An Investigation of the Intrinsic Motivational Factors that Affect Intention to Continue Using Smart Tourism Applications

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Abstract

Since the 1980s, the focus of research in mobile application has been placed on the users' intentions and behaviours toward initial acceptance of information system. However, with further research, more and more researchers are beginning to realise the importance of intention to continuance usage. With information and communication technology (ICT) and the internet developed, mobile applications have become a topic of interest for academics focusing on the tourism industry. Smart tourism applications is a new tourism information system in recent years, referring to the tourism applications running on smartphones, tablets or other mobile devices. With the rapid rise of the popularity of smart tourism, rapid development of online travel and mobile intelligent terminals and mobile internet the current smart tourism application market is in full swing, various types of smart tourism applications have come out. Smart tourism applications use innovative information and communication technologies (ICT). Their purpose is to provide more efficient and convenient services when consumers travel to in different places as well as real-time information to enable a smarter travel environment. Consequently, there is a need for research about what factors influence consumers to intention to continue using smart technology, as well as about their perception of the benefits from extensively adopting this technology. Although a lot is known about the continue intention of information systems within a range of consumer contexts, little is known about continue intention, or the intrinsic factors that influence continue intention within the context of smart tourism.

This study aims to close that research gap. The Technology Acceptance Model (TAM) and Self-determination theory (SDT) were chosen as the basic model to understand consumers' intention to continue usage. By integrating the substantial literature on user intention to continue usage in different research contexts within a consideration of the factors influence use smart tourism application, this research aims to investigate intrinsic factors influencing consumers' intention to continue using smart tourism applications. The purpose of this research is to develop and test a conceptual model that explains the constructs that influence consumers' intention to continue using mobile applications in smart tourism. The data for this research was gathered via online

questionnaire that sought to capture the perception of 421 consumers located in China. Confirmatory factor analysis and structural equation modelling have been used to analyse this primary data.

The findings reveal that consumers' perceived usefulness, perceived enjoyment and inertia affects have significant positive influence in their intention to continue using smart tourism applications, while perceived autonomy, and perceived competence have indirect effect on intention to continue using smart tourism applications.

The study contributes to our knowledge on intention to continue usage in smart tourism applications in a Chinese context. The study indicates that the TAM partially explains smart tourism applications. However, the most important factors were partly the new factors identified to SDT, as well as the intrinsic motivation factors particular to the smart mobile application context. Additionally, practical recommendations are suggested to help the service providers to design appropriate marketing strategies and deliver corresponding activities based on the identified factors in China. Finally, this study opens up opportunities for future research to other domains of smart tourism technologies.

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented has been approved. Approval has been sought and granted by the School Ethics Committee. The word count of this thesis is 71579 words.

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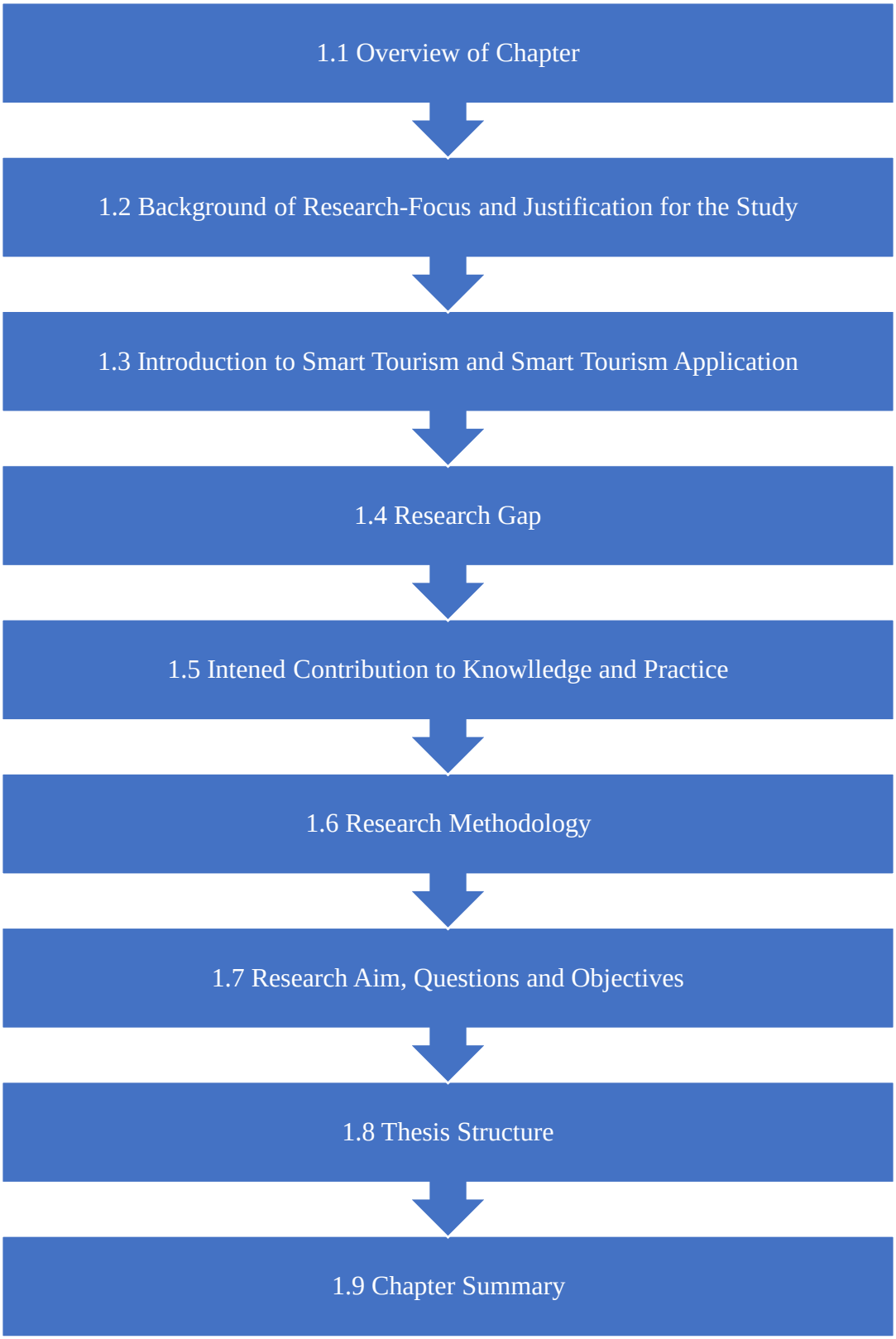
List of abbreviations

Abbreviation	Description
AVE	Average variance extracted
CFA	Confirmatory factor analysis
CMB	Common method bias
CR	Construct reliability
KMO	Kaiser-Meyer-Olkin
VIF	Variance inflation factor
PCA	Principal components analysis
SEM	Structural equation modelling
CFA	Confirmatory Factor Analysis
EFA	Exploratory factor analysis
TRA	Theory of reasoned behaviour
TPB	Theory of planned behaviour
TAM	Technology acceptance model
PEOU	Perceived ease of use
PU	Perceived usefulness
SDT	Self-determination theory
PA	Perceived autonomy
PC	Perceived competence
PR	Perceived relatedness
PE	Perceived enjoyment

Chapter 1: Introduction



1.1 Overview of Chapter

In the context of rapid development of information and communication technology (ICT) and the internet, mobile applications have become a topic of interest among academics, who have focussed on the impact of this development in the tourism industry (Buhalis & Law, 2008; Jelena Dorcic, 2019; Liang, Schuckert, Law, & Masiero, 2017). The extent of academic interest is evident in the number of journals which discuss different aspects and features of the concept (Jarrar, Awobamise, & Sellos, 2020; Tan, Lee, Lin, & Ooi, 2017; Yoo, Kwon, Na, & Chang, 2017). A common denominator in these studies is a belief that mobile applications contribute to growth in the tourism industry.

Y. Li, Hu, Huang, and Duan (2017) contend that smart tourism is "the ubiquitous tour information service received by tourists during a touring process". For tourists, smart devices have made travel smoother and more enjoyable; tourists use smart devices to gain important information, reduce costs, find memorable places, and make their trip more enjoyable (D. Wang, Xiang, & Fesenmaier, 2016). A better understanding of consumer intention to use smart tourism applications will be helpful for academics, businesses, and social marketers with an interest in smart tourism and mobile applications.

This chapter provides a general overview of the PhD thesis. Following contextual information, the intention to continue behaviour of consumers toward smart tourism applications is considered. Following the identification of a research gap, a justification of theoretical concepts and empirical study limitations of current research is offered, before research aims and questions are presented, emphasising the potential contribution of the study. Research strategies for data analysis in the study is provided. Finally, an outline of the overall structure of the thesis is provided at the end of this chapter.

1.2 Background of Research - Focus and Justification for the Study

Following inception in the early 1990s, information and communication technology (ICT) has enacted a significant impact on the hospitality and tourism industries (Buhalis & Law, 2008; Shin, 2018). Exponential growth and advances in mobile phone technology have characterised the twenty-first century. Individual lives have been improved through continuous advances and the impact of mobile technology which leads to improvement in individual lifestyle, including the way people live, work, shop and travel (Z. Wang, He, & Leung, 2018). As an effective method of communication and human activity, the mobile phone has become an integral part of contemporary society (Abeele, De Wolf, & Ling, 2018; Ibrahim et al., 2018). The mobile has undergone a number of technical advancements that have turned it from a simplistic networking system to a technology with a wide range of applications and functions. Resultingly, mobile technology has become an integral aspect of contemporary life, with the number of users steadily increasing. Decreasing costs for mobile devices, and growth in disposable income, are two key causes of increased mobile phone use globally. Furthermore, the portability and convenience of mobile devices have made them suitable replacements for conventional networking systems such as landline telephones (Iqbal, 2017). The smartphone has increased in popularity as a result of its ability to promote quality communication while remaining lightweight, interactive, and user-friendly.

Additionally, continuous development in information technology has enabled mobile devices to develop more advanced computing capabilities and achieve broader data access to wireless services such as WIFI,3G,4G, 5G. Mobile applications are an important tool for accessing various services, such as mobile payments, learning, and banking (Rafique, Almagrabi, Shamim, Anwar, & Bashir, 2020). The innovation associated with mobile phone technology (smart tourism application) has contributed to growth in technology adoption within the tourism industry, profoundly influencing production, distribution, and consumption of hospitality and tourism products and services (Buhalis & Amaranggana, 2015; Y.-C. Huang, Chang, Yu, & Chen, 2019; Xiang, Tussyadiah, & Buhalis, 2015). Mobile applications provide consumers with the ability to search for information from any location at any time (Huang et al., 2019). Therefore, when used in a travel environment, users can access a variety of applications

at any location at their convenience, obtaining information about travel destinations, or submitting review travel tips from other users, sharing experiences, information, advice, reviews, or surveys (Jamal & Habib, 2020; Karl, 2018).

Smartphone use has increased rapidly in recent years in both developed and developing countries. The number of smartphone users worldwide has surpassed 6 billion, and forecast to grow further by several hundred million in the next few years, China has more smartphone users than any country in the world; almost 912 million.(Statista, 2021e). Additionally, there were 4.28 billion unique mobile internet users in 2020, meaning over 90% of the global internet population used a mobile computer to access the internet (Statista, 2021a). The number of mobile applications downloaded was 247 billion (Statista, 2021d). The worldwide adoption and use of smartphones has driven interest in mobile applications in the tourism industry; in a tourism context, mobile applications are now widely used to contribute to tourism development. Mokhtarian and Tal (2013) note that, as mobile applications offer advance features, such as real-time location-specific data, allowing diverse travel choices such as travel routes, time, mode, and destinations. Mobile applications enable consumers to search for destination information, or make travel plans before the trip, accessing the information they need in a timely manner during, or even following, the trip; they can interact with other users about travel experiences through mobile applications. For example, smart tourism applications can provide users with timely, accurate, and complete travel information, as well as supporting the ability to focus on themes of interest, sharing travel experiences at any time. As a result, it's no surprise that smart tourism applications have become increasingly important devices for an increasing number of travellers (Jiaying Lu, Mao, Wang, & Hu, 2015).

According to (Yang Liu, Li, Edu, & Negricea, 2020), during the travel phase including pre-planning, destination planning, and return- Chinese tourists utilise internet services, such as smart tourism applications and services, to book flights and hotels, reserve restaurants, shop, explore attractions, and share experiences with others. Furthermore, as of December 2018, 40.32 million mobile online travel application users were active, accounting for 97.64 percent of all online travel application users, and making online booking the most common means by which Chinese citizens make travel plans (CNNIC, 2019). An increasing number of users engage with mobile applications to browse travel

information, purchase goods, and modify itineraries; this is based on the fast growth of mobile Internet and rising popularity of intelligent communication devices (Jiaying Lu et al., 2015)

Due to the significant potential afforded by mobile applications in the tourism industry, several scholars have focused research on different ways by which consumers adopt ICT in tourism and hospitality services (H. H. Kim & Law, 2015). For example, attention has been paid to factors influencing consumers' travel purchases online (Nunkoo & So, 2015; Sahli & Legohérel, 2016); website design and booking intentions (L. Wang & Law, 2020); application on tourism destination image and behaviour intention (Tavitiyaman, Qu, Tsang, & Lam, 2021); the role of social media in booking travel online (Jeon, Ali, & Lee, 2019); the role of mobile technology in travel planning and use (I.-C. Chang, Chou, Yeh, & Tseng, 2016; M. J. Kim, Chung, Lee, & Preis, 2015). However, academic studies into consumer use of mobile applications tends to emphasise specific topics such as hotel reservations, airline tickets, or other travel-related services (D. Wang et al., 2016), or focus on technological advancement of these mobile applications in the tourism industry (Gavalas, Konstantopoulos, Mastakas, & Pantziou, 2014), and use of mobile phone apps by consumers during their time in tourism destinations (Kamboj & Joshi, 2020). According to a Nielsen（2014）, while the average smartphone user has 42 apps, only 10 of them are used regularly (Nielsen, 2014). As a result of this finding, one would be interested to know how people decide whether to continue to use the apps。 In particular, given the focus of the current study, it is worth considering the topic of what factors influence the intention to continue using a travel app when a person installs it and decides to use it several times. There are few academic concentrations that have explored the factors that influence consumers' use of mobile applications; therefore, this study attempts to address this research gap. Most applications are available for free download and are not problematic as far as installation and initial use is concerned. The question is what intrinsic factors influence consumer intent to use the app or what are the drivers of consumer intent to use the app? Furthermore, in the mobile Internet environment, consumer travel needs are personalised, mobilised and diversified. From the marketer's point of view, understanding the factors of consumers' intention to use may be able to pinpoint potential customers and attract different types of consumers.

The aim of this research is to understand factors influencing consumer intention to continue using smart tourism applications. This will be achieved by exploring:
a) testing and evaluating effects of the SDT motivational variables- perceived autonomy, perceived competence, and perceived relatedness- and examining their impact on perceived ease of use and usefulness, supporting predictions regarding behavioural intention to use.
b) technology acceptance- perceived ease of use and perceived usefulness- as well as intrinsic factors, such as perceived enjoyment and inertia, on consumer intention to continue to use.

This study offers three important contributions to an understanding of the factors affecting consumer intention to continue using smart tourism applications. Firstly, research combines the technology acceptance model and SDT as theoretical foundations, adding perceived enjoyment and inertia factors, based on the characteristics of smart tourism applications, to construct a model of intention to continue using smart tourism applications; this allows an investigation of the intrinsic motivational factors affecting intention to continue using smart tourism applications. Secondly, by integrating intrinsic factors with technology acceptance factors in a research model, we gain an improved understanding of the psychological foundations of consumer intention to continue use. Thirdly, research findings extend and build upon those of prior mobile application studies, demonstrating the importance of adoption of user inertia as an inseparable critical factor in the formation and sustention of dependence among mobile application consumers on the mobile application they current use.

An introduction to the mobile application market will be provided in the next section, while the concept of smart tourism and mobile applications, will be examined in depth in the following chapter (Chapter 2) of this thesis.

1.3 Introduction to Smart Tourism and Smart Tourism Application

1.3.1 Smart Tourism Industry

By integrating mobile information technology with tourism, a new social phenomena known as smart tourism has emerged as a result of technological innovation and changes in tourism behaviour engendered by innovation (Hunter, Chung, Gretzel, & Koo, 2015). In the context of the modern era of ICT, the tourism industry is able to access a multitude of innovative technology. It's not surprising the concept of smart tourism has grown so quickly in the industry, in which information technology is widely employed at organisational and market level (Koo, Shin, Gretzel, Hunter, & Chung, 2016). The core use of ICT in tourism is to connect a wide range of information and intangible values to a physical location. The emergence of e-tourism has changed distribution structure and communication channels in the tourism industry (Buhalis & Deimezi, 2004; Yoo et al., 2017). In this respect, smart tourism may be misunderstood as an extension of e-tourism. However, smart tourism creates new value, connecting digital and physical worlds before, during, and after travel; whereas e-tourism affects primarily two phases of travel (pre-travel and post-travel) (Gretzel, Werthner, Koo, & Lamsfus, 2015). Smart Tourism is a concept focusing on transforming data and information into insights able to be used to support travel destinations, locals, and visitors (Sánchez, 2016). Smart tourism is described as a mobile information system using information and communication technology in the context of tourism to provide tourists with a unique experience. (Yoo et al., 2017). Hamid et al. (2021) believe smart tourism is a logical progression from e-tourism, characterised by widespread adoption of information and communication technologies, and integration of the physical and digital worlds through use of "smart key concepts" such as privacy protection, the Internet of Things, and augmented reality.

Molz (2012) attempted to identify features of smart tourism. According to Molz (2012), smart tourism may be defined as:
connectivity through web-based applications with location capabilities.
tourists as co-producers of destination content.
enhancing experiences with new technologies (augmented reality).
connecting and interacting with local communities and other tourists in the destination.

improving social and environmental sustainability.

Technology in smart tourism refers to infrastructure combining hardware, software, and network technologies able to deliver real-time data, allowing all stakeholders to make informed decisions (Gretzel, Sigala, Xiang, & Koo, 2015). Mobile technology, especially use of smartphones and mobile applications, has a significant impact on development of smart tourism.

The notion of smart tourism in western countries may be traced back to 2000, when Gordon Phillips defined smart tourism as a holistic, longer term and sustainable approach to planning, developing, operating and marketing tourism products and businesses. Phillips (2000) contends smart tourism is shaped by two types of technique:

1) smart demand and use of management techniques capable of managing demand and access
2) smart marketing techniques able to be used to target proper customer segments and deliver appropriate messages (Phillips, 2000).

On January 28th, 2009, at the first meeting in Madrid of the UN World Tourism Organisation's (UNWTO) Tourism Resilience Committee, UNWTO Assistant Secretary-General Geoffrey Lipman called on member states and the sector more broadly to strive for “smart tourism”, defined as clean, green, ethical and offering high quality services (UNWTO, 2012) at all levels of the service chain. In China, smart tourism focuses on the application of technology in the tourism industry, derived from the work of Ma and Yao, and widely cited in writing (Ma & Liu, 2011). Some scholars and organisations with a technological background interpret smart tourism as changes to management, service, and marketing, as brought about by the most recent and cutting-edge use of information and communication technology. Smart tourism is characterised by people-oriented, green, technological innovation; it promotes quality of tourism service through application of information technology, such as cloud computing, network, and high-speed communication technology (Ma & Liu, 2011). Smart tourism has altered consumption behaviour and travel experience; it has become a common trend, integrating tourist growth with technological advance. Yao and Lu (2013) consider tourism resources and information to have been systematically

integrated through the merging of contemporary information technology with tourism services, tourism management, and tourism marketing, placing tourists' interactive experience at the centre. Such development may be used to benefit the public, commercial organisations, and government, assisting organisations in entering a new stage of "tourism information is action." (Yao & Lu, 2013). The characteristics for smart tourism indicate a change to the IT-dependent tourist.

L Zhang, Li, and Liu (2012) and Y. Shi (2013), both contend that smart tourism aims to improve tourism services, enhance experiences, innovate management, and maximise resource supply. They consider the function of smart tourism as being to increase competition among tourist companies, improving tourism industry management. L Zhang et al. (2012) argue smart tourism is based on a new generation of information and communication technology, with the goal of meeting personalised demand for quality service, and realising common sharing and effective use of tourism resources, and promoting the integration of social resources. Y. Shi (2013) suggests smart tourism is a new type of communication technology, integrating cloud computing, networking, and the Internet, with personal mobile devices and artificial intelligence. An understanding of smart tourism is desirable to support companies in meeting the individual needs of tourists, improving satisfaction, while achieving common sharing and intensive use of resources. However, it only considers satisfying demand and improving quality and tourist satisfaction.

Yan (2012) argues smart tourism is a new type of tourist business, benefitting the general public, business, and government; this view is focused on the future of tourism, and the role of new technology in its development. H. Tang (2012) believes smart tourism is an application of networking and intelligent data mining technology applied to tourism experiences, industry development. Therefore, by combining information technology with tourism services, management, and marketing, and using the interactive experience of tourists as a foundation to integrate, develop, and make better use of tourism resources and information in a systematic manner. A new business model for the future is emerging in this new stage of tourist information technology for public, business, and government services. According to Kiatkawsin, Sutherland, and Lee (2020), smart tourism, rather than an entirely modern phenomenon, may be viewed as an extension of previous technology applications in the tourism sector; smart tourism

can be viewed as a more advanced form of e-tourism (Femenia-Serra, Neuhofer, & Ivars-Baidal, 2019). Both concepts boil down to using ICTs to promote tourism. However, smart tourism focuses more on capturing, incorporating, and exploiting data from networks and consumer devices, aiming to create a stronger, more customised travel experience (Gretzel, Sigala, et al., 2015).

In summary, the concept of smart tourism is divided into three levels. Tourists view smart tourism as simply providing access to tourism information and schedules, allowing them to adjust travel plans in a timely manner; for managers, such as the government and tourism businesses, smart tourism provides tourists with a full range of services such as catering, transportation, accommodation, travel, and shopping, building a tourism service platform, and realizing a comprehensive and thorough system providing accurate, convenient and ubiquitous application of tourism information and management efficiency. Finally, from a technical point of view, smart tourism achieves a highly systematic and refined interaction between physical tourism and information resources, providing a new form of future tourism for the public, business and government.

1.3.2 Smart Tourism Application

In the early stages of development of online travel, consumers used desktop computers, or laptops, to search for information about travel products; with the popularity of mobile internet and smartphones, many travel operators in the market have launched mobile services; consumers have gradually began to access relevant travel information services from mobile devices. Compared to traditional online channels, mobile internet provides consumers with a more convenient and quicker service, such as pre-travel information gathering, product booking, information searches during travel, and post-travel sharing. Compared to personal computers mobile devices are more portable and therefore easier for consumers to use when travelling. Consumer requirements for convenience and personalisation in tourism products, as well as the advent of the mobile era, provides new opportunities for smart tourism.

Purcell, Entner, and Henderson (2010, p. 2) define mobile applications as “end-user software applications that are designed for a mobile device operating system and which extend the device’s capabilities by enabling users to perform particular tasks.” Mobile

applications allow consumers access to a variety of services and resources without the need for a web browser. The use of mobile application software for mobile devices, usually referred to as mobile applications (apps), has increased in recent years, reflecting an increase in the number of smartphone subscribers (C. Hsu & Lin, 2015). Following the popularity of smartphones, demand for mobile applications promoted changes in consumption patterns associated with daily life, including use of financial services, media consumption, public transportation reservations, gaming, travel planning and shopping online (Clement, 2020; Y. Kim & Kim, 2020). During the first quarter of 2020, there were over 3.48 million Android apps in the Google Play Store, and 2.22 million iOS apps in the Apple Store (Statista, 2021b, 2021c). As customers use mobile apps daily to connect with people and access information, AI-powered mobile applications make use of data collected related to online behaviour to identify and predict individual customer needs and preferences, providing a more personalised experience (Tong et al., 2020). These apps are convenient and portable; customers develop a stickiness to them and become inertial.

The internet, and other technological innovations, have transformed the structure of the tourism industry (Chalkiti & Sigala, 2008; Chathoth, 2007; T. G. Kim, Lee, & Law, 2008). Following the development of smartphones, people relied heavily on different functions in daily life and travel (Cho, 2016). For example, consumers are able to use mobile apps to book flights, reserve accommodation, manage personal planning matters, book cabs, order food, and access restaurant information (Shukla & Nigam, 2018). The use of the term ‘smart travel’ has expanded during all stages of a journey. Travelers use smartphones to organise trip plans and interact with other travellers, sharing in-depth reviews regarding experiences (S.-B. Yang, Hlee, Lee, & Koo, 2017). According to 2016 statistics, mobile travel bookings using a smartphone accelerated by 1700% between 2011 and 2015, generating a 17% increase in online revenues (Gonzalo, 2016). The report reveals 85% of international travellers use a form of portable devices such as an iPod, tablet, or smartphone, during their trip; 97% of mobile device users share pictures while participating in tourism activities via social media networking sites such as Instagram, Facebook, and TripAdvisor. Consumers are able to connect to the World Wide Web on their mobile devices through stand-alone software, commonly termed mobile applications (Hoehle & Venkatesh, 2015).

The emergence and incorporation of tourism applications, also known as smart tourism applications, represents a significant advance in the development of Information and Communication Technologies (Palos-Sanchez, Saura, & Correia, 2021). Smart tourism applications are computer applications designed to be run on smartphones, tablets, and other mobile devices. Smart tourism applications allow users to perform various tasks, e.g., GPS, searching information about monuments, accessing tourism services, and all these activities can be carried out during travel or at the final destination (Palos-Sanchez et al., 2021; Wörndl & Herzog, 2020). Using mobile travel apps makes it easier for users to have everything ready before they reach their destination; this ease of travel enhances the inflow of tourists. Smart tourism applications have become an important aspect of the tourism industry, offering additional services to tourists at their destinations (Palos-Sanchez et al., 2021). Smart mobile phones and tourism apps have changed the way in which tourists travel to destinations, and how they act when they are there.

1.4 Research Gap

The number of Chinese tourists abroad has increased significantly following the turn of the millennium, with an average annual increase of 16% (UNWTO, 2019). Figures for domestic travel also reflect significant rises, with an analysis of one of China's most important holiday weeks (Golden Week, 1-7 October 2019), with a total visitation of 782 miles, a 7% increase compared to 2018 (Cheng, 2019). Tourist attractions and travel experiences are the reasons Chinese tourists enjoy travel; they gain knowledge, enjoy share experience with family and friends while integrating into local life (Jiang, Scott, & Ding, 2015; Lehto, Fu, Li, & Zhou, 2017; Nielsen, 2019). According to UNWTO (2019), Chinese consumers use online services (mobile apps) to access travel-related information during the travel phase (before, during, and after travel), such as destination information search, flight booking, making travel plans and sharing experiences. Furthermore, more than 93% of Chinese consumers highlighted the fact they would consider mobile payments for future trips abroad. Many companies have responded very positively, transforming continued usage intention among travel app users into fundamental business objectives (Yang Liu et al., 2020).

Furthermore, COVID-19 is influencing many facets of our lives, according to UNWTO (2021), and the tourism industry has been severely harmed. A significant part of the recovery will be technology as a point of engagement between tourists and places. After the pandemic, we avoid person to person contact. However how to replace person to person contact is technology. In this smart app, it is the technology not as widely. Have a widely use Potential with the current crisis situation.

While mobile applications offer huge potential for consumers and are important to organisational success, study into some areas of the tourism industry remain under-explored. For example, internal motivations for continued use. Therefore, understanding factors affecting intention to continue using smart tourism applications is important if firms are to effectively achieve business objectives; the topic has received increased attention in recent years (Fong, Lam, & Law, 2017; Jung, Chung, & Leue, 2015; Koo, Park, & Lee, 2017; Ozturk, Bilgihan, Nusair, & Okumus, 2016; Rafique et al., 2020). Prior studies focused on aspects of smart tourism technology determining satisfaction with travel experience (Hanna Lee, Lee, Chung, & Koo, 2018), as well as the applicability of mobile applications to enhance travel experience (Emmanouilidis, Koutsiamanis, & Tasidou, 2013; M. Kang & Gretzel, 2012; tom Dieck & Jung, 2018), and the development of mobile apps for tourism (Anacleto, Figueiredo, Almeida, & Novais, 2014; Gavalas et al., 2014; Noguera, Barranco, Segura, & MartíNez, 2012; Rodriguez-Sanchez, Martinez-Romo, Borromeo, & Hernandez-Tamames, 2013; W.-S. Yang & Hwang, 2013). In smart tourism, Yang Liu et al. (2020) recently integrated the ECM–ISS model, introducing perceived trust, enjoyment, and risk, as latent variables, constructing a research model focused on user satisfaction and continuance of usage intention. Other driving factors behind intention to continue using mobile applications include perceived destination image and search behaviour (Tavitiyaman et al., 2021), perceived benefit and perceived risk (Jarrar et al., 2020).

