar empirical proof can also be found in Cezar and Ögüt (2016) and Torres et al. (2015).

In terms of the exponential growth of online reviews in size, several studies are conducted to explicate whether and how the volume of online reviews would influence consumers' online purchase decisions (Cezar & Ögüt, 2016; Confente & Vigolo, 2018; Gavilan et al., 2018). After analyzing the secondary data solicited from TravelClick and TripAdvisor, Torres et al. (2015) concluded that the number

of online reviews on TripAdvisor has a positive relationship with the average revenues generated per online transaction. Cezar and Ögüt (2016) showed that a high number of online reviews are positively associated with the conversion rate. The researchers noted that a high number of online reviews could increase the number of bookings by 57.6% compared with a low one. Gavilan et al. (2018) demonstrated the moderation effect of review volume on the relationship between the number and the trustworthiness of the review rating. With reference to their empirical findings, people generally consider high review ratings as trustworthy only when a high number of reviews supports them. If people's trust in a rating is high, they likely include it in the consideration set.

In addition to focusing on content-related cues, the effect of reviewer-related characteristics on online hotel purchase intention has elicited some scholarly attention. Zhao et al. (2015) found and reported that reviewer expertise is positively associated with consumers' hotel online bookings. Given that expert reviewers mainly possess additional knowledge on a specific topic, the information shared by those experts can increase consumers' consumption confidence, thereby motivating them to make online purchases. The influence of similarity between reader and reviewer has also been investigated. The first study of Chan et al. (2017) showed that demographic similarity magnifies the effect of review valence on hotel booking intention. The relationship is stronger when the demographic similarity between reader and reviewers is high. However, the second study in Chan et al. (2017) indicated the substitution effect between demographic and preference similarity.

2.5 Hotel attributes affecting consumers' hotel choice

Since the objective of this study is to understand the influence of various product attributes on the choice decision, in this sub-section, extended studies on hotel choice or hotel selection are examined to identify key attributes that affect consumers' hotel choice decisions. Together with section 2.4, this section attempts to provide a comprehensive overview of factors that affect consumers' online hotel booking choices in the tourism and hospitality literature.

2.5.1 Price

The effect of price has received much scholars' attention when understanding consumers' hotel choice decisions. Typically, consumers list hotel room rate as the most important attribute during their hotel choice process. For example, according to Kucukusta (2017), the price has the highest average importance value to consumers when choosing hotels. This view is supported by Njite and Schaffer (2017) and Verma and Chandra (2018), who conclude that customers consider price as a critical attribute when choosing a hotel. Cezar and Ögüt (2016) also examine and find that room price is negatively associated with hotel guests' intention to stay at green hotels.

Previous studies also confirm that price range and promotional price influence consumers' hotel choice decisions (Dotson & Clark, 2004; Kim, Franklin, Phillips, & Hwang, 2020; Masiero, Viglia, & Nieto-Garcia, 2020). Hu and Yang (2020) stated that promotional price is a significant attribute affecting choice decisions for prospective consumers during both the consideration-set formation stage and the booking stage. Kim et al. (2020) suggested that travelers are more likely to choose a hotel option if it is featured with wide price dominance dispersion. Table 4 shows price-related attributes examined in existing studies.

Table 4 Price-related attributes examined in existing studies

Attribute	Sub-attribute	References
Price	☐ Room rate (26)	Arenoe, van der Rest, & Kattuman, 2015; Cezar & Ögüt, 2016; Hu & Yang, 2020; Jang, Chen, & Miao, 2019; Kim, Hong, Park, & Kim, 2020; Kim, Kim, Lee, Kim, & Cui, 2019; Kim, Kim, King, & Heo, 2019; Kim & Park, 2017; Kim & Perdue, 2013; Kim et al., 2020; Kucukusta, 2017; Lockyer, 2005; Masiero et al., 2015; Masiero et al., 2016; Masiero et al., 2020; Masiero, Yang, & Qiu, 2019; Njite & Schaffer, 2017; Noone & McGuire, 2013; Park et al., 2019; Penn & Hu, 2020; Rianthong et al., 2016; Roe & Repetti, 2014; Sohrabi, Vanani, Tahmasebipur, & Fazli, 2012; Tsai, Yeung, & Yim, 2011; Uca, Altintas, Tuzunkan, & Toanoglou, 2017; Verma & Chandra, 2018; Wen, Lin, Liu, Xiao, & Li, 2020; Wong & Chi-Yung, 2002
	☐ Promotion discount (3)	
	☐ Price range (2)	

2.5.2 Location

Hotel location is another important attribute. Several studies have investigated the influence of location on consumer hotel choice. When choosing a hotel to stay in, consumers usually consider whether the location of a hotel is convenient or not (Nie, Tian, Wang, & Chin, 2020; Wang, Wang, Peng, & Wang, 2020; Yu, Wang, Wang, & Li, 2018). In addition, the surroundings of hotels also have an influence on hotel selection (Jang et al., 2019). According to (Albayrak & Caber, 2015), whether a beach surrounds a hotel is important for consumers to select a hotel.

To be specific, serval studies identified different dimensions of hotel location, including distance to the publication, distance to the shopping district, distance to the attractions. Masiero et al. (2019) identified four dimensions of hotel location. They are walking time to the nearest metro station, walking time to the nearest shopping district, walking time to the nearest attractions, and hotel neighborhood. Their conducted a discrete choice experiment and maintained that these four types of hotel location are found to be statistically significant. Moreover, walking time (every minute) saved to arrive at the nearest metro station, shopping district, and attraction site is estimated to be associated with a willingness to pay of 5.9 US dollars, 1.2 US dollars, and 0.7 US dollars, respectively. Aksoy and Ozbuk (2017) drew our attention to three levels of location: accessibility, urban development, and

tourist attraction. This study argued that the most crucial criterion for tourists to choose a hotel is the number of tourist attractions walking to the hotel. Yang, Mao, and Tang (2018) believe that the accessibility of hotels to attractions, airports, universities and public transportation is an important determinant of consumers' location choice. Different types of tourists show heterogeneous location preferences related to different attractions. Table 5 presents location-related attributes examined in existing studies.

Table 5 Location-related attributes examined in existing studies

Attribute	Sub-attribute	References
Location	☐ Location in general (23)	Aksoy & Ozbuk, 2017; Albayrak & Caber, 2015; Arenoe et al., 2015; Cezar & Ögüt, 2016; Chan & Wong, 2006; Cheng, 2018; Jang et al., 2019; Kim et al., 2019; Kim et al., 2019; Li, Law, Vu, & Rong, 2013; Li et al., 2015; X. Liang, Liu, & Wang, 2019; Lockyer, 2005; Masiero et al., 2019; Nie et al., 2020; Njite & Schaffer, 2017; Park et al., 2019; Rhee & Yang, 2015a, 2015b; Richard & Masud, 2016; Tsai et al., 2011; Tsai, Wu, & Chen, 2015; Uca et al., 2017; Verma & Chandra, 2018; Wang et al., 2020; Wong & Chi-Yung, 2002; Xue & Cox, 2008; Yang et al., 2018; Yavas & Babakus, 2005; Yu et al., 2018; Zaman, Botti, & Thanh, 2016
	☐ Distance to public transportation (5)	
	☐ Surrounding (6)	
	☐ Distance to shopping district (2)	
	☐ Distance to attractions (4)	

2.5.3 Hotel facilities/offers

Apart from price and location, hotel facilities and offers are important attributes affecting consumers' hotel choice. Regarding hotel facilities, frequently mentioned attributes are sports-related facilities, technological facilities, traffic facilities, and catering facilities. In terms of sports facilities, Kim et al. (2020) suggest that a hotel with good sports facilities is important for consumers, especially for young leisure travelers. Particularly, swimming pool (Albayrak & Caber, 2015; Li et al., 2015) and fitness center (Jones & Chen, 2011) are two popular attributes forming consumers' hotel consideration set and hotel choice decision.

Njite and Schaffer (2017) found that consumers are beginning to expect hotels to provide certain aspects of technology as standard. Considering technological facilities, consumers believe high-speed internet is a must-have attribute when selecting a hotel (Jang, Liu, Kang, & Yang, 2018; Kucukusta, 2017). In some empirical studies on hotel choice, car parking (Kim et al., 2019; Spoerr, 2020) and airport /local area shuttles (Kucukusta, 2017) are critical attributes for consumers to decide which hotels to select.

In addition, several studies reported that business facilities (Chu & Choi, 2000), leisure facilities (Xue & Cox, 2008), child facilities (Albayrak & Caber, 2015), and sea-entertainment facilities (Uca et al., 2017) have an influence on consumers' hotel choice decisions in different situations. For example, Uca et al. (2017) conducted a field study in Istanbul to determine the factors that affect the hotel selection process. Their findings found that sea-entertainment facility is one of the key factors to affect respondents' hotel choice decision. Previous studies also confirm that hotel club (Li et al., 2015; Masiero et al., 2016), free minibar (Masiero et al., 2015), food and beverage (Baber, Kaurav, & Williams Jr, 2015; Kim, Kim, & Kim, 2018), and fire prevention system (Sun, Keh, & Lee, 2019) may engender some influences on consumers' hotel choice decisions. Table 6 presents hotel facilities-related attributes examined in existing studies.

Table 6 Hotel facilities/offers-related attributes examined in existing studies

Attribute	Sub-attribute	References
Hotel facilities/offers	☐ Parking (3)	Albayrak & Caber, 2015; Arenoe et al., 2015; Baber et al., 2015; Chan & Wong, 2006; Chiang, Chen, & Hsu, 2019; Chu & Choi, 2000; Jang et al., 2018; Jang et al., 2019; Jones & Chen, 2011; Kim & Park, 2017; Kim & Perdue, 2013; Kim et al., 2018; Kim et al., 2019; Kim et al., 2020; Kucukusta, 2017; Li et al., 2015; Lockyer, 2005;
	☐ Airport/local area shuttles (1)	
	☐ Internet (6)	
	☐ Hotel facility in general (4)	
	☐ Business facility (1)	
	☐ Sea-entertainment facility (1)	
	☐ Fire prevention system (1)	

	☐ Child facility (1)	Masiero et al., 2015; Masiero et al., 2016; Njite & Schaffer, 2017; Park et al., 2019; Penn & Hu, 2020; Sohrabi et al., 2012; Spoerr, 2020; Sun et al., 2019; Uca et al., 2017; Xue & Cox, 2008
	☐ Fitness center (1)	
	☐ Food and beverage (5)	
	☐ Free minibar (2)	
	☐ Leisure facility (1)	
	☐ Sports facility in general (3)	
	☐ Hotel club (2)	
	☐ Technology in general (1)	
	☐ Indoor plants (1)	
	☐ Swimming pool (4)	

2.5.4 Room characteristics

Room-related attributes also attract the attention of consumers when selecting hotels (Li et al., 2013; Rhee & Yang, 2015a; Sohrabi et al., 2012). Technological features are important factors affecting consumers' hotel choices with the adoption of artificial intelligence in the hotel industry. According to Chiang et al. (2019), controlling lighting, temperature, curtains, television, and other amenities with smartphones or an iPad are attractive attributes for consumers. Another study conducted by Masiero et al. (2016) found that a room with guest smartphones is popular.

Apart from the technological features of a room, whether a room has a sea view (Albayrak & Caber, 2015), on what floor a room is (Masiero et al., 2015),

whether a room is a non-smoking room (Jones & Chen, 2011) and bathroom toiletries for a room (Kim et al., 2019) are verified to be influential on consumers' hotel choice decisions. Table 7 presents room characteristics-related attributes examined in existing studies.

Table 7 Room characteristics-related attributes examined in existing studies

Attribute	Sub-attribute	References
Room characteristics	☐ Room view (4)	Albayrak & Caber, 2015; Chiang et al., 2019; Jones & Chen, 2011; Kim et al., 2019; Li et al., 2013; Li et al., 2015; Liang et al., 2019; Masiero et al., 2015; Masiero et al., 2016; Nie et al., 2020; Rhee & Yang, 2015a; Sohrabi et al., 2012; Wang et al., 2020; Wong & Chi-Yung, 2002; Xue & Cox, 2008
	☐ Room characteristic in general (7)	
	☐ Non-smoking (1)	
	☐ Floor (2)	
	☐ Technological feature (4)	
	☐ Bathroom toiletries (2)	

2.5.5 Information provided by websites

As more options are provided, many consumers prefer to book hotels through online travel agents. Based on consumers' previous browsing and booking data, online travel agents generate user-generated content-driven indicators to help them

make decisions. Hotel ranking is one of those indicators. According to Noone and McGuire (2013), if consumers value online travel agent rankings, a hotel may be eliminated from consumers' choice set simply because it does not boast a sufficiently high ranking. Hu and Yang (2020) and Park, Ha, and Park (2017) concluded that the popularity and scarcity of a hotel on the online travel agent could attract consumers to select this hotel.

In addition, when selecting a hotel online, consumers usually read hotel-related information and make their hotel choice decision. Several studies suggested that hotel information-related attributes, including hotel image (Jones & Chen, 2011; Xue & Cox, 2008) and hotel descriptive information (Park et al., 2019) provided by the websites, influence consumers' hotel choice decisions. Zeng, Cao, Lin, and Xiao (2020) concluded that there is a direct effect of websites' virtual reality applications on consumers' hotel choice decisions and moreover when online reviews and virtual reality are combined, there is a greater strength on the choice decision. Table 8 presents information provided by websites-related attributes examined in existing studies.

Table 8 Information provided by websites-related attributes examined in existing studies

Attribute	Sub-attribute	References

Information provided by websites (e.g., OTA)	☐ Booking popularity (2)	Hu & Yang, 2020; Jones & Chen, 2011; Noone & McGuire, 2013; K. Park et al., 2017; Park et al., 2019; Xue & Cox, 2008; Zeng et al., 2020
	☐ Price sorting (1)	
	☐ Hotel ranking (1)	
	☐ Hotel image (2)	
	☐ Virtual reality application (1)	
	☐ Hotel descriptive information (1)	
	☐ Hotel scarcity (1)	

2.5.6 Review

Through the use of eye-tracking technology, Park et al. (2019) observed that consumers usually read reviews posted online when booking a hotel. Their findings show that consumer review is an important factor in developing a hotel consideration set. It is especially regarded as the most influential factor at the phase of making a final choice.

Review valence, which is defined as the positive or negative orientation of information, is a content-related cue of online reviews which has proven to invoke some influence on consumers' hotel choice decisions. Hu and Yang (2020) stated that consumers likely reserve a hotel online if positive reviews about that hotel are presented. By contrast, consumers less likely to make online bookings if shortlisted hotels have many negative online reviews (Casado-Díaz, Andreu, Beckmann, &

Miller, 2020). Similar empirical proof can also be found in Wen et al. (2020), Vermeulen and Seegers (2009) and Leong, Hew, Ooi, & Lin, (2019).

Several studies are conducted to explicate whether and how the volume of online reviews would influence consumers' hotel choice decisions. For example, Cezar and Ögüt (2016) showed that a high number of online reviews are positively associated with the conversion rate. The researchers noted that a high number of online reviews could increase the number of bookings by 57.6% compared with a low one. Zeng et al. (2020) concluded that there is a positive influence of online review quantity on consumers' hotel choice decisions when there is no virtual reality application. Table 9 presents review-related attributes examined in existing studies.

Table 9 Review-related attributes examined in existing studies

Attribute	Sub-attribute	References
Review	☐ Review valence (6)	Casado-Díaz et al., 2020; Cezar & Ögüt, 2016; Hu & Yang, 2020; Jones & Chen, 2011; Leong et al., 2019; Noone & McGuire, 2013; Park et al., 2019; Penn & Hu, 2020; Vermeulen & Seegers, 2009; Wen et al., 2020; Zeng et al., 2020
	☐ Review volume (4)	
	☐ Review in general (3)	

2.5.7 Branding

Branding is a holistic evaluation of a company based on its interactions with consumers in offline and online contexts. Thus, many researchers noted that a company's branding is critical to consumers because few credible signals are obvious in a virtual environment (Jang et al., 2019; Njite & Schaffer, 2017).

Some of the analyzed studies posited and validated that a company's reputation is a significant antecedent of consumers' hotel choice decisions. Chan and Wong (2006) concluded that for repeat male visitors and western travelers, good hotel reputation is viewed as the third most influential factor of hotel choice decision. Tsai et al. (2011) also confirmed that consumers are noticeably more concerned about hotel reputation. In addition, Oh, Lee, and Lee (2020) indicated that a high degree of brand liability and credibility helps consumers decide which hotels to choose.

Several researchers indicate the influence of brand familiarity. For example, Wen et al. (2020) proved that brand familiarity is an important attribute that helps customers make a booking decision. Vermeulen and Seegers (2009) suggested that if a hotel is less known to consumers, consumers may need more online reviews to make decisions. However, if a hotel is well-known, consumers may easily decide whether to select this hotel or not. Whether a hotel is a nationally recognized brand is also confirmed with several studies to influence consumers' hotel choice (Kim & Park, 2017; Kim et al., 2020). Table 10 presents branding-related attributes examined in existing studies.

Table 10 Branding-related attributes examined in existing studies

Attribute	Sub-attribute	References
Branding	☐ Credibility (1)	Chan & Wong, 2006; Jang et al., 2019; Kim & Perdue, 2013; Kim & Park, 2017; Kim et al., 2020; Njite & Schaffer, 2017; Noone & McGuire, 2013; Oh et al., 2020; Tsai et al., 2011; Verma & Chandra, 2018; Vermeulen & Seegers, 2009; Wen et al., 2020; Wong & Chi-Yung, 2002
	☐ Brand in general (3)	
	☐ National recognized brand (3)	
	☐ Reputation (2)	
	☐ Familiarity (4)	
	☐ Liability (1)	

2.5.8 Rating

Consumers believe customer rating can present the quality of a hotel. Many studies confirm this belief. For example, Masiero et al. (2019) proved customer rating has a positive effect on consumers' hotel choice decisions. Jang et al. (2019) conducted a survey and indicated that when people book hotels well in advance, customer rating is a critical factor to consider. Arenoe et al. (2015) showed that people generally consider high review ratings when selecting hotels.

Star rating is another rating factor to affect hotel choice decision. According to the observation of Park et al. (2019), consumers usually use the star rating to filter hotels during the consideration-set formation stage. Customers will book a hotel if the hotel star rating meets their minimum required star rating (Rianthong et

al., 2016). Wong and Chi-Yung (2002) also stated that star rating is the second important attribute that affect the hotel choice of travelers to Hong Kong. Table 11 presents rating-related attributes examined in existing studies.

Table 11 Rating-related attributes examined in existing studies

Attribute	Sub-attribute	References
Rating	☐ Customer rating (10)	Arenoe et al., 2015; Cezar & Ögüt, 2016; Jang et al., 2019; Jones & Chen, 2011; Kim et al., 2019; Masiero et al., 2019; Njite & Schaffer, 2017; Noone & McGuire, 2013; Park et al., 2017; Park et al., 2019; Rianthong et al., 2016; Tran, Ly, & Le, 2019; Wong & Chi-Yung, 2002
	☐ Agency rating (4)	
	☐ Hotel star (2)	

2.5.9 Service

Several studies show that a hotel with breakfast service is preferred by consumers (Leite-Pereira, Brandao, & Costa, 2019; Li et al., 2015; Penn & Hu, 2020). For example, Penn and Hu (2020) stated that whether hotels offer free breakfast would be a critical factor for choosing one hotel. In addition, Tsai et al. (2011) and Chan and Wong (2006) highlighted that loyalty programs and airline

frequent traveler programs have a specific influence on consumers' hotel choice decisions.