Despite progress in research focussed on smart tourism applications, there remain at least two important gaps that require attention. Firstly, there is a lack of research into the intrinsic consumer motivation that drives intention to continue using mobile applications, especially in respect of the use of smart technologies (Femenia-Serra et al., 2019; Mehraliyev, Chan, Choi, Koseoglu, & Law, 2020). For example, intrinsic factors such as perceived autonomy, competence, and relatedness (Y. C. Huang,

Backman, Backman, & Chang, 2016). Perceived enjoyment is the subjective psychological perception of a user (C.-L. Hsu & Lin, 2008); users' attitudes and behavioural intentions toward a mobile application will be substantially influenced if they expect enjoyment from it (S.-J. Hong & Tam, 2006; C.-L. Hsu & Lin, 2008; Rouibah, Lowry, & Hwang, 2016), such as mobile services, websites, instant messaging and online payment. Therefore, intrinsic motivational factors could be influence uses' intention to continue behaviour in context of mobile applications. Secondly, although prior research has indicated habitual (unconscious) as used to predict consumer continuance intention, little is known about the impact of inertia (conscious) factors and their impact on intention to continue using mobile applications in the context of smart tourism.

Mehraliyev et al. (2020) propose incorporating integration of new smart applications and technologies with theoretical developments; Law, Leung, and Chan (2019) identify how the majority of studies (80.9%) employ one theory or model to explain consumer technology adoption tends in a large study of 288 papers on applications used in tourism and hospitality. The authors suggest future research should employ more than one theory, as advanced models which integrate more variables are considered as more effective. Additionally, (J Dorcic, Komsic, & Markovic, 2019), undertake a survey of methodologies used in smart tourism research, reporting that multiple theories and models were used to measure consumer behavioural constructs and mobile technology use intentions; these included Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT) and its extension Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), Diffusion of Innovations Theory, or Theory of Planned Behaviour (TPB). Considering these factors, the current study extends on the work of Law et al. (2019), proposing to employ several theories to support explanation of the intention to continue using smart tourism applications.

Several research have applied the theoretical framework of self-determination theory (SDT) to explain motivated behaviour and behavioural intentions of technology in diverse fields, extending the dimensions of TAM. Such as marketing (Dholakia, 2006), consumer behaviour (Moller, Ryan & Deci, 2006; Morhart, Herzog &Tomczak, 2009), education (Roca & Gagné, 2008) and exercise (Hagger & Chatzisarantis, 2008). The combination of SDT and TAM has been shown to provide a better understanding of

consumer decisions. In line with previous studies on how consumer self-determination is an influential determinant of a person's action (Dholakia, 2006), this research extends the research framework of TAM to incorporate SDT in predicting consumers' intention to continue using smart tourism apps. Although several academic literatures have emerged that attempt to understand tourism and mobile applications, more substantive and theory-based research is still needed to gain insight into consumer behaviour in the context of tourism. Therefore, the aim of this research is to develop a research framework that integrates TAM and SDT to understand consumer' use of smart tourism apps and their impact on behavioural intentions.

This research aims to address research gaps explored above by focusing on the impact of intrinsic user motivation; autonomy, competence, relatedness, and enjoyment; mobile application experience factors; perceived usefulness and ease of use of mobile apps; and inertia of intention to continue using mobile tourism applications. Work is framed and based upon self-determination theory (Richard & Deci, 1985; Ryan & Deci, 2000) and the Technology Acceptance Model (Fred D Davis, 1989). A research model is developed and tested using a sample of users recruited through an online website (Wenjuanxing) in China.

1.5 Intended Contribution to Knowledge and Practice

This study will provide several potential conceptual and theoretical contributions to literature, as well as offering practical contributions to the future development of the tourism industry.

Firstly, research will add new knowledge to literature by:

Applying self-determination theory, integrating the technology acceptance model (TAM), and intrinsic motivation theory, in order to examine consumer behaviour towards smart tourism applications in a tourism context. Smart tourism is unique, as the majority of users who use smart tourism applications are tourists, a very specific type of consumer. When they travel, they wish to do different things, or prefer to try different activities than they would usually undertake at home. Therefore, as to fill in knowledge gaps.

Adding the inertia construct into the integrated model as a variable. Previous studies have not adequately adopted inertia when predicting behavioural intention for mobile applications. This study provides important insights into the role of inertia in smart tourism application intention behaviour, adopting it as a new variable in the integrated model and distinguishing between concepts empirically and conceptually.

Secondly, research will deepen understanding of existing knowledge:

There are a number of articles on SDT which explain the motivated behaviour and behavioural intentions of Web-based technology in various areas, such as VR technology in tourism marketing (Y. C. Huang et al., 2016), online learning (Khan et al., 2018), and video game enjoyment (Rogers, 2017). Established research suggests the integration of SDT and TAM has the potential to allow better understanding of consumer decision-making, reflecting previous studies related to the way consumer self-determination 'is an influential determinant of a person's action' (Dholakia, 2006). However, application in understanding customer perceptions in the field of mobile tourism services remain lacking and deserve more attention. Therefore, this study focuses on application of SDT in Mobile tourism apps, probing the validity of self-determination theory, and testing assumptions, as self-determination theory has not been tested within the smart tourism application domain previously. Therefore, empirical results and findings from this study are useful in contributing to further expansion of research into consumer behaviour in relation to smart tourism applications.

Provision of justification to use the TAM model and explain the smart tourism application intention to continue the behaviour of consumers, further extending mobile application studies.

Thirdly, results of this research will highlight practical implications:

Results will guide developers, or operators of smart tourism applications, to identify important factors underpinning consumer intention to use smart tourism applications from a consumer perspective, helping to understand characteristics of consumers and

usage preferences, meeting users' needs in the improvement of smart tourism applications, reducing the uninstallation rate of tourism apps, increasing the number and activity of tourism app users, and forming brand stickiness and loyalty.

Findings of this study will contribute to the development of hotel managers. From the perspective of design of smart tourism application systems, it is important to understand the demands of users to improve the user experience and increase the frequency of use.

1.6 Research Methodology

The design for this study is discussed in detail in Chapter 3, and the first part of Chapter 4. This section presents a brief introduction to the methodology, explaining the structure of research.

The first section here aimed to define smart tourism and mobile applications, definitions of technology acceptance, and factors influencing user acceptance in varied contexts. A critical analysis of the literature undertaken, with emphasis on studies of mobile applications and technology adoption in general user contexts. Following the literature review, a theoretical framework was established based on a combination of the TAM model, self-determination theory, and additional factors identified in the literature review of technology acceptance and mobile application. Empirical research undertaken was a quantitative methods case study. Quantitative methods were used to collect data, and this was comprised of a preliminary study data collection and analysis, followed by quantitative data collection and analysis. Both phases were conducted in the UK.

In order to explore and examine factors identified in the literature review, the preliminary study phase used semi-structured interviews undertaken with 11 participants. This phase explored participant perspectives, including those based on previous experience, of user acceptance and questioned factors perceived as affecting use of smart tourism applications. After analysing preliminary data, inertia was added to theoretical framework as a new factor that influence consumers' intention to continue using smart tourism applications.

Following the establishment of hypotheses from the literature review and preliminary study, hypotheses were tested using an online questionnaire survey of Chinese users. The design was based on the variables in the revised theoretical framework, as well as a collection of basic personal questions. Questionnaires were distributed through wenjuanxing (online web). There were 421 useable questionnaires completed in the response. Structure Equation Modelling (SEM) was used to analyse quantitative data; by analysing quantitative findings, the theoretical factors were revised to explain the phenomena and generate recommendations for future implementation within the smart tourism industry. The developed research model allows for investigation of factors that affect consumer intention to use behaviour.

1.7 Research Aim, Questions and Objectives

Based on research gaps outlined in the previous section of this introduction, the aim here is to investigate intrinsic motivational factors affecting intention to use smart tourism applications continuously. In the present study, a conceptual model is developed and tested based on the technology acceptance model (TAM) (Fred D Davis, 1989), integrating self-determination theory (SDT) (Richard & Deci, 1985; Ryan & Deci, 2000), perceived enjoyment (F. D. Davis, R. P. Bagozzi, & P. R. Warshaw, 1992a) and status quo bias theory (inertia) (Polites & Karahanna, 2012), within the context of consumer intention behaviour. The main aim of this study is to understand intrinsic factors affecting consumer intention to use smart tourism applications. To focus the study, two main research questions have been developed:

1.What are the key factors influencing consumer's intention to continue using smart tourism applications?

2.What intrinsic motivational factors influence consumer intention to continue using smart tourism applications?

A variety of objectives were designed to support a systematic study method, this was evident from the initial literature survey and research question formulation, through to the study and debate address, supporting engagement with the research questions. These objectives illustrate how each chapter of the study contributes to addressing

research questions and achieving research objectives. Research objectives, and the thesis description, are considered in more detail in the following section: they are reviewed in Chapter 6 to ensure they are achieved.

In order to answer the above, the following objectives have been identified:

Objective 1 (Chapter 2): To critically review the extant literature relating to antecedents and consequences of technology acceptance in mobile application consumption behaviour.

Objective 2 (Chapter 2): To clarify which of the motivation factors (perceived autonomy, perceived competence, and perceived relatedness) have the most influential effect on technology acceptance (perceived usefulness and perceived ease of use) and turn on consumer intention to continue use.

Objective 3 (Chapter 2). To examine the relationships between intrinsic factors (perceived enjoyment and inertia) and the consequence of technology acceptance (intention to continue use) for smart tourism application.

Objective 4 (Chapter 3 and Chapter 4): Develop a suitable methodology to collect and analyse data addressing the research questions; analysing and presenting the findings of the analysis in a comprehensive way to enable later discussion and synthesis.

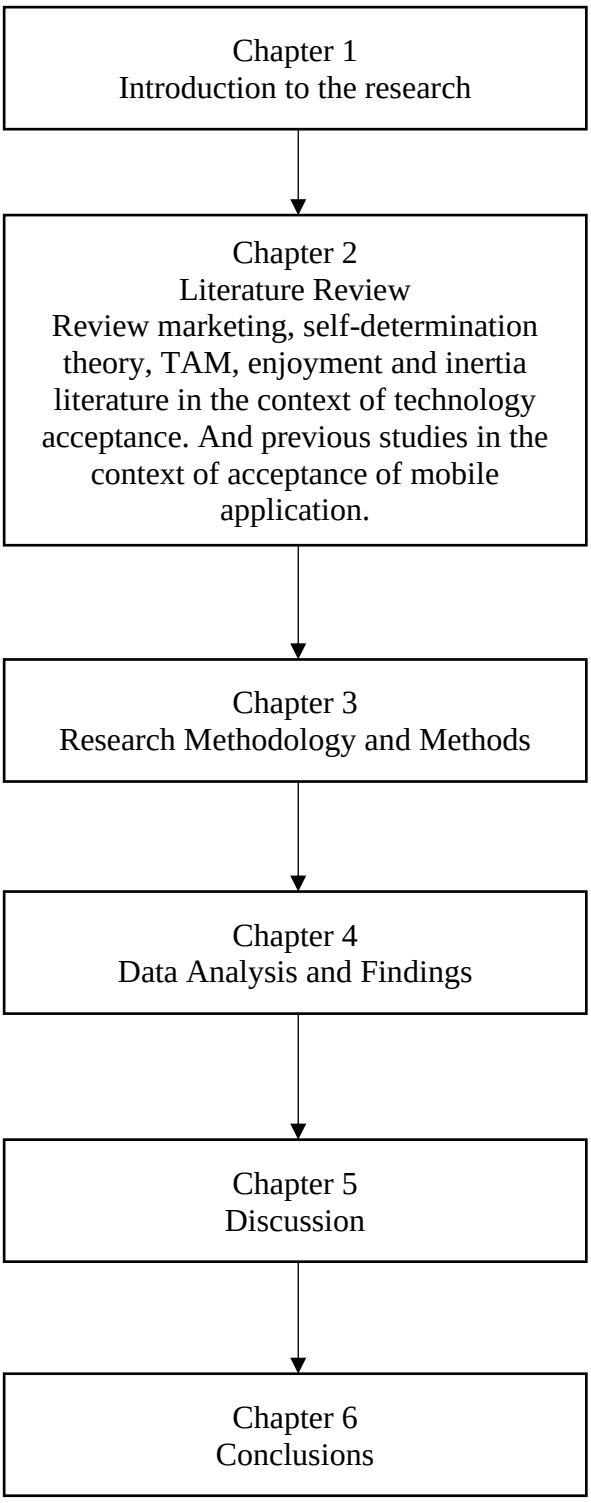
Objective 5 (Chapter 5): To discuss the findings in the context of existing literature and address gaps in earlier studies.

Objective 6 (Chapter 6): Demonstrate how the thesis achieved the primary research aim and identify the contributions, limitations, and areas for further research.

1.8 Thesis Structure

The thesis is organised into six chapters. Figure 1.1 denotes the process of research.

Figure 1.1 Structure of this PhD Thesis



Chapter 1 presents the background of research, identifying factors influencing consumer acceptance in a smart tourism application context; it explains current research gaps in the field, significance of the research, and research aims, questions, and objectives. Research methodology and design are also introduced.

Chapter 2 opens with an overview of the mobile application, reviewing previous adoption of mobile application technology in the industry, as well as the concept of smart tourism applications, and identifying gaps in existing literature that research may address. This chapter reviews literature into self-determination theory (perceived anatomy, perceived competence, perceived relatedness), technology acceptance model (perceived usefulness, perceived ease of use), intrinsic factors (perceived enjoyment and inertia) and intention behaviour. Relevant research hypotheses and conceptual frameworks are presented here as well.

Chapter 3 provides research methodology associated with the present study. The philosophical principles and research methods used are described here. The concept of conducting a preliminary and quantitative study (main study) is explained and presented in a logical order, as well as details related to analysis of quantitative data collected. This chapter also mentions analysis of ethical issues.

Chapter 4 presents the data collection and analysis of the preliminary study and quantitative study phase of this study and the corresponding findings. Firstly, the preliminary study's data were collected through interviews and analysed by the thematic analysis method. The factors from the theoretical framework established in the literature review were applied in the initial analysis of the interview data. As a result of the preliminary study's data analysis, a concept map was produced that presented the main theme and categories identified from the data. Secondly, main study (quantitative study) used questionnaires to test the proposed factors and to understand consumers' perspective of the influencing factors on their intention to continue using smart tourism applications. The design of the questionnaire was based on the literature review. The steps of the SEM analysis method are introduced in detail. This chapter then reports the descriptive analysis of the completed questionnaires. Next, it presents the exploratory factors analysis, confirmatory factor analysis, reliability assessment and convergent and discriminant validity assessment of the data in order to modify the model so that it

achieves a reasonable model fit with the data. The last part refers to the report of the main findings generated from the SEM analysis to discuss the results of hypotheses testing. Final results on the verified conceptual model affirm the powerful influence of each variable.

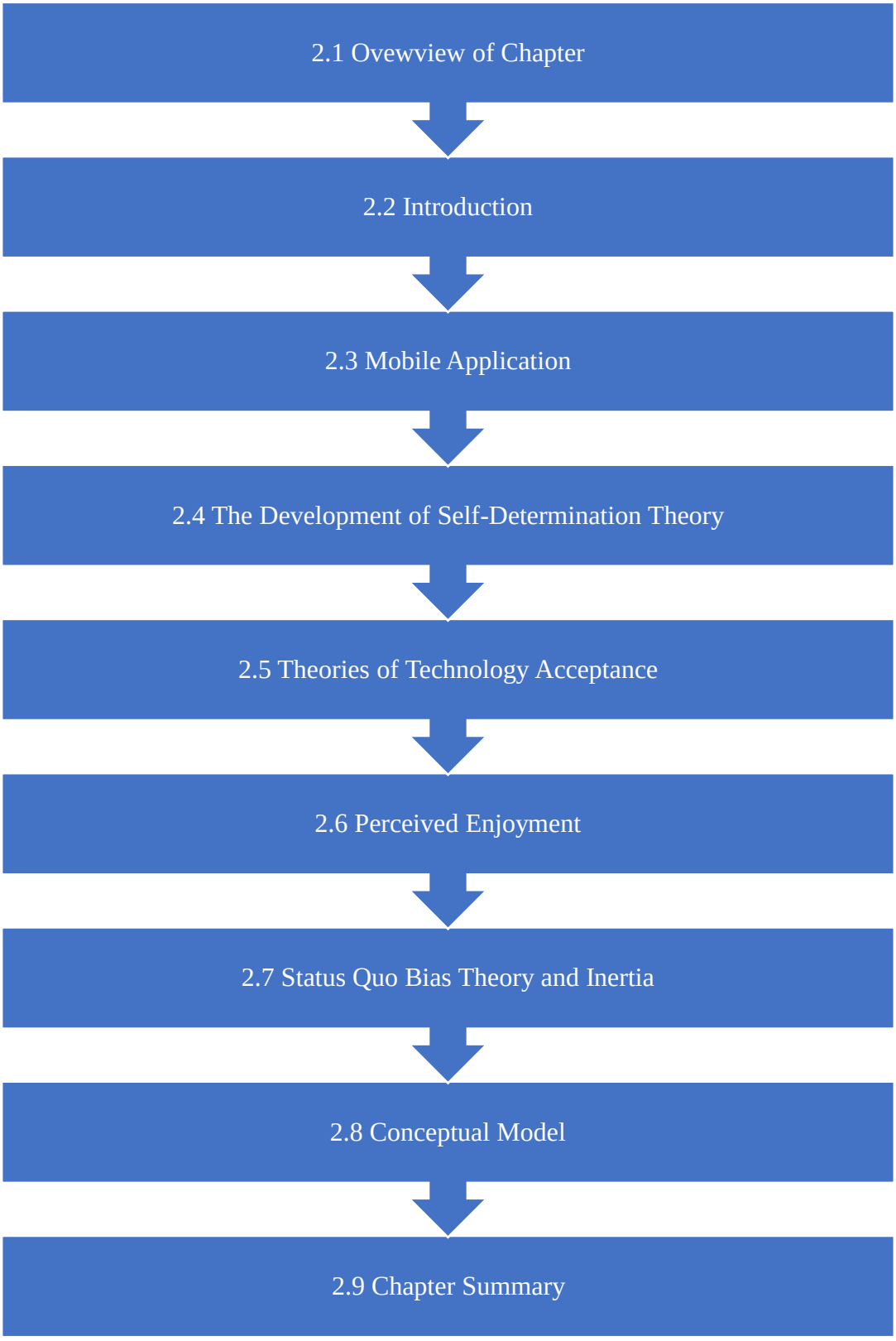
Chapter 5 provides an integrative discussion and analysis of findings from the previous chapter based on the identified factors influencing user intention to continue to use of the smart tourism applications. This chapter reviews the results for users' perspectives of influencing factors and comparing and contrasting existing relevant literature with the current study in relation to research hypotheses and objective.

Chapter 6 includes research conclusions. It provides an overview of the thesis, and it responds to the research questions. The significance of key results in terms of knowledge and implications for practise are highlighted. Furthermore, the study's research limitations are identified, and future research suggestions are recommended.

1.9 Chapter Summary

The principles and background of mobile applications and smart tourism are introduced in this chapter. The primary research aims and objectives that guided the current thesis are presented and will be discussed further in following chapters. This chapter outlines the intended contributions to knowledge, providing a general outline of the remainder of research.

Chapter 2 literature Review

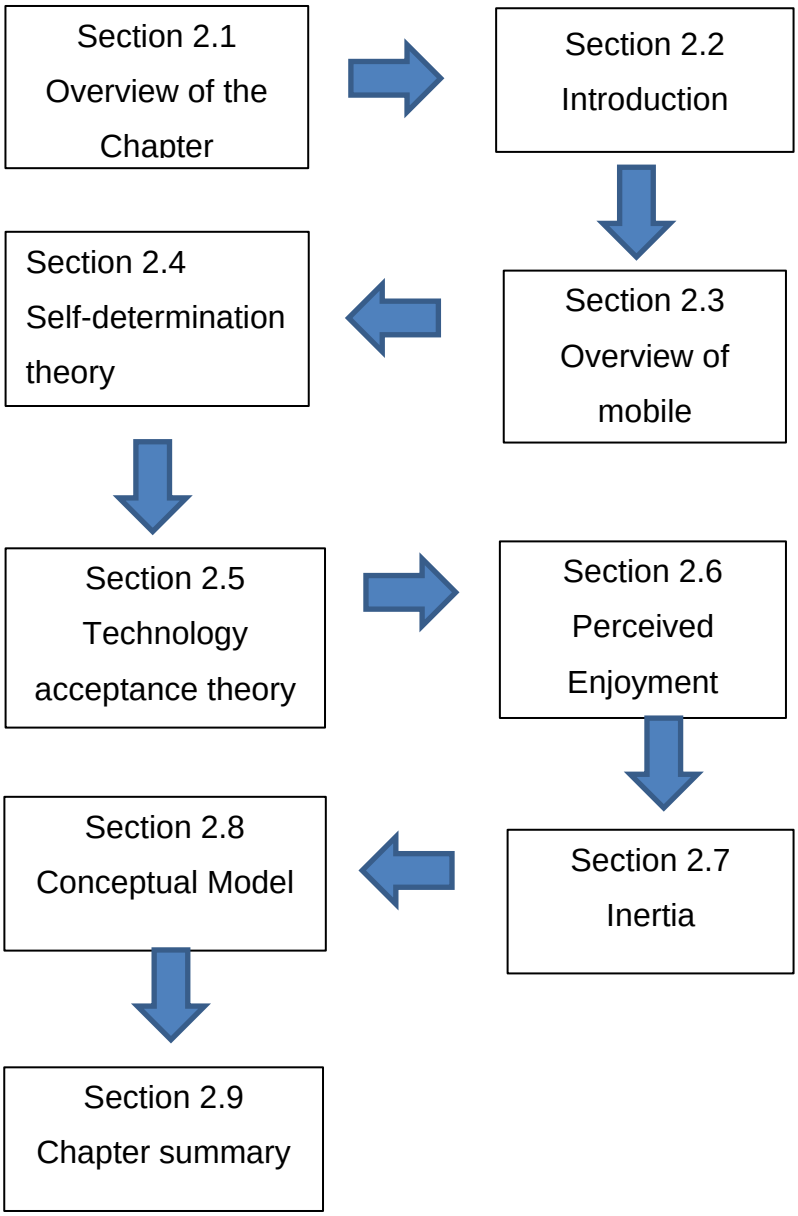


2.1 Overview of Chapter

The following chapter provides an overview of literature concerning self-determination theory, technology acceptance, and some relevant knowledge in marketing, sociological and consumer psychology. Studies applying smart tourism applications are reviewed to understand the underlying factors and intentions of the technology. In addition, theories and rationale underpinning consumer behaviours in marketing are explained.

This chapter commences by providing an overview of mobile applications (section 2.3). More specifically, it includes past research on mobile applications (section 2.3.1), mobile applications in tourism (2.3.2), and previous adoption technology (section 2.3.3). This section will be followed by a review of literature concerning self-determination theory (section 2.4) and technology acceptance theory (section 2.5). In addition, literature documenting two of the intrinsic factors (perceived enjoyment and inertia) will be reviewed in the following sections: perceived enjoyment (section 2.6) and inertia (section 2.7). In these four sections (2.4, 2.5 2.6 and 2.7), the constructs will be discussed in order to lay the foundations upon which the model and research hypotheses will be built. There will be a detailed discussion of these constructs and a justification for their inclusion. Finally, information will be synthesised in a proposed research model and the detailed hypotheses of this study will be presented. Thereafter, a short summary concludes the chapter (section 2.9). Figure 2.1 depicts the literature review for this chapter.

Figure 1.1 The Structure of Literature Revies



2.2 Introduction

The mobile phenomenon has generated interest in both academic and business areas in recent decades. Specifically, smartphones are considered a symbol of the technological superstorm; this is especially the case for smartphones that perform a huge variety of functions such as paying, calling, communication, photography, navigation, and localisation. Notably, the growing adoption and diffusion of smartphones drive the relevant software applications market (Kennedy-Eden & Gretzel, 2012; Tarute, Nikou, & Gatautis, 2017). With an increasing number of applications available on online markets and the increasing capabilities of smartphones, mobile users are able to take advantage of a wide range of applications almost anywhere and at any given time. Additionally, the growing popularity of technologies such as tourism apps (e.g., TripAdvisor, Airbnb, and Mafengwo), social network service apps (e.g., Twitter, Facebook, and YouTube), and location-based service apps (e.g., FourSquare and Google Maps), allow users to locate nearby locations, events, restaurants, and shops; it can also be used to check into locations and share this with friends. AR visualisation improves the consumer buying experience and mobile wallets such as Apple Pay, Google Pay, and Ali Pay are widely used to make in-app payments (Mintel, 2020).

Smartphones, apps, and mobile internet influence almost every facet of everyday life (D. Wang, Park, & Fesenmaier, 2012; Zolkepli, Mukhiar, & Tan, 2020). Travel and tourism industries have actively adopted the Internet as a new distribution channel since the mid-1990s; as such, mobile applications in the business-to- consumer (B2C) or e-commerce sector (Werthner & Ricci, 2004). Xiang et al's (2015) study found that travellers have used an array of online tools since the late 2000s. Thus, it is critically important for mobile application researchers and smart tourism marketers to understand consumers' intentions to use smart tourism applications and the factors influencing their behaviour.

In order to achieve the objective of this research, which is to identify the key factors affecting the intention to use the smart tourism application, it is necessary to gain an understanding of what smart tourism is and what smart tourism applications are.

2.3 Mobile Application

Mobile devices provide convenience and easiness to contemporary consumers (Groß, 2016; Ozturk, Bilgihan, et al., 2016). The freedom to use smartphone applications on the go is one of the features that makes mobile devices such an important part of people's daily lives (R. J. H. Wang, Malthouse, & Krishnamurthi, 2015). Bellman, Potter, Treleaven, Robinson, and Varan (2011, p. 191) define mobile apps as "software that can be downloadable onto a mobile device that prominently displays a brand identity throughout the customer experience, usually through the name of the app and the presence of logo or icon." Mobile apps were originally referred to software for general productivity and information retrieval purposes, including emailing, calendars, stock market trading, weather information, and contact management (C.-H. Hsiao, Chang, & Tang, 2016). However, extra functions have been developed as a result of public demand and the growth of mobile technology, including mobile gaming, banking, e-books, order tracking, location-based services, utilities, social networking sites, and others. These functionalities provide access to business, finance, lifestyle, and entertainment information (C. Hsu & Lin, 2015). As such, the popularity and tremendous growth of smartphone usage has facilitated the research on the extensive adoption of new mobile applications. In addition, due to the popularity and demand of new technology such as wearable technology (activity trackers and smart watches), the demand for custom mobile applications for these smart gadgets is rapidly increasing (Talukder, Chiong, Bao, & Malik, 2019).

With hand-held devices and mobile computing becoming popular in our lives, many people are interested in the use of smartphones in the tourism industry. An increasing number of tourists are booking hotels, searching travel information, or purchasing tickets via their smartphones (Jeon et al., 2019; Sanghoon Kang, Jodice, & Norman, 2020). Mobile apps enable tourists to access online information anytime and anywhere (Law, Chan, & Wang, 2018); moreover, they develop the quality of customer service with their mobile reservations and information search functions while on the move, offering both convenience and flexibility (Y Liu & Law, 2013; Rusu, Cureteanu, Rusu, & Cureteanu, 2009). Technology offers tourists more fun, as well as increased efficiency, making travel flexible (Schmidt-Belz, Nick, Poslad, & Zipf, 2002). Furthermore, the ability to make decisions during a trip becomes increasingly possible,

and traveling is more flexible. Portolan, Zubrinic, and Milicevic (2011); D. Wang, Park, and Fesenmaier (2011) argue that mobile apps change tourist behaviour by providing a personalised service through location-based services; tourists are able to continually evaluate their travel plans, or alternatives, using information sources obtained via mobile apps (Choe, Kim, & Fesenmaier, 2017; Tussyadiah, 2016; Vallespín, Molinillo, & Muñoz-Leiva, 2017; D. Wang et al., 2016). As a result, mobile apps have become increasingly prominent in the smart tourism industry, which exists to provide services and assistance to consumers when making travel plans, or during their trips (Xiang et al, 2015; Law et al, 2018).

2.3.1 Overview of Past Research on Mobile Application

The vehicle for many technological advances, such as order-tracking, location-based services, social networking platforms, and wearable technology, are consumers' mobile devices, via mobile apps. In a context where global trends suggests the emergence of a "mobile everything" society, consumers use mobile apps to make hotel and restaurant reservations, search information such as travel distance and experience, read reviews, and engage with point-of-sale systems (D. Wang et al., 2016). Mobile applications provide a more customised experience, utilising software and hardware capabilities of mobile devices, providing consumers with a unique experience. For example, the camera function can be used to scan bar codes, real-time bookings can be made using mobile payments and hotels and airline tickets can be cancelled, GPS functions provide location-specific content, and consumers receive frequent updates through push notifications. As a result of the unique advantages of mobile apps, consumers can be accessed anywhere and anytime, providing consumers with a useful and convenient way to use them (Marriott & Williams, 2018). Previous studies propose several models to support study of the distinct nature of mobile apps (see table 2.1); we aim to clarify key factors influencing intentions to use the application for smart tourism by analysing examples of different approaches to work undertaken on mobile apps during research.

Verkasalo, López-Nicolás, Molina-Castillo, and Bouwman (2010) used the technology acceptance model (TAM), social norm, and enjoyment to compare users and non-users' adoption of new mobile applications; the researchers identified perceived enjoyment and usefulness as the significant variables for users and non-users. Furthermore, Islam,

Low, and Hasan (2013) employ the technology acceptance model (TAM) and the diffusion of innovation model to investigate user adoption of advanced mobile phone services, such as multimedia messages, location-based information, mobile gaming, and mobile chatting. The findings demonstrate that perceived usefulness and compatibility are key factors in the use of advanced mobile phone services. Moreover, Rafique et al. (2020) extend TAM by combining two external factors (habit and system quality), with the core constructs of TAM to investigate the intention behaviour; they found habit and system quality to have a strong indirect impact on behavioural intention; PEOU and PU also had a strong mediating effect on mobile library application usage.

E. Park, Baek, Ohm, and Chang (2014) propose an integrated model based on TAM, examining the satisfaction and usage intention of mobile social network games; results indicate perceived enjoyment, usefulness, mobility, and control skill are all motivational factors for players. Hajiheydari and Ashkani (2018) employ the technology acceptance model (TAM), and the planned behaviour (TPB), investigating the decision-making process of users considering different factors, such as subjective norms, attitude, perception and quality, and their effect on mobile applications. Examining different internal and external variables, illustrating that the effects of satisfaction on recommendation intention, trust traces on subjective norms, and perceived ease of use on perceived behavioural control, are more powerful.

Song, Kim, Jones, Baker, and Chin (2014) examine users' satisfaction based on mobile-applications' store and applying an environmental psychology perspective, using discoverability facilitators. C.-H. Hsiao et al. (2016) examine key determinants of users' continuance intention, regarding social apps by satisfaction, habit and value, and the model's explained variance of satisfaction; habit and continuance intention accounted for 70%, 67%, and 71%, respectively.

Seok Kang (2014) predicts the intention underpinning the use of mobile applications by applying the extended unified theory of acceptance and use of technology (UTAUT); he found that gender has moderated the relationship between effort expectancy and continuance intention. Women are more likely than men to prefer ease of use for continuance intention. Additionally, S. J. Kim, Wang, and Malthouse (2015) study the

effect of adoption and use of a brand's mobile app on subsequent purchases using the difference-in-difference-in-difference (DDD) model. They report that customers are more likely to adopt the younger they are, whereas males are more likely to adopt than females. Most notably, Hoehle and Venkatesh (2015) address the continuance intention to use social media mobile apps, highlighting 38% of variance in continued intention to use.

C.-H. Hsiao et al. (2016) explore factors influencing consumer satisfaction levels regarding social apps and their continuance intention in a study similar to ours. The study focuses on social mobile apps. In addition, Bellman et al. (2011) investigate the effect of using branded mobile phone applications with the Pre-test/Post-test experimental design. They discovered that mobile apps increase brand attitude and purchase intention goodwill. Harris, Brookshire, and Chin (2016) explore factors influencing consumers before installing a mobile app using perceived risk, trust, perceived benefit, and intent to install, which enhanced the security of the results, adding greater trustworthiness and reduced perceived risk.

A number of studies have explored the general content of mobile applications in all categories. Nevertheless, others have distinguished content specific to mobile services (Dan J Kim & Hwang, 2012; J. Kim, Park, Kim, & Lee, 2014), or focused on a sole mobile application as an illustrative case study, such as mobile games (E. Park et al., 2014).

Qasim and Abu-Shanab (2016) study the drivers of mobile payment acceptance. Tam, Santos, and Oliveira (2020) explore influential factors of continuance intention to use mobile apps. The study indicates that the most important drivers of continuance intention of mobile apps are satisfaction, habit, performance expectancy, and effort expectancy. Evidence illustrates an increasing number of consumers rely on mobile devices in their lives. There is undoubtedly a relationship between consumer skill in internet use, their use of mobile applications (A. Douglas & Lubbe, 2013), their attitude toward mobile applications, and intentions to use them (Rivera, Gregory, & Cobos, 2015). In summary, there are many different ways to approach the study of mobile apps, supported by the use of diverse theories. The next section presents the previous adoption technology in mobile application.

Table 2.1 Overview of past research on Mobile Application

Authors	Context	Model/Theory	Dependent Variable	Sample / Method	Findings
Verkasalo, López-Nicolás, Molina-Castillo, Bouwman, and Informatics (2010)	The factors of intention to use of app's users and non-users	Technology acceptance model (TAM) Perceived enjoyment Social norm	Intention to use	579 smartphone users Structural equation modelling (SEM)	• Behavioural control is directly linked to PU (except for games) and enjoyment. • Perceived enjoyment and usefulness explain intention to use applications for both users and for non-users.
Rafique et al. (2020)	Investigate the factors influence users' intentions to use mobile libraries application (MLA)	Technology acceptance model (TAM) Habit System Quality	Behavioural intention to use	340 respondents Structural equation modelling (SEM)	• perceived usefulness and perceived ease of use are direct significant predictors with the intention to use MLA. • system quality and habit are the influencing factors toward the usage intention of MLA.
Islam et al. (2013)	mobile phone services (AMPS)	Technology acceptance model (TAM) Diffusion of innovation (DOI) model	Intention to use	120 respondents Structural equation modelling (SEM)	• PU and compatibility are key factors for using AMPS. • PEOU and complexity are not as a moderating role between PU /complexity and intention to use AMPS.
E. Park et al. (2014)	the satisfaction and usage intention of mobile social network games	Perceived control & skill Technology acceptance model (TAM) Perceived mobility Perceived enjoyment Satisfaction	Intention to Use	30 student online survey Structural equation modelling (SEM)	• perceived enjoyment, perceived usefulness, perceived mobility, and perceived control skill are motivational factors for players.

(Hajiheydari & Ashkani, 2018)	Investigate the factors influence mobile applications' adoption by users	Satisfaction Trust Technology acceptance model (TAM) The planned behaviour (TPB)	Decision making process	1348 potential mobile application users Structural equation modelling (SEM)	• the effect of satisfaction on intention to recommend, the trace of trust on subjective norms and the influence of perceived ease of use on perceived behavioural control were more potent.
Song et al. (2014)	The satisfaction of uses in mobile apps store.	An environmental psychology perspective, using discoverability facilitators.	User satisfaction	278 respondents, 155 respondents were in US and 123 respondents were in South Korea, Partial least squares (PLS).	• Model explains 49.2% of the variance in the user satisfaction for application discoverability.
C.-H. Hsiao et al. (2016)	Investigating key determinants of users' continuance intention regarding social apps.	Satisfaction, Continuance intention, Habit, and Customer value perspectives,	Continuance intention	407 questionnaires to college students from Taiwan, SEM and confirmatory factor analysis (CFA)	• The model's explained variance of satisfaction, habit, and continuance intention accounted for 70%, 67%, and 71%, respectively.
Seok Kang (2014)	Predict use intention of mobile apps.	Extended unified theory of acceptance and use of technology (UTAUT)	Continuance intention	788 users of apps, Structural equation modelling (SEM)	• The analysis found that only gender moderated the relationship between effort expectancy and continuance intention, implying that women were more likely than men to prefer ease of use for continuance intention.
S. J. Kim et al. (2015)	The effects of adopting and using a brand's mobile apps on subsequent purchases.	Difference-in-difference-in-difference (DDD) model	Effects of app Adoption	10,776 users of apps and 5127 non-users of apps, the propensity score matching model (Pi), the normalized differences (NDs)	• Younger customers are more likely to adopt than older customers, and the oldest customers are the least likely to adopt. Males are more likely to adopt than females.

Hoehle and Venkatesh (2015)	The continued intention to use social media mobile apps explained by a cultural perspective to understand.	Using Hofstede's five cultural values along with mobile apps usability	Continue intention to use	1844 respondents of U.S., Germany, China, and India, PLS.	• The results explained 38% of variance in continued intention to use
Bellman et al. (2011)	The effects of using branded mobile phone applications.	Pre-test/Post-test experimental design	Brand attitude and purchase intention	228 participants, 159 were in the South-western United States and 69 were in Western Australia, Analysis of variance (ANOVA)	• Apps increase the favourability of brand attitude and purchase intention. The relevance of the product category made no difference to the effectiveness of a branded pp
Harris et al. (2016)	Explore the factors that influence a consumer before installing a mobile app.	Perceived risk, Trust, Perceived benefit, and Intent to install and seven antecedents of trust and risk	Intention to Install	128 students, USA, PLS	• perceive more security have greater trust and reduced perceived risk
Hubert, Blut, Brock, Backhaus, and Eberhardt (2017)	mobile shopping applications	TAM, connectivity, contextual value, hedonic motivation, habit and risk (financial, performance and security)	Intention to Use	410 participants Structural equation modelling (SEM)	• risks and benefits impact ease of use and usefulness is influenced by the location sensitivity, time criticality, and extent of control. • acceptance predictors are associated with ease of use and usefulness, which in turn affect intentional and behavioural outcomes.

Source: Author

2.3.2 Previous research of Mobile Application Technology in the Tourism Industry.

In the previous section (2.3.1) we summarised previous research into mobile applications within different contexts. The following section reviews mobile applications in the tourism industry.

Several studies (Table 2.2) explore factors influencing technology adoption in the travel and tourism industry. Consumers tend to adopt mobile technologies and applications if they consider them useful, easy to use, and compatible with tasks such as searching travel information (Jiaying Lu et al., 2015), purchasing travel-related services (Morosan, 2014; Morosan & DeFranco, 2014a), making hotel reservations (Fong et al., 2017; Ozturk, Nusair, Okumus, & Hua, 2016; S. Park & Huang, 2017), or enhancing destination experience (Jung et al., 2015; Hyunae Lee, Chung, & Jung, 2015).

Mobile technologies and applications enable consumers to save time and to be more efficient and effective (Bader, Baldauf, Leinert, Fleck, & Liebrich, 2012). Most academic literature is in agreement that consumer motivation in a mobile environment follows the same reasoning, expectations, and behaviour as in a virtual environment (Magrath & McCormick, 2013). Traditionally, the virtual environment is described as a set of visible and audible stimuli.

However, the mobile environment is characterised by substantial differences and unique characteristics compared to the virtual online environment. For example, the possibility of identifying location, also known as “geolocation” (Zhao & Balagué, 2015), and obtaining relevant information based on user location. In the mobile environment, consumers are offered the possibility to carry out various actions, such as scanning QR codes, taking pictures, creating, and sharing self-generated content. While the aforementioned theories provide a considerable theoretical underpinning supporting examination of the new IS adoption, few empirical investigations concern the adoption of mobile Apps. Furthermore, the theories above do not fully capture user intention

behaviour regarding smart tourism App usage, which users frequently perform and is likely to become inertia and automatic over time (Lankton, McKnight, & Thatcher, 2012). Notably, there are many different subjects and methods to approach the study of mobile apps using diverse theories.

This study will develop SDT and TAM models. It introduces perceived enjoyment and habit to explore the intention usage of the smart tourism App, providing a better understanding of user adoption intentions in mobile App research. In the next four subsections, we describe theories and models applied in this research.

Table 2.2 Previous research of Mobile Application technology in the tourism industry

Authors	Context	Model/Theory	Dependent Variable	Sample / Method	Findings
(No & Kim, 2014)	Smartphones	united theory of acceptance and use of technology (UTAUT)	Travel decision making	400respondents Structural equation modelling (SEM)	usefulness, ease of use, social influence, and satisfaction with travel websites are main determinants influence travellers' intentions to use travel information on smartphones for their trips.
(Morosan, 2014)	Investigate air travellers' adoption of mobile phones to purchase ancillary air travel services.	Technology Acceptance Model (TAM); trust, privacy, security, innovativeness,	Intention to purchase	556respondents Structural equation modelling (SEM)	The strongest predictor of attitudes was perceived usefulness, followed by perceived ease of use and trust.
(Morosan & DeFranco, 2014b)	mobile applications (apps)	Technology Acceptance Model (TAM)	attitudes and intentions to use	737respondents Structural equation modelling (SEM)	It was found that usefulness and subjective norms have an impact in developing attitudes, which in

		Personalization privacy			turn influence club members' intentions to use mobile devices in clubs.
(Fong et al., 2017)	mobile applications (apps)	united theory of acceptance and use of technology (UTAUT)	Intention to reuse	457 Chinese participants	results show direct positive predictions of intention to reuse from UTAUT anchors
(Ozturk, Nusair, et al., 2016)	mobile hotel booking	motivational theory self-determination theory	Continue intention to use	396 respondents Structural equation modelling (SEM)	utilitarian and hedonic value had significant impacts on users' continued usage intentions
(Jung et al., 2015)	smartphone and mobile gadgets enhancing the experience in the destination	process theory	users' satisfaction intention to recommend	241 theme park visitors Structural equation modelling (SEM)	personalized service, and system quality affect users' satisfaction and intention to recommend augmented reality applications.

(H. Lee et al., 2015)	Augmented Reality (AR) application enhancing the experience in the destination	Technology Acceptance Model (TAM)	investigated the impact of cultural difference on acceptance of AR application (app) in cultural heritage tourism sites.	145 respondents Structural equation modelling (SEM)	The results showed that aesthetics of AR have the strongest influence on perceived enjoyment

Source: Author

2.4 The Development of Self-determination Theory

Self-determination theory (Richard & Deci, 1985; Ryan & Deci, 2000), commonly applied for examining human motivational behaviour, has been effective in explaining motivation, human motivational dynamics, and human motivational behaviour. It is described in the following terms: "Self-determination theory focuses on the dialectic between the active, growth oriented human organism and social contexts that either support or undermine people's attempts to master and integrate their experiences into a coherent sense of self" (P. P. Baard, Deci, & Ryan, 2004, p. 27). Ryan and Deci (2000) define self-determination theory as being when, "humans have the basic propensities to be intrinsically motivated, to assimilate their social and physical worlds, to integrate external regulations into self-regulations, and, in so doing, integrate themselves into a larger social whole".

Self-determination theory proposes two types of motivations: intrinsic and extrinsic. Intrinsic motivation is defined as being driven by interest and enjoyment, derived from participation in an activity; conversely, extrinsic motivation is defined as a type of motivation that is based on external reward or punishment (Nikou & Economides, 2017; Ryan & Deci, 2000). In diverse domains, the application of the principles of self-determination theory lead to increased intrinsic motivation (Guay, Ratelle, & Chanal, 2008; Ntoumanis et al., 2020). The theory is utilised in many areas of applied research, including education (J Reeve & Lee, 2014), organisational studies (Gagné et al., 2015), sport and exercise psychology (Matosic et al., 2017), health and medicine (Niven & Markland, 2016), and recreational activities (Rogers, 2017). Scholars highlight that SDT can be applied to an understanding of consumer behaviour intention (Hoffman & Novak, 2012; Y. C. Huang et al., 2016). An extrinsically motivated individual is inspired by the expectation of award, or benefit, external to interaction between system and user (Brief & Aldag, 1977). Therefore, extrinsic motivation influences behaviours, due to the beneficial value of performance; intrinsic motivation relates to the affective satisfaction derived from an activity for its own sake (Fred D Davis et al., 1992a). Ryan and Deci (2020) observe that external regulation concerns behaviours driven by externally imposed rewards and punishments; it is a form of motivation typically experienced as controlled and non-autonomous.

Prior research highlights intrinsic motivation leads to better persistence, performance, and satisfaction than extrinsic motivation in a variety of tasks across various domains (e.g., education, behaviour) (P. P. Baard et al., 2004; Black & Deci, 2000; Deci, Connell, & Ryan, 1989; Williams, Grow, Freedman, Ryan, & Deci, 1996). However, K.-Y. Lin and Lu (2011) highlight that IT usage intention may be explained by both intrinsic and extrinsic motivations, represented by constructs of "perceived enjoyment" and "perceived usefulness" respectively. J. Wu and Lu (2013) support these conceptualisations, finding that, with regard to behavioural intention studies on IT, perceived enjoyment and usefulness are the most prominent intrinsic and extrinsic motivators. Ryan and Deci (2000) address concerns that one common approach to measure intrinsic motivation is to access self-reported enjoyment of an activity. If an individual is motivated intrinsically, he or she is doing something for fun, rather than rewards behind the action; alternatively, those extrinsically motivated seek other outcomes behind the activity (Ryan & Deci, 2000).

This study examines factors influencing consumer use of smart tourism apps. Firstly, consumers use mobile apps voluntarily or habitually before, during, or after a trip for enjoyment, rather than as a consequence of rewards or punishments for doing so. In this study, SDT to TAM denotes the process of converting extrinsic motivators into intrinsic motivators, influencing consumer intention to use the app.

In an environment where smart tourism mobile Apps, such as TripAdvisor, Mafengwo, and Qunaer are free to download, intrinsic motivation is an important psychological construct to consider as barriers to access are relatively low compared with traditional forms of travel, such as no service fees and switching costs. Furthermore, from a customer point of view, participation with such travel applications is a voluntary activity; the customer can choose a type of service with minimal penalties. For example, customers can refer to travel experiences shared by other travellers when making their own travel plans; trips may be continued, altered, or cancelled with ease. Self-determination theory places emphasis on an individual "sense of choice, volition, and commitment", which is defined as autonomy; one of three basic psychological needs along with competence and relatedness (Deci & Ryan, 2010, p. 2). SDT focuses on motivation, proposing humans have basic psychological needs for autonomy, competence, and relatedness.

Various researchers have applied different approaches to examine intrinsic motivation (see Table 2.3). Early research that led to the development of cognitive evaluation theory, a sub-theory of SDT (Deci & Ryan, 2010), has shown external controls can diminish intrinsic motivation. This is specific to time spent on an activity during a free choice period and in respect of self-reported interest in the task, such as contingent rewards (Deci, Koestner, & Ryan, 1999), deadlines (Amabile, DeJong, & Lepper, 1976), surveillance, evaluation (Amabile, 1979; Harackiewicz, Manderlink, & Sansone, 1984), and threats (Deci & Cascio, 1972).

Table 2.3 Different approaches to examine intrinsic motivation

Authors	Aim	Method	Findings
Deci, Koestner, & Ryan, 1999	Contingent rewards	A meta-analysis of 128 studies	engagement-contingent, completion-contingent, significantly undermined free-choice intrinsic motivation and self-reported
(Amabile, DeJong, & Lepper, 1976	Studied the effects of externally imposed deadlines on individuals' task performance.	experiment	In the absence of external constraints, subjects in the deadline condition were less interested in the game than those in the non-deadline condition.
Amabile, 1979	Examined the conditions under which the imposition of an extrinsic constraint upon performance of an activity can lead to decrements in creativity.	experiment	subjects in the evaluation groups produced artworks significantly lower on judged creativity than did subjects in the non-evaluation control groups.
Harackiewicz, Manderlink, & Sansone, 1984	an evaluative contingency established before playing, performance feedback, and the receipt of a reward.	experiment	evaluation is responsible for negative reward effects, whereas competence feedback and cue value have independent positive effects
Deci & Cascio, 1972	Intrinsic Motivation as a	experiment	negative feedback and threats of punishment decrease intrinsic motivation

	Function of Negative Feedback and Threats

Source: Author

In accordance with Ajzen (1991) theoretical framework, studies in various fields suggest that the psychological need of autonomy, competence, and relatedness determine underlying motivational mechanisms directing individual behaviour intentions. This type of research has been explored further in marketing (Dahl & Moreau, 2007; C.-P. Lin, Tsai, & Chiu, 2009; Schepers, Falk, de Ruyter, de Jong, & Hammerschmidt, 2012). Researchers have found a significant relationship between SDT and Technology Acceptance, which can be applied to an understanding of consumer behaviour intentions (Hoffman & Novak, 2012; Y. Lee, Lee, & Hwang, 2015). Furthermore, Roca and Gagné (2008) apply SDT constructs to predict perceived usefulness, perceived ease of use, and playfulness, suggesting that individual intrinsic can be predicted in relation to satisfaction of the three psychological needs of autonomy, competence, and relatedness.

2.4.1 Autonomy

Autonomy is defined as a desire to self-organise action, resulting in the individual being able to freely purse the activity, feeling volitional in doing so (Deci et al., 1989; Deci & Ryan, 2010; Elliot & Thrash, 2002). Autonomy is characterised by authentic behaviours and actions, emanating from and fully endorsed by the self (Ryan & Deci, 2017). Autonomy sits in contrast to heteronomy, in which behaviours are regulated by controlling forces either internal (guilt) or external (rewards or punishments). When the need for autonomy is satisfied, individuals become more likely to perform at their best (Adie, Duda, & Ntoumanis, 2008), act creatively (Sheldon, 1995), engage and persist with activities (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), feel psychologically well (Ryan & Deci, 2001), and form and maintain high-quality social relationships (Deci & Ryan, 2014).

Self-determination theory predicts negative outcomes due to a lack of autonomy, such as reduced interest and persistence, potentially resulting in a host of undesirable psychological consequences. Q. B. Liu and Karahanna (2017) study notes the interactive environment of the Internet, emphasising the importance of providing autonomy to consumers to determine

information they would like to examine; as such, autonomy provides consumers with a greater sense of control and empowerment.

McShane and Sabadoz (2015) denote consumer empowerment as a state of being, whereby consumers are free to exercise their rights in the marketplace in such a way that allows them to pursue economic, rational, and broader human interests. Furthermore, with the development of information technology, consumers are provided with more freedom of choice and information opportunity (Broniarczyk & Griffin, 2014). Customers are likely to feel empowered when they are able to select a range of services in line with their needs. There are many smart tourism apps that consumers can choose; for example, Tripadviser and Mafengwo, are popular among consumers due to their broad range of options and services.

Furthermore, several studies have highlighted the positive impact that mobile application tools and technologies can have on learning (Archer et al., 2014; D. C. Wu, Li, & Song, 2012). Increasing intrinsic motivation by increasing autonomy by providing options rather than external incentives. For example, according to Turkay and Adinolf's study (2015), a personalised video game increased users' willingness to continue playing the game. Thus, technology that enhances users' control, whether it be more influence, more knowledge, and more resources, provides a closer relationship with colleagues and communication partners, making him/her feel competent to perform tasks; he/she will be more intrinsically motivated to use the technology. The sense of control that a person feels within a specific context is linked to independence within SDT. Informed by previous work, this study proposes the following hypothesis:

H1a: Autonomy has a positive impact on perceived usefulness.
H1b: Autonomy has a positive impact on perceived ease of use.

2.4.2 Competence

According to Rigby and Ryan (2018), competence is our basic need to feel effective, successful, and experience growth. People want to feel that they have what they need to succeed at daily tasks, including resources, skills, and expertise. Perceived competence, defined as the capacity of a person to assume responsibility for each procedure, stems from the capability to transcend apparent difficulties (Ryan & Deci, 2000). Competence refers to a desire to be

effective when performing an activity (Deci et al., 1989; Deci & Ryan, 2010; Elliot & Thrash, 2002).

Hughes, Galbraith, and White (2011) suggest perceived competence consists of two elements: self-efficacy and self-concept. However, self-efficacy and self-concept differ in the extent to which competencies contribute to their composition. Self-efficacy is thought to deal primarily with perceived perception of competence; self-concept is typically viewed as being comprised of affective, as well as competency, perceptions (Marsh, 1992). Pajares and Schunk (2002) observe that self-efficacy perceptions ask "can" questions. For example, can I do this technology? On the other hand, self-concept competency perceptions involve "being" questions, such as: am I good at this mobile app?

In this study, perceived competence is defined as the capability to perform and complete a task or activity. Self-efficacy is individual belief in the ability to perform a particular task, or behaviour, and it is similar to the concept of competence within SDT. Bandura (1986, p. 391) presents self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. People with stronger sense of self-efficacy are less likely to give up on an action".

Although self-efficacy is indirectly associated with actual competence (Dörnyei, 1998), it shares common features with perceived competence in SDT (Roca & Gagné, 2008); it is concerned with skills and judgments regarding ability and skills. Previous research establishes that self-efficacy has an important role in improving motivation, attitude, and intention (Ajjan, Hartshorne, Cao, & Rodriguez, 2014; C.-H. Hsiao & Tang, 2015). X. Zhang et al. (2017) argue the self-efficacy of mobile applications is associated with perceived ease of use, attitude, and adoption intention of mobile applications. In view of this, perceived competence may be considered as influencing perceived ease of use.

Furthermore, perceived competence reflects individual belief about ability to perform an action successfully and achieve goals, increasing motivation (Ryan & Deci, 2020). In a technology context, this belief is associated with user perception about the available system, such as utility and ease of use (Y. Lee et al., 2015). The perceived utility of a system reflects user concepts of given value to that system for the improvement of performance (Fathali & Okada, 2018). In

this study it was expected that perceived competence would influence perceived usefulness. Therefore, this study proposes the following hypothesis:

H2a: Competence has a positive impact on perceived usefulness.
H2b: Competence has a positive impact on perceived ease of use.

2.4.3 Relatedness

Relatedness is accomplished in the context of technology when the consumer feels connected to other people (Sundar, Bellur, & Jia, 2012). Although most individuals consider "person interactivity" as a manifestation of "information interactivity"—the ability to exchange information back and forth with others (Sundar, Jia, Waddell, & Huang, 2015). Self-determination theory proposes psychological needs as relatedness, which is defined as a user's desire to "interact with, be connected to, and experience caring for other people" (Ryan & Deci, 2000). Although perceived relatedness is considered less influential than perceived autonomy and competence, it occupies an important role in behavioural intentions (Ryan & Deci, 2000). Engaging with technology reflects a desire to feel connected and associated with others (Tamborini, Bowman, Eden, Grizzard, & Organ, 2010). Relatedness, as with autonomy and competence, facilitates high-quality motivation and describes a human need to form close interpersonal relationships (La Guardia & Patrick, 2008), belong to a group (Baumeister & Leary, 1995), and feel cared for by others (Ryan, Huta, & Deci, 2008). One of the primary factors in customer behaviour is that actions are valued by others to whom an individual feels attached or related (Ryan & Deci, 2000).

Ryan and La Guardia (2000) argue that an activity can be interesting, even though it is not enjoyable in itself, and valued by others with whom users wish to connect. User motivation can be enhanced through the sense of relatedness, especially when they are in an autonomous, supportive environment. Relatedness leads users of any technology towards feelings of enjoyment (Rogers, 2017). Users depend on the formation of close bonds with others in Apps. A supportive environment of relatedness provides the ability to connect with others for mutual benefit. As a factor in autonomous motivation, perceived relatedness will help users self-determine the behaviour of using smart tourism apps for their travel.

In an investigation into e-service, M.-H. Hsu and Chiu (2004) report perceived relatedness as having significant effects on attitudes toward e-service usage. In addition, T.-S. Hew and Syed A. Kadir (2017) argue that perceived relatedness with significant others predicts usage behaviour. Users can communicate with people from multiple locations around the world through smart tourism apps; it is therefore hypothesised that increased perception of relatedness with significant others inclines users to use smart tourism apps. As a result, perceived relatedness should be positively related to perceived usefulness and perceived ease of use in the present context. Therefore, the following hypothesis is proposed:

H3a: Perceived Relatedness has a positive impact on perceived usefulness.
H3b: Perceived Relatedness has a positive impact on perceived ease of use.

2.5 Theories of Technology Acceptance

Various researchers have developed models that explain consumers' behavioural intentions using technology systems. The most common models include TAM (Fred D Davis, 1989), UTAUT (Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, & Fred D. Davis, 2003a), and TPB (Ajzen, 1991) which was originally extended from TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), emphasising the belief-attitude-intention-behaviour rationale.

Fishbein (1967) developed the TRA model in an effort to understand the relationship between attitudes and behaviour. TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) posits that behavioural intentions, viewed as the immediate antecedents to behaviour, function as salient information, or belief regarding the likelihood that a certain behaviour will lead to a specific outcome. Madden, Ellen, and Ajzen (1992) further demonstrate that information or salient beliefs affect intentions and subsequent behaviour through attitudes and/or subjective norms. Furthermore, the TRA model depicts attitudes towards behaviours, along with the impact of relevant reference people (the subjective norm), and formation of intention, which in turn results in behaviour (Fishbein & Ajzen, 1975, 2011).

Most empirical applications of TRA attempt to explain the interaction of specific internal and external factors, underpinning individuals' willingness to perform the general behaviour (Teich, 2002), and from marketing, such as in tourism studies (Çelik & Rasoolimanesh, 2021;

Chung, Lee, Kim, & Koo, 2018). For example, Çelik and Rasoolimanesh (2021) examine how cost-benefit attitudes fulfil a mediating role between resident attitudes and support for tourism development using the TRA model. Results indicate that the negative and positive attitudes of residents towards tourism have a direct effect on cost-benefit attitudes and indirect effects on support for tourism.

However, the TRA model has received criticism as it does not consider situations where behaviour is not completely under individual control (Yusuf & Derus, 2013). For example, consumers may avoid purchasing groceries online if they perceive the purchase process as too complex, or if the consumer does not possess the resources necessary to perform the considered behaviour. Although the TRA model has proven remarkably robust in various settings (Gentry & Calantone, 2002), examples of the use of the TRA in the context of technology consumption are limited.

Another widely used model able to predict intentions and behaviour is the Theory of Planned Behaviour (TPB) (Ajzen, 1991). Fishbein and Ajzen (2011) propose TPB, extending TRA by explicitly incorporating perceived behavioural control (PBC) as a determinant of behavioural intentions and behaviour. TPB depicts attitudes toward the behaviour and the impact of relevant reference people (the subjective norm), customers' perceived control over the behaviour under study (perceived behavioural control), and the formation of intentions. Madden et al. (1992) note that perceived behavioural control will be higher in individuals who possess more resources and opportunities. Additionally, the inclusion of perceived behavioural control significantly enhances predictions of intent and target behaviour; TPB explains more variation than TRA (Madden et al., 1992).