Previous studies also confirm that service for kids (Uca et al., 2017), new & recreational information (Sohrabi et al., 2012), automatic rebook service (Masiero et al., 2020) and cancellation fee (Masiero et al., 2015; Masiero et al., 2016; Masiero et al., 2020) are critical attributes to affect consumers hotel choice decision. Considering cancellation fees and automatically rebook service, Masiero et al. (2020) found that risk-seeking consumers prefer to have a free cancellation service. Table 12 presents service-related attributes examined in existing studies.

Table 12 Service-related attributes examined in existing studies

Attribute	Sub-attribute	Reference
Service	☐ Service in general (13)	Baber et al., 2015; Bodet et al., 2017; Cezar & Ögüt, 2016; Chan & Wong, 2006; Chu & Choi, 2000; Kucukusta, 2017; Leite-Pereira et al., 2019; Li et al., 2013; Li et al., 2015; Liang et al., 2019; Masiero et al., 2015; Masiero et al., 2016; Masiero et al., 2020; Nie et al., 2020; Penn & Hu, 2020; Rhee & Yang, 2015a, 2015b; Sohrabi et al., 2012; Tsai et al., 2011; Tsai et
	☐ Service for kids (1)	
	☐ Breakfast (5)	
	☐ News & recreational information (1)	
	☐ Cancellation policy (3)	

	☐ Loyalty program (4)	al., 2015; Uca et al., 2017; Wang et al., 2020; Xue & Cox, 2008; Yavas & Babakus, 2005; Zaman et al., 2016
	☐ Automatic rebook service (1)	

2.5.10 Value

Perceived value is one important attribute affecting hotel choice decision. No matter for business travelers, couple travelers, and solo travelers, value is an important attribute when travelers choose hotels for their trip (Wang et al., 2020). Table 13 presents value-related attributes examined in existing studies. In an empirical study, whether the room and food are value for money ranks the second important attribute for consumers when choosing hotels (Kim et al., 2018). Zaman et al. (2016) tested and confirmed that value for money would influence the decision-making process of potential hotel guests.

Table 13 Value-related attributes examined in existing studies

Attribute	Sub-attribute	References
Value	☐ Value for money (12)	Cezar & Ögüt, 2016; Chu & Choi, 2000; Kim et al., 2018; Li et al., 2013; Nie et al., 2020; Rhee & Yang, 2015b; Shiu, 2018; Spoerr, 2020; Verma & Chandra, 2018; Wang et al., 2020; Yu et al., 2018; Zaman et al., 2016

2.5.11 Hotel design

Table 14 presents hotel design-related attributes examined in existing studies. The overall atmosphere of a hotel influences consumers' hotel choice decisions is proved by previous studies (Kim & Perdue, 2013; Yavas & Babakus, 2005). In particular, the hotels' comfort and entertaining features are highlighted. For example, Sohrabi et al. (2012) and Albayrak and Caber (2015) indicated that consumers might focus on hotels' comfort and entertaining features to decide their preference. In addition, whether a hotel is designed as a green hotel is mentioned as an important factor by consumers (Njite & Schaffer, 2017).

Both the external design and internal design of hotels will affect the choice of consumers. Based on the importance-performance analysis, Kim, Lee, and Han (2019) stated outward appearance of a hotel is perceived as important for consumers. In terms of internal design, Nanu, Ali, Berezina, and Cobanoglu (2020) show that the interior design type of a hotel lobby has a significant impact on the reservation intention of different generations. Compared with non-millennials, millennials are influenced by the type of hotel lobby design. Penn and Hu (2020) state that hotels with indoor plants could attract consumers to stay at the hotel.

Table 14 hotel design-related attributes examined in existing studies

Attribute	Sub-attribute	References
Hotel design	☐ Comfort and entertaining features (10)	Albayrak & Caber, 2015; Baber et al., 2015; Cezar & Ögüt,

	☐ Plants in design (2)	2016; Kim & Perdue, 2013; Kim & Park, 2017; Kim et al., 2019; Kim et al., 2020; Nanu et al., 2020; Njite & Schaffer, 2017; Penn & Hu, 2020; Sohrabi et al., 2012; Spoerr, 2020; Sun et al., 2019; Tsai et al., 2011; Tsai et al., 2015; Yavas & Babakus, 2005; Zaman et al., 2016
	☐ Green (1)	
	☐ Overall atmosphere (6)	
	☐ Lobby ambience (2)	
	☐ Outward appearance (2)	

2.5.12 Quality

Sleep quality and room quality are two frequently mentioned attributes affect hotel choice decision. By analyzing online reviews, Yu et al. (2018) show that sleep quality is considered as tourists may not choose a hotel because of noise from busy streets. Liang et al. (2019) also analyzed online review. They found that consumers pay much attention to sleep quality when evaluating hotels. Kim and Park (2017) indicated that business travelers might emphasize room quality and a comfortable environment when choosing a hotel to stay.

Apart from room quality and sleep quality, service quality (Jang et al., 2018; Kim et al., 2020; Sun et al., 2019), staff friendliness (Kim et al., 2018; Sohrabi et al., 2012), bill accuracy (Sun et al., 2019), check-in experience (Sun et al., 2019), reservation experience (Sun et al., 2019), facility quality (Kim et al., 2018) are also

highlighted as important attributes to influence hotel choice decision. Table 15 presents quality-related attributes examined in existing studies.

Table 15 Quality-related attributes examined in existing studies

Attribute	Sub-attribute	References
Quality	☐ Sleep quality (10)	Albayrak & Caber, 2015; Baber et al., 2015; Cezar & Ögüt, 2016; Chan & Wong, 2006; Chu & Choi, 2000; Jang et al., 2018; Kim & Perdue, 2013; Kim et al., 2018; Kim et al., 2019; Kim et al., 2020; Kucukusta, 2017; Li et al., 2013; Li et al., 2015; Liang et al., 2019; Lockyer, 2005; Nie et al., 2020; Penn & Hu, 2020; Rhee & Yang, 2015a, 2015b; Sohrabi et al., 2012; Spoerr, 2020; Sun et al., 2019; Uca et al., 2017; Verma & Chandra, 2018; Wang et al., 2020; Yu et al., 2018; Zaman et al., 2016
	☐ Facility quality (1)	
	☐ Room quality (4)	
	☐ Food quality (4)	
	☐ Service quality (9)	
	☐ Staff friendliness (6)	
	☐ Billing accuracy (1)	
	☐ Check-in experience (1)	
	☐ Reservation process (1)	
	☐ Cleanliness (16)	

2.5.13 Security

Multiple studies verified that the security of a hotel is considered by consumers when choosing hotels. Table 16 presents security-related attributes examined in existing studies. According to Sun et al. (2019), consumers may notice the security personnel of a hotel when choosing and staying at a hotel. Kim et al. (2019) compared the attribute importance between economy hotels and luxurious hotels. The findings show that security is important when selecting economy hotels. The findings of Richard and Masud (2016) also confirmed that though security factors are not the most important attributes, they still have a certain effect on hotel choice decisions.

Table 16 Security-related attributes examined in existing studies

Attribute	Sub-attribute	References
Security	☐ Security in general (19)	Baber et al., 2015; Chu & Choi, 2000; Kim et al., 2019; Richard & Masud, 2016; Sohrabi et al., 2012; Spoerr, 2020; Sun et al., 2019; Tsai et al., 2011; Xue & Cox, 2008

Sections 2.4 and 2.5 attempted to provide a comprehensive overview of findings in the tourism and hospitality literature on factors affecting consumers' online hotel booking choice. Table 17 summarizes critical hotel attributes that affect consumers' hotel choices.

Table 17 List of studied hotel attributes affect consumers' hotel choice

Attribute	Sub-attribute
Price	☐ Room rate
	☐ Promotion discount
	☐ Price range
Location	☐ Location in general
	☐ Distance to public transportation
	☐ Surrounding
	☐ Distance to the shopping district
	☐ Distance to attractions
Hotel facilities/offers	☐ Parking
	☐ Airport/local area shuttles
	☐ Internet
	☐ Hotel facility in general
	☐ Business facility
	☐ Sea-entertainment facility
	☐ Fire prevention system
	☐ Child facility
	☐ Fitness center
	☐ Food and beverage
	☐ Free minibar
	☐ Leisure facility
	☐ Sports facility in general
	☐ Hotel club
	☐ Technology in general
	☐ Indoor plants
	☐ Swimming pool
Room characteristics	☐ Room view
	☐ Room characteristic in general
	☐ Non-smoking
	☐ Floor
	☐ Technological feature
	☐ Bathroom toiletries
Information provided by websites (e.g., OTA)	☐ Booking popularity
	☐ Price sorting
	☐ Hotel ranking
	☐ Hotel image

	☐ Virtual reality application
	☐ Hotel descriptive information
	☐ Hotel scarcity
Review	☐ Review valence
	☐ Reviewer characteristic
	☐ Review volume
	☐ Review in general
Branding	☐ Credibility
	☐ Brand in general
	☐ National recognized brand
	☐ Reputation
	☐ Familiarity
	☐ Liability
Rating	☐ Customer rating
	☐ Agency rating
	☐ Hotel star
Service	☐ Service in general
	☐ Service for kids
	☐ Breakfast
	☐ News & recreational information
	☐ Cancellation policy
	☐ Loyalty program
	☐ Automatic rebook service
Hotel design	☐ Comfort and entertaining features
	☐ Plants in design
	☐ Green
	☐ Overall atmosphere
	☐ Lobby ambience
	☐ Outward appearance
Value	☐ Value for money
Quality	☐ Sleep quality
	☐ Facility quality
	☐ Room quality
	☐ Food quality
	☐ Service quality
	☐ Staff friendliness
	☐ Billing accuracy
	☐ Check-in experience
	☐ Reservation process

	☐ Cleanliness
Security	☐ Security in general

2.6 Consumer hotel choice behavior in different choice stages

Consumers' choice process is proved to be a phased process that consumers go through a funnel-like process to make their final hotel booking decisions, including awareness choice set, consideration set, and final choice (Gavilan et al., 2018; Hung & Petrick, 2012; Pan et al., 2013; Park et al., 2019). Previous literature suggested that different stages of the decision-making process should be explored instead of examining the final choice stage only. The formation of the consideration stage also plays an important role during the choice process. For example, Putsis Jr and Srinivasan (1994) found that consumers usually select a product from the consideration set after this set is assembled. Furthermore, Hauser (1978) showed that 80% of the uncertainty in choice models could be explained by knowing the consideration set. If customers do not consider a product, there is no chance for consumers to choose this product. Thus, it is important to understand why and how customers eliminate certain products from further consideration (Hauser, Ding, & Gaskin, 2009).

In the hotel choice context, several studies have investigated the formation of the consideration set and found that it is different from the formation of the final choice. Table 18 presents studies the examined the consideration stage for hotel

choice decision. For example, Jones and Chen (2011) identified different factors that influence choice at both the stage of consideration set and the stage of the choice set. It then reported that consumers usually consider non-smoking, swimming pool, high-speed Internet, hot tub, fitness center, and room service for the formation of the consideration set. While comparison, pictures, reviews, star-ratings, and sort by price are used to form a choice set. Noone and Robson (2014) indicated that booking a hotel online involves two major stages: browsing and deliberation. The researchers used eye-tracking technology to track individuals' eye movements while selecting a hotel in their study. According to their results, consumers review hotel names, images, price, and location, in addition to user ratings during the browsing stage. During the deliberation phase, more detailed information, like images and firm-provided descriptions, will be reviewed. Consumers also fixate on price and room offers, as well as user-generated ratings and reviews. Varkaris and Neuhofer (2017) showed that in the evaluation stage, the content searched includes pictures, reviews, comments, and rankings. The information searched includes cleanliness, location, price, quality, proximity, and appearance. Also, price, number of reviews, and rating affect the awareness and consideration of hotels and reduce consumers' consideration set (Gavilan et al., 2018; Pan et al., 2013; Vermeulen & Seegers, 2009).

Table 18 Limited studies examined the consideration stage for hotel choice decision

Key findings	References
☐ The consideration stage - the listed price, promotional discount, overall rating, review volume, and booking popularity are significant attributes. ☐ The booking stage - listed price, promotional discount, overall rating, and review volume are significant attributes.	Hu & Yang, 2020
☐ The consideration stage - the use of the filter function of price, facility, and location are commonly observed among travelers. ☐ The booking stage - price- and location-related attributes are the most sought.	Park et al., 2019
☐ There is an asymmetric interaction between consumers' numerical ratings and reviews' influence on hotel booking decisions.	Gavilan et al., 2018
☐ The consideration stage - cleanliness, location, price, quality, proximity, and appearance are important factors. ☐ The booking stage - the consumers usually search for pictures, reviews, comments, rankings.	Varkaris & Neuhofer, 2017
☐ During the browsing stage, consumers fixate primarily on the hotel name, images, price, room offers, location, and user ratings. ☐ During the deliberation phase, consumers review more detailed information from which a purchase decision is made.	Noone & Robson, 2014
☐ Consumers tend to reduce their consideration set by focusing on price.	Pan et al., 2013
☐ Factors including non-smoking, swimming pool, high-speed internet, hot tub, fitness center, room service have an influence on consideration-set formation. ☐ Factors including pictures, reviews, star-ratings, and sort by price have an influence on the final choice formation.	Jones & Chen, 2011
☐ Hotels which exposure to online reviews are more likely to be considered by consumers.	Vermeulen & Seegers, 2009

2.7 Methods used to examine attribute importance in previous studies

2.7.1 Interview and survey

A stream of literature adopted interviews or survey to examine what attributes affect consumers' hotel choice, where hotel attributes are represented by short-answer questions or a set of keywords, and respondents are asked to rate the importance of the attributes. For example, Spoerr (2020) designed a survey with four dimensions of hotel attributes, including cleanliness, service professionalism, value for money, and brand familiarity. Respondents are asked to indicate attributes' importance when choosing a hotel using an eight-point Likert-type scale. Kim et al. (2019) identified a total of 33 hotel attributes, including 17 intangible and 16 tangible attributes and asked respondents to rate the importance of the attributes affecting hotel revisit intentions on a five-point Likert's scale. Though conducting survey methods can present sufficient attributes to respondents, asking respondents rate the importance of the attributes directly may have a bias from stated preference.

2.7.2 Online reviews

Several studies attempted to using online reviews to examine hotel attributes preference. For example, Liang et al. (2019) believe that online reviews would help tourists improve decision-making efficiency when buying tourism products. In their

study, online reviews from TripAdvisor.com were used to analyze sentiment words, the sentiment preferences of tourists are transformed into the linguistic distribution. According to the frequency of the linguistic evaluation distribution, the weight vector of evaluation features is determined. This idea fails to measure consumers' pre-booking preference because consumers' hotel consumption experience influences the information from reviews.

2.7.3 Choice experiment

Considering choice experiments, researchers usually manipulate the hotel options based on their identified attributes. Respondents are then asked to view each choice card separately and rank these cards in order of preference or rate them on a numerical scale according to the degree of desirability. For example, Hu and Yang (2020) used listed price, promotional discount, price disparity, review valence, review volume, and booking popularity to generate hotel options. Finally, 22 hotel choices were built for respondents to choose from. In the study of Masiero et al. (2020), each respondent faced ten choice tasks generated through four hotel attributes. Choice experiments also have several limitations. First, the number of choice options and attributes is limited, failing to a realistic online choice environment (Kim et al., 2020). Second, the choice experiment method still asks respondents to rank or rate all choice cards; thus, data collection may be complex,

particularly if a large number of alternatives and attributes are involved and the model must be estimated at the individual level.

2.7.4 Observation - eye-tracking technology

With the development of artificial intelligence, some studies attempt to use eye-tracking technology to observe consumers' behavior processes. For example, Park et al. (2019) combined observation and survey approach by arguing that the observation method allows researchers to obtain actual behavioral information. The survey method allows researchers to obtain cognitive responses during the decision-making process. Though using the eye-tracking technology can capture a comprehensive attribute set, the importance of each attribute is still measured by respondents' stated preference. Table 19 summarized the methods used to evaluate attribute importance in previous studies.

Table 19 Methods used to evaluate attribute importance in previous studies

Data Collection Method	Limitation
Interview & Survey	☐ Biases from stated preference
Online reviews	☐ Failed to measure pre-booking preference
Choice experiment	☐ Failed to stimulate real booking environment
Observation	☐ Biases from stated preference

2.8 Random Forest

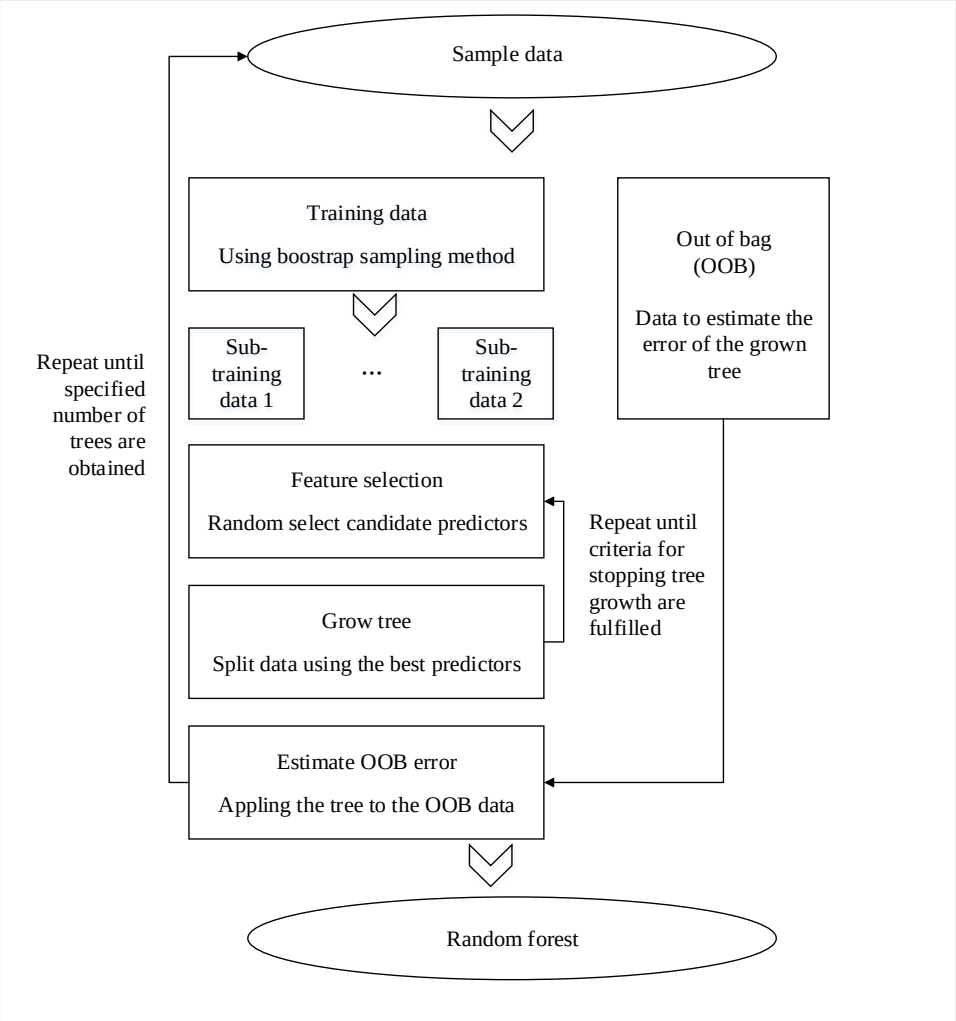
2.8.1 Random Forest algorithm

Random Forest is a popular and efficient machine learning algorithm, which can address both classification and regression problems. As a method introduced by (Breiman, 2001), the Random Forest algorithm belongs to the family of ensemble methods, based on model aggregation ideas, appearing in the machine learning field at the end of the nineties (Genuer, Poggi, & Tuleau-Malot, 2010). Random Forest can be used to understand the importance level of explanatory variables for interpretation and build a data-driven prediction model. The principle of Random Forest is to combine a large number of binary decision trees (namely classification and regression tree, CART), use several bootstrap samples coming from the sample data and choose randomly at each node a subset of explanatory variables (Boulesteix, Janitza, Kruppa, & König, 2012; Genuer et al., 2010).