Similar to TRA, TPB has also been applied extensively in many different fields. Not only has it been used to examine weight loss (Schifter & Ajzen, 1985) and information systems (Mathieson, 1991), but it has also provided a platform to investigate tourists' visiting intentions (Ashraf, Hou, Kim, Ahmad, & Ashraf, 2020) and self-service technologies (Al-Ajam & Nor, 2015; Yeap, Ramayah, & Soto-Acosta, 2016). However, the theory has been criticised for incorporating PBC as the only aggregated variable to answer all non-controllable elements of behaviour (Taylor and Todd, 1995a). TPB has also been criticised with regard to its comprehensiveness and the positive relationship between PBC and BI; it is believed that other constructs, such as habit, might also predict intention and behaviour (Eagly & Chaiken, 2011).

However, it is only reasonable for positively valanced behaviours and not for negatively valanced behaviours (Eagly & Chaiken, 2011; Hale, Householder, & Greene, 2002). In summary, individuals who believe they can control behaviour may experience changing intentions; nevertheless, this does not mean that individuals are obliged to change their intentions if they possess negative attitudes towards the behaviour (Hale et al., 2002).

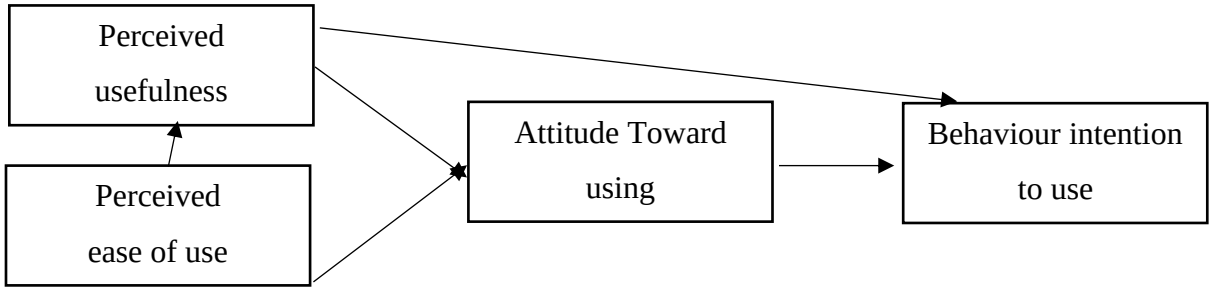
2.5.1 Technology Acceptance Model

Despite the aforementioned general theories developed to explain "virtually any human behaviour" (Ajzen & Fishbein, 1980, p. 4), Davis (1985) proposed the Technology Acceptance Model (TAM). Based on a theory of reasoned action, TAM was proposed by Fred D. Davis (1989) to assess individual acceptance of information technology, postulating that perceived usefulness and ease of use determines individual attitude toward using information technology.

According to Fred D Davis (1985), the use of technological products depends on the intention to use (IU), which, in turn, depends on associated attitudes. This attitude is formed by an assessment of the perceived ease of use (PEOU), and the perceived usefulness (PU) of technology. In wireless technology research, models with and without the "attitude" variable explain the intention to use mobile technology in an organisational context (C.-S. Wu, Cheng, Yen, & Huang, 2011).

Perceived usefulness is defined as 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Fred D. Davis, 1989, p. 320). Perceived ease of use is defined as 'the degree to which a person believes that using a particular system would be free of effort' (Fred D. Davis, 1989, p. 320). This model is considered the most influential theoretical approach in the study of determinants related to the use of information technology due to its robust, flexible, and explanatory strength (Djamasbi, Strong, & Dishaw, 2010; Hussein, 2017). The factors influencing behaviour are illustrated in Figure 2.2 below.

Figure 2.2 Technology Acceptance Model



Source: Fred D. Davis (1989)

In a study of consumer behaviour towards technology, the TAM model has been widely applied and enhanced with factors deriving from multidisciplinary knowledge (Fred D Davis, 1989). The UTAUT from Viswanath Venkatesh, Michael G Morris, Gordon B Davis, and Fred D Davis (2003b) expands TAM, postulating that expected performance, expected effort, social influence, and facilitating conditions are four key concepts of user acceptance. Madigan et al. (2016) highlight that UTAUT is viewed as a robust theory able to investigate consumer adoption of technology; it is normally applied to study the use of information systems (IS).

Additionally, both TAM and UTAUT models are generic, explaining the general acceptance of technology. Therefore, they cannot accurately explain the adoption of a specific system (C. Kim, Mirusmonov, & Lee, 2010; J. Lu, Yao, & Yu, 2005). However, C. Kim et al. (2010) argue that, even though UTAUT effectively explains the intention to use an information system, TAM is preferred for the research context, namely mobile payments. Furthermore, D.-s. Liu and Chen (2009) highlight that UTAUT is unable to explain the acceptance behaviour of mobile systems.

Agrebi and Jallais (2015) propose a model specific to mobile commerce, explaining the intention to use the system by TAM. For instance, Yoo et al. (2017) adopted the Technology Acceptance Model and Uses & gratifications theory to explore factors affecting the adoption of gamified smart tourism applications. The results indicate perceived usefulness and ease of use have positive influences in intention adoption. In summary, there are many versions of TAM, and no single version is able to fit all contexts. Studies suggest that developing a TAM based model for a specific industry will provide more accurate and meaningful results.

Therefore, these various models explain intention behaviour; the basic TAM can be adapted for this study.

The TAM has been widely applied and tested in diverse studies; it is used to predict and investigate customer intention and behaviour in various contexts. The use of TAM is due to its simplicity, understandability, and flexibility, especially in the tourism and travel context (Mathew & Soliman, 2021; Matikiti, Mpinganjira, & Roberts-Lombard, 2018; Sahli & Legohérel, 2016). Stocchi, Michaelidou, and Micevski (2019) examine drivers and outcomes of mobile app use intention, whereas other research focuses on social media for outbound leisure travel (Singh & Srivastava, 2019). Mathew and Soliman (2021) investigate the impact of self-efficacy and innovation on attitude and intention to adopt mobile learning using the TAM in a tourism education context.

With regard to travel and tourism, results from a 2015 Cornell University illustrate that consumers are using, or willing to use, mobile devices in all stages of their travel; most users are willing to download travel apps (Linton & Kwortnik, 2015). Recent research explores opportunities to use marker-based or GPS-based AR to enhance their overall tourism experience (Garau, 2014; Jung et al., 2015). However, it is essential to examine user acceptance while assessing the potential of new technologies; a large amount of user acceptance research adopts the technology acceptance model (TAM) to identify the acceptance of new technological innovations. A recent study by tom Dieck and Jung (2018) develops a new model of AR acceptance in the context of urban heritage tourism through the TAM model. The outcomes suggest PEOU, PU affects the intention to use, and information system quality, are considered important in terms of mobile AR acceptance within the tourism context. However, cost of use, in terms of receiving free Wi-Fi or having to pay for the Internet, as well as the application, were perceived as acceptance factors. Y.-C. Huang, Backman, Backman, and Moore (2013) report a positive relationship between tourist perceptions of ease of use and travel intention in a context of 3D tourism. In the area of consumer-generated media usage for travel decision-making, Hew et al. (2018) note a positive connection between perceived usefulness and mobile social tourism shopping intentions.

Furthermore, the theoretical framework of TAM can be used to understand tourists' use of information technology to make decisions during their trip (Noor, Hashim, Haron, & Aiffin, 2005). Recent research suggests the use of information technology in promoting tourism

products and destinations provides tourists with a virtual experience, influencing consumer travel intentions (C. Chen & Schwartz, 2008; Y.-C. Huang et al., 2013; H.-b. Kim, Kim, & Shin, 2009; Morosan & Jeong, 2008). Casaló, Flavián, and Guinalíu (2010) investigate consumer behaviour in firm-hosted online travel communities. The study indicates the positive influence of perceived ease of use and usefulness on consumer attitudes and intentions to participate in the virtual travel community and the likelihood of recommending tourism products and services.

TAM, H.-b. Kim et al. (2009) examine consumer use of airline websites, finding that constructs of perceived ease of use and usefulness are positively associated with consumer attitudes and behavioural intentions. Moreover, C.-C. Chen and Tsai (2019) integrate the TAM and information system success model to explore user intentions regarding the use of the personalised location-based mobile tourism application (PLMTA) for travel planning. It was found that perceived ease of use and utility significantly affects individuals' intentions to use PLMTA. Similarly, Ayeh, Au, and Law (2013) investigate the use of consumer-generated media for travel planning; they suggest perceived ease of use and usefulness positively influence behaviour intentions.

In addition, given the variety of goals that travel mobile apps are designed to achieve, as well as the variety of features that these apps incorporate to achieve those goals, one might expect that an individual's decision to use a particular travel app would be based on the app's benefits and the level of complexity (or simplicity) of using it. These two considerations are sufficient to demonstrate TAM's suitability for determining people's proclivity to use or continue using a particular app. While research into the use of smart tourism apps that use TAM as a theoretical foundation is still in its early stages, a few studies have confirmed the model's validity in the context of smart tourism apps by highlighting the impact of perceived usefulness and perceived ease of use on people's actual use of mobile apps (B. R. Wang, Park, Chung, & Choi, 2014) and their intention to continue using a mobile app (Cho, 2016; Cho, Lee, & Quinlan, 2015). In this research, a model based on TAM is developed to explain how various customer perceptions are formed, and how they influence customer intention to use smart tourism applications.

2.5.2 Perceived Ease of use (PEOU)

Perceived Ease of Use (PEOU) is defined as the degree to which a person believes using a system will be free of effort (Fred D. Davis, 1989). In this research, PEOU is defined as the degree of ease associated with the use of smart tourism apps. PEOU is a key component of technology adoption and usage behaviour. One of the relations of TAM is the positive correlation between perceived ease of use and perceived usefulness; this shows there is an indirect relationship between perceived ease of use and perceived usefulness. Many studies over the past decade have highlighted evidence regarding the critical effect of perceived ease of use on intention, either directly or indirectly, with that of perceived usefulness (Agarwal & Prasad, 1998; Fred D. Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000). Information system researchers have found a positive and significant relationship between behaviour intention towards new information systems and perceived ease of use (Chong, Liu, Luo, & Keng-Boon, 2015; Fred D. Davis, 1989; K. Hur, Kim, Karatepe, & Lee, 2017). Additionally, Liébana-Cabanillas, Marinković, and Kalinić (2017) argue there is no significant relationship between perceived ease of use and behavioural intention towards mobile commerce acceptance. Respondents were willing to continue using m-commerce services based on the usefulness offered by mobile payments rather than the simplicity of the transaction.

However, the focus and context of this research is smart tourism applications, which are somewhat different from m-commerce. Consumers are able to use the app for other primary services in addition to the commerce function, such as real-time searches for information and GPS location. Hubert et al. (2017) highlight consumer intention may be influenced by information received about the ease of use and usefulness of the technological system. Therefore, drawing on this discussion, the study proposes the following hypothesis:

H4a: Perceived ease of use positively affects the perceived usefulness in smart tourism app.
H4b: Perceived ease of use positively affects the intention to use in smart tourism app.

2.5.3 Perceived Usefulness (PU)

Perceived Usefulness (PU) is defined as the degree to which a person believes using a particular system will enhance their job performance (Fred D. Davis, 1989). PU is the key antecedent of

TAM, consistently influencing behaviour intention of users towards new information or technology systems. (S. C. Chang & Tung, 2008; Chong et al., 2015; Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014; Venkatesh & Davis, 2000) recommend perceived usefulness as having a positive relationship with behaviour intention related to use of new technology. Perceived usefulness generally has a stronger impact on acceptance of new technology (Adams, Nelson, & Todd, 1992; Fred D Davis, 1989). Most notably, a number of empirical studies have demonstrated the relationship between perceived usefulness and intention to use mobile phones in the field of mobile commerce (Khalifa and Shen (2008); June Lu (2014); J.-H. Wu and Wang (2005). In addition, Natarajan, Balasubramanian, and Kasilingam (2017) and Liyi Zhang, Zhu, and Liu (2012) meta-heuristic studies demonstrated the significance of the positive relationship between perceived usefulness and intention to use mobile shopping applications.

Studies related to the effects of PU in the field of new technologies present different results. Previous studies in the field of information systems provide evidence of the significant effect of PU on the usage intention of mobile banking apps (Luarn & Lin, 2005; Pham & Ho, 2015). However, others do not show significant results for this relationship (H. Li, Liu, & Heikkilä, 2014). Furthermore, PU was shown to be a significant predictor of intention to use a new technology system (AbuShanab & Pearson, 2007; San Martín & Herrero, 2012; Venkatesh et al., 2003a). Overall, people utilise smart tourism apps based on their perception of their beneficence. Therefore, we state the following proposition:

H5: Perceived usefulness positively affects the intention to use smart tourism apps.

2.6 Perceived Enjoyment

In addition to ease of use, usefulness, autonomy, competence, and relatedness, perceived enjoyment as an intrinsic factor also influences intention behaviour. Results of previous studies suggest the behaviour assumed by individuals is partly influenced by perceived enjoyment (Teo et al., 1999). In an information system context, perceived enjoyment is defined as the fun or pleasure derived from use of a technology; hedonic motivation is added as a predictor of consumer behavioural intention (Fred D Davis et al., 1992a; Venkatesh, Thong, & Xu, 2012). Fred D Davis et al. (1992a) believe enjoyment is an intrinsic motivation, describing how an

individual perceives something as enjoyable regardless of anticipated consequences; the extent to which the activity of using computer system is perceived to be personally enjoyable removed from the instrumental value of technology.

Enjoyment has a hedonic value which influences user attitude and intention toward the use of information system. Therefore, when users find a system delightful and pleasurable, they become intrinsically motivated to adopt it (Van der Heijden, 2004). For example, microcomputers (Igbaria, Schiffman, & Wieckowski, 1994), online video games (C. P. Lin & Bhattacherjee, 2010), or mobile data services (B. Kim & Han, 2011); this could be applicable equally in the context of smart tourism applications.

Prior research proposes enjoyment as a determinant of ease of use (Venkatesh, 2000; Venkatesh, Speier, & Morris, 2002), and of behavioural intention (Fred D Davis et al., 1992a; Venkatesh et al., 2002). Venkatesh et al. (2003b) and Mun and Hwang (2003) argue that perceived enjoyment has no direct influence on intention to use, but it can influence ease of use and usefulness. However, perceived enjoyment remains important in hedonic or semi-hedonic technology settings as the intrinsic joy of using technology is a significant determinant of user perception and behaviour (Turel, Serenko, & Giles, 2011) Perceived enjoyment is the strongest factor in explaining the adoption intentions of mobile data services (SeJoon Hong, Thong, & Tam, 2006). MäNtymäKi and Salo (2011) examine the role of enjoyment on continuance usage intention toward virtual goods, finding continuance usage intention is strongly determined by perceived enjoyment. C.-C. Hsiao and Chiou (2012) discovered that players' perceived enjoyment significantly influences attitudes toward online gaming. Similarly, Chiu, Chang, Cheng, and Fang (2009) demonstrate the positive influence of enjoyment on customers' online repurchase intentions.

Considering mobile devices, while mobile apps have utilitarian benefits, due to their ubiquitous and convenient nature, consumers' hedonic motivation to use them is fundamental to app success (Y.-H. Fang, 2019). C.-H. Hsiao et al. (2016) affirm the level of enjoyment experienced during use of a mobile app as able to influence consumer attitudes and use intention with the mobile app. Following this, June Lu, Liu, and Wei (2017) highlighted the importance of enjoyment in predicting the intention to use a mobile app.

Teo, Lim, and Lai (1999) studied the effects of motivation to use technology, focusing particularly on the Internet. They found perceived ease of use influences perceived enjoyment; if the use of a system is perceived as easy, it is also perceived as fun (Bruner Ii & Kumar, 2005). This facility gives users a sense of control which, in turn, induces a greater feeling of enjoyment and fun. Bruner Ii and Kumar (2005) demonstrate a positive relationship between the utilitarian and hedonic aspects of shopping with mobile phones. However, Hubert et al. (2017) examine enjoyment as an antecedent of perceived usefulness, considering ease of use towards m-shopping usage intention; both relationships were found as insignificant, confirming the existence of questions surrounding the role of enjoyment at the usage phase.

Agrebi and Jallais (2015), studied the relationship between perceived ease of use and perceived enjoyment; through an experimental study into a mobile commerce ticket booking website, they tried exploring intrinsic and extrinsic motivational factors for use of technology. Mobile commerce websites give the user a sense of control over actions; this induces a great feeling of fun and enjoyment in the user (Agrebi & Jallais, 2015). This can be extended to mobile tourism applications. Therefore, this study proposes the following hypothesis:

H4c：Perceived ease of use positively affects the perceived enjoyment in smart tourism app.

Additionally, the construct enjoyment has been examined in relation to autonomy, as an important factor in understanding user experience in smart tourism environments. Exploring motivational behaviour and persistence in the context of online environments, Neys JLD (2010) posit the satisfaction of autonomy as contributing to individual experiences of enjoyment, and resulting in sustained future behaviour. Studying entertainment media, Tamborini et al. (2010) validate the framework of SDT, with respect to association between satisfaction of psychological needs and participant enjoyment and engagement in the context of a multi-user online environment. Additionally, Ryan and Deci (2000), and K. Kim et al. (2015), determine enjoyment and satisfaction are derived from particular activities, and may be understood in relation to a sense of independence that accompanies them. The study further identified enjoyment, and fulfilment of requirements, as encouraged by a sense of control derived from computer games. Therefore, this study proposes the following hypothesis:

H1c: Perceived Autonomy has a positive impact on perceived enjoyment.

Several studies have examined the influence of enjoyment on the TAM within different IS contexts. Al-Maghrabi, Dennis, and Vaux Halliday (2011) find enjoyment is one of the factors influencing continued intention among users regarding e-shopping in Saudi Arabia. Similarly, Wen, Prybutok, and Xu (2011) examine the influence of enjoyment on online repurchase continuance intention among university students in the USA.

Previous research established that perceived enjoyment may have a positive effect on intention to use new technologies (Fred D Davis et al., 1992a); it is claimed to be a significant precursor of the intention to use; the same is true in the context of mobile services; intention to use is significantly affected by enjoyment (Nysveen, Pedersen, & Thorbjørnsen, 2005). Perceived enjoyment is claimed as a significant precursor of intention to use (X. Fang, Chan, Brzezinski, & Xu, 2005; Ho Cheong & Park, 2005). Smart tourism apps for smartphones are not only tools able to achieve utilitarian goals, such as making travel plans, but also hedonic goals, such as the excitement of using the app. Perceived enjoyment enhances the hedonic value of apps, increasing intended adoption (Dong Jin Kim, Kim, & Han, 2007). In a study investigating perceived enjoyment as a driver of user continuance intention of mobile applications, June Lu et al. (2017) reported enjoyment as a primary driver attitude influencing continuance intention.

Agrebi and Jallais (2015) conclude that using the phone to make purchases can be perceived as pleasant, given wireless devices can be used anytime and anywhere; some people use mobile web services to pass time. Choi, Wang, and Sparks (2019) employed a qualitative approach to investigate factors affecting mobile app user's continued use intention; based on previous participant experiences, they suggest perceived enjoyment as a key determinant of use intention in the context of travel apps. In this sense, perceived enjoyment is a concept introduced in the model to show intention to use depends on hedonic factors in the context of smart tourism applications. It therefore follows that:

H6: Perceived enjoyment positively affects intention to use in smart tourism apps.

2.7 Status quo bias theory and Inertia

Status quo bias theory denotes the way an individual stays in a status without doing anything, while making an actual decision (Samuelson & Zeckhauser, 1988). When faced with a new decision, the consumer most likely does nothing, or maintains a current or previous decision. The status quo effect may be caused by three factors: (1) rational decision making; (2) cognitive misperceptions; (3) psychological commitment (Samuelson & Zeckhauser, 1988, p. 33). Polites and Karahanna (2012) suggest status quo bias may be considered as behaviour, cognitive, and affective-based decision preferences. Behaviour-based status quo bias refers to continued use of the incumbent product without thought; cognitive-based denotes a conscious decision to continue using the incumbent product at hand; affective-based reflects the fact consumers have an emotional attachment toward an incumbent product, with little intention to switch.

The focal incumber system construct is inertia, a manifestation of status quo bias. Polites and Karahanna (2012) define individual level inertia as the attachment to, and persistence of, existing behavioural patterns; even when there are better alternatives or incentives to change. Based on SQB theory, Polites and Karahanna (2012, p. 28) suggest " inertia is the mechanism by which incumbent system habit impacts behavioural beliefs and intention toward using a new system." Incumbent system habit refers to situations where users are accustomed to using current collaboration systems. From an automatic process perspective, incumbent system habit also leads to status quo inertia. (Polites & Karahanna, 2012).

Some studies confuse the concept of inertia with habit (M. H. Huang & Yu, 1999; White & Yanamandram, 2004). Habit refers to action, automatically triggered by stimulus cues. Incumbent system habit refers to situations whereby users are accustomed to their current collaboration systems (Polites & Karahanna, 2012). From the automatic process viewpoint, incumbent system habit also leads to status quo inertia. Habits are often viewed as beneficial, as they prevent individuals from the necessity to make decisions, reducing costs of "individual choice and responsibility, including gathering and processing information and weighing outlay against input" (Wood & Quinn, 2004, p. 55).

As noted by Samuelson and Zeckhauser (1988) habits enable individuals to automatically defer to the status quo, reducing costs associated with reanalysis of past decisions to follow a

particular course of action; this implies habits will be associated with behaviour-based inertia. Inertia has been recognised as a concept with implications for many scientific disciplines; in the IS field, H.-W. Kim and Kankanhalli (2009) use SQB to describe user resistance to new systems. Habit and inertia are simultaneously cognitive and affective (Polites & Karahanna, 2012). “Habit is a learned response automatically triggered by stimulus cues; inertia is a conscious choice to stay with the status quo” (De Guinea & Markus, 2009).

K. Lee and Joshi (2017), argue cognitive misconceptions, loss aversion, uncertainty, and psychological commitment, drive the choice of status quo. However, habit may be unconscious. De Guinea and Markus (2009) state, “Behavioural inertia implies that use of a system continues simply because it is what the individual users have always done, and therefore without giving it much, if any, thought.” Therefore, inertia appears frequently interchangeable with habit. Some studies confuse concepts of inertia and habit (M. H. Huang & Yu, 1999; White & Yanamandram, 2004). One researcher illustrated inertia in brand purchasing as “habituation” (Bawa, 1990); Fredrickson and Iaquinto (1989) equate inertia, momentum, and habit. Polites and Karahanna (2012) believe that, although habit may lead to inertia, inertia is a conscious choice to remain within the status quo, even when presented with better alternatives.

In the previous review, according to Polites and Karahanna (2012), inertia consists of three components: cognitive-based inertia, affective-based inertia, and behavioural-based inertia. Firstly, cognitive-based inertia implies an individual consciously continues to use a (smart tourism app) system, even when aware it may not be the best option, or the most effective way to do things. Secondly, affective-based inertia denotes how users continue to use a system (smart tourism apps), as change is stressful, or they enjoy using it, or feel comfortable; they may have developed a strong emotional attachment to the ‘current way’ of doing things. Finally, behavioural-based inertia implies use of the system (smart tourism apps) will continue, as it is what the user has always done. Specifically, consistency of previous consumption behaviour drives consumer psychological preference for a no-thought state, activating inertia; the magnitude of previous consumption drives consumer preference for a no-regret state, leading to inertia. In summary, when consumers create inertia through cognition, psychology, and behaviour, it is difficult for consumers to change to a new system (other smart tourism apps). Therefore, habit will be created with each use of the incurrent system (smart tourism apps).

In literature related to the field of marketing, constructs of habit and inertia are used to predict consumer continuance intention (Bawa, 1990; Polites & Karahanna, 2012). There may be a "tug-of-war" between conscious (inertia), and unconscious (habitual), behaviour in mobile phone use (Soror, Hammer, Steelman, Davis, & Limayem, 2015). In the context of mobile applications, consumers use different apps several times independently, maximising benefits of the services of different apps, and generating inertia.

2.7.1 Inertia on Intention to Continue Usage

Thorhauge, Swait, and Cherchi (2020) suggest habit and inertia are often used interchangeably; inertia has a broader definition, encompassing habit. Habitual behaviour is shown as inertia, but conversely the same is not necessarily true. A behaviour can be inertia, but not habitual. Inertia can also be caused by a need to deal with complex decisions, avoiding constant re-evaluation of the same choice, and external factors such as limited information, switch cost, or psychological stress.

Inertia, manifested in frequency of repeated behaviours, is reinforced by presence of constraints; the same travel app, by comparison, found it was cheaper to buy tickets on APPa than APPb; the travel experiences shared by other travellers on APPc were more detailed and useful than APPa and APPb. In practice, it is difficult to unravel different components of inertia, especially habit, as behaviours initially inertial, due to the presence of constraints, may over time become habitual.

Ajzen (2002) and Ajzen (1991) argue the relationship between past and future behaviour is mainly a reflection of temporal stability. Knussen, Yule, MacKenzie, and Wells (2004, p. 238), observe "the factors that influenced the past behaviour continue to influence the intentions and future behaviour, but past behaviour does not cause future behaviour". This suggests inertia should be considered as a latent effect when studying behaviour. Therefore, if (latent) inertia is strong, future behaviour is likely to be similar to previous behaviour. Prior research indicates inertia is an important factor affecting the customer choice in industries with low switching costs, including e-service and m-service industries (Soongeun Hong, Kim, & Lee, 2008; Murray & Häubl, 2007). Inertia is an attitudinal tendency to maintain the status quo, regardless of potential alternatives, hindering switching behaviour of consumers (R. Lee & Neale, 2012;

T.-C. Lin & Huang, 2014). This consensus implies positive influence of individual inertia on intention to use to stick with the status quo, such as a technology, service.

Existing studies explore relationships between inertia and intention behaviour. Liao, Palvia, and Lin (2006), studying the use of e-commerce, report how inertia substantially affects behavioural intentions to utilise e-commerce services. Similarly, Lewis, Fretwell, Ryan, and Parham (2013) established that inertia significantly affects intention to adopt classroom technology. Therefore, it can be inferred propensity to use technology is directly proportional to past habit (Limayem, Hirt, & Cheung, 2007a). The relationship between inertia and intention to use have proved controversial. Gong, Zhang, Chen, Cheung, and Lee (2020) report that inertia directly decreases user intention towards mobile payment services. However, Amoroso and Lim (2017), and (Lafley & Martin, 2017) found inertia to be positively correlated with intention behaviour as related to mobile applications.

Similarly, Nel and Boshoff (2019) highlight that, when consumers use a new mobile app for information, or a product purchase experience, it reduces inertia and online purchase habits. Other studies also affirm the fact inertia has relatively little conceptual overlap with intentions, providing potential additional explanatory power regarding continued IT use (W.-K. Lee, 2014; Limayem, Hirt, & Cheung, 2007b). Gefen (2003); Liao et al. (2006) indicate how inertia can increase behavioural intention for continued use of inertia technology; the use of an IS becomes routine.

Inertia is intentional, in that it is functional, or goal-oriented, in nature. In this study, before consumers became familiar using the app, they tried many services in different apps; eventually, after learning, they felt it was cheaper to book a flight using this type of app rather than another one; they could use another app to check travel tips. Participants became used to using the app, due to previous behaviour. These behaviours are conscious, intended to reduce costs, or due to the fact services in the app provide a better experience, or benefit, to the consumer. When an individual repeats an action regularly, and consumers are satisfied with the outcome, the action becomes habitual (Verplanken & Orbell, 2003). If consumers repeat an action, and the outcome is not satisfied, the action cannot become habitual, then becoming inertia. However, once consumers consciously attach themselves to a brand that meets rational or emotional needs, inertia may trump satisfaction and loyalty in predicting intention (Lafley & Martin, 2017).

Inertia may also make users blind to novelty (Berinato, 2017). In the context of mobile apps, when consumers go on vacation, they may want to break inertia, especially in a place they are unfamiliar with. In this case, consumers may use different tourism apps for services they need at a specific moment. When consumers are planning a new trip, they may use a different tourism app to obtain information.

In this study, following a comparison of use of different smart tourism apps, consumers found services provided by different apps to be very similar. However, consumers find different smart tourism apps have different unique selling points by using the apps. For example, APPa compared to other APPs; especially in the service of booking hotels, there are a lot of hotels to choose from and it is value for money. When consumers want to book a hotel, they think of APPa. This behaviour activates inertia, creating habit with each use. However, this does not mean consumers become dependent on the existing system, especially in the context of mobile applications. The advantage of smart tourism apps is that each app has approximately similar services; when a consumer finds another app with better activities for booking hotels, they may use the new app. Therefore, it seems reasonable to expect that:

H7: Inertia has a positive impact on intention to continue using smart tourism applications.