The general workflow of the Random Forest analysis is shown in Figure 10. Using the bootstrapping sampling method, the original sample set can be extracted into training data sets and an internal validation data set. CART is applied to select splitting predictors from a randomly selected subset of predictors in the training data sets. The decrease of Gini impurity is used as a splitting criterion. The growth of CART will stop until the criterion is fulfilled. Until a specified number of trees is obtained, the Random Forest is formed. The out of bag (OOB) method is

conducted to calculate the prediction error rates. The predictions of all trees are finally aggregated through majority voting by error rates or calculating the mean error rates of all trees to determine the final outputs of the Random Forest analysis.

Figure 10 Random Forest algorithm



Source: Boulesteix et al. (2012)

Compared with logistic regression and CART model, studies show that the Random Forest algorithm outperformed in both performance and prediction accuracy. For example, Chen, Jai, and Yuan (2017) used the logistic model, Random Forest, and other classification tree models to map landslide susceptibility. The results show that the Random Forest model performs the highest predictive capability. Muchlinski, Siroky, He, and Kocher (2016) demonstrated that the algorithmic approach like Random Forest provides more accurate civil war outbreak predictions with sample data than logistic regression models. It is helpful to predict rare events by using conflict data accurately. Thus, the Random Forest model's application should open up a new perspective for the study of consumers' online hotel selection process.

2.8.2 Applications of the Random Forest method

The Random Forest model has received a lot of attention in many fields due to its ability to handle large numbers of variables and assessing variable importance. The Random forest method has been widely used in medical and biological research. Alvarez de Andrés and Díaz-Uriarte (2006) proposed a new method of gene selection in classification problems based on Random Forest. They found that the new gene selection procedure yields very small sets of genes while preserving predictive accuracy. Masetic and Subasi (2016) applied machine learning methods

to classify normal and congestive heart failure. This study found that the Random Forest method gives 100% classification accuracy in detecting congestive heart failure. The Random Forest model was also applied to financial research. Liu, Chan, Kazmi, and Fu (2015) applied the Random Forest model for financial fraud detection and the selection of detailed features. Moreover, this study applied four statistical methodologies and concluded that Random Forest has the highest accuracy and can improve the detection efficiency significantly. Lin, Wu, Lin, Wen, and Li (2017) exploited a heuristic bootstrap sampling approach combined with the ensemble Random Forest algorithm on large-scale insurance business data mining.

Random Forest has also been applied in consumer-related research, Kruppa, Schwarz, Arminger, and Ziegler (2013) presented a general framework to estimate credit risks using machine learning methods. The researchers found that Random Forest outperformed a tuned logistic regression on credit scoring data. Chen, Honda, and Yang (2013) investigated consumer preferences for technology products and identified the product's key attributes by using three machine learning methods: Artificial Neural Networks, Random Forest, and Gradient Boosted Regression. A case study by Ravnik, Solina, and Zabkar (2014) used machine learning methods to predict consumer behavior in a retail environment, primarily for the role in purchase decision process and purchase situation.

Unlike other disciplines, very few have applied the Random Forest method in hospitality-related research. To the best of the author's knowledge, only a few

studies have applied Random Forest classification models in hotel review classification issues (e.g., Lee et al., 2018; Oğul & Ercan, 2016; Xiang, Du, Ma, & Fan, 2018). Martinez-De-Pison, Fernandez-Ceniceros, Pernia-Espinoza, Martinez-De-Pison, and Sanz-Garcia (2016) used Random Forest and other eight models for improving room demand forecasting. In addition, Ahani, Nilashi, Ibrahim, Sanzogni, and Weaven (2019) collected reviews from TripAdvisor and used CART to predict consumers' travel choices.

Regarding the studies about hotel choice process and hotel attributes importance, conjoint analysis, regression analysis and analysis of covariance are popular methods to examine the importance of attributes. Mathematical models, like discrete choice modeling and analytic hierarchy process, are also used. This study attempts to adopt the Random Forest method because of several reasons:

1. The Random Forest method is data-driven; it does not presuppose that consumers have to follow a certain decision rule. This presuppose fit the assumption of this study that consumers may use different decision rules in different situation adaptively.

2. When exploring hotel choice decisions through experimental design, adequate hotel alternatives should be given instead of questioning consumers about their purchase intention directly or offering them only a small range of hotel choices and hotel attributes that are out of touch with reality. Although more research using

experimental design emerge in recent years, they mostly show a small number of alternatives, which is not realistic in the real-life situation. With a hypothetical OTA to collect data, instead of providing several choice cards to consumers, this method can better measure consumers' actual preferences.

3. Moreover，as the application of machine learning usually improves the quality of models and leads to improved predictions (van Wezel & Potharst, 2007), this study attempts to use a machine learning method to predict consumers' online hotel choice pattern.

2.9 Research gaps

To the best of the author's knowledge, although diversified issues have been examined on hotel choice in the hospitality and even business literature, research gaps from the conceptual and methodological point of view can still be identified. This study attempts to redress these research gaps by applying the Random Forest analysis to investigate "which and how hotel attributes affect consumers' online hotel choice process" (see Table 20).

Table 20 Research gaps in this study

	Research gaps	Attempts of this study	Key strengths of this study
Conceptual point of view	(1) A need to systematically re-examine the influence of various hotel attributes that existing in an online setting.	This study identifies key hotel information related attributes by a comprehensive review of literature and analysis of major OTAs in the real-life world.	Eleven key attributes are identified, including customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-in and check-out time, hotel facilities and renovated time. Among these eleven key attributes, two new hotel attributes - renovated time and check-in and check-out time are added into the key hotel attribute set.
	(2) It is not clear how consumers actually evaluate hotel attributes to form their consideration-set and make the final choice during their online hotel choice process.	This study examines the decision rules applied in the consideration-set formation stage and the final choice formation stage of the online hotel choice process.	The decision process is subdivided into the formation of the consideration-set stage and the formation of the final choice stage.
Methodological point of view	(1) Adequate hotel alternatives should be given instead of questioning consumers about their purchase intention directly or giving them only a small range of hotel choices;	This study will employ a hypothetical OTA booking platform to simulate the online hotel choice process.	139 finalized hotel alternatives will be provided for respondents to simulate a real online booking environment.

	(2) A better prediction method could be used to predict consumers' hotel choice.	This study will conduct a machine learning method to predict consumers' online hotel choice patterns.	A new method, the Random Forest algorithm, will be employed in the tourism and hospitality research, which performs well on prediction accuracy.

Based on the research gaps mentioned above, this study attempts to provide a significant opportunity to advance the understanding of hotel choice by adapting the multi-stage and multi-attribute choice model proposed in the previous section.

2.10 Chapter summary

This chapter reviewed the literature of information processing theory, phased decision theory and multi-attribute decision-making theory. Existing studies on hotel choice, hotel preference, and online hotel booking were analyzed and summarized to identify the underlying attributes of purchase decisions for online hotel booking. Since it is important to adapt the study of consumer hotel choice in an online setting and provide a more realistic scenario for consumers to predict their real-life decisions, a new approach of investigating attributes priorities in the process of consumers' online hotel purchasing decision is proposed. The following chapter will discuss the methodology.

CHAPTER 3 METHODOLOGY

The third chapter primarily describes the methods used in this study. In the following sub-sections, details pertinent to the research paradigm, study settings, stimulus materials, experiment design and data analysis methods are going to be explicated.

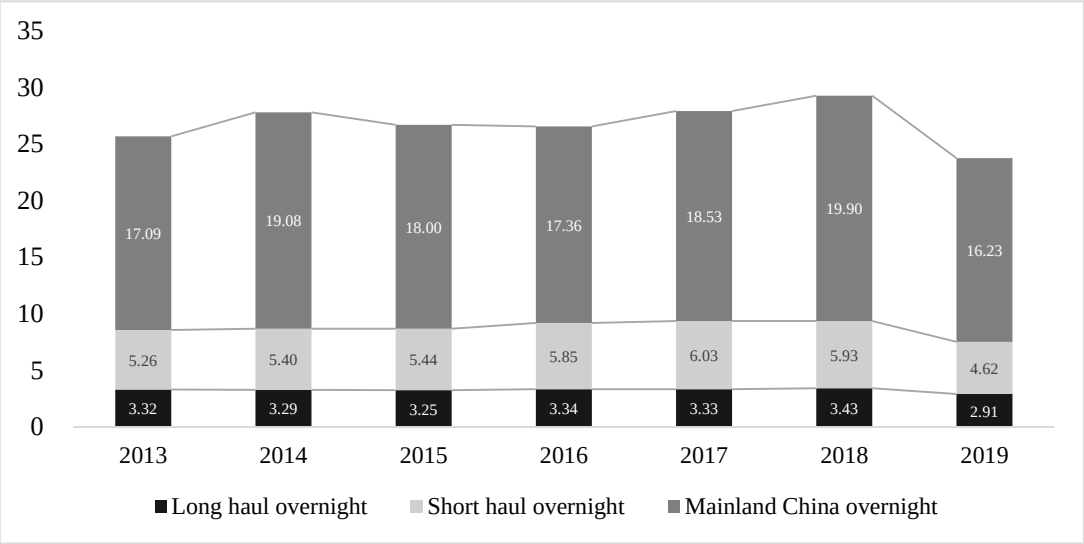
3.1 Research paradigm

A research paradigm serves as a belief system or world view that guides the researchers and the research process. Several philosophical perspectives exist to guide ontological, epistemological and methodological perspectives, such as phenomenology, positivism, constructivism, critical theory and constructionism (Guba & Lincoln, 1994). Across various paradigms, this study adopts a post-positivist paradigm. With the extension from positivism that only a single truth exists, a post-positivist researcher believes that knowledge exists but is imperfectly understandable, and truth must be explored (Creswell, Plano Clark, Gutmann, & Hanson, 2003; Guba & Lincoln, 1994). Under this paradigm, the process is directed towards decision rules exploring. The data are collected using a quantitative method to examine factors that affect consumers' online hotel choice in the consideration-set formation stage and the final choice formation stage.

3.2 Study destination

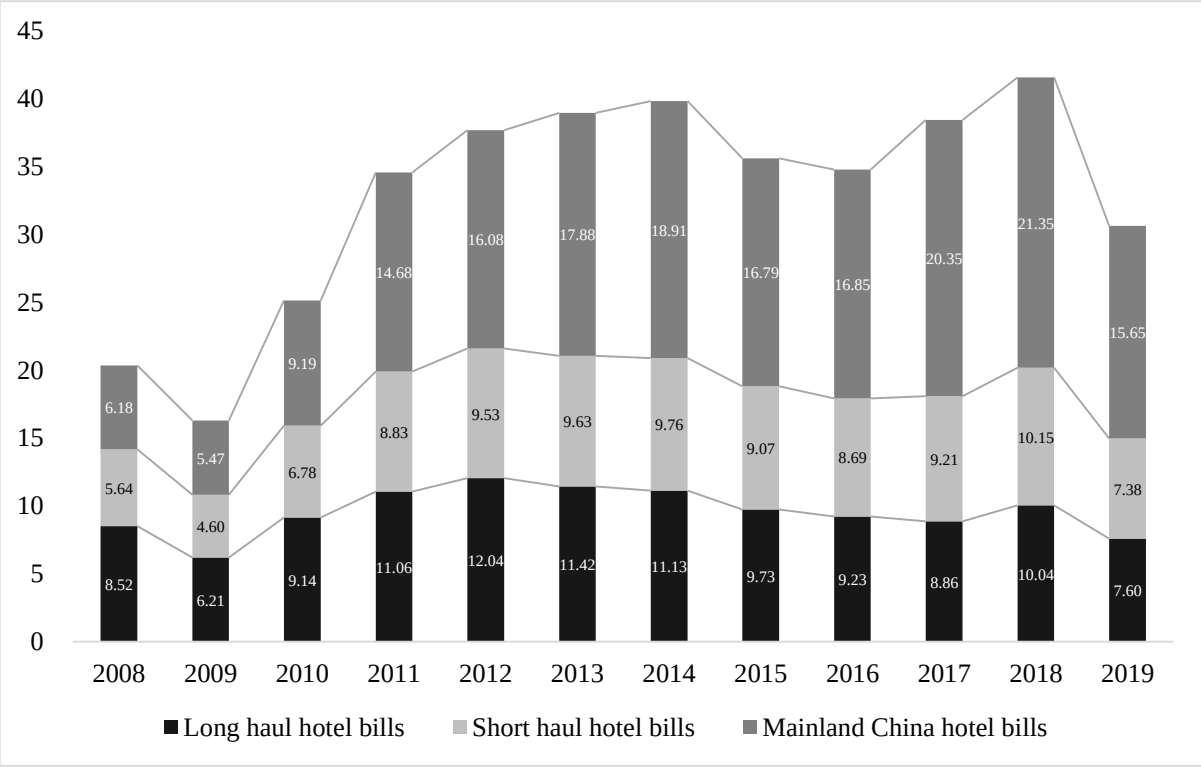
Hong Kong was chosen as the destination in this study for several reasons. First, Hong Kong, a top international city destination, attracts overnight tourists from diverse markets, thus generating a great demand for accommodation (see Figure 11). According to Hong Kong Tourism Board (2020c), 42% of international visitors were overnight visitors and they stay in Hong Kong with an average length of 3.3 nights in 2019 (Hong Kong Tourism Board, 2020d). Second, Hong Kong vacation travelers' spending on hotels accounts for a large proportion of their total travel spending. In 2019, travelers' hotel expenditure was over 30 billion Hong Kong dollars, representing 22.16% of the total expenditure (Hong Kong Tourism Board, 2020b, 2020c) (see Figures 12 to 13). This fact ensures that the empirical findings of the study have much relevance and interest to the Hong Kong hotel industry. If hoteliers can throughout understand travelers' preferences and decision rules and thereby making adaptive adjustments, they can gain more from this huge potential market opportunity. Hence, the practical implication of this study is considered strong.

Figure 11 Hong Kong overnight visitors by market (Millions)



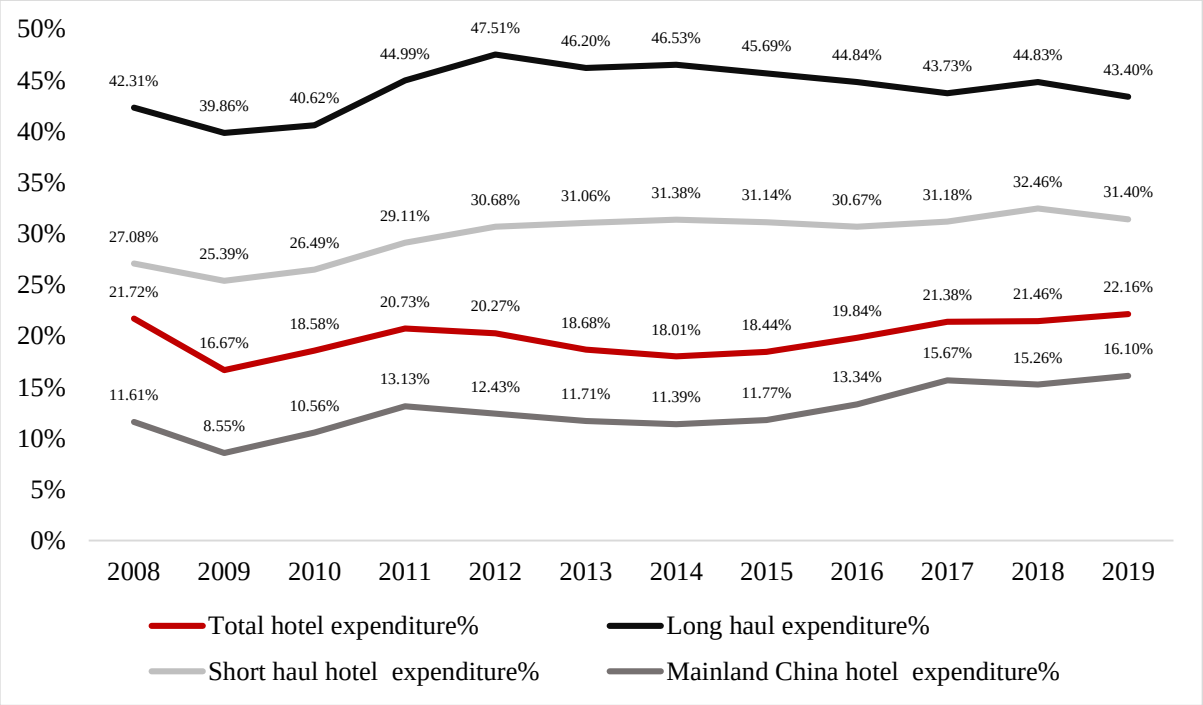
Source: Hong Kong Tourism Board (2020c)

Figure 12 Hotel expenditure by market (billion Hong Kong dollar)



Source: Hong Kong Tourism Board (2020b, 2020c)

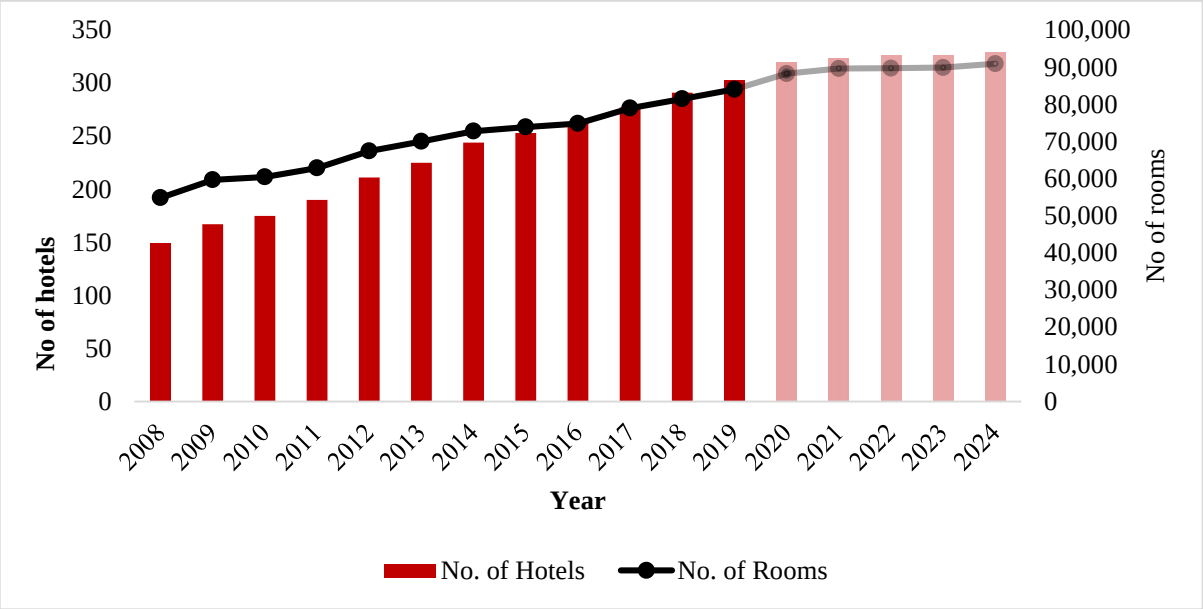
Figure 13 Hotel expenditure percentage



Source: Hong Kong Tourism Board (2020b, 2020c)

Third, regarding the hotel supply in Hong Kong, as of 2019, there were 303 approved hotels, providing 84,089 rooms. It is estimated that the number of hotels in Hong Kong will continue to increase. By 2024, the number of approved hotels will be increased to 329 (Hong Kong Tourism Board, 2020a). Such a variety of hotel choices implies that consumers need to consider huge amount of information and alternatives that make it a proper testing ground to address the purposes of this study (Figure 14).

Figure 14 Hotel supply in Hong Kong

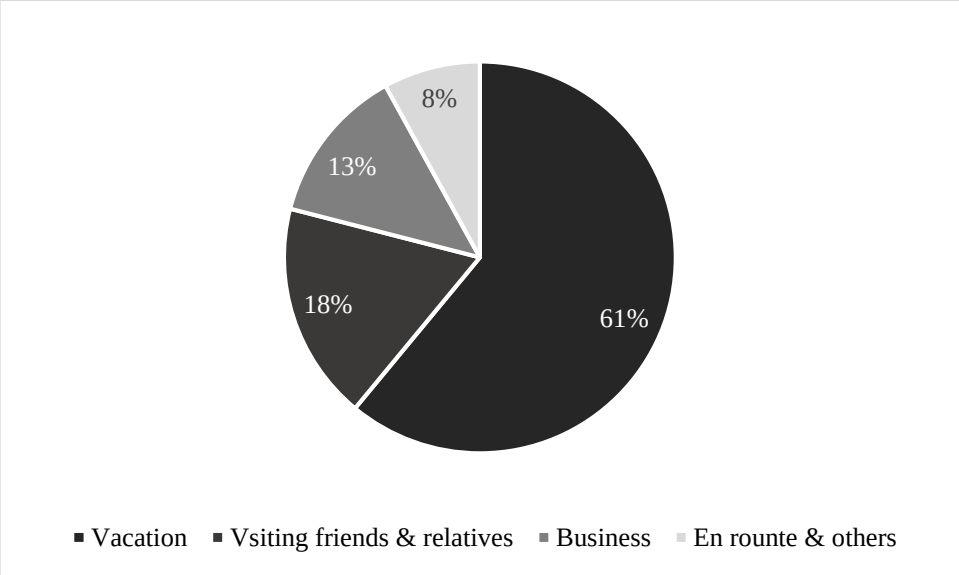


Source: Hong Kong Tourism Board (2020a)

3.3 Participants

The target population of the current study is Mainland leisure tourists, as Mainland China is the major source market of inbound tourists to Hong Kong (Hong Kong Tourism Board, 2020c). According to previous studies, the attributes used to evaluate a hotel differ from the type of travelers (leisure vs. business) (Chu & Choi, 2000; Yavas & Babakus, 2005). Leisure tourists are the primary target of this study because the Hong Kong Tourism Board (2020c) reported that 61% of overnight visitors to Hong Kong are leisure tourists in 2019 (Figure 15).

Figure 15 Overnight visitors' purpose of visit by major market areas - 2019



Source: Hong Kong Tourism Board (2020c)

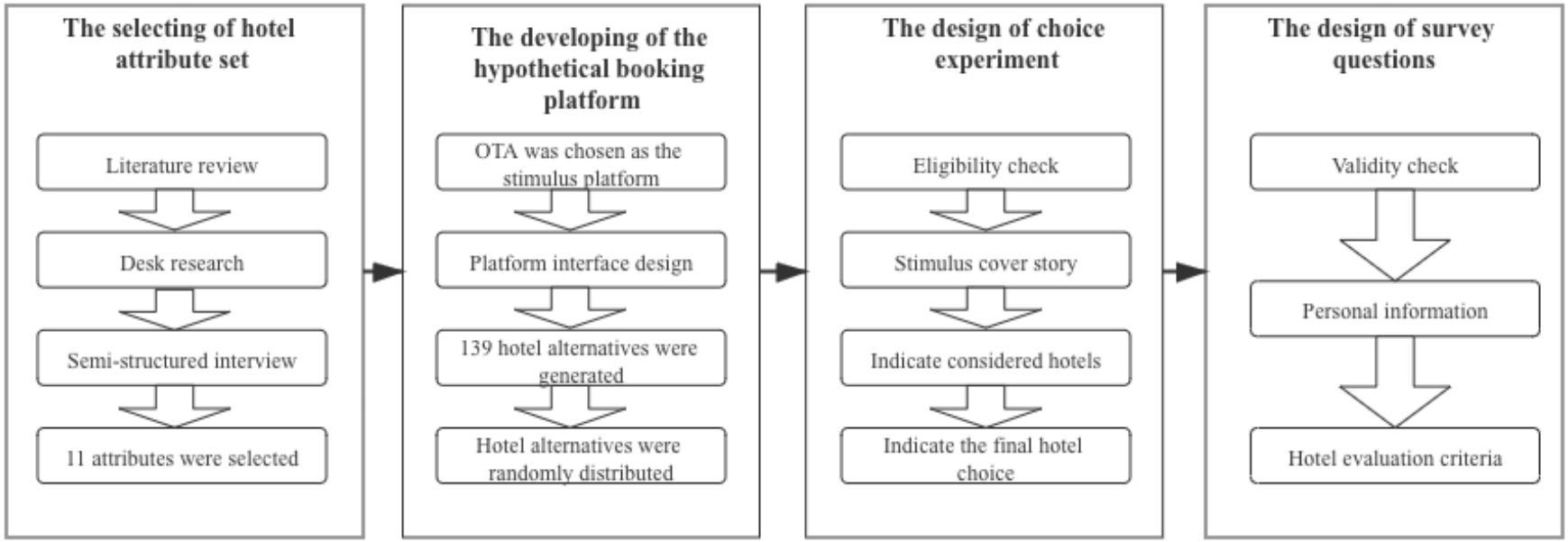
The author recruited the target population through an online data collection company, i.e., Ye research (http://www.yeinsight.com/), which contains a pool of 1.6 million people in Mainland China. Ye research has served many companies to conduct data collection, including SONY company, Coca-Cola company and Procter & Gamble company. The data collection company sent out invitations to recruit members who meet the selection criterion. The criterion is people who have online hotel booking experience in the past 24 months or people who have online hotel booking intentions. The selection question is "Have you ever booked a hotel online in the past 24 months?" If the participants answer "Yes", they will participate in the experiments. If the participants answer "No", they will be then asked another

question, “Will you consider booking a hotel online in the future?” If the participants answer “Yes”, they will participate in the experiments. The pool members that are interested in the study will then respond and participate in the experiments. All the participants in the study are from Mainland China.

3.4 Research design

This study employed a scenario-based experimental design approach to simulate consumers’ online hotel choice process. In the following sections, further explanation of the stimulus materials and experiment procedure used in this study will be given. The explanation includes information on the hotel attribute set and an online booking platform used to generate hotel stimulus, the choice experiment procedure and survey questions. Figure 16 shows the flowchart of the research design.

Figure 16 The flowchart of research design

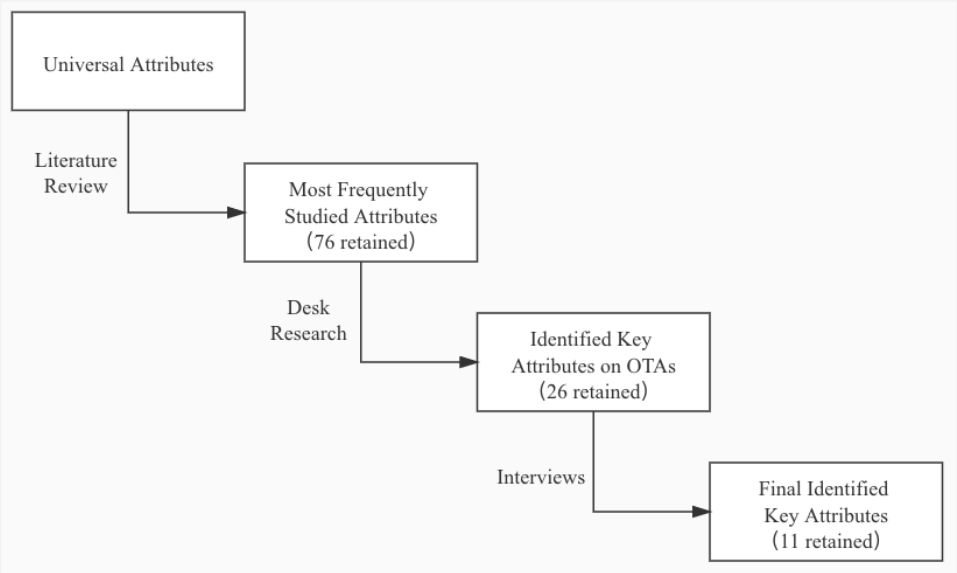


3.4.1 *Selecting of hotel attributes set*

Literature review

Figure 17 shows the process of identifying the studied hotel attributes of this research. At first, a thorough literature review was conducted to identify the most frequently studied attributes affecting consumers' hotel choice among past literature. Seventy-six attributes were identified after completing the literature review, and the results of the literature review are shown in Table 17 on page 64-66.

Figure 17 Flowchart of identifying key hotel attributes in this study



Desk research

Then, desk research was conducted to identify the attributes that are often displayed on OTA platforms. The purpose of conducting desk research is to confirm whether the attributes identified in the literature review step are fit into the online booking platform content. Major OTA platforms, including Booking.com, Agoda.com and Ctrip.com, were chosen to conduct content analysis. Four criteria were used to reduce attributes:

Criterion 1 - attributes related to room characteristics (e.g., room floor) were reduced, as a hotel was considered as one unit in this study;

Criterion 2 - perceptual-based attributes which are subjective and not manageable were reduced (e.g., consumers' perceived cleanliness);

Criterion 3 - ambiguous attributes were reduced (e.g., hotel facility in general);

Criterion 4 - attributes which are not often displayed on OTAs were reduced (e.g., fire prevention system). After completing the desk research, 50 attributes were reduced and 26 attributes were retained. The analyzed results are shown in Table 21.

Table 21 Hotel attributes identified after desk research

Attribute	Sub-attribute	Literature review	Desk research
Price	Room rate	-	-
	Promotion discount	-	-
	Price range	-	-
Location	Location in general	-	Reduced (Criterion 3)
	Distance to public transportation	-	-
	Surrounding	-	-
	Distance to shopping district	-	-
	Distance to attractions	-	-
Hotel facilities/offers	Parking	-	-
	Airport/local area shuttles	-	-
	Internet	-	-
	Hotel facility in general	-	Reduced (Criterion 3)
	Business facility	-	-
	Sea-entertainment facilities	-	Reduced (Criterion 4)
	Fire prevention system	-	Reduced (Criterion 4)
	Child facility	-	-
	Fitness center	-	-
	Food and beverage	-	-
	Free mini bar	-	-
	Leisure facility	-	Reduced (Criterion 3)

	Sports facility in general	-	Reduced (Criterion 3)
	Hotel club	-	Reduced (Criterion 1)
	Technology in general	-	Reduced (Criterion 3)
	Indoor plants	-	Reduced (Criterion 4)
	Swimming pool	-	-
Room characteristics	Room view	Reduced (Criterion 1)	
	Room characteristic in general		
	Non-smoking		
	Floor		
	Technological feature		
	Bathroom toiletries		
Information provided by websites (like OTA)	Booking popularity	-	-
	Price sorting	-	-
	Hotel ranking	-	-
	Hotel image	Reduced (Criterion 2)	
	Virtual reality application	-	Reduced (Criterion 4)
	Hotel descriptive information	-	-
	Hotel scarcity	-	-
Review	Review valence	Reduced (Criterion 2)	
	Reviewer characteristic	Reduced (Criterion 2)	
	Review volume	-	-
	Review in general	-	Reduced (Criterion 3)
Branding	Credibility	Reduced (Criterion 2)	
	Brand in general		

	National recognized brand		
	Reputation		
	Familiarity		
	Liability		
Rating	Customer rating	-	-
	Agency rating	-	-
	Hotel star	-	-
Service	Service in general	-	Reduced (Criterion 3)
	Service for kids	-	Reduced (Criterion 4)
	Breakfast	-	Reduced (Criterion 1)
	News & recreational information	-	Reduced (Criterion 4)
	Cancellation policy	-	-
	Loyalty program	-	Reduced (Criterion 2)
	Automatic rebook service	-	Reduced (Criterion 4)
Value	Value for money	Reduced (Criterion 2)	
Hotel design	Comfort and entertaining features	Reduced (Criterion 2)	
	Plants in design		
	Green		
	Overall atmosphere		
	Lobby ambience		
	Outward appearance		
Quality	Sleep quality	Reduced (Criterion2)	
	Facility quality		
	Room quality		

	Food quality	
	Service quality	
	Staff friendliness	
	Billing accuracy	
	Check-in experience	
	Reservation process	
	Cleanliness	
Security	Security in general	Reduced (Criterion 2 & Criterion 3)

Semi-structured interview

The identified hotel attributes from the literature review and desk research were validated by asking respondents to examine the validity of the chosen hotel attributes. Mainland leisure tourists or potential Mainland leisure tourists to Hong Kong were invited to attend the semi-structured interviews in May 2020 (see Appendix A). The researcher recruited the target interviewers by convenience sampling. Before the interviews, respondents were asked whether they had online hotel booking experience in the past 24 months or whether they have online hotel booking intentions to check their eligibility. In addition, which channel do you usually use when booking a hotel for your vacation was asked? Only respondents who usually use OTAs to book hotels were interviewed.

The first part of the interview was to introduce the interview purpose to participants. The purpose of the interview is to understand what information/attributes will affect their hotel choice decisions for vacation. The second part was to ask the participants to list hotel attributes that may affect (1) whether they consider a hotel (2) whether they finally decide to book one hotel when booking hotels on OTA platforms for a two days' trip to Hong Kong with a friend for an upcoming weekend. In this part, participants could freely state whatever attributes they want. In the third part, an attribute set was provided to participants, which combined the attributes in Table 21 and the attributes mentioned by the participants in the second part of the interview. Participants were asked to (1) rank the attributes which affect their hotel consideration decisions by the

attributes' importance; (2) rank the attributes which affect their final hotel choice decisions.

The interview questions were designed in simplified Chinese initially and the interviews were conducted in simplified Chinese. The results of the interview were then translated back into English for data analysis. Each interview lasted for 10-30 minutes. The interviews continued until no new insights were generated. Two rounds of interviews were conducted and in total, 14 respondents were interviewed. According to the results of the interviews, room rate, reviews, customer rating, accessibility to public transportation and hotel image were frequently mentioned attributes that have influences on the formation of consideration-set stage. Reviews, room rate, accessibility to the attractions and customer rating were frequently attributes mentioned that have influences on the formation of the final choice stage. Though the data collection was conducted in the COVID-19pandemic, according to the interviews with the participants, they did not mention any attributes related to the pandemic when selecting hotels online. Compared with the literature review and desk research results, renovated time and check-in and check-out time were two new attributes mentioned in the interviews. The results of the interviews and the interviewees profile can refer to Appendix F.

Considering the frequency of attributes examined in previous literature and the results of interviews, customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, hotel facilities, cancellation policy were identified as the key hotel attributes that affect

consumers' hotel choice decisions. In addition, two new hotel attributes - renovated time and check-in and check-out time were added into the key hotel attributes set as well. Therefore, 11 hotel attributes were confirmed in the hotel attributes set after completing a comprehensive review of literature, desk research and interviews. These 11 hotel attributes are customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-in and check-out time, hotel facilities and renovated time. Focusing on hotel facilities, swimming pool, fitness center, airport shuttle, parking and restaurant are highlighted. Because these five facilities were frequently examined in previous literature and frequently mentioned in the interviews. Following is the definition of those identified hotel attributes:

1. **Customer rating** is defined as the overall numeric rating that all reviewers give to their hotel experience.
2. **Review volume** refers to the number of reviews a hotel received from reviewers.
3. **Room rate** refers to the shown room price per night in the Hong Kong dollar.
4. **Agency rating** is the five-star-rating category of a hotel given by a host website.
5. **Accessibility to the city center** is measured by the straight-line distance on the map from the hotel to the nearest city center.

6. **Cancellation policy** refers to the availability and amount of cancellation charge if a guest cancels a hotel reservation.

7. **Accessibility to transportation** is measured by the straight-line distance on the map from the hotel to the nearest transportation.

8. **Check-in and check-out time** refer to the time consumers can check-in on the date of arrival and check-out on the date of departure.

9. **Hotel facilities** refer to the buildings, pieces of equipment, or services that hotels provided to consumers for a particular purpose. The swimming pool, fitness center, airport shuttle, parking and restaurant are highlighted in this study.

10. **Renovated time** refers to the time that the hotel most recently repaired/improved its facilities.

11. **Location** refers to the affiliated district of the hotel.

To control the impact of external variables, all aspects of the hypothetical hotels (e.g., hotel image) remained identical apart from those 11 variables. In terms of the attribute level, the information on Booking.com and Ctrip.com was taken as references to generate the attribute level. Table 22 shows the attribute level in this study.

Table 22 Hotel attribute level

Indicators/Attributes	Level
Room rate (RMB)	258-3725
Agency rating	3-5
Customer rating	6.4-9.3
Review volume	107-6656
Accessibility to the city center (Kilometer)	0.35-26
Renovated time (Year)	1992-2020
Accessibility to transportation	1-near transportation
	0-not near transportation
Check-in and check-out time	1-14pm&11am
	2-14pm&12am
	3-15pm&11am
	4-15pm&12am
Airport shuttle	1-with airport shuttle
	0-without airport shuttle
Parking	1-with parking
	0-without parking
Swimming pool	1-with swimming pool
	0-without swimming pool
Fitness center	1-with fitness center
	0-without fitness center
Location	1-Kwun Tong
	2-Kowloon City
	3-Kwai Tsing
	4-Islands
	5-Tsuen Wan
	6-Sha Tin
	7-Tuen Mun
	8-Wan Chai
	9-Eastern HK
	10-Southern HK
	11-Yau Tsim Mong
	12-Yuen Long
	13-Centeral and Western

Restaurant	1-with restaurant
	0-without restaurant
Cancellation policy	1-with free cancellation policy
	0-without free cancellation policy

3.4.2 Developing of the hypothetical OTA booking platform

The stimulus materials of this study is a hypothetical OTA booking platform, with a set of hotel accommodations to accommodate the manipulation of the identified hotel attributes. OTA was chosen in this study because online hotel booking platforms continue playing an important role in hotel distribution for consumers and Chinese people mostly rely on OTA to purchase hotel accommodation (Buhalis & Law, 2008; Navío-Marco et al., 2018). A hypothetical booking platform was used to avoid the influences brought by past experience and brand perception. To provide a realistic online hotel booking and reviewing environment, the interface of the hypothetical OTA booking platform was designed to mimic the layout and core features of Ctrip.com - the most popular OTA websites in Mainland China (Liu & Zhang, 2014). There are 139 hotels for reservation on the hypothetical OTA booking platform. The hotels in the first five pages from Booking.com and Ctrip.com were taken as references to inform the simulated hotel booking website's design. The hotel alternatives were randomly presented on the hypothetical booking platform, which means each participant could see different hotel alternatives display orders. The sample of this hypothetical OTA booking

platform is presented in Figure 18. Figure 19 presents the example of hotel alternatives. Appendix G shows the descriptive statistics of the hotel alternatives.