2.7.2. Autonomy and Inertia

According to Deci et al. (1989); Deci and Ryan (2010), perceived autonomy refers to feeling willingness and volition with respect to one's behaviour; autonomous motivation leads to behavioural persistence. Ryan (1995) and Ryan and Deci (2000) suggest the intensity of inertia, and previous conduct, have a stronger correlation with degrees of autonomy control; estimation of inertia intensity is possible according to previous conduct and self-control (Gardner & Lally, 2013). The experience of autonomy is often accompanied by greater effort and persistence (Deci & Ryan, 2004). Further research, such as that undertaken by Colapietro (2016), finds a sense of independence can lead to formation of inertia; strong inertia is commonly produced by self-directed actions. Customers can compare and choose which app or service to use based on their needs automatically and voluntarily, resulting in behavioural persistence. As B. Kim and Kang (2016) argue, when consumers of mobile services are familiar with the content of the service (e.g., functions, features, and operating protocols), they feel free and comfortable

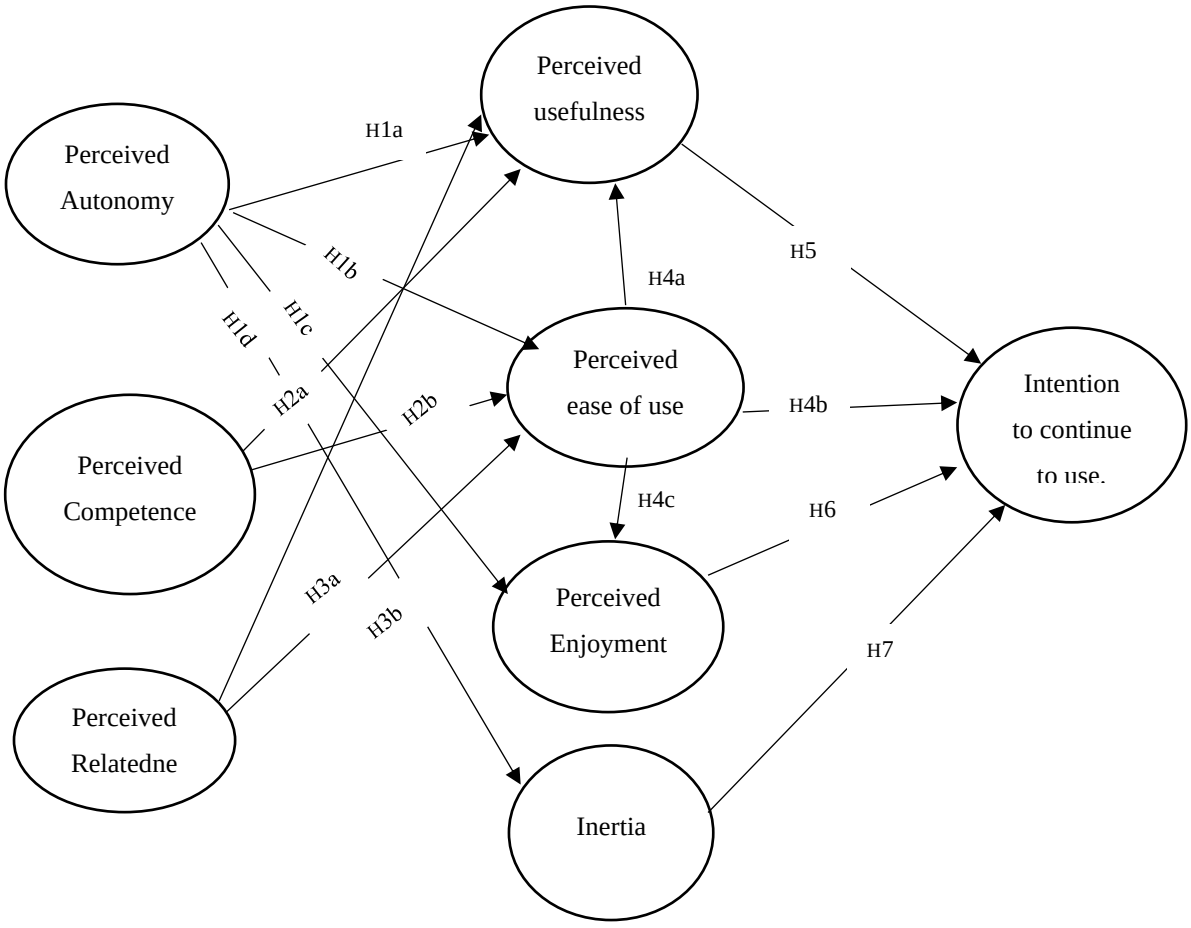
and want to stay in that service, and therefore become attached to the current service. It therefore follows that:

H1d: Autonomy has a positive impact on inertia.

2.8 Conceptual Model

Based on the theoretical background and hypotheses discussed above, a framework is established in Figure 2.3, describing the proposed relationships between perceived autonomy, competence, relatedness, perceived usefulness, ease of use, enjoyment inertia and intention behaviour towards smart tourism applications.

Figure 2.3 Conceptual model

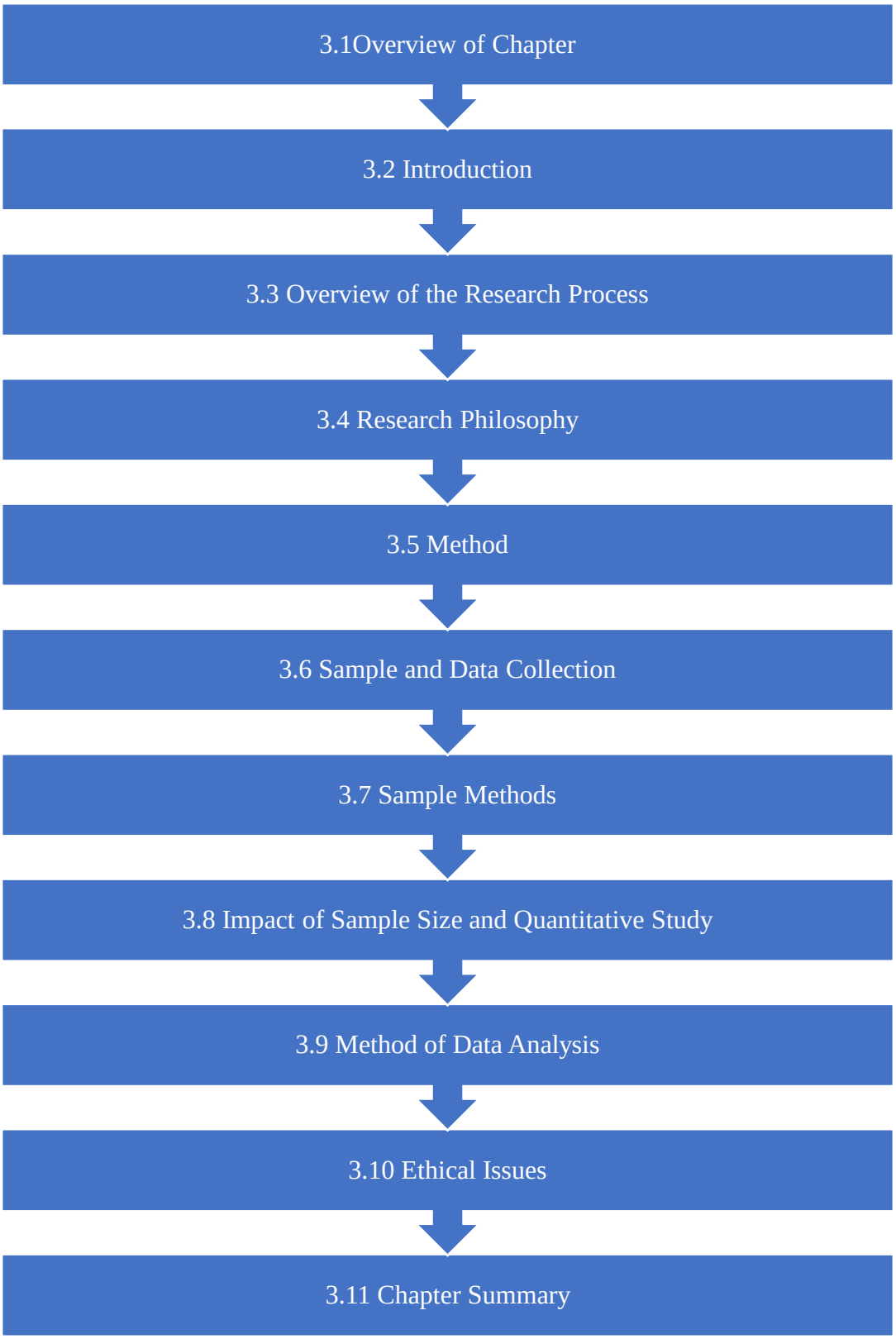


2.9 Chapter Summary

This chapter presents an overview of literature from across the fields of marketing, self-determination theory, technology acceptance model, habit, perceived enjoyment, and consumer psychology in the domain of technology acceptance. It offers a comprehensive picture of the study of acceptance of mobile applications. A series of cognition based behavioural theories, Including TRA and TPB, have been reviewed, as well as the long-standing rationale that underpins them; belief-attitude-intention-behaviour. Furthermore, factors identified as important influences on technology acceptance, in the context of smart tourism applications, were categorised in three ways; intrinsic factors are comprised of positive features of smart tourism applications from the perspective of customers, including perceived autonomy, perceived competence, perceived relatedness and perceived enjoyment. Perceived usefulness and perceived ease of use explain how consumers develop acceptance for use of technology in the context of smart tourism applications. Furthermore, inertia as a personal variable has been introduced.

In conclusion, this chapter provides a framework for research, promoting subsequent interviews and creating a conceptual model for a quantitative study. The methodology and underpinning theory employed in this research, used to identify, and examine key factors impacting the intention to use smart tourism applications, will be presented in Chapter 4 - Methodology and Methods. Additionally, the process of design and execution of each stage of research is explained in further detail.

Chapter 3 Methodology



3.1 Overview of Chapter

This chapter examines the philosophical foundation of research, explaining the use of the quantitative method approach, and justifying why it was appropriate. This chapter also describes how the questionnaire was developed, considering reasons for selecting measurements. Finally, the chapter presents reasons behind the selection of the method, and challenges related to evaluation and interpretation, as well as advantages and disadvantages of the method. Finally, ethical considerations are explored.

3.2 Introduction

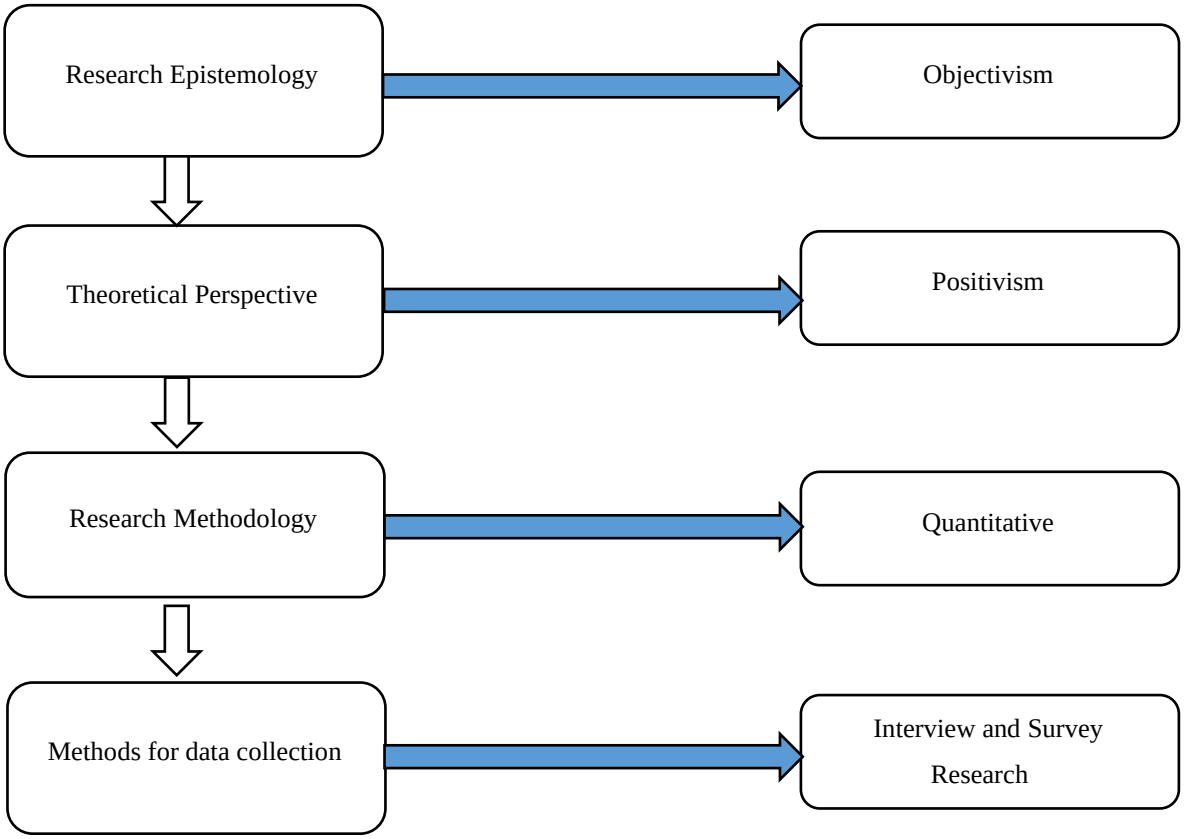
Liang et al. (2017) consider different approaches to the study of mobile application consumption and consumer behaviour; these approaches include surveys, experiments, in-depth interviews, and focus groups (Carroll et al., 2017; Ellis, Davidson, Shaw, & Geyer, 2019). This research employs a questionnaire survey, examining consumer intention behaviour as related to a smart tourism application. As discussed in Chapter 2, examining consumer intention behaviour with a questionnaire design offers numerous advantages in comparison to other methods; for example, the ability to examine the influence of several different factors on consumer behaviour simultaneously.

In any academic research, the researcher must be clear regarding the philosophical basis of research, as this philosophical framework influences the entire research (Crotty, 1998; Easterby-Smith, Thorpe, & Jackson, 2012).This section presents the philosophical position of this work, along with epistemological and ontological beliefs that act as a basis for research. The following section concludes by demonstrating how ontological and epistemological considerations inform the choice of research methods (Grix, 2019). The quantitative research methods used to collect data are also discussed. Furthermore, the survey instrument implemented for the measurement of intention to use smart tourism apps is discussed, justifying content, and connected to current literature. The following section presents the procedures used for pre-testing of this research, the pilot study, and final study; following this, sampling methods and sample sizes are discussed. This section explains and evaluates the techniques used to collect data, offering a discussion of the potential limitations of the research design, as well as related ethical considerations.

3.3 Overview of the Research Process

In this research, positivism and objectivism are adopted as theoretical perspective and epistemology, respectively; data is collected using a deductive research approach, using a quantitative survey questionnaire. Figure 3.1 presents the elements of this research process.

Figure 3.1 Overviews of Research Philosophy and Methodology



Creswell and Creswell (2017) consider research design as the research process, including research potential, overall hypothesis of data collection, and analysis methods. According to Crotty (1998), information for supporting the philosophical underpinning, and framework, of research is supported by four elements: epistemology, theoretical perspective, methodology and methods. These four elements are expanded into four questions listed below:

- What epistemology underlines the methodology?
- What theoretical perspective informs the methodology?

- What methodology supports the chosen methods?
- What method does the researcher propose to use?

3.4 Research Philosophy

Before conducting any form of research, it is important to define the framework and philosophy of research (Crotty, 2009). Research philosophy relates to development of knowledge, and the nature of that knowledge. According to Crotty (2009), science philosophy is concerned with questions of how to move from theory, described as a system of related claims, to scientific findings. The key questions to be used are: What epistemology informs the theoretical perspective? What theoretical perspective underpins the methodology? What methodology governs the collection and implementation of methods? What methods are proposed? Crotty (2009). The method and technique chosen is largely determined by researcher understanding of what constitutes acceptable knowledge; the researcher's epistemological position (Henn, Weinstein, & Foard, 2009).

This framework influences methods applied in the study, and the choice of methodology. Before examining data collection and analysis methods, this section explicitly presents the philosophical framework of the study, explaining why a particular paradigm was chosen over the others. Four elements of the research process- epistemology, theoretical perspective, methodology and methods are presented in Table 3.1, and briefly described below.

Table 3.1 Four Elements of the Research Process

Elements	Definition	Examples	Reference
Epistemology	defines the way in which the theory of knowledge can be used in the research methodology.	Objectivism, Constructionism, Subjectivism.	Crotty (2009). Creswell and Creswell (2017); (Easterby-Smith, Thorpe, Jackson, & Jaspersen, 2018)
Theoretical perspective	A philosophical position that informs	Positivism, Interpretivism.	Crotty (2009).

	the methodological foundations.		Creswell and Creswell (2017);
Methodology	presents the researcher's selected approach for determining reality.	Survey research, Experimental research, Action research, etc.	Crotty (2009) Creswell and Creswell (2017); Easterby-Smith et al. (2018)
Methods	Research methods implemented to obtain research data.	Questionnaire, Observation, Interview, Case study, etc.	Crotty (2009) Creswell and Creswell (2017); Easterby-Smith et al. (2018)

3.4.1 Research Epistemology

Building on the work of Crotty (2009), in considering methodological framework, research epistemology as "the theory of knowledge embedded in the theoretical perspective and thereby in the methodology", Blaikie (2009) noted epistemology denotes different methods of understanding knowledge concerning the social world, especially the way in which knowledge is gained, and what that knowledge is, as well as the valid means by which it can be implemented to attain truth. The type of research conducted depends on the nature of knowledge intended for discovery, which in turn depends on the researcher's assumptions regarding the nature of reality; epistemology concerns methods of gaining knowledge, as well as methods used by researchers to differentiate truth from falsehood. Crotty (2009) classified researchers into subjectivist and objectivist. The present research epistemology concerns the theory of objectivism.

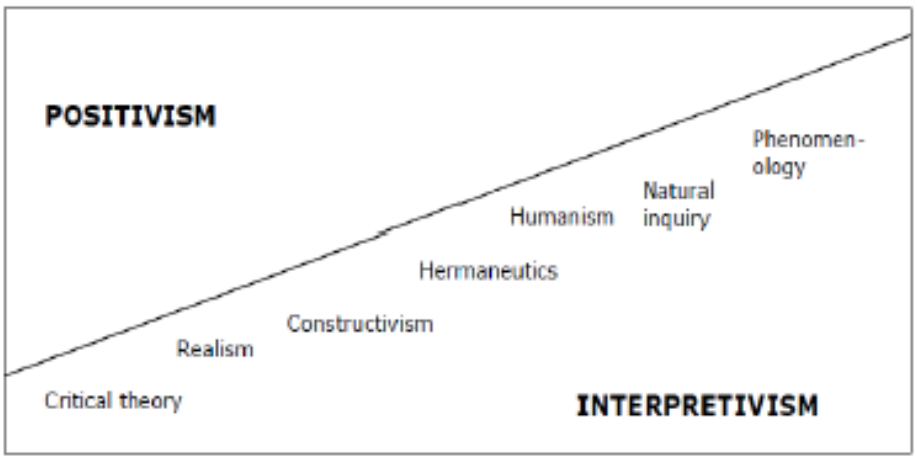
Crotty (2009) contends that objectivism is an epistemological position that holds social entities face us as external facts and are not subject to our influence. The world around the research will be accepted as "external and objective" and therefore cannot be influenced by individuals (Bell, Bryman, & Harley, 2018). The researcher is completely independent of research design, data collection and analysis (Crotty, 2009).

The objectivistic paradigm has been applied in this research; knowledge is assumed as objective and discoverable, assessing consumer intention behaviours in relation to smart tourism applications. This work belongs in the objectivist paradigm of research, as it is inconsistent with the argument that meaning is subjective, and knowledge is constructed in the minds of those being investigated. Such an approach is highly positivistic, using statistical methods to analyse quantitative data from experiments. The theoretical basis of this study will be described in the following sections. (Bryman & Bell, 2015; Crotty, 2009; Easterby-Smith et al., 2012)

3.4.2 Theoretical Underpinning

An important part of guiding research is the process of establishing appropriate theoretical perspectives, or paradigms. According to Guba and Lincoln (1994, p. 3), paradigm is defined as "worldviews or belief systems that guide researchers". M. N. Saunders and Lewis (2012) note how research philosophy represents development and nature of knowledge, suggesting the researcher's worldview. Several studies in literature highlight the long-standing debate regarding which philosophical approach is more appropriate, the advantages and disadvantages of each approach, and why each should be adopted. Carson, Gilmore, Perry, and Gronhaug (2001) describe the paradigms used most frequently in social research as a continuum (Figure 3.3), in which interpretivism and positivism represent two ends of a single line.

Figure3.2 Continuum of research philosophies Source: Carson et al., 2001, p.8



Two philosophical positions affect the choice of philosophy: positivism and interpretivism. The division of research paradigms into these two categories is widely accepted; it is useful for researchers (Morgan & Smircich, 1980; Tashakkori & Teddlie, 2010). It should be noted that positivism and interpretivism indicate major contrasting paradigms regarding business research, and they are both well-known in the field of marketing research (Carson et al., 2001; Davies & Fitchett, 2005). There have been numerous examinations of the differences concerning ontological, methodological, and epistemological aspects of the two paradigms (Bryman & Bell, 2015; Crotty, 2009). Table 3.2 summarises the two contrasting scientific paradigms.

Table 3.2 summarises the two contrasting scientific paradigms

Paradigm		
Element	Positivism	Interpretivism
Ontology	Reality is real and apprehensible and exists independently of the subjects being studied.	Reality is individually constructed, dynamic and changing, an output of social and cognitive processes.
Epistemology	Findings constitute observable material things – the researcher is objective by viewing reality through a 'one-way mirror'.	Knowledge is socially constructed accessed only through social actors using language and shared meanings. Observer interacts with what is being observed.
Methodology	Deductive. Testing theories. Cause and effect relationship. Static design. Context free. Formulate and test hypothesis. Large samples.	Inductive. Building theories. Understanding of what is happening. Emerging design. Context bound. Patterns, theories develop. Small samples.

Methods	Quantitative methods (Survey questionnaire, experiments, hypotheses)	Qualitative methods (in-depth interview, case studies, participant observation, action, and grounded theory research)

Sources: Guba and Lincoln (1994); Perry et al. (1999, p. 17); Gill and Johnson (2002); Cepeda and Martin (2005); Eriksson and Kovalainen (2008); Collis and Hussey (2009); Crotty, (2009); Grix (2010); Bryman and Bell (2011); Easterby-Smith et al. (2015).

3.4.2.1 Research Philosophy-Positivism

In social science, positivistic viewpoints were adopted from the natural sciences. Positivists agree social phenomena can be studied with accuracy, objectivity, and rigour. Given this assumption, positivism allows for numerical measurement of social realities, aiming to generate objective results using a large number of tests, and minimising reliance on researchers in a study. Using statistical methods to convey and interpret extremely important characteristics is useful in this method, increasing the ability to draw generalisations from samples (Collis & Hussey, 2013).

As shown in Table 3.2, positivism is based on principles of realism, providing a framework for the researcher to conduct study in the research field of social science. Positivists believe there is only one reality, independent of us (Collis & Hussey, 2013). Positivism, as a theoretical ideology, contends that facts must be understood through observation, or experience of the objective environment, and external factors; the social world exists independently of the object under examination. Therefore, reality should be measured using objective methods. Researchers conducting business research under a positivism paradigm focus on theories explaining social phenomenon, establishing cause-and-effect relationships between variables, adhering to a deductive process, and providing explanatory theories (Collis & Hussey, 2013). Conversely, interpretivists argue knowledge is constructed in a subjective way, reality is socially constructed, and embodied with meaning by humans. Humans experience the external material world as actively known and interpreted, rather than passively perceived and accepted (Carson et al., 2001; Crotty, 2009). The positivist approach to research assumes knowledge is objectively derived through data analysis and observation; interpretivists give attention to knowledge as subjectively inferred, requiring meaning offered by the researcher (Easterby-Smith et al., 2018).

Carson et al. (2001) argue that the only correct paradigm considered by researchers to obtain valid results is the positivist research paradigm. Although this view is polarised, different valid research methods are accepted in modern research. Rowley (2002) contends that, when designing positivist marketing studies, researchers should continue to use applied criteria, such as validity, reliability, testing predefined hypotheses, controlled observations, deductions, replicability and generalisability, similar to those criteria used in the natural sciences. Easterby-Smith et al. (2018) explain that a positivist researcher must be independent from what is being observed; research should be conducted with hypothesis and deductions that use predefined concepts.

Formative research associated positivist marketing closely with quantitative data. According to Easterby-Smith et al. (2018), and Carson et al. (2001), when conducting positivist research, there are three advantages to quantitative marketing methods. (1) internal validity - a valid model limits the possibility of errors, or alternative explanations of the effects measured. (2) external validity - in terms of generalising results beyond the sample to the wider population. (3) rigour- the researcher is external and objective. Furthermore, Bell et al. (2018, p. 15) propose a positivist approach to "generate hypotheses that can be tested and that will thereby allow explanations of laws to be assessed". Carson et al. (2001) and Easterby-Smith et al. (2018) suggest it is important to ensure that while conducting quantitative, positivist research, it should remain external and objective, offering benefits regarding internal and external validity and rigour; a valid research model mitigates the risk of errors.

In this study a statistical survey design is used to elicit consumer intention, following a deductive research progress, and using large sample sizes. Following the positivist paradigm as presented in Table 3.2, this thesis provides information regarding independence of research, deductive processes, and validity and generalisability of findings. The researcher conducts a preliminary study-interview, confirming constructs used and validating the conceptual model. Subsequently, a quantitative study is conducted, exploring, and evaluating significant factors that influence customer perceptions and intention to use; questioning the extent to which these factors impact customer acceptance.

The information presented in this section is drawn from a number of different sources, addressing a number of different perspectives, and supporting the fact this study follows a positivist theoretical framework. As this section of the thesis discusses reasons for choosing

positivism as an appropriate theoretical basis for study, the following section discusses research methodology, the next stage of the epistemological framework (Crotty, 2009).

3.4.3 Research Methodology and Methods

Guba and Lincoln (1994, p. 108) define research methodology as answering the question: "How can the inquirer (would-be knower) go about finding out whatever he or she believes can be known?". The answer should be consistent with previous decisions made regarding epistemology and the theoretical underpinning of research. However, this question does not refer to methods used, which should be considered in the following stage, consistent with research methodology. According to Hesse-Biber (2010), methodology is viewed as a theoretical bridge connecting the research problem with research method; it is driven by certain ontological and epistemological assumptions, comprised of research questions and hypotheses, a conceptual approach to a topic, and method by which data may be collected and analysed (Grix, 2019).

When following the positivist paradigm, methodology suggests analysis of survey data from large samples with the aim of testing, and generating, theory (Easterby-Smith et al., 2018). Crotty (2009), and Hesse-Biber (2010), propose methods identified as tools, suggesting specific techniques for collecting and analysing data. Grix (2019) argues the core spirit of research methodology is linked to research questions posed and data sources. In this study, the pragmatic paradigm is used as a philosophical foundation, suggesting the quantitative approach as suitable to answer research questions.

3.4.4 Categories of Research Design

Creswell and Creswell (2017) define study design as the plan and procedure for conducting a study; it is determined by a process of movement from broad hypotheses to detailed data collection and analysis. According to Neuman (2014b), and as described in Table 3.3, social research (business and management, including marketing, are part of social research) can be split into three types.

Table 3.3 Three Types of Research

Type of Research	Definition	Purposes of Research Types	Research Questions
Descriptive research	Research in which the primary aim is to use words or numbers to 'paint to image' and to present a profile, a classification of forms, or a summary of steps to answer questions such as who, when, where, and how.	Provide a detailed, highly accurate picture. Locate new data that contradict past data. Create a set of categories or classify types. Clarify a sequence of steps or stages. Document a causal process or mechanism. Report on the background or context of a situation.	Who, When, Where, and How
Exploratory research	Research whose primary aim is to explore and generate preliminary ideas about problem or phenomenon and move towards refined research questions.	Create a general mental picture of conditions. Formulate and focus questions for future research. Generate new ideas, conjectures or hypotheses. Determine the feasibility of conducting research. Develop techniques for measuring and locating future data.	What
Explanatory research	Research whose primary objective is to clarify why events occur and to improve, develop, broaden or test theory	Test a theory's predictions or principle. Elaborate and enrich a theory's explanation. Extend a theory to new issues or topics. Support or refute an explanation or prediction. Link issues or topics to a general principle. Determine which of several explanations is best.	Why

Source: Neuman (2014a, p. 38)

As show in Table 3.3, there are three major research purposes here: exploratory, descriptive and explanatory. However, this classification does not mean research questions need only be

related to one of these purposes, as research questions may be both descriptive and explanatory, meaning a research project may have more than one ultimate purpose (Mark Saunders, Philip Lewis, & Adrian Thornhill, 2012). When a lot of items are unknown, or researchers unable to obtain further knowledge about a specific subject, an exploratory study is suitable and likely to be used (Mark Saunders et al., 2012). An exploratory analysis is appropriate when little is known about the research issue, and there exists a need to broaden the scope of the investigation. The necessary research methodology should be considered based on the characteristics of exploratory analysis. For example, research may be completed by interviewing subjects and focus groups, obtaining a deeper and more complete understanding of what is actually taking place (Uma & Roger, 2010).