Figure 18 The sample of hypothetical OTA booking platform

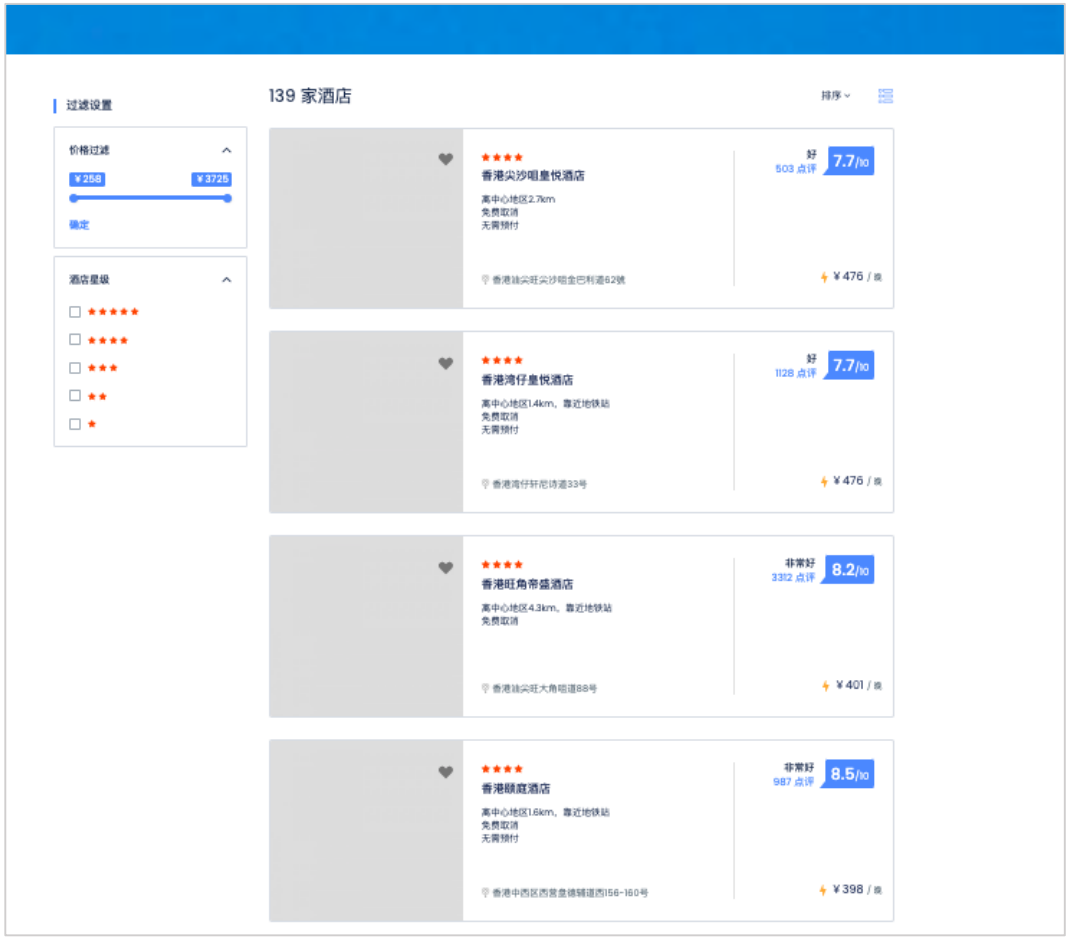


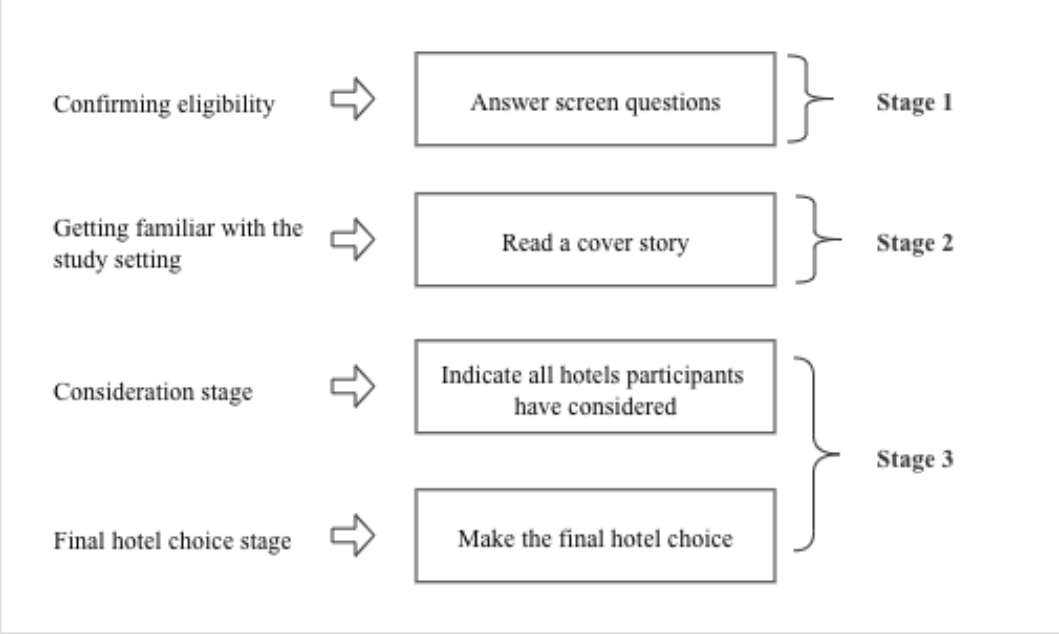
Figure 19 The sample of hotel alternatives

3.4.3 Design of choice experiment

A choice experiment was conducted to collect data. Figure 20 shows the procedure of the designed choice experiment. As mentioned earlier, this experimental study simulates an OTA booking platform to allow consumers to book one hotel online. OTA platform was chosen because it continues to be an important platform for consumers to book hotels (Navío-Marco et al., 2018). The experiment materials were initially developed in simplified Chinese by the author, whose mother language is Chinese. The initial materials were read, reviewed and revised by three Chinese doctoral students. The materials were revised to improve the accuracy and understandability of the respondents. The instruction to experiment's

participants is shown in Appendix B and Appendix C. Data was collected using a three-stage choice experiment:

Figure 20 Choice experiment procedure



Stage 1 Eligibility check

In the first stage of this experiment, the eligibility of participants was checked. All participants were asked to answer two questions. The first one is *"Have you ever participated in this experiment before? (Yes/No)"*. It is designed to exclude those who have participated in the research. The second question is *"Have you ever booked a hotel online in the past 24 months, and if not, will you consider booking a hotel online in the future? (Yes/No)"*. It is used to check whether participants are past online hotel bookers or potential online hotel bookers, the target population of

this study. After confirming their eligibility, participants could then enter the next stage of the experiment.

Stage 2 Getting familiar with the study setting

In the second stage, participants were first asked to get familiar with the setting of this study. Specifically, they were asked to read the following cover story to help them familiarize themselves with the setting of the experiment: "*You are currently planning a two days' trip to Hong Kong with a friend for an upcoming weekend. You are responsible for booking a hotel online for this trip."*

According to previous literature, people's prior experience and knowledge with the booking platform may affect their judgment and may cause biases in their responses (Hernández, Jiménez, & Martín, 2010; Vermeulen & Seegers, 2009). A hypothetical online hotel booking platform was built to minimize the influences brought by prior experience and knowledge about booking platforms.

Stage 3 Hotel choice experiment

After reading the cover story, participants were asked to freely use the hypothetical platform for reviewing and identifying a hotel for the trip. Participants were required to indicate the hotels that they have considered during their choice

process. At last, participants need to select only one hotel that they will book for the trip, and they cannot make their reservation for more than one hotel.

3.4.4 Post-experiment survey

Along with the hotel choice experiment, respondents were also asked to answer a set of questions concerning the validity of participants and experiment materials, evaluation of the hotel, and personal information. The questionnaire was initially developed in simplified Chinese by the author, whose mother language is Chinese. The initial materials were read, reviewed and revised by three Chinese doctoral students. Changes to the questionnaire were made based on their comments and suggestions.

The questionnaire begins with validation questions and realism questions to ensure the validity of participants and the experiment materials. Then, respondents were required to report their personal information. At last, respondents were asked to rank the 11 manipulated attributes during their hotel consideration-set formation stage and the final choice formation stage. To understand the differences between actual behavioral preference and stated preference, respondents were also asked to state five important attributes during their hotel consideration-set formation stage and the final choice formation stage. The full version of the questionnaire (in English and Chinese) is presented in Appendix D and E.

3.5 Data collection

3.5.1 Pilot test

Before the main data collection, a series of pilot tests were conducted. These pilot tests were conducted to ensure the applicability as well as the validity of the experiment materials and procedure used in this study. In detail, the purposes of the pilot test are to check (1) whether the respondents can understand this study; (2) the clarity of the instruction; (3) the realism of the stimulus materials, including the experiment procedure and the hypothetical OTA platform; (4) the clarity of wording used in the survey questions. The pilot tests continued until respondents were clear about the experiment materials and procedure.

The pilot test was conducted with 50 respondents in early-September 2020. The results showed that no modification was needed, and then the experiment materials and questionnaire were shared with Ye research for data collection. The experiment and survey proceeded to the full launch in mid-November 2020 after no problems were identified.

3.5.2 Sampling method and sample size

Sampling is an important process of selecting participants that could represent the properties and characteristics of the population. The quota sampling method was adopted to reduce the variability and increase the representativeness of the groups (Altinay, Paraskevas, & Jang, 2015). Factors including education, age and

gender were considered when samples were selected to keep in consistent with the traveler profile from the Hong Kong Tourism Board statistics.

Following McClave, Benson, and Sincich (2012) recommendation on the sample size adequate to seek statistical power, the current study intends to collect data from a total of 1000 respondents, who are potential Mainland leisure tourists to Hong Kong and have online hotel booking experience in the past 24 months/have online hotel booking intentions. In the current study, the data collection was conducted by a third-party research company.

3.6 Data analysis

In this current study, the Random Forest algorithm was employed to achieve two objectives: (1) establish the relationship between consumers' online hotel choice decisions and a set of explanatory attributes; (2) to understand the relative importance of each explanatory attribute.

The Random Forest algorithm is a combination of bagging and decision trees. Bagging is a framework for ensemble learning. Usually, the CART tree is one of the most popular decision tree algorithms. A forest consists of many independent decision trees and the final model is determined by calculating the average of all the decision tree results.

CART tree

First, the CART algorithm is briefly described. The introduced notation will be helpful in the following part of the study. A CART tree is a tree structure that describes the classification of input variables, which consists of nodes and directed edges. The CART algorithm starts with a single node. In each created node, a particular subset of the training dataset is processed during the learning process. This recursive binary splitting will construct a model.

The procedure of the CART algorithm is as follows:

- **Step#1 -** All objects in the training data set are signed to the root node first.

- **Step#2 -** Based on the first treatment (s) of the first feature (j) in the dataset, the dataset is divided into two datasets, R1 and R2: R1 (j, s) = {x | xj < s}, R2 (j, s) = {x | xj > s}. The average of the y values in the R1 and R2 are c1 and c2 separately: c1=$\frac{\sum_{i=1}^{N_{R1}} y_i}{N_{R1}}$ and c2=$\frac{\sum_{i=1}^{N_{R2}} y_i}{N_{R2}}$. Then the mean absolute error (MAE) can be calculated.

- **Step#3 -** Repeat step 2 and make each explanatory attribute is split at all possible splits.

- **Step#4 -** Find a split with the minimum MAE and take this split point as the node of the tree, assign the two datasets to the left subtree and the right subtree of the node, respectively.

- **Step#5 -** Step 3 and 4 are repeated until the tree has the maximum size.

- **Step#6 -** The tree is grown according to the following equation: f(x) = $\sum_{m=1}^{M} c_m I(x \in R_m) + \varepsilon$, the original dataset is divided into M datasets.

- **Step#7 -** The tree back is pruned to select the optimal tree.

Random Forest algorithm

The procedure of the Random Forest algorithm is as follows:

- **Step#1 -** Selection of sample sets

Assuming that there are N samples in the original sample set, N samples are extracted from the original sample set by bootstrapping sampling method in each round, and a training set of N samples is obtained. A total of K rounds extraction, then the training set from each round of extraction is defined as T_1, T_2, ... T_k.

- **Step#2 -** Generation of a CART tree

A new feature set is formed by randomly selecting d features (d < D) from an original D features set. Then, a decision tree is generated by using this new feature set. In total, K decision trees are generated in K rounds. As the selection of training sets and features for the K decision trees are random, these K decision trees are independent of each other.

- **Step#3** - Combination of trees

Since these K decision trees are independent of each other and the importance of each decision tree is equal, they can be considered to have the same weights. For classification problems, the final classification results are determined by voting, and for regression problems, the mean values of all decision trees are used as the final results.

- **Step#4** - Validation of the Random Forest model

For an original data set with N samples, if the bootstrapping method is used and a training set of N samples is extracted, the probability for a sample that is not being selected is $(1-\frac{1}{N})^N$. When N is large, this probability is around 36.8%. Therefore, these unselected data can be automatically used as a validation data set for the out of bag estimating to generate predictions and calculate prediction error rates.

Calculating variable importance is one of the main characteristics of the Random Forest. In the process of the Random Forest modeling, an OOB and an OOB estimation are generated. To calculate the variable importance, in a random target bag, the target variables are changed randomly while the OOB of other variables remains unchanged. Then the noise data is used to test the model and another OOB estimation is obtained. These two OOB estimates are positively correlated with the importance of variables. The difference between the two OOB estimation divided by the standard deviation is the variable importance. The variable's importance is used to delete unimportant variables until there are only two remaining variables. This process helps to select the best Random Forest performance model (Breiman, 2001).

3.7 Chapter summary

This chapter introduced the methodology employed in the study. First, this study indicated that the target population is Mainland inbound leisure tourists to Hong Kong. Followed is detailed information for the experiment, including identifying the manipulated attributes, experiment design, scenario, and experiment procedure. Then, data analysis method, the Random Forest model, has been elaborated. Table 23 demonstrates the validity and reliability of the current research design.

Table 23 Validity and reliability

Objectives	Procedures
(1) To identify the set of key attributes used by consumers in *the consideration-set formation stage* of their online hotel choice process.	Literature review; Desk research; Semi-structured interview
(2) To identify the set of key attributes used by consumers in *the final choice formation stage* of their online hotel choice process.	
(3) To examine the decision rule applied in *the consideration-set formation stage* of consumers' online hotel choice process.	Choice experiment; Random Forest analysis
(4) To examine the decision rule applied in *the final choice formation stage* of consumers' online hotel choice process.	
(5) To identify the differences between actual attribute preference and stated attribute preference in *the consideration-set formation stage* of consumers' online hotel choice process.	Choice experiment; Survey; Random Forest analysis; Importance ranking calculation
(6) To identify the differences between actual attribute preference and stated attribute preference in *the final choice formation stage* of consumers' online hotel choice process.	

CHAPTER 4 FINDINGS

4.1 Main study

The main study was conducted in November 2020 with the help of a data collection company, Ye Research, in Mainland China. A total of 1158 responses were obtained from Mainland Chinese participants.

Objective 1 and objective 2

Literature review, desk research and semi-structured interviews were conducted to achieve objective 1 - to identify the set of key attributes used by consumers in *the consideration-set formation stage* of the online hotel choice process and objective 2 - to identify the set of key attributes used by consumers in *the final choice formation stage* of the online hotel choice process.

According to the thorough literature review, 76 attributes were identified as the most frequently studied attributes affecting consumers' hotel choice among past literature. The results of the literature review are shown in Table 17. After completing the desk research, 50 attributes were reduced and 26 attributes were identified as often displayed on OTAs. The analyzed results are shown in Table 21. According to the results of semi-structured interviews, 11 attributes were selected as the key attributes affecting consumers' hotel choice in this study, including customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-

in and check-out time, hotel facilities and renovated time. Focusing on hotel facilities, swimming pool, fitness center, airport shuttle, parking and restaurant were highlighted.

Objective 3 and objective 4

The Random Forest analysis was used to achieve objective 3 - to examine the decision rules applied in *the consideration-set formation stage* of consumers' online hotel choice process and objective 4 - to examine the decision rules applied in *the final choice formation stage* of consumers' online hotel choice process. Findings of objective 3 and objective 4 were shown in section 4.5.1 and section 4.6.1.

Objective 5 and objective 6

The importance ranking score for each attribute was calculated based on participants' post-experiment survey to achieve objective 5 - to identify the difference between actual attribute preference and stated attribute preference in *the consideration-set formation stage* of consumers' online hotel choice process. Objective 6 - to identify the difference between actual attribute preference and stated attribute preference in *the final choice formation stage* of consumers' online hotel choice process. Findings of objective 5 and objective 6 were shown in section 4.5.2 and section 4.6.2.

4.2 Data preparation

Among the 1158 responses collected, 101 cases did not complete all the tasks (including the experiment and survey) and were thus excluded from the analysis. Moreover, outliers in the time taken by the participants (seconds) to complete the experiment and survey were checked. In terms of the experiment duration, 13 cases with an exceptionally long duration of 5520 seconds (92 minutes) or above were discarded. Another 21 cases which took 180 seconds (3 minutes) or less were also excluded from the analysis. Considering the survey duration, 16 cases with an exceptionally long duration of 2400 seconds (40 minutes) or above, as well as 14 cases that took 180 seconds (3 minutes) or less, were removed from the dataset. Missing data were not considered a huge concern since no individual case contained any missing values. In total, 993 valid responses were collected. As each participant evaluated 139 hotel alternatives on the hypothetical OTA platform, a total of 138027 observations were collected.

After the data screening and cleaning processes, the transformation of data was performed. The two dependent variables (Consideration and Choice) were created as categorical variables by coding the two conditions. One dependent variable is Consideration, “0” refers to i hotel was considered by j participant , and “1” means i hotel was considered by j participant . Another dependent variable is Choice, “0” refers to i hotel was chosen by j participant, and “1” means p i hotel was chosen by j participant.

4.3 Participants' demographic profile

Table 24 reports the demographic profile of the 993 participants in this study. There are slightly more female (50.8%) than male participants (49.2%). Most participants (89.8%) are aged between 16 to 45 years old. The majority of them are working adults (88.3%). Around half of them (58.4%) have a bachelor's degree. There are slightly more participants who traveled to Hong Kong before (46.1%) than participants who have not traveled to Hong Kong before (53.9%). More than half of them (77.4%) booked a hotel online more than twice in the past 24 months.

Table 24 Participants' demographic profile

	Frequency	**Percentage**
Gender		
Male	489	49.2%
Female	504	50.8%
Age range		
15 or below	0	0.0%
16-25	141	14.2%
26-35	468	47.1%
36-45	283	28.5%
46-55	71	7.2%
56-65	27	2.7%
66 or above	3	0.3%
Highest education attained		
High school or below	68	6.8%
Diploma/Higher diploma	255	25.7%
Bachelor's degree	580	58.4%

Master's degree	87	8.8%
Doctoral degree	3	0.3%
Occupation		
Working	877	88.3%
Student	53	5.4%
Retired	36	3.6%
Unemployed	2	0.2%
Homemaker	18	1.8%
Others	7	0.7%
Online hotel booking experience (in the past 24 months)		
Less than 3	224	22.6%
3-5	461	46.4%
6-10	208	20.9%
More than 10	100	10.1%
Past visitors to Hong Kong		
Yes	458	46.1%
No	535	53.9%

4.4 Realism and manipulation check

A realism check was performed to verify whether the simulated OTA booking platform is as realistic as those available in the real world. A manipulation check was performed to verify participants can notice the generated hotel alternatives are different. Questions were asked by using a 7-point Linkert scale (1 = strongly disagree, 7 = strongly agree). The realism check question checks the level of agreement that the respondents think the simulated website and actual hotel booking website are similar and the average rating is 6.40. The results showed that the realism of the stimulated website is acceptable. The manipulation check question checks the level of agreement that the respondents think that the hotel

alternatives on the simulated OTA booking platform are different and the average rating is 6.28. Table 25 shows the results of the data analysis.

Table 25 Realism and manipulation check results

Questions	Mean	SD
The simulated website & real hotel booking website are similar	6.40	1.31
The hotels on the simulated website are different	6.28	1.75

4.5 Consumers' decision rules in the formation of the consideration-set stage

4.5.1 Actual behavioral preference

Random Forest

Statistical software Python Ver.3.7 and the Random Forest Classifier package were used to analyze the data. Categorical variables were transformed into numerical variables. In total, there are fifteen indicators.

The train-test-split package was used to divide the original data set into a training data set and a test data set. This study utilized the best parameter to optimize the model to improve accuracy. That is, this study set the max_depth with five to control the complexity of the tree (tree size). The n_estimators were used to control the number of trees. In this study, the number of trees was set as 10 to 1500 to find the best performance model. According to the data analysis, it showed no impact on the accuracy improving when the tree number is more than 500. Thus, in

the study, the tree number was set as 500. Until a specified number of trees was obtained, the Random Forest was formed. Random Forests combine results at the end of the process by using majority rules. The accuracy of the test data set is 0.747, which indicates the model has a good prediction performance. Figure 21 presents an example of the decision trees in the forest at the formation of the consideration-set stage.

Figure 21 An example of decision trees at the formation of the consideration-set stage

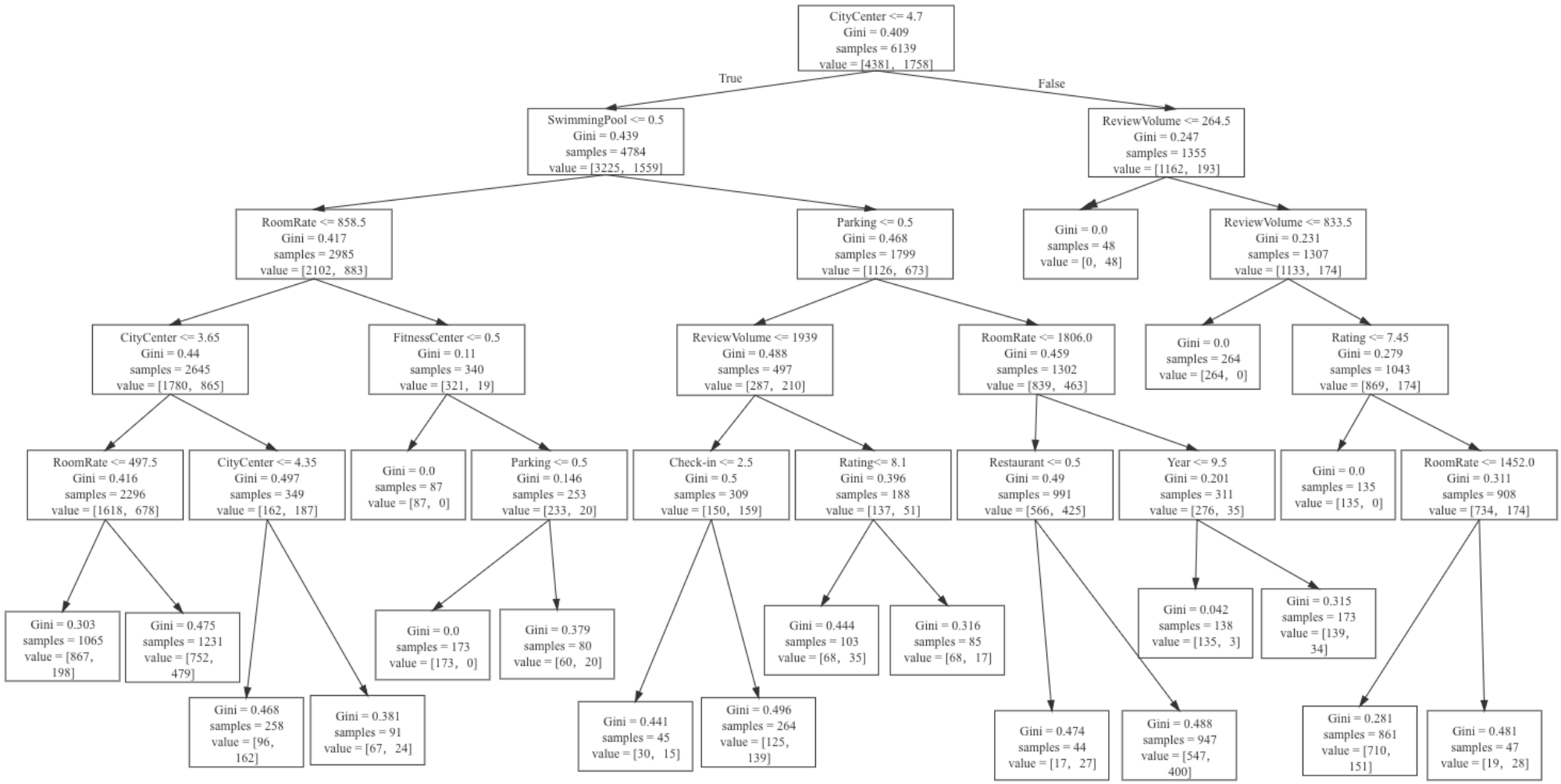


Figure 21 shows an example of a decision tree at the formation of the consideration-set stage. As shown in the tree, 6139 samples were extracted from the original sample set by bootstrapping sampling method. The algorithm takes accessibility to the city center as the first node. Because this attribute has the minimum Gini coefficient (0.409), which means the classification result is the best at this node. In these 6139 samples, 4381 observations show hotels are not considered, and 1758 observations show hotels are considered. These 6139 samples were assigned to the left subtree and the right subtree of the node, respectively. When the accessibility to the city center is smaller than 4.7 kilometers, the data was assigned to the left subtree. Otherwise, the data was assigned to the right subtree. The splitting was repeated until the tree had the maximum size. In this study, the tree size was set as five to control the complexity of the tree.

These 500 decision trees are independent of each other and the importance of each decision tree is equal. They can be considered to have the same weights. The final classification results were determined by the majority voting rule, and the results showed the relative importance of each attribute.

Relative importance of key attributes

Considering the measurement method for the Random Forest, a decrease Gini coefficient was used to measure the importance of the variables in the model. A smaller Gini coefficient shows the splitting capability of the attribute is better,

which means this attribute is more important for consumers when making decisions. The results are shown in Table 26. Results show that the most important indicator of the model is accessibility to the city center (the average accessibility to the city center for the hotels are considered is 3.49 kilometers), followed by review volume (the average review volume for the hotels are considered is 1611) and room rate (the average room rate for the hotels are considered is 765 RMB). The findings show that accessibility to the city center is the most important attribute to affect consumers' formation of the consideration-set stage. Review volume is the second important attribute and room rate is the third important attribute. The importance of the other variables in the model, including swimming pool, accessibility to transportation and cancellation policy, are relatively not particularly prominent.

Table 26 Attribute importance at the formation of the consideration-set stage

Importance ranking	Attribute
1	Accessibility to the city center
2	Review volume
3	Room rate
4	Renovated time
5	Customer rating
6	Location
7	Check-in and check-out time
8	Restaurant
9	Parking
10	Agency rating
11	Fitness center
12	Airport shuttle
13	Swimming pool

14	Accessibility to transportation
15	Cancellation policy

4.5.2 Stated preference

Regarding the stated preference of hotel attributes rated by the participants, this study calculated the total scores for each attribute based on participants' post-experiment survey. The participants ranked the manipulated attributes in the order in which they think the attribute is the most important (1) to the least important (11). The formula of the total score is T = $\sum_{n=1}^{993} R_n$, where T is the total score for each attribute, R is the importance ranking for each attribute which is rated by participants, n is the number of participants. The decrease in the total score shows the importance of the attribute, which means the smaller the total score is, the more important the attribute is.

According to the analysis, room rate is the most important attribute at the formation of the consideration-set stage, followed by location and accessibility to the city center. The least important attribute is check-in and check-out time when considering a hotel. Considering the median value for the ranking of each attribute obtained, room rate, location, customer rating, hotel facilities and accessibility to the city center are the top five important hotel attributes that affect the formation of the consideration-set stage. Table 27 shows the relative importance of all eleven attributes according to participants' stated preferences.

Table 27 Stated hotel attribute importance at the formation of the consideration-set stage

Attribute	Total Score	Mean	Median	SD	Rank
Room rate	4360	3.54	2	2.84	1
Location	4657	4.00	3	2.78	2
Accessibility to the city center	5469	5.25	5	2.99	3
Hotel facilities	5603	5.46	5	2.93	4
Customer rating	5688	5.59	5	2.96	5
Accessibility to the transportation	5743	5.68	5	2.89	6
Agency rating	6000	6.07	6	3.14	7
Review volume	6617	7.03	7	2.63	8
Renovated time	7058	7.71	8	2.57	9
Cancellation policy	7067	7.72	8	2.67	10
Check-in and check-out time	7210	7.94	8	2.69	11

4.6 Consumers' decision rules used in the formation of the final choice decision stage

4.6.1 Actual behavioral preference

Random Forest

Statistical software Python Ver.3.7 and the Random Forest Classifier package were used to analyze the data for the final choice decision stage as well. Still, categorical variables were transformed into numerical variables at first.

Same as the procedure in the analysis of the consideration-set formation stage, the train-test-split package was used to divide the original data set into a training data set and a test data set. To improve accuracy, this study found the best parameter

to optimize the model. This study set the max_depth with five to control the complexity of the tree (tree size). The n_estimators were used to control the number of trees. In this study, the number of trees was set as 10 to 1500 to find the best performance model. According to the data analysis, it showed that there was no impact on the accuracy improving when the tree number is more than 500. Thus, in the study, the tree number was set as 500. The decrease of Gini impurity was used as a splitting criterion. Until a specified number of trees was obtained, the Random Forest was formed. The accuracy of the test data set is 0.773, which indicates the model has a good prediction performance. Figure 22 presents an example of the grown decision trees in the forest at the formation of the final choice decision stage.

Figure 22 An example of decision trees at the formation of the final choice stage

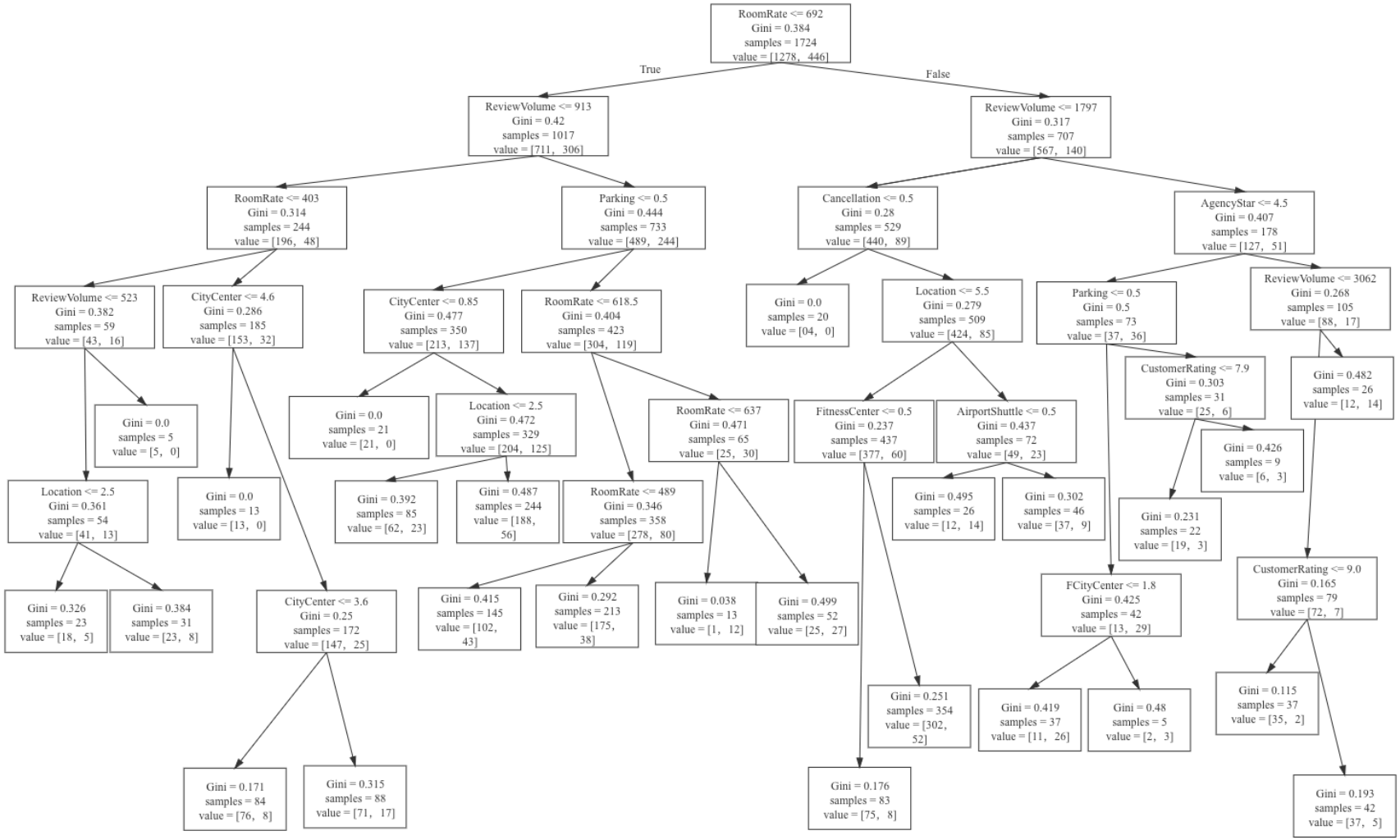


Figure 22 shows an example of a decision tree at the formation of the final choice stage. As shown in the tree, 1724 samples were extracted from the original sample set by bootstrapping sampling method. The algorithm takes room rate as the first node. Because this attribute has the minimum Gini coefficient (0.384), which means the classification result is the best at this node. In these 1724 samples, 1278 observations show hotels are not chosen, and 446 observations show hotels are chosen. These 1724 samples were assigned to the left subtree and the right subtree of the node, respectively. When the room rate is smaller than 692 RMB, the data was assigned to the left subtree. Otherwise, the data was assigned to the right subtree. The splitting was repeated until the tree had the maximum size. In this study, the tree size was set as five to control the complexity of the tree.

Relative importance of key attributes

Considering the measurement method for the Random Forest, a decrease Gini coefficient was used to measure the importance of the variables in the model. The results are shown in Table 28. Results show that the most important indicator of the model is room rate (the average room rate for the hotels are chosen is 701 RMB), followed by review volume (the average review volume for the hotels are chosen is 1796) and accessibility to the city center (the average accessibility to the city center for the hotels are chosen is 3.45 kilometers). Different from the findings at the formation of the consideration-set stage, room rate is the most important attribute to affect consumers' formation of the final choice decision stage. Similar to the

formation of the consideration-set stage, the importance of hotel facilities-related attributes, including swimming pool, fitness center, parking and restaurant, are not important.

Table 28 Attribute importance at the formation of the final choice decision stage

Importance ranking	Attribute
1	Room rate
2	Review volume
3	Accessibility to the city center
4	Customer rating
5	Location
6	Check-in and check-out time
7	Renovated time
8	Airport shuttle
9	Accessibility to transportation
10	Agency rating
11	Swimming pool
12	Fitness center
13	Parking
14	Restaurant
15	Cancellation policy

4.6.2 Stated preference

Alike the calculation for attribute importance in the formation of the consideration-set stage, the total scores of each attribute were calculated based on participants' post-experiment survey responses. Room rate is the most important attribute at the formation of the final choice decision stage, followed by location and hotel facilities. The least important attribute is renovated time when choosing

a hotel. Considering the median value of the importance ranking that each attribute obtained, room rate, location, hotel facilities, customer rating, accessibility to transportation and accessibility to the city center are the top six important hotel attributes that affect the formation of the final choice decision stage. Table 29 shows the relative importance of all eleven attributes according to participants' stated preferences.

Table 29 Stated hotel attribute importance at the formation of the final decision choice stage

Attribute	Total Score	Mean	Median	SD	Rank
Room rate	2211	3.41	2	2.79	1
Location	2716	4.19	3	2.79	2
Hotel facilities	3397	5.24	5	2.84	3
Accessibility to the city center	3563	5.50	5	2.89	4
Accessibility to the transportation	3654	5.64	5	2.97	5
Customer rating	3672	5.67	5	3.03	6
Agency rating	4050	6.25	7	3.16	7
Review volume	4531	6.99	7	2.67	8
Check-in and check-out time	4901	7.56	8	2.67	9
Cancellation policy	4983	7.69	8	2.59	10
Renovated time	5091	7.86	9	2.86	11

4.7 Differences between the formation of considerations-set stage and the final choice decision stage

Table 30 presents the relative importance of those 11 attributes at the formation of the considerations-set stage and the final choice decision stage. This study found that accessibility to the center, review volume and room rate are the most important attributes affecting the formation of the considerations-set stage and the formation of the final choice decision stage.

Comparing with the attribute importance at the formation of the consideration-set stage, the importance rank at the formation of the final choice decision stage has a slight change. The ranking of accessibility to the city center changed from the first to the third. The ranking of customer rating changed from the fourth to the seventh.

Table 30 Attribute importance differences

Rank	Consideration-set stage	Final choice stage
1	Accessibility to the city center	Room rate
2	Review volume	Review volume
3	Room rate	Accessibility to the city center
4	Renovated time	Customer rating
5	Customer rating	Location
6	Location	Check-in and check-out time
7	Check-in and check-out time	Renovated time
8	Restaurant	Airport shuttle
9	Parking	Accessibility to transportation
10	Agency rating	Agency rating
11	Fitness center	Swimming pool
12	Airport shuttle	Fitness center
13	Swimming pool	Parking
14	Accessibility to transportation	Restaurant
15	Cancellation policy	Cancellation policy

4.8 Chapter summary

This chapter shows the findings of this study. The findings show how consumers prioritize attributes in the formation of the consideration-set stage and the formation of the final choice stage. The differences between actual preference and stated preference were compared.

CHAPTER 5 DISCUSSIONS

In this study, the Random Forest algorithm was applied to develop a tree-based decision pattern, reflecting how different attributes sequentially influence consumers' hotel choices at different decision stages. The first two objectives identified the set of key attributes used by consumers in the consideration-set formation stage and the final choice decision stage of their online hotel choice process. The third and the fourth examined the decision rules applied in two stages of consumers' online hotel choice process. The last two objectives attempted to identify the difference between actual attribute preference and stated attribute preference in the consideration-set formation stage and the final choice decision stage of consumers' online hotel choice process. This chapter discusses the findings of the six objectives.

5.1 Key attributes affecting consumers' online hotel choice decision

OTAs play a critical role when consumers select and book hotel accommodation during travel. With the development of OTAs, consumers can get a broader range of choices and related information. Therefore, consumers can choose from a larger hotel set and compare more hotel information when making choice decisions (Christou & Kassianidis, 2002; Marcussen, 2001). In this study,

after completing a comprehensive review of literature, desk research and interviews, eleven hotel attributes were found as the key hotel attribute set that has significant influences on consumers' hotel choice decisions. These attributes are customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-in and check-out time, hotel facilities and renovated time. In terms of hotel facilities, swimming pool, fitness center, airport shuttle, parking and restaurant are highlighted. These attributes are confirmed to have an influence on consumers' hotel choice decisions by previous studies respectively (e.g., Jones & Chen, 2011; Kim et al., 2019; Park et al., 2019).

According to Jones and Chen (2011), the actual number of attributes used for consumers to determine hotel choices is much smaller than prior studies have examined. It shows that different kinds of information have different levels of importance for consumers. Many attributes are displayed on the websites, while consumers may use part of them to make decisions. According to the semi-structured interview, this study consistently demonstrates that in reality, consumers only use a small number of attributes to help make decisions. The findings of this study could help to find critical attributes affecting consumers' hotel choice decisions.

Identifying hotel attributes that affect consumers' hotel choice process is valuable for outlying the map of attributes that have influences on consumers' hotel choice process. In Kim and Perdue (2013)'s findings, attributes can be classified as

cognitive attributes (e.g., price), affective (e.g., comfortable feeling) and sensory (e.g., overall atmosphere) attributes. Though the current study only focuses on the objective and manageable hotel attributes in an online setting to describe the nature of a hotel, the map of attributes identified in this study could provide clues for other research.