The aim of a descriptive study is to provide a detailed description of individuals, activities, or circumstances (Robson, Pemberton, & McGrane, 2011). This method of study is suited to researchers who want to clearly capture social phenomenon. According to Mark Saunders et al. (2012), the aim of the explanatory study is to not only to explain characteristics of variables, but also define causal relationships between them. The research presented in this thesis seeks to identify factors influencing consumer behaviour as related to smart tourism applications; the study does not attempt to seek meaning in human behaviour of these consumers. The study is explanatory, seeking to offer deeper understanding of the reasons that underpin consumer intention to use mobile applications. If research was descriptive, it may document the number of consumers who would like to use the mobile application; an explanatory study is interested in learning why these consumers intend to use the smart tourism application. This research begins with a preliminary study, interviewing participants to confirm and validate constructs that emerged from literature; this is followed by use of a quantitative method, in the collection of large-scale samples via an online survey, with a purpose to test the proposed hypotheses and conceptual model.

3.4.4.1 Quantitative versus Qualitative Study

This means of research refers to methods of data collection and analyses. Qualitative research focuses on exploring and understanding meaning that individuals or groups assign to social or human issues. The aim of qualitative research is to uncover assumptions in order to obtain a systematic and accurate understanding of phenomena; this method is considered more personal (Collis & Hussey, 2013). In contrast, the quantitative approach is focused on empirical

perspectives of phenomena, emphasising numerical measurement through a highly-structured approach (Collis & Hussey, 2013; Creswell & Creswell, 2017). Quantitative research is a method of testing theory with relevant evidence, by studying causal relationships between variables (Collis & Hussey, 2013). Therefore, the 'quantitative approach is often associated with positivism, while the qualitative approach is associated with interpretivism' (Neuman, 2014b).

Furthermore, the researcher is independent of the researched; the research is value-free and unbiased; the data generated by research is quantitative; the research is context-free; the results are accurate and reliable; through validity and reliability, findings can be generalised from the sample to the population (Collis & Hussey, 2013). Table 3.4 summarises the two study designs and their corresponding investigation strategies.

Table 3.4 summarises the two study designs and their corresponding investigation strategies

	Qualitative Research	Quantitative Research
Definition	An approach to exploring and understanding the meaning that individuals or groups give to social or human issues.	A method for testing theories by examining the relationships between variables.
Research Methodologies	Case study, grounded theory Narrative etc.	Surveys, experiments etc.
Research Methods	Qualitative methods Open-ended questions Interview data, observation data, document data, audio-visual data Text or image data Themes, patterns interpretation	Quantitative methods Closed-ended questions. Predetermined approaches Attitude data, census data, observational data statistical analysis statistical interpretation

Resource: Creswell (2014) and Collis and Hussey (2009)

3.4.4.3 Justification for Quantitative

The main advantages of the use of quantitative methods are ease of replication, and ability to examine different contexts during the process of research; data collection and analysis can be

time and cost-efficient; results generated have a high degree of generalisability (Easterby-Smith et al., 2018).

The following points illustrate how this study, examination of intention to use smart tourism mobile applications, benefited from a quantitative design. Firstly, quantitative research is focused on detecting causal relationships between variables. The details of individual experiences and behavioural intentions- in this research behavioural intentions towards mobile applications- behind statistical data can be understood only through quantitative research (Grbich, 2012; Tashakkori & Teddlie, 2010). Nardi (2018) contends researchers tend to emphasise explanation of individual behaviour, or predictions of future behaviour, in order to accurately study consumer behaviour; a considerable number of participants are required, allowing findings to be generalised against a broader setting and context. Secondly, according to Creswell and Creswell (2017), in quantitative research the problem is best addressed by understanding the way factors or variables influence an outcome. Understanding the factors that explain, or are related to, an outcome helps us understand and explain research questions. Additionally, quantitative research is an approach aimed at generalising findings against a broader population; it commonly consists of hypotheses deduced from existing theories, which require testing, allowing researchers to collect numerical data from large sample sizes before measurement in a statistical manner.

This research uses a quantitative approach to understand perceptions of respondents who are mainly tourists, testing hypotheses regarding intention behaviours in the context of smart tourism applications. In explaining and predicting concrete social phenomena, quantitative methods are beneficial (Creswell & Creswell, 2017). In particular, G. Li (2012) claims statistical analysis is an effective quantitative tool for the study of tourist behaviour. The research strategy refers to the overall direction of the process (Remenyi, 1998). The research strategy is "a general plan of how the research questions will be answered" (Mark Saunders et al., 2012). As there are a wide variety of research strategies, researchers should make strategic choices as to which are better suited to specific research paradigms (Collis & Hussey, 2013).

Survey research is chosen as a research strategy here, allowing the researcher to collect a large volume of data; quantitative analysis is used in a non-experimental design, and survey research is considered as suitable for quantitative research. Although data collected through survey

research lacks detail, the breadth allows the researcher to standardise and compare various groups of respondents (Denscombe, 2014; M. Saunders, P. Lewis, & A. Thornhill, 2012).

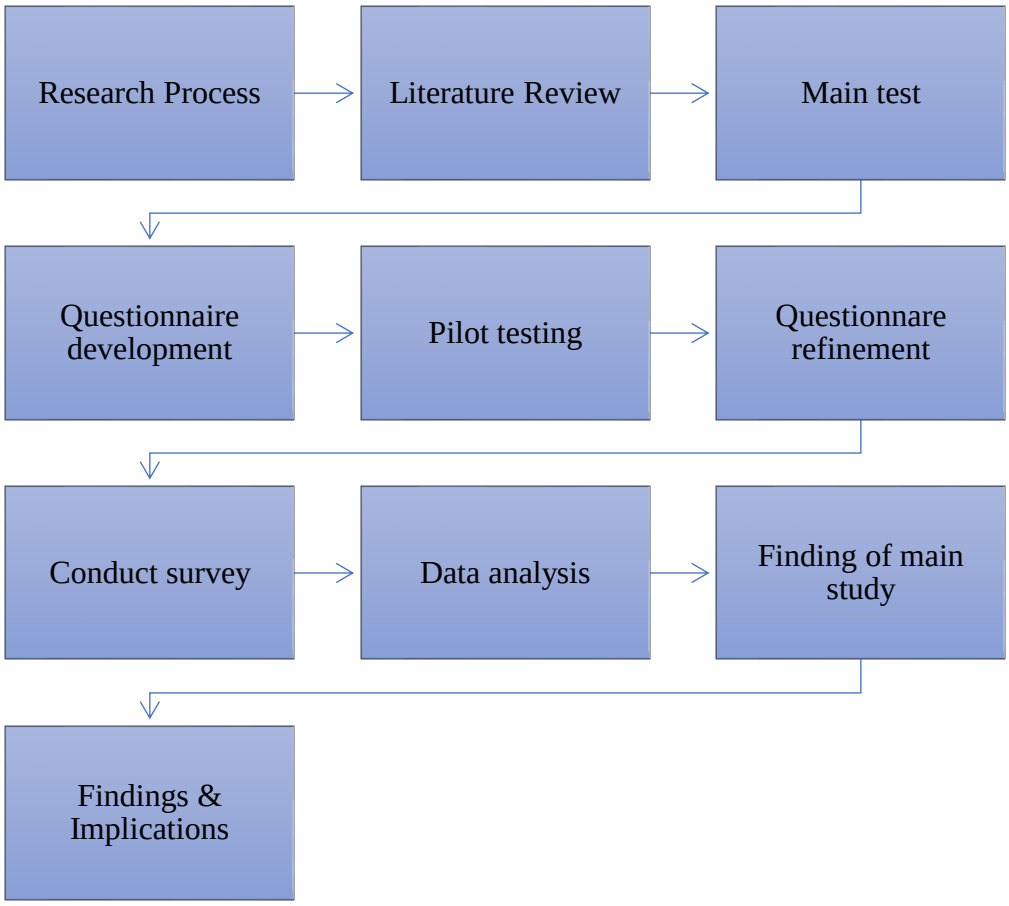
3.5 Method

3.5.1 Outline of Research Design

Design in social research refers to methods and procedures used to perform research projects. The research design offers a formal structure for data collection and interpretation (De Vaus, 2013)

The purpose of this research is to identify factors important to determining consumer intention behaviour towards smart tourism applications. Based on the discussion above regarding varied means of research, this study evaluates research objectives using the survey questionnaire method, providing an understanding of why consumers intend to use smart tourism applications. Therefore, a test hypothesis based on the research model will be tested. This chapter discusses why this data collection approach was chosen, describing the survey questionnaire. The information used to design the survey is obtained via documentary research. Additionally, carefully monitoring the sampling process and questionnaire mitigates survey research weaknesses, such as low response rate, poor data quality, and insincere responses.

Figure 3.4 The following figure shows overall summary of the research process



3.5.2 Study-Survey Questionnaire

This research uses a quantitative data collection method, conducting a survey to obtain primary data. According to Crowther and Lancaster (2012), researchers should observe clear conventions when working with quantitative data. The following section describes clear procedures for collecting quantitative data, supporting understanding of perceptions and intentions of participants regarding smart tourism applications.

The most common method used in market research to collect quantitative data is the survey questionnaire. The purpose of this approach is to discover something of customers in different contexts, including an understanding of customer satisfaction with products or services, and customer acceptance of technological products. By using survey research, a numeric description of opinions, trends, and the attitudes of groups, is obtained by examining a

population sample. Survey results can help the organisation outline customer profile, enhance target goods and services, and evaluate customer opinions of new product launches (Crowther & Lancaster, 2012).

The design of the survey questionnaire is described below. A short statement is presented at the beginning of the questionnaire, explaining the focus of the study, and how results will be used, as well as whether participants agree to participate. The main section of this work presents a closed-ended questionnaire, providing a convenient means by which participants can respond and by which results can be easily summarised and analysed. Bell et al. (2018) state that questionnaires can be considered as research tools, whereby respondents are asked a series of questions about a subject of study to obtain data; the respondents fill in the questionnaire to answer questions. In contrast to other methods, such as focus groups, or structured interviews, there is no need for an interviewer to ask questionnaire questions; respondents have to independently read and answer each question. Therefore, research instruments must be particularly easy to understand, using questions respondents can easily answer. Bryman and Bell (2015) observe how questionnaires tend to have few open-ended questions, as closed-ended questions are easy to answer and designed to be easy to follow; there is less risk of respondents becoming confused, or inadvertently missing questions.

Gathering a large number of responses concerning consumer behaviour towards smart tourism apps, a web-based questionnaire was used. Sue and Ritter (2012) propose conducting online questionnaires increases the chance of gaining more participants, which also enhances reliability and validity based on the large sample size. Researchers, as well as participants, can benefit from online questionnaires, as participants can complete the survey in their own time; the researcher is able to obtain data immediately, and can view preliminary results anytime, downloading data files to EXCEL, SPSS, or other formats easily to undertake analysis with software packages (Collis & Hussey, 2013). The link to the questionnaire was shared using varied social media platforms such as wenjuanxing.

Research includes previous literature used to support a determination regarding relevant constructs, as well as the best suited measures the survey should include, to allow research questions to be examined accurately. Research target population includes consumers who use the smart tourism app service. Furthermore, the research targeted a large sample size, which limited biases and enhanced generalisability and sample representativeness. Additionally, as

research focused on using mobile apps, it targeted only those respondents with knowledge, as well as resources, to access and utilise online tools; because of this, an online survey was considered as best suited to gather data. As original scales used English language, research questionnaires were later translated into Chinese. This translated survey was first pilot tested; respondent feedback was considered when making changes to wording.

3.6 Sample and Data Collection

3.6.1 Sampling Frame

The sampling frame is defined as members of the population eligible for possible selection (Blair, Czaja, & Blair, 2013). To examine consumer perceptions, and intent to use smart tourism mobile applications, the online survey included individuals who had used smart tourism applications previously. Considering ethical issues, all respondents were aged above 18 years. Additionally, research focuses on consumer intention behaviour towards smart tourism applications; internet access was a requirement. All respondents required access to the internet, as data will be administered through an online questionnaire. The research survey (pilot study and main study) commenced on 23 January 2019 and ended in May 2019. All respondents were provided with a participation incentive voucher following completion of the survey.

3.6.2 The Seven-Point Likert Scale

The Likert scales utilised seven response categories developed, as per numerous studies (R. L. Armstrong, 1987; L. Chang, 1994; Garland, 1991; Green & Rao, 1970; Lozano, García-Cueto, & Muñiz, 2008). Numerous factors led to selecting the seven-point Likert scale for this research. Firstly, as noted by N. K. Malhotra and Dash (2016), respondents are able to accurately distinguish every response category in terms of extensive scale points. Secondly, as noted by Hinkin (1995), a seven-point Likert scale provides increased options for respondents, offering them more space to assess validity and reliability. Additionally, Viswanathan, Sudman, and Johnson (2004) show that a seven-point scale is able to adequately determine similarities, as well as differences, relevant to respondents. The majority of scale items implemented for assessing variables were obtained from existing literature. Consistent with previous literature into technology acceptance, seven-point Likert scales are commonly used

to measure consumer attitudes and intentions. For example, adoption of wireless Internet services (J. Lu et al., 2005), product purchase intention of IT brands (Guo et al., 2018), and intention to use self-driving cars (Payre, Cestac, & Delhomme, 2016). In addition, the seven-point Likert scale has been pilot tested; respondents report this as appropriate. Therefore, a seven-point Likert scale was used in this study; in research, participants were asked to use a scale ranging from 'strong disagreement', on a scale of 1, to a 'strong agreement', on a scale of 7. Such a scale helps respondents better understand questions, as well as aiding the collection and evaluation of data.

3.6.3 Preparation for the Study —Back-Translation Technique

Craig and Douglas (2005) state back translation is widely used in the field of market research in different linguistic and cultural contexts. To facilitate respondent use of their own language, especially if they do not speak the foreign language, it is crucial to ensure verbal and non-verbal stimuli are translated correctly and accurately (Stening & Zhang, 2007).

The questionnaire used in this study was originally designed in English, and therefore required translation into Chinese. To ensure accuracy of translation, two new source questionnaires were compared following the back-translation technique - from source to target to source - and then the final version of the questionnaire was produced (Brislin, 1970; S. P. Douglas & Craig, 2007). Furthermore, this process is vital to development of measurement items in different cultures, as the formed scale may not work exactly the same. Therefore, both source and target questionnaire require necessary successive iterations of translation and retranslation; a useful method to ensure the accuracy of the translation, as well as to improve participant understanding of terminology and measurement scales in their own language context. (Craig & Douglas, 2005). Following the back-translation process, the English to Chinese translation of the questionnaire was checked by two senior lecturers from China, both of whom are very knowledgeable about marketing; the Chinese back translation into English was reviewed by a native English speaker. In addition, to determine quality of the questionnaire, a small group of participants took part in a pre-test study. The aim of the pre-test survey was to identify potential problems with misunderstood and ambiguous questions, and check translation between Chinese and English. All participants in the pre-test study were fluent in Chinese and English; all had overseas study experience, and some knowledge of marketing.

3.6.4 Survey Instrument Design

The first section of the questionnaire consisted of factual questions regarding previous use of mobile apps; this section queried the frequency with which respondents use smart tourism mobile apps, how many smart tourism apps they had, which services they used from smart tourism apps, and what type of smart tourism app they like to use. Subsequently, to examine variables generated from Study 1, and those derived from the existing literature, and consider whether they could predict consumer intention to use smart tourism apps, measurement methods were developed; the survey measures for each construct were derived from previous literature studies into technology acceptance. The third section consists of demographic questions, comprised of four questions related to gender, age, education level, and employment status.

3.6.5 Research Scale Development

The survey involved several questions focused on conceptual model constructs by taking into account scales from previous studies; these questions were validated in terms of interviews, as well as during the pilot-test stage (Table 3.5).

Table 3.5 Measurement Scales Development

Construct	Reference	Measures
Perceived Ease of Use	(Venkatesh et al., 2003a)	PEOU1: My interaction with the Smart tourism app is clear and understandable. PEOU2: It is easy for me to become skilful at using the Smart tourism app. PEOU3: I find the Smart tourism app easy to use.
Perceived Usefulness	(Venkatesh et al., 2003a)	PU1: Using the Smart tourism app enhances my effectiveness. PU2: The Smart tourism app is useful for my travel.

		PU3 Using the Smart tourism app increases my productivity.
Perceived Autonomy	(Edward McAuley, 1989); (P. P. Baard, Deci, E. L., & Ryan, R. M, 2004)	AUT1: I feel a sense of choice and freedom while participating in the Smart tourism app. AUT2: I feel pressured during the Smart tourism app. AUT3: The Smart tourism app provides me with interesting options and choices. AUT4 There is not much opportunity for me to decide for myself how to do the Smart tourism app (Gao, Liu, Liu, & Li, 2018a) AUT5 When I am in this user's smart tourism app, I feel that my choices are based on my true interests and values
Perceived Competence	(Edward McAuley, 1989); (P. P. Baard, Deci, E. L., & Ryan, R. M, 2004)	COMP1: I think I am pretty good at the Smart tourism app. COMP2: After working at the Smart tourism app for a while, I felt pretty competent. COMP3: The Smart tourism app was an activity that I couldn't do very well.
Perceived Relatedness	(Edward McAuley, 1989); (P. P. Baard, Deci, E. L., & Ryan, R. M, 2004)	REL1: I have the opportunity to be close to others when I participate in the Smart tourism app. REL2: I feel close to others when I participate in the Smart tourism app. REL3: I feel connected with other travellers or users when I participate in the Smart tourism app.

		REL4: I feel really distant to other travellers or users when I participate in the Smart tourism app. (Gao et al., 2018a) REL5: When I am in smart tourism app, I feel loved and cared about
Enjoyment	(Agarwal & Karahanna, 2000) (Dong Jin Kim et al., 2007) (K. Hur et al., 2017)	ENJ1: Using smart tourism apps provides me with a lot of enjoyment. ENJ2: I have fun using smart tourism apps. ENJ3: I use the smart tourism apps to combat boredom EHJ4: I use smart tourism apps because it is entertaining
Inertia	(Schwarz, 2012) (X. Shi, Lin, Liu, & Hui, 2018)	Inertia1: I prefer using this app of smart tourism as it makes me feel comfortable. Inertia 2: I prefer using this app of smart tourism as I have got used to it. Inertia 3: I prefer using this app of smart tourism as this what I am used to.
Continue to intention using	(Venkatesh et al., 2003a) (Venkatesh et al., 2012)	1: I indent to use smart tourism app in the future. 2: I plan to use smart tourism frequently. 3: I will continue to search smart tourism apps that I am interested in.

3.6.6 Survey Implementation Pre-Test and Pilot Study

3.6.6.1 Pre-Testing

Prior to the pilot study, a pre-test survey was conducted. A common problem in designing questionnaires involves respondents misunderstanding questions (Belson, 1981; Hunt,

Sparkman Jr, & Wilcox, 1982; Nuckols, 1953). When data is collected through self-administered questionnaires, pre-testing is especially important (Visser, Krosnick, & Lavrakas, 2000). N. Malhotra and Birks (2007) defined pre-testing as testing the questionnaire on a small group of respondents, identifying and reducing potential problems, and modifying the questionnaire. Hair, W. Black, B. Babin, and R. Anderson (2010) state that, when improving measurement items for research. or drawing on existing research, some form of pre-testing should be performed. In pre-tests, it is possible to check whether the intended objective of the issues is being met and understood by the people to whom questions are addressed.

Furthermore, it is noted that pretesting can minimise sampling errors, while concurrently increasing questionnaire response rate (Edith D De Leeuw, 2001; Drennan, 2003). During this process, the questionnaire was improved based on feedback and comments collected from respondents (N. Malhotra & Birks, 2007). Additionally, the pre-test process indicates the required for completing the questionnaire, enabling the researcher to modify questionnaire length within a reasonable period of time (De Vaus, 2013). Blair et al. (2013) observe how participation in the pre-test is informal, based on the ability to offer immediate feedback, and participants can be family members, colleagues or acquaintances. N. Malhotra and Birks (2007) propose a sample size ranging between 15 and 30 participants for pre-testing. In this research, the pre-test study was carried out between the 10th to 15th of January 2018. Five Chinese PhD students living in UK, nine full time employees, with Bachelor, Master, or Doctor Degrees, and three individuals working in travel agents. People living in China were selected for the pre-pilot survey. Participants were asked to fill out the questionnaire and offer feedback. The average time required to complete the questionnaire was 5 minutes.

Suggestions for improving the questions were offered by participants. Most participants suggested it would be better to change Question 6 *Did you ever use any one of smart tourism app below: yes or no*? to a multiple-choice question. Doing so will make it much easier for respondents to recall times they used an app. Considering the social-demographic profile, in terms of gender, one respondent suggested some people may not wish to answer questions regarding gender. Therefore, the question was enhanced with one more option: *prefer not to say*.

3.6.6.2 The Pilot Study

The goal of the pilot study is to verify completeness, reliability, and validity of responses in the main study, prior to testing the hypotheses (Karahanna, Straub, & Chervany, 1999). The questionnaire aimed to ensure the researcher was aware of possible problems experienced in the collection of data. Bell et al. (2018) contend that it is better for the pilot sample to be closely matched with the final sample. De Vaus (2002) supports the idea that matching specific features of the pilot with the final samples is important. Accordingly, this research considered gender, age, education, and employment status for matching. Edith Desirée de Leeuw and Dillman (2008) suggest pilot studies should include 100 to 200 participants, while De Vaus (2002) recommend between 75 and 100 pilot participants. In this research, the pilot study included 100 participants. The research plan is offered below.

3.6.6.3 Advantages of Pilot Study

Many researchers (Teijlingen & Hundley, 2001; Thabane et al., 2010) have identified different reasons for conducting a pilot for research. The following are three advantages of pilot studies.

To determine how well questions flow, and whether any require revision to enhance features of the questionnaire; for example, removing less important questions that do not form a variable (Bell et al., 2018), it is also a way of evaluating clarity of instructions and time required to complete a questionnaire (Bell et al., 2018).

To enhance reliability of the measurement scale, and face validity of the scale, verifying whether the questionnaire questions were appropriate, and whether the object was consistently perceived by the researcher and participants is important (Neuman, 2014a). Using Cronhach's alpha, widely used to assess internal reliability, measurement parameters have been determined; the value should be above 0.80 (Bell et al., 2018; Hair et al., 2010). Table 3.5 shows findings of the study. Create an opportunity for the researcher to identify the most suitable method of collecting and analysing data. This is a good opportunity to determine appropriateness of the research process, methodology and strategy chosen, providing the required reference for rigorous research. (Bell et al., 2018).

3.6.6.4 Data collection Procedure of Pilot Study

Consumers who use smart tourism apps were chosen for the pilot study sample, matching with the main sample of this research. However, the size is smaller than the whole sample. This procedure aimed to remove potential problems in the questionnaire. Following the pilot study, questions may be added, deleted or modified. The final version of the questionnaire was evaluated in terms of instructions, ease of use, reading level, clarity, item wording and response formats; it was judged to possess face and context validity (Hair et al., 2010). Data in this research was obtained via an online survey (wenjuanxing). In addition to the survey, this study also pilot-tested the platform. For the pilot study, 196 questionnaires were dispersed from 23rd January to 24th February. Every respondent completed the questionnaire in approximately five minutes. Following data collection, 96 incomplete and unusable questionnaires were eliminated. The final sample consisted of 100 respondents.

3.7 Sampling Methods

Minichiello, Aroni, and Hays (2008) classify population as the whole population to be analysed by research; a sample is described as a part of that population and considered representative of that population. Quantitative samples are larger than qualitative samples, due to requirements to achieve a goal of statistical generalisation, rather than seeking deep insight into the underlying phenomena (Bell et al., 2018).Throughout the analysis, sampling is an efficient procedure, allowing the researcher to select a sample from the population to collect information about a specific event (R. Kumar, 2018). R. Kumar (2018) believes the purpose of sampling in quantitative research is to identify causal relationships based on data collected; the group from which the researcher selects the sample (R. Kumar, 2018).

3.7.1 Sampling in Quantitative Research

Neuman (2014a) and Bell et al. (2018) state there are two types of sampling methods, probability sampling and non-probability sampling. Each can be divided into different techniques for sampling.

3.7.1.1 Probability Sampling

Henry (1990) defined probability sampling as focussed on the distinguished characteristics of every unit in the population having a known and nonzero possibility of being added to the sample. Each individual or object in the relevant population has an equal possibility of being selected for study (Bell et al., 2018). Furthermore, Fink (2003, p. 10) considers probability sampling as a type of sampling through which the possibility of selection is equal for all participants from a population. An overview of probability sampling techniques is presented in Table 3.6 below.

Table 3.6 Probability Sampling Techniques

Probability Sampling Techniques	
Simple random sampling	Simple random sampling involves a process in which all members of the population are assigned a number, and then random numbers are chosen (and people selected) until the sample list has been created (Henn et al., 2009, p. 154)
Stratified sampling	Stratified random sampling involves a researcher pre-allocating the appropriate proportions of the sample to individual categories and then sampling randomly within those categories (Cameron & Price, 2009, p. 231)
Systematic sampling	With systematic sampling, the population is divided by the required sample size, which creates the sampling interval. Select the first unit randomly, and remaining units according to the interval (Henn et al., 2009, p. 154)
Cluster (multistage) sampling	Cluster sampling involves first selecting larger groupings, called clusters, and then selecting the sampling units from the clusters randomly (Frankfort-Nachmias, 1997, p. 192)

3.7.1.2 Non-Probability Sampling

Bell et al. (2018) denote non-probability sampling as including participants selected in a non-random fashion from the population. The selection method can be made easy by non-

randomness, selection carried out as per convenience, appearing simpler, less costly, and faster compared with approaches to chance sampling. Convenience sampling, snowball sampling, and judgmental sampling, have all been used in quantitative research, and are the most commonly used non-probability sampling designs (R. Kumar, 2018). An overview of probability sampling techniques is presented in Table 3.7 below.

Table 3.7 Non-Probability Sampling Techniques

Non-Probability Sampling Techniques	
Quota sampling	The quota sampling method aims to achieve statistically representative samples, but where there is no list of potential respondents (or sampling frame) or where resources do not permit the use of a random probability method (Henn et al., 2009, p. 157).
Convenience sampling	Convenience sampling involves the researcher selecting whichever cases are conveniently available (Henn et al., 2009, p. 157).
Snowball sampling	With snowball sampling, the researcher will typically build up a network of respondents through an initial group of informants, who introduce the researcher to other members of the same population (Henn et al., 2009, p. 158).
Purposive (judgement) sampling	With purposive samples, researchers select sampling units subjectively in an attempt to obtain a sample that appears to be representative of the population (Frankfort-Nachmias, 1997, p. 184)

3.7.2 Justification for Choosing Non-Probability Sampling

In this research, different sampling techniques are used at different stages, and employed dependent on objectives in each stage. Based on the discussion above regarding probability sampling methods and non-probability sampling methods, the researcher employed non-probability sampling strategies to select samples in both main and preliminary studies.

Considering that this preliminary study aims to confirm constructs used, and validate conceptual models from participants prior to design of the questionnaire, purposive sampling was used to select research participants. Purposive sampling allows the researcher to choose individual participants who appear as information rich cases (Patton, 2005). These participants benefit the study in terms of contributing constructs and conceptual models, best enabling the researcher to address research questions and achieve research objectives (Mark Saunders et al., 2012). Even though purposive sampling is unable to be statistically representative of a whole population, it is regarded as being suitable in the preliminary study (Mark Saunders et al., 2012). Therefore, participants in the preliminary study were using a smartphone or tablet; they had all used mobile applications previously, and the researcher interviewed a total of 11 participants, reaching saturation point. This was guided by researcher judgment of when to stop collecting data.

For the pilot study, convenience sampling was used; the main aim of the pilot was to collect respondent comments, feedback, and evaluation of difficulty in completing the questionnaire. Convenience sampling results in the sample being chosen based on accessibility to researcher (Bell et al., 2018). Although findings of a convenience sample study cannot be generalised, as it is unknown whether the sample is representative, convenience sampling is a time-saving and valid method of performing preliminary, or pilot, testing.

As the population of this research was Chinese tourists who had used a first or repeated smart tourism applications, the sampling frame is not available, and specific population data is absent. Therefore, adoption of non-probability convenience sampling is appropriate. Furthermore, this form of sampling is readily available and convenient, resulting in time and cost effectiveness (De Vaus, 2013; Sekaran & Bougie, 2016). According to Kerlinger (1986), convenience sampling is considered appropriate in research aimed at examining relationships between variables; this method of sampling introduces significant bias into the relationship. In addition, Creswell and Creswell (2017) state that researchers must use naturally occurring cohorts; convenience sampling is appropriate for quantitative studies, such as volunteers. This sampling method is widely used in literature studies of technology acceptance in different contexts. Table 3.6 illustrates evidence that demonstrates prevalence of using convenience sampling strategies in studies exploring mobile application technology acceptance.

Table 3.8 Empirical Studies using Non-Probability Sampling

Authors/Year	Research purpose	Contexts	Methodology Sampling method/ sample size	Approach	Tool
(RATTANABURI & VONGURAI, 2021)	To investigate the factors that influence the actual usage of mobile shopping applications among Generation Y (Gen Y) users in Thailand	Mobile Shopping Applications	Non-probability sampling N=502	Online survey	questionnaire
(Shelleka, 2021)	To investigate the impact of customer engagement on customer value in case of mobile travel apps.	Mobile travel apps.	Non-probability sampling N=200	Online survey	questionnaire
(Losa-Iglesias et al., 2019)	To examine that the App Heart Rate Plus is an easy, understandable, and attractive App for use by the general population and nurses	Mobile Heartbeat Measuring applications	Non-probability sampling N=80	observational study	questionnaire
(Kamboj & Joshi, 2020)	To investigate the factors influencing smartphone apps use at tourism destinations	Tourist destinations Mobile apps	Non-probability sampling N=357	Online survey	questionnaire

(Tarute et al., 2017)	To understand which features of mobile applications stimulate consumer engagement and lead to continuous use of mobile applications.	Mobile applications	Non-probability sampling N=246	Online survey	questionnaire

3.8 Impact of Sample Size on Quantitative study

Establishing a predetermined sample size is important in quantitative research, as it directly affects the statistical power of the significance test, and the generalisability of findings (Hair et al., 2010). Typically, a more diverse the population results in a more robust investigation of statistical analysis; greater sample sizes are desirable, especially in studies designed to test hypotheses, or construct associations (Neuman, 2014a). Burns (2010) states that sample size has an important effect on representation accuracy. Bryman and Bell (2015), note that, when sample sizes are large, there is a greater likelihood of generalisations accurately indicating population. De Vaus (2013) note how a large sample size reduces error risk. Furthermore, J. F. J. Hair, W. C. Black, B. J. Babin, and R. E. Anderson (2010) observe how certain determinants impact sample size, including expense, time, and access to respondents for collecting data.

A large sample size is crucial to ensure results. Stevens (2012) contends that the necessity of sample size supported by researchers has decreased recently, due to an increasing number of studies being conducted on the subject. Therefore, the sample sizes applied in similar research regarding evaluation of smart tourism were explored, as well as considering implementing intention; this was undertaken in the form of a guide for sufficient research sample size. Sample size has a crucial effect on the method of analysis proposed. The accuracy of results generated by multivariate analysis techniques will be influenced by sample size; the study involved confirmatory factor analysis (CFA), and structural equation modelling (SEM). Furthermore, Marsh et al. (2009, p. 441) believe guidelines, or golden rules, concerning proper sample size are problematic, as guidelines consider studies which tend to be restricted by generalisability, due to the related research being established by conditions (J. F. J. Hair et al., 2010). According to Iacobucci (2010), and Tabachnick and Fidell (2013), when fitting indices with SEM, a larger sample is ideal. Additionally, Kline (2015) notes vague guidelines regarding the most appropriate SEM sample size; when there are less than 100 cases, almost every SEM analysis can be invalid, apart from the simplest model.

Considering the structural equation modelling (SEM) requirement, Tabachnick and Fidell (2013, p. 618) believe a minimum of 300 cases as a good number for conducting factor analysis; every factor had three or four indicators. As stated by Hu, Bentler, and Kano (1992), when there is reasonable normality assumption, Maximum Likelihood as well as Scaled ML,

estimations of SEM parameters, deliver good performance when the sample size is above 500. Tabachnick and Fidell (2013) note the importance of sample sizes above 500 in poor conditions concerning low communalities; the square multiple correlation among variables is <0.60, with a greater number of weakly determined factors, meaning variables with loadings are <0.80. Therefore, considering this research's model complexity, as well as previous research, approximately 500 responses were evaluated, determining whether they fulfil SEM analysis requirements. 613 consumers were included over six months in the substantive study; 421 questionnaires were considered usable following elimination of 135 questionnaires, and 65 incomplete questionnaires.

Empirical studies are presented in Table 3.7, which presents an unequal distribution throughout various contexts in which they were applied; the average sample size was approximately 500. Hair et al. (2010) observe how statistical studies have agreed a larger sample size to ensure better data analysis.

Table 3.9 Empirical Large Scale Research Projects

Authors	Sample Size	Research Area
Yoo et al. (2017)	n=315	Smart tourism application
Nikou and Economides (2017)	n=140	Mobile learning
J.-J. Hew, Leong, Tan, Lee, and Ooi (2018)	n=400	Mobile social tourism apps
Zhou (2016)	n=475	Massive Open Online Courses (MOOCs)
R. R. Kumar, Israel, and Malik (2018)	n=744	mobile banking apps
Y. C. Huang et al. (2016)	n=186	Smart tourism
Y.-H. Fang (2019)	n=634	Mobile brand apps
Hajiheydari and Ashkani (2018)	n=1348	Mobile application user behaviour
Tarute et al. (2017)	n=246	Mobile technologies and mobile applications

3.9 Method of Data Analysis

3.9.1 Statistical Software-SPSS

In this research, survey questionnaire data was evaluated using SPSS (Version 24.0) for Windows (Bell et al., 2018), supporting analysis and evaluation of quantitative survey data (Neuman, 2014b). The various data analysis steps used in this study are explained below.

3.9.2 Structural Equation Modelling (SEM)

SEM is one statistical model designed to explain the relationship between multiple variables (Hair et al., 2010). SEM is used to analyse statistical models that hypothesise relationships (Hair et al., 2010), allowing the researcher to study a series of multiple regression equations simultaneously. These equations present the relationships between constructs, and consider the dependent and independent variables involved in the analysis (Hair et al., 2010). Therefore, SEM can help establish causal relationships between variables, checking the extent to which theoretical models are supported by sample data (Schumacker & Lomax, 2004). SEM consists of two parts: a measurement and structural model.

The measurement model specifies the extent to which a set of measured variables represent the underlying constructs they are intended to measure; the structural model shows how constructs are interrelated, often with multiple dependencies (Hair et al., 2010). The interest and focus of SEM is often on theoretical constructs, represented by latent factors. Furthermore, theoretical construct relationships are indicated by the factors' regression, or path, coefficients. As opposed to statistical techniques, SEM provides an overall convenient framework in which to conduct statistical analysis, involving various traditional multivariate procedures, such as multiple regression and factor analysis (Hox & Bechger, 1998). Therefore, SEM is considered a unique combination of factor analysis and multiple regression analysis (Hair et al., 2010). Needless to say, SEM analysis is determined by a strong theoretical foundation (Hair et al., 2010). Furthermore, SmartPLS is selected for the testing of SEM, as it has simple features.

3.9.3 Exploratory Factor Analysis (EFA)

The purpose of exploratory factor analysis is definition of underlying structures among variables in the analysis (Hair et al., 2010; Mazzocchi, 2008), identifying the number of factors and interpreting what they represent. Factor analysis is suitable for exploring the unknown, or uncertain, relations between observed and latent variables. There are three steps to conduct EFA. Firstly, the Kaiser-Meyer-Olkin (KMO; (Kaiser, 1974) measure, and Bartlett (1951; BTS) test of sphericity is conducted, ensuring appropriateness in running a factor analysis. Furthermore, factor extraction and principal components analysis (PCA) with Promax rotation (Matsunaga, 2010) is employed, confirming dimensionality of constructs, and establishing the discriminant validity between sets of constructs. Finally, the coefficient alpha (Cronbach, 1951) will be examined to assess the reliability of scales.

3.9.4 Confirmatory Factor Analysis (CFA)

Schmitt (2011) considers CFA as useful to confirm an expected factor structure, rather than to determine a structure. CFA is most purposeful when the researcher has a good understanding of the number of factors needed to explain the interrelationships between measured variables (Sureshchandar, Rajendran, & Anantharaman, 2002). CFA is more appropriate for use when proposed research models are constructed on the basis of logical and theoretical findings (Byrne, 2013). In this research, it is crucial to conduct a factor analysis of CFA; the aim here is to test the relationship between a factor, and the corresponding measure term, checking consistency with the theoretical relationship designed by the researcher. It is considered an appropriate method.

3.9.5 Reliability

Reliability is “a measure of the degree to which a set of indicators of a latent construct is internally consistent based on how highly interrelated the indicators are with each other” (Hair et al., 2010, p. 636). There are different reports regarding the acceptable values of alpha, ranging from 0.70 to 0.95 (Curvin & Slater, 2002; Hair et al., 2010) Table 3.8 summarises the accepted level of reliability by researcher.

Table 3.10 The Accepted Level of Reliability

Author(s)		Recommended Cronbach's alpha level
Paulhus, Robinson, Shaver, and Wrightsman (1991)	Exploratory research	0.6
Hair et al. (2010)	Normal acceptable level	0.7
	Unacceptable level	Below 0.6
Murphy and Davidshofer (1994)	Low level	0.7
	Moderate to high level	0.8-0.9
	High level	Above 0.9
Curvin and Slater (2002)	Acceptable level	Slightly below 0.7
Bryman and Bell (2015)	Acceptable level	0.8

3.9.4 Estimation Method

To obtain useful results from survey research, statistical methods are useful to analyse data. Statistical software will be used to analyse data collected here; this research employs two phases of data analysis to test the proposed model. Firstly, frequency analysis is employed to understand respondent characteristics and profiles. Secondly, the model fit helps establish how much the structural equation model fits the sample data; research applied PLS-SEM to assess the conceptual model. J. F. Hair, Ringle, and Sarstedt (2013) noted how PLS primarily aims to improve explained variance of dependent latent variables, extensively used in marketing and business research. Also Ringle, Wende, and Becker (2015) advised the following rules as selection criteria PLS-SEM, "If the goal is predicting key target constructs or identifying key 'driver' constructs, select PLS-SEM" or "If the research is exploratory or an extension of an existing structural theory, select PLS-SEM."

Henseler, Ringle, and Sinkovics (2009) state PLS-SEM is useful to assesses the measurement model testing the validity and reliability of constructs, conducting structural model testing on hypothesised relationships of independent and dependent constructs. Therefore, as analysis of this research focuses on a predictive models and extensions of an existing structural theory, research here adopted the PLS-SEM method. Specifically, PLS analysis has strong advantages

over other multivariate methods, such as structural equation modelling (SEM), and multiple regression. Therefore, only a minimum level of constraint is required for measurement scales, sample sizes, non-parametric distributions, and support of constructs with a single-item as variance base SEM (Barclay, Higgins, & Thompson, 1995; Ringle et al., 2015; Vinzi, Trinchera, & Amato, 2010). This research model was tested using SmartPLS 3.0 software (Ringle et al., 2015).

3.10 Ethical Issues

Before the researcher approaches participants, they should first obtain formal ethical approval from the appropriate ethics committee; consideration of possible ethical issues is an important prerequisite to data collection from respondents, especially for studies involving human participants (Collis & Hussey, 2013). As the purpose of this study was to understand perceptions and behavioural intentions, the researcher first conducted interviews, then administered a questionnaire, in order to collect data based on a large sample. As noted by Broom (2006), prior to conducting a study, researchers must gain formal ethical approval from the relevant ethical committee. Accordingly, the Newcastle Business School Ethics Committee granted ethical approval (Appendix E). Ethical considerations for this study were carried out in full accordance with the Northumbria University Handbook of Research Ethics and Governance. (handbook:https://www.northumbria.ac.uk/research/ethics-and-governance/-/media/corporate-website/documents/pdfs/research/ethics-in-research-policy-statement.ashx).

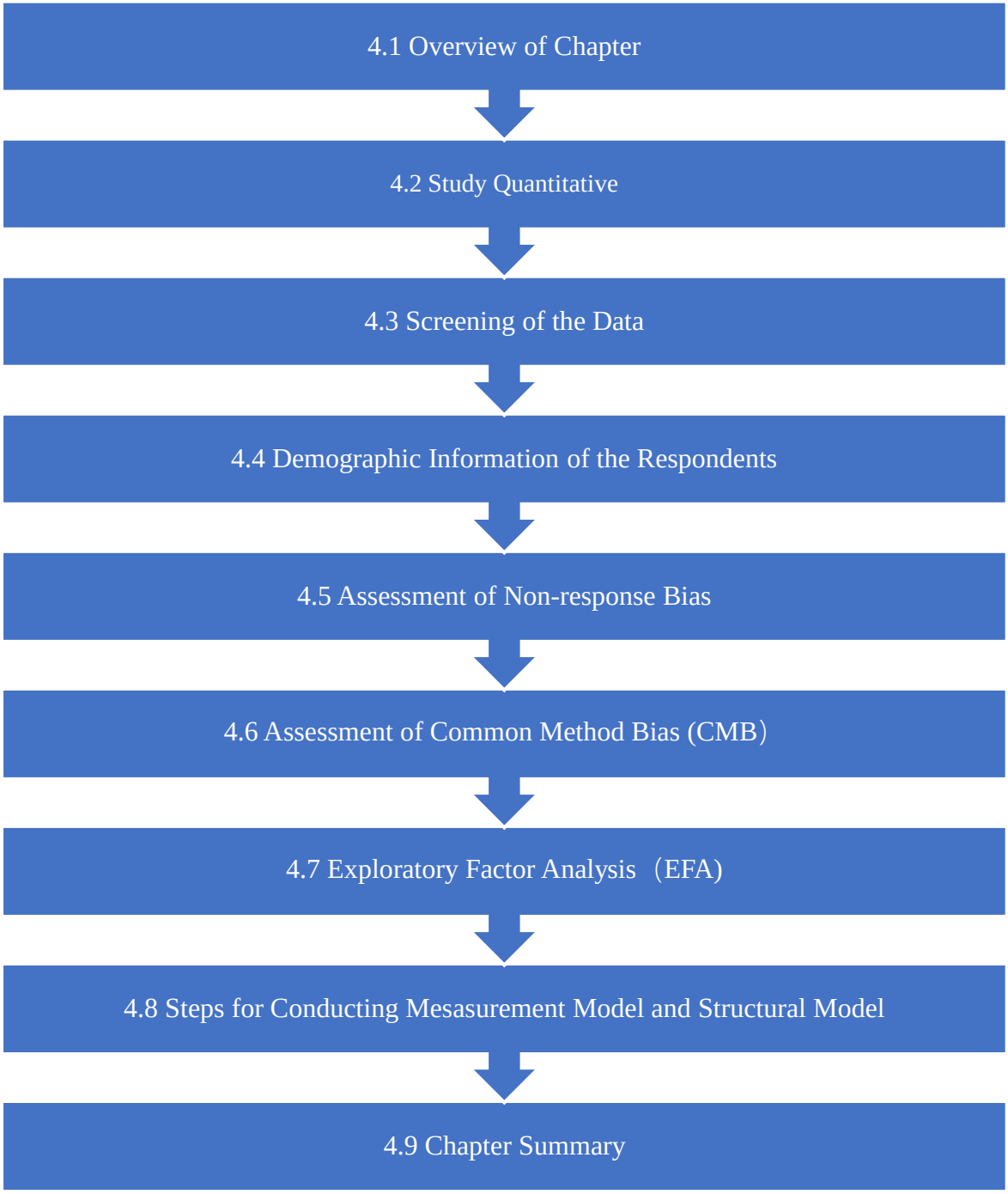
Broom (2006) states both confidentiality and privacy are significant ethical concerns in social research. Ethical responsibility was ensured in this research by appropriately handling confidential information using agreements regarding confidentiality and anonymity (Easterby-Smith et al., 2018; Fowler Jr, 2013). Furthermore, a coding system was used to conceal respondent identity; responses were kept anonymous. According to the University's Ethics Committee, when a questionnaire is completed, consent is implied, and there is no need to attain individual informed consent forms. Therefore, the front page includes information that explains the purpose of the survey, stating data will be anonymous and confidential. Furthermore, all data was secured, and password protection used for electronic data; physical copies were locked in a filing cabinet. Ethics forms specify collected data is retained until the

thesis is complete, as well as following publications relevant to this information, after which it is destroyed.

3.11 Chapter summary

This chapter aims to generate an appropriate methodology for data collection, as well as examining research questions. Therefore, this chapter explores methodological, as well as philosophical, frameworks applied in research, explaining how this framework affects various stages of research. Following this, research used a preliminary study (interview) method, and main study (questionnaire) method, assessing various methodological options with rationales concerning data collection, questionnaire development, survey design, and measurement item. This describes procedures involved to conduct research, which are literature review, pilot study, data analysis, and development of the survey instrument. Finally, the concludes presented the research's ethical procedures and related restrictions as well as potential problems.

Chapter 4: Data Analysis and Results



4.1 Overview of Chapter

Given the necessity to focus on understanding customer perceptions and behavioural intentions regarding smart tourism applications, another one is understanding the relationships between examined determinants via rigorous statistical approaches based on the proposed conceptual model in the context of smart tourism applications. A sample of 421 participated in the study.

The purpose of this chapter is to report on preliminary study findings informing the conceptual framework development and quantitative aspect of the study, and the statistical analysis of findings of the survey; it describes the process involved in preparing data using Structural Equation Modelling (SEM) in Smart-PLS (3.0). The quantitative survey in the body of the study. (Section 4.2). Brief discussion of the overall dataset is discussed in Section 4.3. The following section provides a review of the distribution of overall data. Data normality and outliers (section 4.3.1.1) are explored before revealing the descriptive demographic analysis of data (section 4.4). Based on the preliminary evaluation, a summary of key findings and justifications for the aforementioned steps are offered, ensuring that data in this study is appropriate for in-depth analysis using SEM. The measurement and structural models (section 4.7) are evaluated within 3-step data analysis. Step one develops a theoretical model (section 4.7). Step 2 analyses undimensionality for the 8 constructs (section 4.8). Step 3 is a structural model analysis (section 4.8). Finally, a chapter summary is provided (section 4.9).

4.2 Study-Quantitative

In this section, characteristics of the sample data in the main study are presented. A statistical analysis of models and hypotheses developed, validated on qualitative in-depth interviews, is conducted. Specifically, description of the questionnaire and data collection is explained; relevant measurements are identified. The work then presents the research model and data analysis based on it, presents the process of data analysis, showing the analysis results. Finally, the purpose of this study is to assess whether user intention to use smart tourism applications can be predicted by factors from the literature review.

4.2.1 Review the Research Hypotheses

Hypothetical assumptions inform the basis of this study, as research measures form motivation in the use of smart tourism applications using self-determination theory and the Technology Acceptance Model to identify factors influencing consumer intention to continue using smart tourisms applications. Literature supported the view that addressing those factors are:

Table 4.1 Hypotheses Based on the Literature Review

H1	a	Autonomy has a positive impact on perceived usefulness.
	b	Autonomy has a positive impact on perceived ease of use.
	c	Autonomy has a positive impact on enjoyment.
	d	Autonomy has a positive impact on Inertia.
H2	a	Competence has a positive impact on perceived usefulness.
	b	Competence has a positive impact on perceived ease of use.
H3	a	Perceived Relatedness has a positive impact on perceived usefulness.
	b	Relatedness has a positive impact on perceived ease of use.
H4	a	Perceived ease of use positively affects the perceived usefulness
	b	Perceived ease of use positively affects the intention to use in smart tourism app.
	c	Perceived ease of use positively affects the perceived enjoyment
H5		Perceived usefulness positively affects the intention to use in smart tourism apps.
H6		Perceived enjoyment positively affects the intention to use in smart tourism apps.
H7		Inertia has a positive impact on the intention to use for smart tourism application.

As discussed earlier in Research Methodology and Method (Chapter3), all constructs used in this study have been adopted from well-established academic studies. A total of 28 items are distributed across 8 constructs: perceived autonomy, perceived competence, perceived relatedness, perceived usefulness, perceived ease of use, inertia, perceived enjoyment, and intention to use.

4.3 Screening of the Data

A survey was chosen as the principal distribution method for this research. A total of 622 questionnaires were received; 65 were incomplete. However, in order to ensure all data was able to generate quality results, the following criteria were applied in the selection of data.

Firstly, before launching the survey questionnaire, length and time needed to complete it were tested at the pilot stage among consumers who used smart tourism apps. According to results of a pilot study, the average time to complete the questionnaire was around 10 minutes. Therefore, if completion time of the questionnaire is less than 3 minutes, it was considered that little thought had been given to the questions.

Secondly, although some responses had a reasonable completion time, some answers in the questionnaire did not make sense. For example, some respondents listed the same answer throughout the questionnaire, even though some questions were reverse code, or some respondents said they had used smart tourism applications more than once in the last 12 months, yet the amount they have used smart tourism apps on their phones was zero. It can be seen those questionnaires were not carefully answered. Therefore, those questionnaires need to be eliminated from the dataset.

After initial screening and deletion of 136 unqualified responses, the remaining 421 questionnaires were further subjected to normality testing and outlier checking, which will be explained in the following section.

4.3.1 Data Preparation: Tests of Normality and Outliers

This section describes how to prepare data for SEM. SEM is the primary statistical methodology utilised in this study; it necessitates the fulfilment of specific data conditions, particularly related to distributional features. Model-fitting programmes might fail to produce a solution due to data-related issues. To ensure the correctness of a SEM study, thoroughly screened data (the examination and resolution of problematic data before the principal analysis) is required.

4.3.1.1 Normality

The most fundamental assumption in multivariate analysis is normality. The two types of normality are univariate and multivariate normality. The normality of a single variable is referred to as univariate normality. Multivariate normality (the combination of two or more variables) means both the individual variables and combinations are normal in a univariate context. In some instances, a multivariate normal variable is also a univariate normal variable.

As a result, obtaining multivariate normalcy is easier if all variables are univariately regular. However this is not assured (Hair et al., 2010). Due to the difficulty of assessing multivariate normalcy (Stevens, 2012), this research focuses on assessing and achieving univariate normalcy.

The normality of variables is typically determined by visually inspecting the histogram, or using statistical tests (Hair et al., 2010). A visual examination is the most basic diagnostic test for normalcy. It compares observed data values to a distribution similar to the normal distribution. This system, on the other hand, is highly subjective. An objective test is required to determine whether a distribution is natural. According to Hair et al. (2010), the skewness and kurtosis measures are reliable approaches for examining deviations from normality, yet they each deal with only one type of non-normality. Skewness is a term used to define distribution symmetry, implying the mean of a skewed variable is not in the centre (Robson et al., 2011). A positive skew indicates distribution shifted to the left, whereas a negative skewness reflects a shift to the right. Kurtosis is a measure of a distribution's "peakedness" in comparison with normal distribution; a distribution is either too peaked (with short, thick tails), or too flat (with long, thin tails). In a normal distribution, skewness and kurtosis should be zero (Hair et al., 2010).

Skewness and kurtosis values are typically converted into a z-score, which is simply a score from a distribution with a mean of 0 and a standard deviation of 1 e (Hair et al., 2010). The following formula can be used to calculate the z value of skewness and kurtosis:

$$Z_{skewness}=\frac{Skewness}{Std.Error\ of\ skewness}$$

$$Z_{kurtosis}=\frac{Kurtosis}{Std.Error\ of\ kurtosis}$$

If calculated z values exceed the fixed critical value, then distribution is non-normal distribution (Hair et al., 2010). Commonly used critical values are ± 3.29 (at 0.001 significance level), ±2.58 (at 0.01 significance level) and ±1.96 (at 0.05 significance level) (Hair et al., 2010).

Field (2013) debates the fact that large sample sizes (200 or more) generate smaller standard errors. As the sample size gets bigger, significant vales arise from even small deviations in normality. Field (2013) advises that it is more important to observe the shape of the distribution visually, paying attention to the value of skewness and kurtosis, rather than calculating their significance. Hair et al. (2010) argue that testing significance is less useful for large sample sizes, recommending researchers always use both the graphical plots, and any statistical tests, to assess the actual degree of departure from normality. Accordingly, this study follows recommendations by Field (2013) and Hair et al. (2010), in assessing normality by observing the skewness and kurtosis values in combination with distribution of the histograms provided by SPSS. The assessment of normality for the items is exhibited in Table 4.2 below.

Table 4.2 indicates that the kurtosis value is higher than the upper threshold value of ± 3.29, demonstrating significant non-normality. Results also show that the majority of individual items' Critical Ratio values are more than ± 3.29, significant at a 1% level. The sample size of this research at 421 can be considered relatively large and sensitive, due to insignificant standard errors. Therefore, it is not surprising that outcomes are poor in this situation, as the significance test is less useful.

Table 4.2 Assessment of Normality of Full Samples (n=421)

Constructs	Item	Min	Max	Skewness	C.R.of Skewness	Kurtosis	C.R.of Kurtosis
	PA1	1.000	7.000	-0.962	-8.084	0.849	3.582
Perceived Autonomy	PA2	1.000	7.000	-0.847	-7.117	0.326	1.375
	PA3	1.000	7.000	-0.787	-6.613	0.383	1.616
	PA4	2.000	7.000	-0.799	-6.714	0.317	1.337
	PC1	1.000	7.000	-0.998	-8.386	0.760	3.206
Perceived Competence	PC2	1.000	7.000	-0.892	-7.495	0.307	1.295
	PR1	2.000	7.000	-0.702	-5.899	-0.084	-0.354
	PR2	1.000	7.000	-0.584	-4.907	-0.540	-2.278
Perceived Relatedness	PR3	1.000	7.000	-0.515	-4.327	-0.469	-1.978
	PR4	1.000	7.000	-0.393	-3.302	-0.606	-2.556
	PR5	1.000	7.000	-0.587	-4.932	-0.476	-2.008
	PEOU1	1.000	7.000	-0.874	-7.344	0.771	3.253
Perceived ease of use	PEOU2	1.000	7.000	-1.030	-8.655	1.002	4.227
	PEOU3	1.000	7.000	-0.940	-7.899	0.788	2.902

Perceived usefulness	PU1	1.000	7.000	-0.998	-8.386	1.041	4.392
	PU2	1.000	7.000	-0.941	-7.907	0.679	2.864
	PU3	1.000	7.000	-0.992	-8.336	0.787	3.320
	PE1	1.000	7.000	-0.725	-6.092	0.083	0.350
Perceived enjoyment	PE2	1.000	7.000	-0.767	-6.445	0.144	0.607
	PE3	1.000	7.000	-0.588	-4.941	-0.600	-2.531
	PE4	1.000	7.000	-0.764	-6.420	0.796	3.358
	Inertia1	1.000	7.000	-0.611	-5.134	-0.357	-1.506
Inertia	Inertia2	1.000	7.000	-0.855	-7.184	0.266	1.122
	Inertia3	1.000	7.000	-0.773	-6.495	0.04	0.168
	ITU1	1.000	7.000	-0.943	-7.924	0.876	3.696
Intention to use	ITU2	1.000	7.000	-0.759	-6.378	0.016	0.067
	ITU3	1.000	7.000	-0.923	-7.756	0.47	1.983

Consequently, the researcher decided to visually check histograms (Appendix G) through the SPSS software, in order to assess the actual degrees of departure from the data in relation to normality.

After checking the shape of the distribution of each item among items of 8 constructs (perceived autonomy, perceived competence, perceived relatedness, perceived ease of use, perceived usefulness, enjoyment, inertia and intention to use), and given that a large sample size (421) has been used in the study, it may be accepted that the sample contains a minority of non-normal distributed data. According to Byrne (2013) there are certain methods that are available for aiding non-normal distributed data in SEM analysis. Details regarding solutions for dealing with non-normality are discussed in Section 4.3.2.

4.3.1.2 Outliers

Outliers are "observations with a unique combination of characteristics identifiable as distinctly different from the other observations" (Hair et al., 2010, p. 64). Outliers can be identified from a univariate, bivariate or multivariate perspective based on the number of variables considered. Univariate and bivariate outliers are used to assess one or two variables, examine the distribution of observations, and select those cases falling at the outer ranges (high or low) of the distribution. However, multivariate outliers involve a multivariate assessment of each observation across a set of variables. As this study included a number of variables, the multivariate analyses are what this research is interested in. Normally, there are two ways to

analyse the outliers for univariate and bivariate: (1) to check the shape of the distribution such as observing a boxplot or scatterplot, or (2) to compare z-scores (Hair et al., 2010). In contrast, when there is a detection of multivariate outliers, Mahalanobis D analysis is a common method used. In terms of Mahalanobis D measurement, this is a method that measures distance of each observation in a multidimensional space from the mean centre of all observations (Hair et al., 2010). It effectively measures the position of each observation compared with the centre of all the observations across a set of variables. It provides a measurement approach for multidimensional centrality and also has statistical properties that allow for significance testing (Hair et al., 2010). Given the nature of the statistical tests, it is suggested that a conventional significance level is 1% (i.e., $p<0.001$), as the threshold value for designation as an outlier. Table 4.3 below demonstrates the multivariate outliers which were calculated from the Mahalanobis distance test in SPSS.