5.2 Importance of key attributes in the formation of the consideration-set stage

This study found that consumers attached different levels of importance to hotel attributes in the formation of the consideration-set stage, namely accessibility to the city center, review volume, room rate, renovated time, customer rating, location, check-in and check-out time, restaurant, parking, agency rating, fitness center, airport shuttle, swimming pool, accessibility to the transportation, and cancellation policy. These hotel attributes are often displayed on OTAs. Among these fifteen attributes, swimming pool, parking, restaurant, airport shuttle and fitness center belong to hotel facilities. These findings attempt to provide new insights into consumers' formation of the consideration-set stage.

Location-related attribute is among the most critical attributes for affecting consumers' hotel choice in previous literature. At the formation of the consideration-set stage, the findings show that accessibility to the city center ranks first, while accessibility to transportation ranks the fourteenth place. In line with

previous studies, accessibility to the city center is important for consumers when considering hotels (Aksoy & Ozbuk, 2017; Masiero et al., 2019). One possible reason would be that in Hong Kong, the city center usually has shopping malls. Shopping is one of the most popular activities for Chinese leisure tourists to Hong Kong. Thus, they may prefer to stay near the city center. Though previous findings proved that the hotel's distance to the metro station and the tram station is the significance of inner-city mobility from the travelers' viewpoint (Aksoy & Ozbuk, 2017), the findings of the current study are not consistent with previous findings. One possible explanation would be that the studied destination is Hong Kong. As Hong Kong's transportation network is well developed, most of the hotels in Hong Kong are close to transportation means and particularly metro stations. Hence, consumers would not pay much attention to the attribute of accessibility to transportation.

Review volume is the second most important attribute that affect whether consumers consider a hotel or not. Previous studies also proved that the volume of online hotel reviews is positively associated with the likelihood that a hotel will be considered (Hu & Yang, 2020). Since review volume can reflect hotels' popularity, considering review volume help reduce customers' perceived uncertainty when evaluating a hotel (Mayzlin, Dover, & Chevalier, 2014; Zhang, Ye, Law, & Li, 2010). If a hotel has a large review volume, consumers may believe this hotel is popular because more reviews imply that more consumers have selected this hotel. In addition, customer rating, another electronic word of mouth indicator, ranks the

fifth place. A large review volume and high customer rating can offset customers' intuitive assumption that low-priced hotels are of low quality. As the current study did not consider review content, review volume and customer rating seem to have a relatively high importance weight to reduce hotels' uncertainty. At the formation of the consideration-set stage, consumers may consider a sufficient number of hotels to choose a satisfying hotel by considering previous consumers' feedback.

Price is believed to be an important stimulus to attract consumers' attention and purchase intention. However, according to the findings of this study, price is not the most important attribute when formulating the consideration-set. Kim et al. (2006) concluded that Chinese hotel customers are less likely to rely on hotel price benefit as they become more experienced Internet users. When room rate is not a problem for people who are truly committed that hotels' prices represent the hotels' value, they may not put the highest weight on price (McCarthy, 2001). Especially when consumers are at the stage of considering hotels instead of making the final choice, they may be not pay much attention to the room rate.

Renovated time was found to be important by consumers when formulating their consideration-set. Usually, consumers may have the intuitive assumption that renovated time is associated with hotel facility quality and comfortable feel. Perceptual-related attributes, including overall atmosphere, facility quality, room quality and comfort features, significantly influence consumers' hotel choice decisions (Kim & Park, 2017; Kim et al., 2018; Kim et al., 2020). The year of renovation of a hotel is an intuitive reflection of whether a hotel is old-fashioned or

relatively new and comfortable. Therefore, consumers' value for the renovated time shows that the feeling of a hotel is important for consumers.

At the formation of the consideration-set stage, hotel facilities-related attributes, including swimming pool, parking, restaurant, airport shuttle and fitness center, do not obtain a high importance weight by Chinese leisure tourists. One possible reason to explain this result is that consumers may shortlist some suitable hotels from a wide range and then evaluate the facilities of these hotels in detail later.

5.3 Importance of key attributes in the formation of the final choice decision stage

Compared with the importance weight at the formation of the consideration-set stage, the attributes importance ranking changed at the formation of the final choice decision stage, namely room rate, review volume, accessibility to the city center, customer rating, location, check-in and check-out time, renovated time, airport shuttle, accessibility to the transportation, agency rating, swimming pool, fitness center, parking, restaurant and cancellation policy. The findings provide an understanding of consumers' formation of the final choice decision stage in an online setting.

At the formation of the final choice decision stage, the importance of room rate changed from third to first. Room rate may not be substantially important when

formatting a consideration-set, but it is highly important when consumers make the final choice decision (Jones & Chen, 2011; Park et al., 2019). When consumers are closer to the stage of purchase, they may pay more attention to the actual effort or cost. Similarly, the attributes of accessibility to the city center and location are important at the formation of the final choice decision stage. When consumers are closer to the stage of purchase, they may confirm their hotel location according to their travel plan. The importance of accessibility to transportation has increased at the formation of the final choice decision stage.

Review volume is still valued at the formation of the final choice decision stage. According to Hu and Yang (2020), the volume of online hotel reviews is positively associated with the likelihood that a hotel will be booked. A high number of hotel recommendations has a significant and positive impact on conversion rates (Cezar & Ögüt, 2016). Still, review volume is an important indicator to reduce consumers' uncertainty of making the purchase decision. Though customer rating can reflect hotels' popularity and quality, consumers may think there are fake ratings and would like to seek feedback from previous consumers.

Compared with the formation of the consideration-set stage, another difference was found. Some detailed information about the hotel has become more important at the formation of the final choice decision stage. That is, check-in and check-out time and airport shuttle are valued by consumers. Check-in experience is proved to be one important attribute to affect consumers' choice (Sun et al., 2019). Airport/local area shuttles are proved to be the second important attribute for

Chinese tourists (Kucukusta, 2017). When moving to the final choice decision, consumers may spend more time evaluating each considered hotel carefully. Thus, specific hotel service policies and hotel facilities may be valued based on consumers' needs.

5.4 Differences between the formation of considerations-set stage and the final choice decision stage

Differences were found between consumers' actual attribute preference and stated attribute preference during their formation of the consideration-set stage and the final choice decision stage. In general, room rate and location are the most important attributes at both the formation of the consideration-set stage and the final choice decision stage according to the stated preference. In contrast, from the actual preference, there are differences between the formation of the consideration-set stage and the final choice decision stage.

According to Payne et al. (1993), individuals have adaptive decision behavior when solving decision problems. A decision-maker may have more than one decision rule available to solve a decision problem based on the influence of problem characteristics and social context characteristics. These findings are in line with this concept of the adaptive decision-maker. Consumers value different attributes when facing different problems. When the size of the hotel alternative set

is large enough for consumers to evaluate and choose from, the information acquisition behavior may vary across different stages of the hotel choice process.

When facing the actual market, there are many hotel alternatives for consumers to choose from. Previous studies proved that choice set size influences consumers' choice decisions. For example, Guillet et al. (2020) indicated that when facing a large number of hotel alternatives, consumers may perceive choice overload and this overload may reduce their decision confidence. In such a situation, consumers may use a filter mechanism to minimize consumers' perception of choice overload. Pan et al. (2013) indicated that consumers with a lengthy set of hotel alternatives seemed to overwhelm the consumers. Thus, they tended to reduce their consideration set by focusing on price. Consumers rarely choose without comparison. They usually focus on the relative advantages or disadvantages of alternatives. The size of the comparative circle will affect their hotel preference and decision-making (Sun et al., 2019). The existing product presentation in the real market would affect consumers' actual preferences.

5.5 Chapter summary

This chapter discussed the results presented in Chapter 4. The findings identified hotel attributes examined in previous studies and a set of key hotel nature-related attributes were extracted during consumers' hotel choice process. The findings of this study could help to find critical attributes affecting hotel choice

decisions to design websites more effectively. This study also found that consumers attached different levels of importance to hotel attributes in the formation of the consideration-set stage and the final choice decision stage. Review volume, location-related attributes, room rate and customer rating are valued by consumers. This finding provides new insights into consumers' formation of the consideration-set stage and the final choice decision stage. Differences were found between consumers' actual attribute preference and stated attribute preference during their formation of the consideration-set stage and the final choice decision stage. When the size of the hotel alternative set is large enough for consumers to evaluate and choose from, the information acquisition behavior may vary across different stages of the hotel choice process.

CHAPTER 6 CONCLUSION

6.1 Summary of research

Hotel choice is a multi-attribute and multi-stage decision-making process. The needed information to understand consumers' choice criteria includes attributes and their weighting, which are used to measure the importance of attributes. Identifying the key hotel attributes used in consumers' online hotel choice process and knowing the importance of each attribute offer insightful knowledge to consumers' decision-making literature and for hotel managers' operations. The overall goal of this study is to understand which and how hotel attributes affect consumers' online hotel choice decisions, thereby guide hotel development and improve marketing strategies. Specifically, six objectives were proposed for this research: (1) To identify the set of key attributes used by consumers in the consideration-set formation stage of their online hotel choice process; (2) To identify the set of key attributes used by consumers in the final choice formation stage of their online hotel choice process; (3) To examine the decision rule applied in the consideration-set formation stage of consumers' online hotel choice process; (4) To examine the decision rule applied in the final choice formation stage of consumers' online hotel choice process; (5) To identify the differences between actual attribute preference and stated attribute preference in the consideration-set formation stage of consumers' online hotel choice process; (6) To identify the differences between actual attribute preference and stated attribute preference in the final choice

formation stage of consumers' online hotel choice process. The present research conducted a real choice experiment and applied Random Forest algorism to achieve the above objectives.

In response to objective 1 and objective 2, literature review, desk research analysis and semi-structured interviews were conducted. First, the literature review was conducted to identify the most frequently studied attributes affecting consumers' hotel choice in previous research. Seventy-six attributes were identified (see Table 17 in Chapter 2). Then, desk research was conducted to identify the attributes are shown to consumers on major OTA platforms, including Booking.com, Agoda and Ctrip.com. After the desk research step, fifty attributes were reduced, as the purpose of this study is mainly focused on hotel information-related attributes in an online setting (see Table 21 in Chapter 3).

At last, the identified hotel attributes from literature review and desk research were validated by semi-structured interviews. Considering the frequency examined in previous literature and the results of interviews, customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, hotel facilities, cancellation policy were identified as the key hotel attributes that affecting consumers' hotel choice decision. In addition, two new hotel attributes - renovated time and check-in and check-out time were added into the key hotel attributes set as well. Therefore, 11 hotel attributes, including customer rating, review volume, room rate, agency rating, accessibility to the transportation, accessibility to the city center, location, cancellation policy, check-

in and check-out time, hotel facilities and renovated time, were confirmed in the key hotel attributes set to influence the formation of the consideration-set stage and the formation of the final choice decision stage during consumers' hotel choice decisions. In terms of hotel facilities, swimming pool, fitness center, airport shuttle, parking and restaurant were highlighted.

For objective 3 and objective 4, the findings show that at the formation of the consideration-set stage, accessibility to the city center, review volume, room rate, renovated time and customer rating were the top five important attributes regarding consumers' actual preference. Room rate, location-related attributes and hotel facilities were valued by consumers according to their stated preference.

Regarding objective 5 and objective 6, at the formation of the final choice decision stage, room rate, review volume, accessibility to the city center, customer rating, location and check-in and check-out time were the top five important attributes regarding consumers' actual preference, while room rate, location-related attribute and hotel facilities were valued by consumers according to their stated preference.

6.2 Theoretical contribution

Firstly, a key attribute set was identified and it could complement the online hotel choice literature by emphasizing what are the critical attributes that affect consumers' online hotel choice decisions. Though previous literature on hotel

choice had examined different kinds of attributes, consumers usually use only a small number of attributes to form their consideration-set and their final choice decision in reality. Consumers are proved to actually use an average of 3.3 attributes in forming their consideration set and an average of 2.6 attributes to make their final hotel choice (Jones & Chen, 2011). This study identified eleven critical hotel information-related attributes in an online setting after completing a comprehensive review of literature, desk research and semi-structured interviews. Among the identified key hotel attribute set, two new hotel attributes - renovated time and check-in and check-out time were added into the key hotel attribute set. These two new attributes attempt to gain the knowledge of understanding attributes affecting consumers' hotel choice decisions.

Before identifying the key attribute set examined in this study, this study conducted a comprehensive review of hotel choice literature. The results show a map of examined hotel attributed from previous literature. This map could help outline which attributes were paid much attention to and which attributes were rarely studied in previous studies.

Moreover, this study proposed a multi-stage and multi-attribute choice model to advance the theoretical understanding of consumers' hotel choice behavior by combining the knowledge derived from Howard and Sheth model, Hansen model, EKB model, Bettman model and Phased decision-making model. This study considers consumer choice behavior as an information processing procedure and believe consumers have limited information processing capacity. Consumers tend

to use simplified decision rules by going through attributes sequentially based on attributes' importance level. These decision rules can clearly describe consumers' psychological evaluation of attributes. Besides, the choice process is not a one-off event of making a final choice. Instead, this study emphasizes that consumers reach their final choices by undertaking two decision stages, which are the stage of forming a consideration set and the stage of making a final choice. Since limited scholarly attention has been paid to the impact of attributes on consumers' behavior in the online setting conclusively and on the differences of the formation of the considerations-set stage and the final choice decision stage, the findings of this study could contribute new knowledge to the existing literature.

6.3 Methodological contribution

Regarding the methodology part, this study employed an actual choice experiment to examine the decision rules applied in the consideration-set formation stage and the final choice formation stage of consumers' online hotel choice process. Compared with other methods used in previous hotel choice literature, the actual choice experiment conducted in this study has several advantages. First, an actual choice experiment could avoid bias from respondents' stated preference. When using interviews, surveys or eye-tracking technology to examine attribute importance in hotel choice decision, bias from respondents' stated preference is a concern as respondents may not speak out their true ideas. Second, compared with

analyzing online reviews to examine attribute importance in hotel choice decisions, an actual choice experiment could measure consumers' pre-booking preference, while the information from reviews is influenced by consumers' hotel consumption experience and failed to measure pre-booking preference. Third, though previous studies applied stated choice experiment, the numbers of choice alternatives and attributes are limited in the experiment. Instead, the actual choice experiment could mimic more choice alternatives which could reflect the booking experience of the respondents in realistic markets. Thus, the actual choice experiment used in this study is a more appropriate method to examine consumers' actual preferences.

Especially, this study employed a hypothetical OTA booking platform with sufficient alternatives to simulate the hotel choice process. As previous relevant studies only provided 8 to 16 alternatives for respondents to choose from, the current study's setting applied 139 alternatives, which is more likely to reflect the real-life situation than previous studies. Thus, compared with other data collection methods used in previous literature, this study provided sufficient hotel choices for respondents and examined consumers' hotel choice decisions in a more realistic way. As consumers may have different decision-making patterns when facing different hotel choice sizes (Pan et al., 2013), the findings of this study could reflect consumers' actual online hotel choice decisions better.

Last but not least, this study represents one of the first efforts to adopt the Random Forest algorithm to examine the attribute importance in the consideration-set formation stage and the final choice formation stage of consumers' online hotel

choice process. The concept of decision tree in the Random Forest algorithm provides an effective structure to explain how consumers evaluate hotel alternatives and make decisions. Applying a machine learning algorithm to predict consumer behavior can be immensely useful as it can improve the accuracy of results. This study enriches the methods of understanding consumers' online hotel choice patterns.

6.4 Practical contribution

From a practical viewpoint, this study has implications for hotel managers and OTA websites. Firstly, findings from this study could offer insightful knowledge to hotel managers with clues for guiding hotel establishment. For example, when considering building new hotels, hotel managers can invest in the most important hotel attribute with limited budgets. If location is important for consumers during their hotel choice process, more efforts should be devoted to the research of consumers' demand for a geographical location or city-inner location. Thus, though this hotel does not have any advantage on other attributes when competing with other hotels, the hotel still could have a high chance to be selected when consumers.

Secondly, accurate results of consumers' hotel choice preferences can guide hotels to optimize operation management, avoid common biases, and assist leaders' judgment. For example, when hoteliers have different business targets, they can carry out effective business operations according to different attributes' importance.

When they hope to improve the click rate, they can pay more attention to the attributes affecting consumers' formation of the consideration-set stage. When they desire to improve the conversion rate, they may pay more attention to the attributes that affect consumers' formation of the final choice decision stage.

Lastly, due to the commoditized nature of hospitality products and the large share of OTA hotel bookings, travelers may continually rely on information obtained from OTA distribution channels in the future. The findings of this study could help improve online hotel booking website navigation and adopt proper marketing communications strategies. For example, since marketers are paying more attention to hotel websites' interface, including the presentation and design of hotel website information, OTAs could utilize the findings of this study to design the website navigation to meet consumers' decision rule patterns. The websites of OTAs could design different website interfaces for consumers to choose from. The attribute importance could help designers to decide which attribute should appear more prominent on online interfaces. For consumers who prefer to consider a small number of attributes, a streamlined online interface could be chosen to suit their fast-paced decision-making nature. For consumers who prefer to consider a large number of attributes, tools like a wish list or comparison feature could be provided to them. The findings of this study can help OTAs design more effectively websites. Such websites can bring pleasant online booking experience to consumers.

6.5 Limitation and future research

Although this study contributes theoretical knowledge and provides practical solutions, it has several limitations. First, the purpose of this study is mainly to focus on hotel information-related attributes in an online setting to show the nature of one hotel, eleven critical hotel attributes were examined in this study. Future research may consider extending the attribute set to examine attribute impotence to have a more comprehensive understanding of consumers' hotel choices in different decision stages. For example, previous studies proved that consumers may read reviews when choosing hotels, especially in the formation of the final choice decision stage (Jones & Chen, 2011; Park et al., 2019). Future studies may consider adding such perceptual-based attributes to explore hotel choice decisions further. In addition, future research may consider adding the attribute of hotel type to examine the influences of hotel types on consumers hotel choice.

Second, regarding the study context, Hong Kong inbound Chinese leisure tourists' online hotel choice for two persons is examined in this study. According to previous studies, the attributes used to evaluate a hotel differ from the type of travelers (leisure vs. business) (Chu & Choi, 2000; Yavas & Babakus, 2005). Thus, the findings of this study may be considered to be generalized to city tourism destinations only and may not be generalizable to populations of other nationalities. Future research may consider expanding the diversity of the research subjects so that the impact of cultural difference and other travel modes (e.g., travel with families, travel with kids) can be further investigated. In addition, the context of

this study is limited to online hotel booking, especially booking on the OTA platforms, another direction for future research is to expand the scope of study to offline and direct online hotel booking. For online hotel booking, further research may examine the effects of consumers' searching habit, online behavior patterns on hotel choices, as the current study only examined consumers online hotel choices via computer.

Third, future research may explore hotel choice decisions deeper by considering consumers' decision-making styles, as this study examined general decision rules for all types of decision-making styles. Previous studies suggested different decision-making styles (e.g., arbitrary decision-maker, standard decision-maker, comprehensive decision-maker, price and value consciousness decision-maker, effortless decision-maker, impulsive decision-maker) influence consumers' choice behavior (Park et al., 2019; Park & Gretzel, 2010). Thus, future studies may consider examining consumers' decision rules by distinguishing their decision-making styles.

Lastly, an improvement of the current study could be combining eye-tracking technology to record participants' choice process. In this way, participants' browsing behaviors during the hotel choice process could be recorded and help identify influencing attributes and explain consumers' choice decisions.

6.6 Chapter summary

This chapter concluded this study by summarizing the findings and presenting the theoretical, methodological and practical contributions. The six objectives of this study were fulfilled. Future research directions have been provided to address the limitations of this study and extend the current findings.

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APPENDICES

Appendix A Semi-structured interview

Interview Design

Following steps are the procedure of the interview:

#1 Introduce the purpose of this interview to participants:

To understand what information/attributes affect your hotel choice decisions during your hotel booking process for vacation.

#2 Which channel do you usually use when booking a hotel for your vacation?

(OTA, Offline, Official website…?)

#3 If you book hotels online, there are many attributes you can see. Please list hotel attributes that may affect (1) whether you consider a hotel (2) whether you finally decide to book one hotel.

 # 4 Please (1) rank the attributes which will affect your hotel consideration decisions by their importance; (2) rank the attributes which will affect your final hotel choice decisions.

Appendix B Instruction to experiment's participants (in Chinese)

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

School of Hotel & Tourism Management 酒店及旅遊業管理學院

实验说明

尊敬的先生/女士:

我是来自香港理工大学酒店及旅游管理学院的一名博士生，现在正进行一项关于游客在线酒店选择决策的研究。我诚邀您参加这个实验。本次实验包括在线酒店预订和问卷调查两项任务。

参与本次调查纯属自愿，您可以随时终止此实验或填写此问卷。您的资讯将仅用作学术研究，您所有的回答将严格保密。

所有答案没有对与错之分。如填写问卷时遇到任何问题，请与我联系。非常期待您的参与，谢谢！

本次实验为您假设了一次旅游场景:

假设您正计划与一位朋友在一个周末，将要到香港进行为期两天的旅行。您需要负责为这次旅行在网上预订一间酒店。

■ **实验流程**

请根据本次实验假设的旅游场景，前往模拟网站完成(1)酒店模拟预订任务和(2)问卷调查任务。

在(1)酒店模拟预定的过程中:

- 如果某些酒店您会考虑预定它们，请您点击该酒店左侧的收藏按钮(爱心形状)。您可以收藏多家酒店;
- 您需要最终选定一家酒店进行预订,作为您本次旅行将要入住的酒店。请在最终选定的酒店页面填写工作人员提供给您的验证码编号(四位数字)，并点击预定按钮。您只能最终选定一家酒店进行预定;

在(2)问卷调查任务中:

- 在完成后模拟预定后，请前往问卷调查地址，并回答所有问题。

Appendix C Instruction to experiment's participants (in English)

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

School of Hotel & Tourism Management 酒店及旅遊業管理學院

EXPERIMENT INSTRUCTION

Dear Participant:

My name is Qiulin WANG, and I am a Ph.D. student at the School of Hotel and Tourism Management, The Hong Kong Polytechnic University. I am conducting a study relating to the online hotel booking decisions and would like to invite you to participate in this research by completing an experiment. You will be asked to browse a simulated hotel booking website, and book a hotel for a leisure trip, and then complete a survey related to this study.

Participation is voluntary, and you can stop at any time during the process. The information collected will solely be used for research. Please be assured that all your responses will be kept strictly confidential.

There are no right or wrong answers to all questions, and we only want to know your true opinion. Should you have any questions regarding this questionnaire, please do not hesitate to contact me. Thank you!

Please imagine the following scenario:

You are currently planning a two days' trip to Hong Kong with a friend for an upcoming weekend. You are responsible for booking a hotel online for this trip.

Experiment tasks:

According to the scenario assumed in this experiment, please go to the simulated website to complete (1) an online hotel booking task and (2) a survey.

** refer to Appendix D for the booking website used **

(1) Online hotel booking task

- Please click the collection button (a heart shape button) on the left side of the hotel if you would like to consider one hotel. The number of hotels you can consider is not limited.
- You are asked to select one hotel to book, which you are going to stay for this trip. Please fill in the verification code number provided by the research staff in the booking page and click the reservation button. You can only choose one hotel for reservation.

(2) Survey task

- Once you have completed the booking task, please move on to the questionnaire and answer the related questions.

Appendix D Questionnaire (in Chinese)

您好！

我是来自香港理工大学酒店及旅游管理学院的一名博士生，现在正进行一项关于游客在线酒店选择决策的研究。我诚邀您参加这个调查问卷。完成这次调查大约需要 15 分钟。

参与本次调查纯属自愿，您可以随时终止此实验或填写此问卷。您的资讯将仅用作学术研究，您所有的回答将严格保密。

所有答案没有对与错之分。如填写问卷时遇到任何问题，请与我联系。非常期待您的参与，谢谢！

王秋霖

联系电邮: qiulinnn.wang@

联系电话:+86-178

- 我同意参与这项研究
- 我拒绝参与这项研究

在正式回答问卷之前，请先回答以下问题:

1. 您是否曾参与本调查?

☐ 是 ☐ 否

(当选择了“否”时，问卷才会继续)

2. 请填写您的验证码编号: _____

请详细阅读以下句子，并选出您对于以下陈述的赞同程度:

3. 您认为刚才使用的模拟预定网站与真实的酒店预定网站是相似:

非常不同意　　非常同意

1　　2　　3　　4　　5　　6　　7

4. 您认为刚才的模拟预定网站展示的所有酒店之间是有差异的:

非常不同意　　非常同意

1　　2　　3　　4　　5　　6　　7

以下是有关您在网上预定酒店的经验，请选择最适合您的答案:

5. 在过去的两年内，您是否在网上预定过酒店?

☐ 有 ☐ 没有

(当选择了“有”时，回答第 6 题; 当选择了“没有”时，回答第 7 题;)

6. 在过去两年内，您在网上预定过酒店的次数:

☐ 小于 3 次 ☐ 3-5 次 ☐ 6-10 次 ☐ 大于 10 次

7. 在未来，您是否有在网上预定酒店的想法?

☐ 有 ☐ 没有

(当选择了“有”时，问卷才会继续)

以下是有关您的个人信息，请选择最适合您的答案:

8. 您的性别: ☐ 男 ☐ 女

9. 您的年龄: ☐ 15 岁及以下 ☐ 16-25 岁 ☐ 26-35 岁 ☐ 36-45 岁

☐ 46-55 岁 ☐ 56-65 岁 ☐ 65 岁以上

10. 您的最高受教育程度: ☐ 高中及以下 ☐ 专科 ☐ 本科 ☐ 硕士 ☐ 博士

11. 您的职业: ☐ 在职人士 ☐ 学生 ☐ 退休 ☐ 无业

☐ 料理家务者 ☐ 其他_____

12. 您之前去过香港吗: ☐ 有 ☐ 没有

(当选择了“有”时，回答第 12 题)

13. 您去过香港的次数: ☐ 1 次 ☐ 2 次 ☐ 3 次 ☐ 大于 3 次

14. 当您出去旅行时，通常是不是由您来负责预定酒店: ☐ 是 ☐ 不是

15. 您通常在哪个(哪些)平台预定酒店: _____

* 可以填写多个平台

* 如果使用多个平台，请按照使用频率从高到低的顺序填写

16. 您长期居住的城市: _____

以下是有关您考虑酒店范围的决策，请选择最适合您的答案:

17. **当您把某些酒店纳入考虑范围时**，请根据下列酒店属性对您的重要性进行排序:

** 1 为第一重要*
** 2 为第二重要*
** 3 为第三重要，以此类推*

-- 顾客评分

-- 价格

-- 星级

-- 位置

-- 取消政策

-- 入住/离店时间

-- 酒店开业/装修年份

-- 酒店设施

-- 评论数量

-- 离公共交通的距离

-- 离中心地区的距离

18. 在本次酒店模拟预定中，请列出**您在考虑酒店时**，您认为重要的 5 个酒店属性:

** 1 为第一重要*
** 2 为第二重要*
** 3 为第三重要*
** 酒店属性不限于前面排序题 17 中列出的属性*

1. _____

2. _____

3. _____

4. _____

5. _____

以下是有关您确定预定酒店的决策，请选择最适合您的答案:

19. **当您决定预定某一家酒店时**，请根据下列酒店属性对您的重要性进行排序:

** 1 为第一重要*
** 2 为第二重要*
** 3 为第三重要，以此类推*

-- 顾客评分

-- 价格

-- 星级

-- 位置

-- 取消政策

-- 入住/离店时间

-- 酒店开业/装修年份

-- 酒店设施

-- 评论数量

-- 离公共交通的距离

-- 离中心地区的距离

20. 在本次酒店模拟预定中，请列出**您确定预定某家酒店时**，您认为重要的 5 个酒店属性:

** 1 为第一重要*

** 2 为第二重要*

** 3 为第三重要*

** 酒店属性不限于前面排序题 19 中列出的属性*

1. _____

2. _____

3. _____

4. _____

5. _____

******* 问卷结束，多谢您的参与 ******

Appendix E Questionnaire (in English)

Dear Participant:

My name is Qiulin WANG, and I am a Ph.D. student at the School of Hotel and Tourism Management, The Hong Kong Polytechnic University. I am conducting a study relating to the online hotel booking decision and would like to invite you to participate in this research study by completing a survey. The entire survey will require approximately 15 minutes.

Participation is voluntary, and you can stop at any time during the process. The information collected will be solely used for research. Please be assured that all your responses will be kept strictly confidential.

Please be noted that there is no right or wrong answer to the questions, and you have to provide answers that best reflect your opinions. Should you have any questions regarding this questionnaire, please do not hesitate to contact me. Thank you!

Qiulin WANG

Email: qiulinnn.wang@

Contact number: +86-178

☐ I agree to participant in this study

☐ I refuse to participate in this study

Please answer the following questions before proceeding with the survey:

1. Have you participated in this study before?

☐ Yes ☐ No

(proceed only if "no" is selected)

2. Your verification ID: _____

Please indicate your level of agreement to each statement by circling the number that best describes what you think:

3. The simulated website and real hotel booking website are similar:

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

4. The hotels on the simulated website are different:

Strongly disagree						Strongly agree
1	2	3	4	5	6	7

The following is related to your online booking experience, please select/fill in the answers that are most appropriate to you:

5. Have you ever booked a hotel online in the past 24 months?

☐ Yes ☐ No

(proceed to Q6 when "yes" is selected; proceed to Q7 when "no" is selected.)

6. How many times have you booked a hotel online in the past 24 months?

☐ Less than 3 ☐ 3-5 ☐ 6-10 ☐ More than 10

7. Will you consider booking a hotel online in the future?

☐ Yes ☐ No

(proceed only if "yes" is selected)

Below is your personal information. Please select the answers that are most appropriate to you:

8. Gender: ☐ Male ☐ Female

9. Age: ☐ 15 or below ☐ 16-25 ☐ 26-35 ☐ 36-45

☐ 46-55 ☐ 56-65 ☐ 66 or above

10. Highest education: ☐ High school or below ☐ Diploma/Higher diploma

☐ Bachelor degree ☐ Master degree ☐ Doctoral degree

11. Occupation: ☐ Working ☐ Student ☐ Retired ☐ Unemployed

☐ Homemaker ☐ Others_____

12. Have you ever been to Hong Kong? ☐ Yes ☐ No

(proceed to Q13 when "yes" is selected)

13. How many times have you been to Hong Kong? ☐ 1 ☐ 2 ☐ 3 ☐ More than 3

14. Are you usually responsible for the hotel reservation when traveling:

☐ Yes ☐ No

15. Which booking platform do you usually use to book hotels for your trip: _____

* The number of platforms is not limited

* If more than one platform is used, please fill in the order of frequency from high to low

16. Your residence(city): _____

The following is related to your hotel consideration decision, please select/fill in the answers that are most appropriate to you:

17. Please rank the following attributes in the order in which you think the attribute is the most important (1) to the least important (11) **when you consider a hotel for a trip**:

-- Customer rating

-- Room rate

-- Star

-- Location

-- Cancellation policy

-- Check-in and check-out time

-- Renovated time

-- Hotel facilities

-- Review volume

-- Accessibility to the transportation

-- Accessibility to the city center

18. Please name five criteria that a hotel can catch your attention **while considering a hotel for a trip** with another person:

** 1 refers to the most important*
** 2 refers to the second most important*
** 3 refers to the third most important*
** Attributes are not limited in Q17*

1. _____

2. _____

3. _____

4. _____

5. _____

The following is related to your hotel booking decision, please select/fill in the answers that are most appropriate to you:

19. Please rank the following attributes in the order in which you think the attribute is the most important (1) to the least important (11) **when booking a hotel for a trip**:

-- Customer rating

-- Room rate

-- Star

-- Location

-- Cancellation policy

-- Check-in and check-out time

-- Renovated time

-- Hotel facilities

-- Review volume

-- Accessibility to the transportation

-- Accessibility to the city center

20. Please name five criteria **when booking a hotel for a trip** with another person:

** 1 refers to the most important*

** 2 refers to the second most important*

** 3 refers to the third most important*

** Attributes are not limited in Q19*

1. _____

2. _____

3. _____

4. _____

5. _____

******* End of the experiment. Thank you very much! ******

Appendix F Semi-structured interview results

Respondents	**Factors affecting the consideration stage**	**Rank**	**Factors affecting the final choice decision stage**	Rank
Respondent 1	Hotel type	2	Hotel image	2
	Customer rating	1	Review valence	1
	Agency star	3		
	Room rate	5		
	Accessibility to the attractions	4		
	Cancellation policy	6		
Respondent 2	Room rate	1	Accessibility to the attractions	1
	Reviews	2	Reviews	2
	Renovated time	3		
	Breakfast	4		
	Hotel image	5		
	Promotion	6		
Respondent 3	Reviews	1	Room rate	1
	Customer rating	2	Value for money	2
	Hotel image	3	Accessibility to the city center	1
	Cancellation policy	4		
Respondent 4	Accessibility to public transportation	3	Reviews	1
	Security	1	Cancellation policy	3
	Cleanliness	2	Breakfast	2
	Hotel brand	4	Airport shuttle	4

	Room rate	5	Customer rating	1
Respondent 5	Security	1	Accessibility to public transportation	3
	Hotel facilities: WIFI	2	Room rate	2
	Hotel image	4	Reviews	1
	Reviews	3		
	Accessibility to the city center	5		
Respondent 6	Room rate	1	Room rate	2
	Hotel image	6	Hotel image	5
	Location	2	Accessibility to the attractions	1
	Customer rating	3	Customer rating	3
	Reviews	7	Reviews	7
	Review volume	4	Review volume	4
	Hotel brand	5	Hotel brand	6
Respondent 7	Location	1	Hotel facilities: WIFI, Breakfast	2
	Accessibility to public transportation	2	Negative review	3
	Room rate	3	Hotel image: room type	1
	Hotel style	4		
Respondent 8	Accessibility to the city center	1	Room rate	3
	Room rate	2	Location / Accessibility	1
	Cleanliness (hotel image)	3	Availability of breakfast	2
			Points (if I can use or get points to stay)	4
Respondent 9	Accessibility to the attractions	1	Agency star	1

	Accessibility to public transportation	2	Room rate	1
	Hotel facilities	3	Reviews (cleanliness, security)	2
			Renovated time	1
			Customer rating	2
			Review volume	2
			Cancellation policy	3
			Swimming pool	4
Respondent 10	Breakfast	6	Room style	2
	Accessibility to public transportation	1	Accessibility to airport/train station	1
	Room rate	2	Accessibility to the attractions	3
	Hotel style	3	Cancellation policy	4
	Reviews	5	Check-in and check-out time	4
	Customer rating	4		
Respondent 11	Hotel star	1	Reviews	2
	Accessibility to the attractions	2	Value for money	1
	Accessibility to public transportation	2	Accessibility to the attractions	4
	Child facilities	4	Accessibility to public transportation	4
	Room rate	5	Cancellation policy	5
	Renovated time	3	Customer rating	3
	Reviews	7		
	Breakfast	6		
Respondent 12	Accessibility to the attractions	4	Room style	1

	Accessibility to public transportation	4	Accessibility to the attractions	2
	Customer rating	1	Accessibility to public transportation	2
	Positive reviews	3		
	Bathtub	5		
	Room rate	2		
	Room style	6		
	Agency star	7		
	Review volume	8		
	Breakfast	8		
	Cancellation policy	8		
	Check-in and check-out time	8		
Respondent 13	Room rate	1	Customer rating	1
	Location	2	Negative reviews	2
	Surroundings	2	Hotel brand	2
	Hotel image	3	Check-in and check-out time	3
			Review volume	3
Respondent 14	Location / Surroundings	1	Fitness center	3
	Hotel image (hotel style)	2	Hotel facilities	1
	Customer rating	3	Room rate	1
	Review volume	3	Cleanliness	2
			Security	2
			Reviews	2

According to the results of the interviews, room rate (10), reviews (7), customer rating (6), accessibility to public transportation (6), hotel image (5), hotel style (4), accessibility to the attractions (4), breakfast (4), cancellation policy (3), hotel facilities (e.g., WIFI, child facility) (3), location / surroundings (3), review volume (3), accessibility to the city center (2), hotel brand (2), cleanliness (2), security (2), agency star (2), renovated time (2), promotion (1), hotel star (1), bathtub (1), room style (1) and check-in and check-out time (1) were mentioned have influence on the formation of consideration-set, reviews (10),room rate (6), accessibility to the attractions (5), customer rating (5), cancellation policy (4), hotel image (3), accessibility to public transportation (3), review volume (3), hotel facilities (e.g., swimming pool, fitness center, WIFI) (3), room style (2), value for money (2), breakfast (2), hotel brand (2), check-in and check-out time (2), accessibility to the city center (1), accessibility to the airport/train station (1), airport shuttle (1), location (1), loyalty points (1) agency star (1) renovated time (1), security (1) and cleanliness (1) were mentioned have influence on the formation of the final choice decision stage.

Interviewees profile

Respondents	Gender	Age	Highest level of education level	Occupation
Respondent 1	Female	27	Bachelor	Working
Respondent 2	Female	27	Doctoral	Student
Respondent 3	Male	39	Master	Working
Respondent 4	Male	32	Master	Working
Respondent 5	Male	28	Master	Student
Respondent 6	Female	41	Master	Working

Respondent 7	Female	30	Master	Working
Respondent 8	Male	35	Bachelor	Working
Respondent 9	Male	23	Bachelor	Student
Respondent 10	Male	24	Master	Working
Respondent 11	Female	53	Bachelor	Retired
Respondent 12	Female	27	Bachelor	Working
Respondent 13	Male	18	High school	Student
Respondent 14	Female	48	Bachelor	Unemployment

Appendix G Hotel alternatives' descriptive statistics

Indicators/Attributes	Mean	Min	Max
Room rate (RMB)	790.9	258	3725
Agency rating	4.1	3	5
Customer rating	8.1	6.4	9.3
Review volume	1445.9	107	6656
Accessibility to the city center (kilometer)	4.58	0.35	26
Renovated time	2013	1992	2020
Indicators/Attributes	**Level**		**Frequency**
Accessibility to transportation	1-near transportation		82.7%
	0-not near transportation		17.3%
Check-in and check-out time	1-14pm&11am		9.4%
	2-14pm&12am		58.3%
	3-15pm&11am		7.2%
	4-15pm&12am		25.1%
Airport Shuttle	1-with airport shuttle		30.9%
	0-without airport shuttle		69.1%
Parking	1-with parking		48.9%
	0-without parking		51.1%
Swimming pool	1-with swimming pool		41.0%
	0-without swimming pool		59.0%
Fitness center	1-with fitness center		72.7%
	0-without fitness center		27.3%
Location	1-Kwun Tong		2.9%
	2-Kowloon City		3.7%
	3-Kwai Tsing		0.7%
	4-Islands		2.9%
	5-Tsuen Wan		4.3%
	6-Sha Tin		3.6%
	7-Tuen Mun		1.4%
	8-Wan Chai		19.4%
	9-Eastern HK		5.0%
	10-Southern HK		1.4%
	11-Yau Tsim Mong		36.7%
	12-Yuen Long		2.2%

	13-Centeral and Western	15.8%
Restaurant	1-with restaurant	77.0%
	0-without restaurant	13.0%
Cancellation policy	1-with free cancellation policy	95.0%
	0-without free cancellation policy	5.0%