Table 4.3 Analysis of Outliers

Observation number	Mahalanobis D^2	Significance	Observation number	Mahalanobis D^2	Significance
77	58.391	0.000	143	13.049	0.11
1	44.011	0.000	114	13.041	0.11
78	39.029	0.000	235	12.954	0.113
2	38.077	0.000	19	12.905	0.115
96	30.626	0.000	228	12.898	0.115
22	29.458	0.000	131	12.841	0.117
30	28.401	0.000	18	12.729	0.122
237	28.363	0.000	168	12.641	0.125
215	27.868	0.001	42	12.583	0.127
17	27.862	0.001	225	12.564	0.128
26	27.796	0.001	327	12.454	0.132
58	23.545	0.003	95	12.284	0.139
174	22.338	0.004	416	12.267	0.14
73	21.715	0.005	265	12.161	0.144
34	21.591	0.006	4	12.121	0.146
21	21.221	0.007	107	11.969	0.153
50	21.037	0.007	238	11.957	0.153
67	20.081	0.01	162	11.892	0.156
6	19.413	0.013	316	11.861	0.157
7	18.666	0.017	90	11.723	0.164
3	18.022	0.021	321	11.709	0.165

82	17.825	0.023	159	11.661	0.167
38	16.809	0.032	120	11.653	0.167
16	16.455	0.036	355	11.632	0.168
9	16.328	0.038	5	11.63	0.168
288	16.182	0.04	86	11.565	0.172
31	15.936	0.043	258	11.442	0.178
10	15.277	0.054	330	11.407	0.18
28	15.272	0.054	205	11.34	0.183
33	15.129	0.057	40	11.226	0.189
91	14.778	0.064	199	11.153	0.193
35	14.608	0.067	37	11.139	0.194
111	14.408	0.072	287	11.128	0.195
24	14.327	0.074	299	11.105	0.196
221	14.307	0.074	276	11.098	0.196
97	14.29	0.075	39	10.986	0.203
12	14.252	0.075	51	10.963	0.204
400	14.135	0.078	89	10.86	0.21
134	13.906	0.084	11	10.837	0.211
68	13.797	0.087	13	10.837	0.211
195	13.771	0.088	385	10.833	0.211
198	13.732	0.089	361	10.81	0.213
401	13.554	0.094	36	10.744	0.217
52	13.397	0.099	62	10.736	0.217
29	13.389	0.099	14	10.701	0.219
20	13.364	0.1	220	10.641	0.223
189	13.146	0.107	25	10.62	0.224
101	13.146	0.107	116	10.55	0.229
166	13.13	0.107	348	10.526	0.23
353	13.076	0.109	155	10.424	0.237

From the SPSS output “Mahalanobis distance” (see table 4.3), the program identifies 8 cases (i.e., shaded items in the table where the significance level is $p<0.001$) for which the observed scores differ markedly from the centroid of scores for all 421 cases. Mahalanobis D^2 values are used as measures of distance; they are reported in decreasing rank order. After a re-check of the original dataset, there is no evidence to identify this data as aberrant. This study may attempt to strengthen multivariate analysis by eliminating these outliers. However, this would limit generalisability. There are no findings that reflect extremes on many variables, so as to be considered unrepresentative of the study, according to the Mahalanobis results. The observations identified as outliers seem similarly adequate to the remaining observations

retained in the multivariate analysis ($p<0.001$). Therefore these 8 observations should be kept, especially as they may be adjusted in the resultant Structure Equation Modelling analysis in a manner which does not significantly distort the analysis (Hair et al., 2010)

4.3.2 Solutions for Reducing the Influence of Outlier in Non-Normality

Outliers are observations with a unique combination of characteristics identifiable as distinctly different from the other observations (Alves & Nascimento, 2007). Once outliers have been identified, the researcher must decide whether the outliers are to be retained or deleted in analysis (Tabachnick & Fidell, 2013). There are several strategies for reducing impact. Hair et al. (2010) advise that outliers cannot be categorically characterised as either beneficial or problematic, but rather must be viewed within the context of analysis and should be evaluated by types of information they may provide. Alves and Nascimento (2007), and Hair et al. (2010), further claim researchers should retain outliers unless specific evidence is available they are truly aberrant, and not representative of valid observations of the population. In line with this, 8 observations are rechecked, as they have been identified as outliers in this study. After carefully examining and rechecking, these 8 outliers are similar to remaining samples and can be considered as representing the sample. Based on the guidance of Hair et al. (2010), it is decided 8 observations should be retained in the analysis.

An alternative option is transformations, normally used as a remedy for non- standard distribution data (Hair et al., 2010). The purpose of transformations data is to transform entire data, correcting for distributional issues or outliers. However, this method is associated with several limitations and not generally recommended. Tabachnick and Fidell (2013) argue that transformation may not work for a truly multivariate outlier, as the problem is with the combination of scores on two or more variables, not with the score on any one variable. It is difficult to interpret, especially for scores generated by transformed variables. Non-normal data is a common issue for researchers who utilise SEM techniques. Enders (2001) investigated the full information of maximum-likelihood estimation (FIML) in structural equation models with non-normal indicator variables using a Monte Carlo simulation. Results of this investigation suggest the existence of non-normal data does not exacerbate the problem, as non-normal data has no effect on FIML bias. As FIML bias is mostly unaffected by distribution shape and looks

to be the method of choice, the non-normal data discovered in this investigation should not pose a significant problem in this investigation.

4.4 Demographic Information of the Respondents

4.4.1 Demographic Characteristics

This section presents results of the descriptive analysis. Table 4.4 displays the demographic characteristics of the overall sample. A total of 421 surveys were received via Wenjuanxing. There were 39.2% female and 58.4% male participants in the survey. The age distribution of participants was as follows: The 33% respondents were 21-30 years age, 24.5% were under 20 years age and 22.3% were 31-40 years age. Most respondents were undergraduate (49.9%), followed by Masters (19.5%), high school or less (19.7%) and professional (10.9%) respectively. Respondents were 46.1% full-time employees, 5% part-time employee, and 32.5% student. All respondents in this survey were Chinese.

Table 4.4 Presents a Summary of the Respondents' Profile.

Characteristics（n=421）	Percentage (%)	Frequency
Gender		
Female	39.2	165
Male	58.4	246
Prefer not to say	2.4	10
Age		
20 or under	24.5	103
21-30	33.0	139
31-40	22.3	94
41-50	15.2	64
51or over	5.0	21
Educational level achieved		
High school or less	19.7	83
Undergraduate	49.9	210
Masters	19.5	82

Professional	10.9	46
Occupational status		
Student	32.5	137
Full-time employee	46.1	194
Part-time employee	5.0	21
Self-employed/Owner	4.5	19
Freelancer	10.2	43
Others	1.7	7

4.4.2. Smart Tourism Apps Usage History Characteristics

As displayed in Table 4.5, the majority of respondents (81%) were on a trip at least once in the last year. This means these respondents are more likely to have used tourism apps in real life. As for smart tourism apps, nearly 42.5% of respondents had 1-2 smart tourism apps in their Smartphone or Tablet; 29.2% had 3-4 smart tourism apps. Most respondents used their smartphone for a relatively similar time, as over 47.5% of uses were 3-6 hours, 28% were over 6 hours. These potentially indicate that, firstly, smart tourism applications are common on respondents' mobile devices, with almost half of them having at least one smart tourism application, and secondly, the frequency of smartphone use is high; almost half of respondents use their smartphones for at least 3 hours a day, potentially increasing frequency of mobile application use.

Table 4.5 Participants' Experience with Using Mobile Apps

Characteristics	Percentage (%)	Frequency
How many smart tourism apps in your Mobile (Smartphone, Tablet)		
0	8.3	35
1-2	42.5	179
3-4	29.2	123
5-6	9.7	41
≥7	10.2	43

How long do you use Mobile App everyday		
< 1	7.8	33
1-3	16.6	70
3-6	47.5	200
>6	28	118
Did you travel at least once in the last 12 months		
Yes	81	341
No	19	80

Table 4.6 presents data on smart tourism apps respondents used for their most recent travel. As is observed, the vast majority (just over 86.2%) used smart tourism apps to find out travel information,13.7% of the sample have ever used. As for usage history, over 55.3% used the Crip, 44.9% used Quner, 33.3% used Feizhu, and 25.5% Airbnb.

Table 4.6 Most Used Smart Tourism Apps

Characteristics	Percentage (%)	Frequency
Have you ever used smart tourism apps when trying to find out travel information (e.g. tourism experience, restaurants, accommodations, entertainment, etc.		
Yes	79.3	363
No	13.7	58
Which smart tourism apps have you used		
Mafeng Wo	27.8	117
Qunaer	44.9	189
Crip	55.3	233
Fei zhu	33.3	140
Airbnb	25.2	106
Others	24.7	104

4.5 Assessment of non-response bias

Of 421 useful questionnaires, 421 responses were gathered in 8 weeks (March 25-May 25). Since it took 8 weeks to gather 421 usable questionnaires in online survey (wenjuanxing), the nonparametric Mann-Whitney U test is conducted to assess the non-response bias. The researcher compared the means of all the factors including demographic characteristics of early respondents (n=255) and late respondents (n=167) (J. S. Armstrong & Overton, 1977). Graca et al., 2015) The results indicated no significant difference between the two groups in this study. Therefore, non-response bias was not likely to be a problem in this study.

4.6 Assessment of Common Method Bias (CMB)

When the same respondents evaluate the predictor and criterion variables in behavioural research, common method bias can be a prevalent problem(Mittal & Dhar, 2015). Common method bias (CMB) refers to variance generated as a consequence of the forms of measurement at different levels of abstraction, such as content of specific items, scale type, and response format (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Following Podsakoff et al. (2003) and Mittal and Dhar (2015), this study conducts a Harman's single factor analysis, one of the most widely used techniques, to the check the possibility of common method bias. If CMB is an issue in the model, a single factor will account for a majority (% of variance >50%) of the variance in an unrotated factor analysis. Results showed the greatest covariance explained by one factor is 43.306%, less than 50% (see Table 4.7). Therefore, common method bias was not an issue in this study.

Table 4.7 Total Variance Explained

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.926	43.306	43.306	14.926	43.306	43.306
2	2.504	8.942	62.249			
3	.986	3.520	65.769			
4	.801	2.861	68.630			
5	.598	2.136	70.766			

6	.568	2.027	72.794			
7	.542	1.935	74.728			
8	.524	1.871	76.599			
9	.492	1.756	78.356			
10	.475	1.696	80.051			
11	.441	1.576	81.627			
12	.434	1.550	83.177			
13	.401	1.433	84.611			
14	.385	1.375	85.985			
15	.366	1.307	87.292			
16	.354	1.264	88.557			
17	.339	1.211	89.767			
18	.315	1.126	90.893			
19	.304	1.086	91.979			
20	.303	1.081	93.060			
21	.295	1.053	94.113			
22	.289	1.034	95.147			
23	.276	.985	96.132			
24	.248	.885	97.017			
25	.244	.870	97.887			
26	.214	.766	98.653			
27	.196	.698	99.351			
28	.182	.649	100.000			
Extraction Method: Principal Component Analysis.						

4.7 Exploratory factor analysis (EFA)

As these scales were not evaluated in the context of smart tourism applications, EFA will be suitably used in this research. Following Matsunaga (2010) and Thompson (2004), before to EFA and CFA, an initial collection of items is screened using principal component analysis (PCA) in SPSS version 26. PCA provides an effective tool to reduce a pool of items into a smaller number of components with minimal loss of information (Matsunaga, 2010).

Firstly, to assess if the sample size was sufficient for factor analysis, stepwise analysis was performed using the Kaiser-Meyer-Olkin (KMO) statistic. An acceptable value for KMO is 0.5 and it becomes better as it approaches 1. The second statistic calculated was Bartlett's test of sphericity; if significant, it indicates the correlation matrix is not equal to its identity matrix, and there is a relationship between variables (Thompson, 2004). In this study, the KMO is 0.975, and the Bartlett's test of sphericity is significant. Therefore, further factor analysis can be conducted.

The next step is factor extraction, performed by computing the correlation matrix's eigenvalues. The magnitudes of related eigenvalues of variables influence factor retention (some may be large and others small).

The default setting in SPSS is to maintain factors using Kaiser's criterion (eigenvalue>1). The number of factors for each scale was determined using minimum eigenvalues of 1.0. All of the variables in this analysis can be grouped into 8 factors, which account for 76.599 % of the overall variance.

The "eigenvalues greater than one" rule, often attributed to Kaiser (1960), is implicitly linked to this null model and states that the number of factors to retain should correspond to the number of eigenvalues greater than one (i.e., deviating from the null expectation). Intuitively, one can motivate this rule by stating that an eigenvalue that represents a "true structural dimension" should at least explain more variance than contained in a single variable. Atheoretical justification is that for a factor to have positive Kuder–Richardson reliability (cf. Cronbach's alpha), it is necessary and sufficient that the associated eigenvalue be greater than 1 (Kaiser,1960, p. 145). Hence, the greater than one rule is essentially an asymptotical and theoretical lower bound (see, e.g., Guttman,1954) to the number of true and reliable structural dimensions at the population level.

To ensure maximum dispersion of loadings within factors, the PCA with Promax rotation was used. Proxmax is one of the rotation methods able to provide solutions with correlated components/factors (Matsunaga, 2010). Items loading above 0.40 on one factor, and with a minimum difference of 0.20 on all other factors, were retained (George & Mallery, 2007). In this study, total items loading is between 0.658 and 0.908. From Table 4.8 below, except for

PR4 and Enjoyent1, which have a cross loading distribution in component groups 6 and 7, the overall factor loadings are perfect. Matsunaga (2010) states that an item should be retained if its primary-secondary discrepancy is sufficiently large, usually 0.3-0.4. The primary-secondary difference of PR4 is 0.442 (0.919-0.477), and the difference of Enjoyment1 is 0.513 (0.818-0.305). Therefore, PR4 and Enjoyment1 are retained for the following data analysis. Further CFA will be conducted to examine whether they should be in one factor group.

Table 4.8 Factor Loading-Cross Loading

Pattern Matrixa								
	Component							
	1	2	3	4	5	6	7	8
PEOU1								.448
PEOU2								.695
PEOU3								.599
PU1	.917							
PU2	.853							
PU3	.834							
PA1				.500				
PA2				.810				
PA3				.501				
PA4				.892				
PA5								
PC1						.632		
PC2						.559		
PR1		.958						
PR2		.866						
PR3		.834						
PR4		.477				.919		
PR5		.553						
Enjoyment 1					.818		.305	
Enjoyment 2					.754			

Enjoyment 3					.878			
Enjoyment 4					.682			
Inertia 1							.767	
Inertia 2							.690	
Inertia 3							.907	
Intention to continue to use 1			.559					
Intention to continue to use 2			.760					
Intention to continue to use 3			.828					
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 9 iterations.								

In summary, EFA yielded 8 constructs, perceived autonomy (PA), perceived competence (PC), perceived relatedness (PR), perceived ease of use (PEOU), perceived usefulness (PU), enjoyment, inertia, and intention to use. All of the factor loadings of each item were above 0.50, demonstrating soundness of the factor structure (Hair et al., 2010).

Finally, all scales used in the primary study were subject to reliability analysis, measured through coefficient alpha by SPSS 26 (Cronbach, 1951). The internal consistency of items demonstrated a high level of reliability above 0.7 (Cronbach, 1951), ranging from 0.795 to 0.867. Therefore, all scales used in this study are regarded as highly reliable. The results of the Cronbach's Alpha internal reliability analysis are presented in Table 4.9.

Table 4.9 Cronbach's Alpha Internal Reliability Analysis

Construct	Cronbach's Alpha	N of Items
perceived autonomy	0.805	5
perceived competence	0.795	2
perceived relatedness	0.880	5
perceived ease of use	0.830	3
perceived usefulness	0.873	3
enjoyment	0.845	4
inertia	0.861	3
intention to continue to use.	0.867	3

However, the EFA, referring to principal component factor analysis, does not require a priori hypotheses about factor-indicator correspondence, or even the number of factors (Kline, 2011). For example, EFA tests unrestricted factor models, in which all indicators are allowed to load on each factor. Following the EFA, confirmatory factor analysis (CFA) and structural equation modelling (SEM) will be developed, both of which serve as confirmatory tools, as the researcher builds an explicit model of the factor structure underlying the data and statistically tests the fit (Matsunaga, 2010; Russell, 2002). The next section provides more details about conducting CFA and SEM.

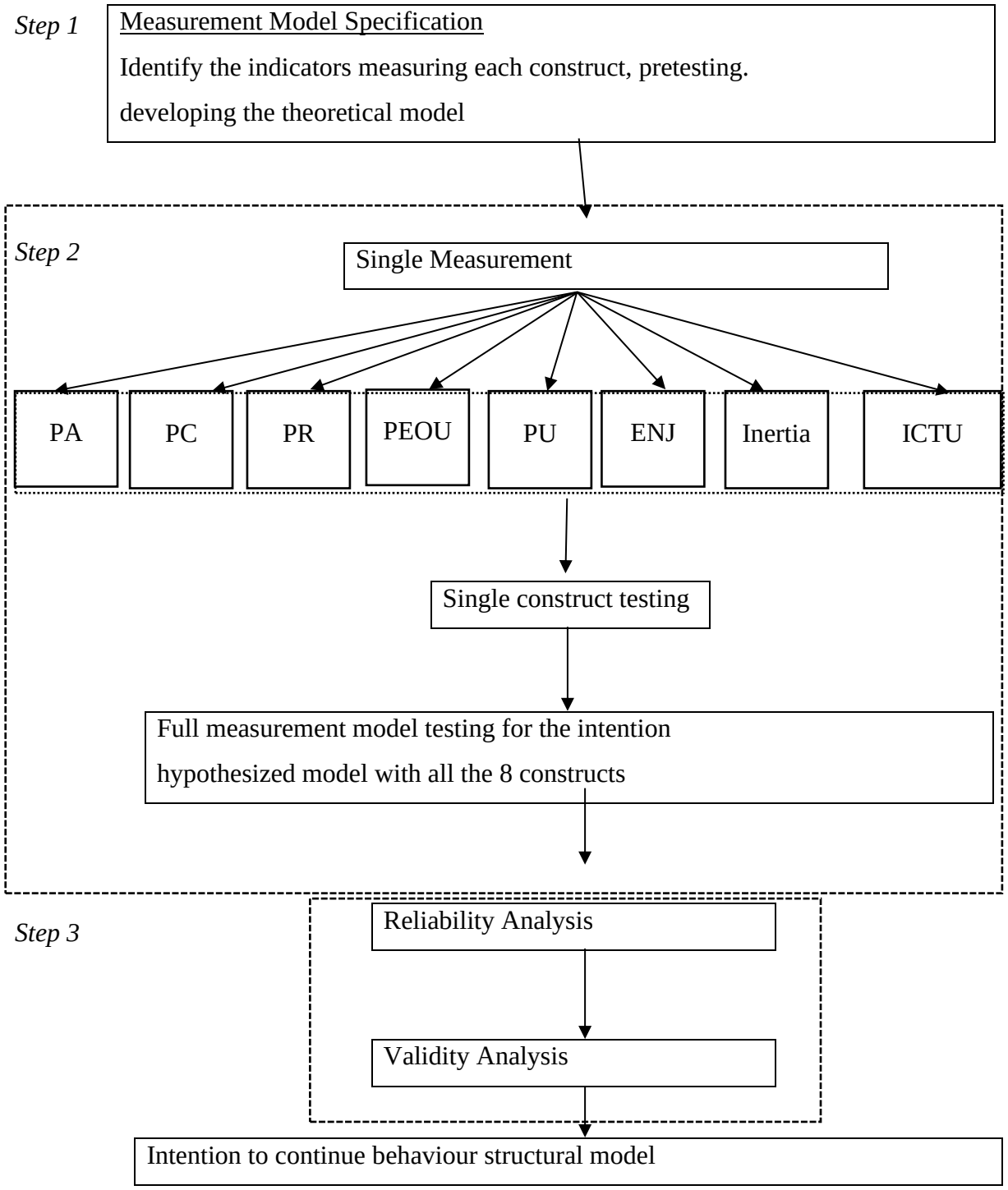
4.8 Steps for Conducting Measurement Model and Structural Model

Kline (2015) recommended that structural equation modelling (SEM) includes two approaches, which are the measurement model test and structural model. The measurement model specifies the causal relations and underlying latent variables, or theoretical constructs, which are presumed to determine response to be observed measures (Hair et al., 2010). To estimate correlations, the measurement model in SEM can be evaluated through Confirmatory Factor Analysis (CFA) (Hair et al., 2010). Although using well-established scales, all of the scales used to operationalise the constructs must be examined through assessment of the measurement model (Hair et al., 2010).

Following the process for SEM from Hair et al. (2010) and Kline (2011), this study adopts three steps to conduct the structural equation modelling, as detailed in Figure 4.1 below.

Firstly, a brief overview of the original theoretically based conceptual model is provided before testing the hypothesised relationships in the conceptual model. Individual constructs will be specified and pretested. Secondly, SmartPls 3.0 is used to evaluate the measurement scales, as well as to test hypothesised relationships represented in the conceptual model. According to Hair et al. (2010), a highly mandatory condition for construct reliability and validity involves checking the unidimensionality of the measurement. Unidimensional measures mean "a set of measured variables (indicators) that can be explained by only one underlying construct" (Hair et al., 2010, p. 696). Each construct is measured by multiple indicators, and each indicator measures only a single construct. To check for unidimensionality, a measurement model is specified for each construct and CFA is run for all the constructs. Individual items in the model are examined in order to demonstrate how closely they represent the same construct (Kline, 2015). The measurement model is assessed with the CFA. As shown in Figure 4.2 below, conducting a measurement model to check the unidimensionality of each construct. Thirdly, the measurement model is further assessed for construct reliability and validity testing examination after unidimensionality testing, in order to obtain the consistency and generalization of results. Finally, following the measurement purification for each construct and their indicators, the hypothesized relationships from the conceptual model are tested with the structural model.

Figure 4.1 Stages for Conducting Structural Equation Modelling (SEM)



Source: Adapted from Hair et al. (2010, p. 654)

Note: PA: perceived autonomy; PC: perceived competence; PR: perceived relatedness; PEOU: perceived ease of use; PU: perceived usefulness; ITCU: Intention to continue usage

4.8.1 Step One: Developing a Theoretical Model

Based on the theoretical background discussed previously, this study infers a positive or negative relationship between each construct involved in the theoretical model. The research model is expressed as a path diagram; the direction of the arrows indicates theoretical cause-and-effect relationships within the hypothesised model. The key determinants of intention behaviour are four goal-frames- "perceived autonomy", "perceived competence", "perceived relatedness", perceived usefulness", "perceived ease of use", "perceived enjoyment", "inertia", and "intention to use"; all have been developed based on existing literature. The postulated causal relations among all variables in this hypothesised model are grounded in theory and empirical research. The measurement scale set with pretesting results is presented below in

Table 4.10 Constructs scale item and Descriptive Statistics

Variables	Mean	SD	Factor loading	Cronbach's Alpha
PA1: I feel a sense of choice and freedom while participating in the Smart tourism app	5.40	1.447	0.810	0.814
PA2: I feel pressured during the Smart tourism app.	4.51	1.971	0.626	
PA3: The Smart tourism app provides me with interesting options and choices	5.25	1.579	0.856	
PA4 There is not much opportunity for me to decide for myself how to do the Smart tourism app	4.85	1.753	0.655	

PA5 When I am in this user's smart tourism app, I feel that my choices are based on my true interests and values	5.27	1.463	0.809	
PC1: I think I am pretty good at the Smart tourism app.	5.44	1.473	0.911	0.795
PC2: After working at the Smart tourism app for a while, I felt pretty competent.	5.42	1.492	0.911	
PR1: I have the opportunity to be close to others when I participate in the Smart tourism app.	4.86	1.757	0.876	0.879
PR2: I feel close to others when I participate in the Smart tourism app.	4.87	1.756	0.888	
PR3: I feel connected with other travellers or users when I participate in the Smart tourism app.	4.76	1.686	0.851	
PR4: I feel really distant to other travellers or users when I participate in the Smart tourism app.	4.73	1.680	0.644	
PR5. When I am in smart tourism app, I feel loved and cared about	4.91	1.700	0.845	
PEOU1.My interaction with the Smart tourism app is clear and understandable.	5.36	1.417	0.850	0.830
PEOU2.It is easy for me to become skilful at using the Smart tourism app.	5.43	1.463	0.866	

PEOU3.I find the Smart tourism app easy to use.	5.38	1.473	0.876	
PU1: Using the Smart tourism app enhances my effectiveness.	5.46	1.403	0.877	0.873
PU2: The Smart tourism app is useful for my travel	5.48	1.417	0.898	
PU3 Using the Smart tourism app increases my productivity.	5.49	1.398	0.904	
ENJ1: Using smart tourism apps provides me with a lot of enjoyment.	5.18	1.533	0.846	0.848
ENJ2: I have fun using smart tourism apps	5.23	1.532	0.842	
ENJ3: I use the smart tourism apps to combat boredom	4.81	1.791	0.785	
EHJ4: I use smart tourism apps because it is entertaining.	4.96	1.644	0.841	
Inertia1: I prefer using this app of smart tourism as it makes me feel comfortable	5.03	1.649	0.886	0.862
Inertia 2: I prefer using this app of smart tourism as I have got used to it	5.25	1.567	0.889	
Inertia 3: I prefer using this app of smart tourism as this what I am used to	5.06	1.635	0.880	

Intention to continue usage 1: I intend to use smart tourism app in the future	5.33	1.436	0.874	0.867
Intention to continue usage 2: I plan to use smart tourism frequently	5.23	1.563	0.890	
Intention to continue usage 3: I will continue to search smart tourism apps that I am interested in	5.24	1.526	0.902	

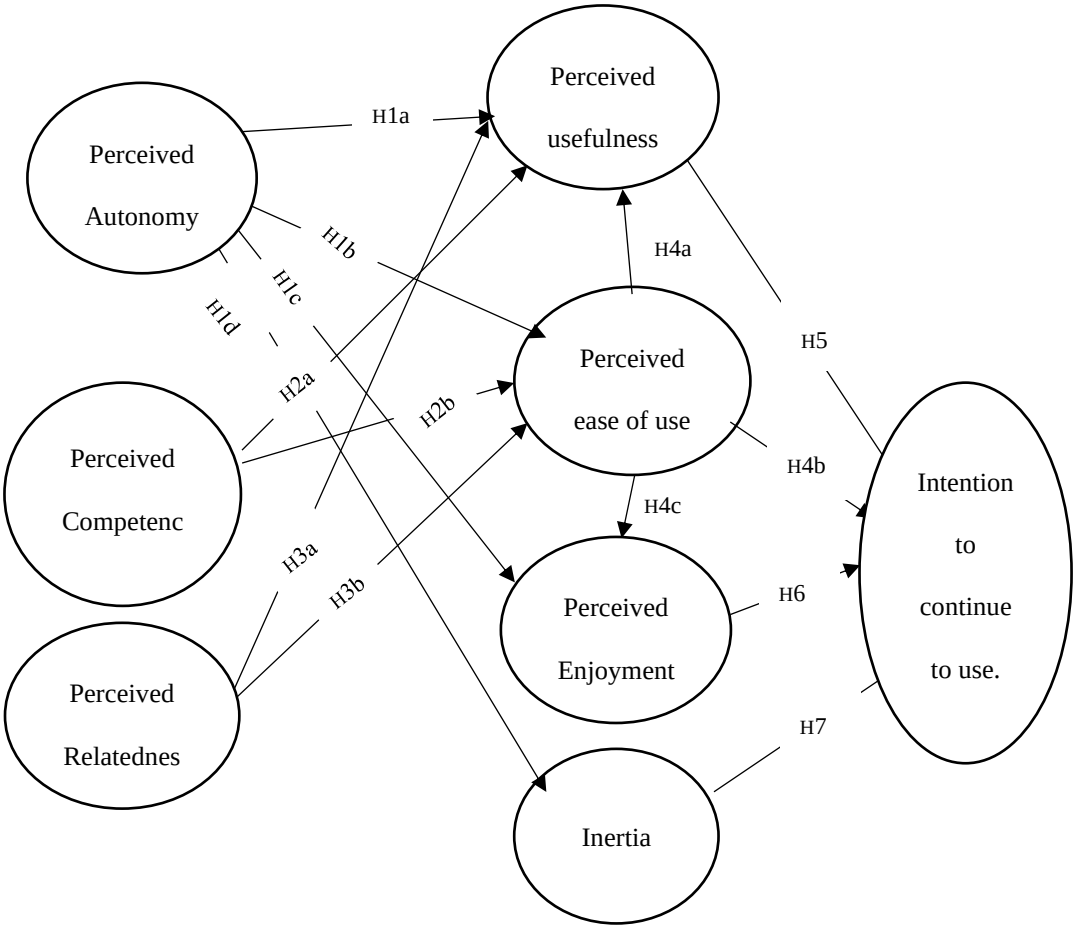
To avoid these issues when the final model is analysed, items that do not behave statistically as expected may require refinement or deletion. As a result, construct reliability and validity will be tested beforehand.

The most commonly reported reliability coefficient in literature is the coefficient alpha, also known as Cronbach's alpha, the most widely used measure of internal consistency reliability (Hair et al., 2010), illustrating the degree to which responses are consistent across items within a measure (Kline, 2015). The value of Cronbach's alpha is required to be equal to, or higher than, 0.7 to ensure reliability (Murtagh & Heck, 2012). All constructs in this sample have Cronbach's alpha values above 0.75 (see Table 4.10), indicating how their internal quality is high, and that items' content is very good or excellent as a potential unit of analysis for the measure (Kline, 2015).

The factor loading in Table 4.10 are calculated by SmartPls 3 to ensure all loadings are significant as required for convergent validity. Hair et al. (2010) suggest loadings should be at least 0.5, and preferably 0.7 or higher. In this study, as Table 4.12 shows, all loadings of variables used are higher than 0.6.

In reviewing this model as shown in Figure 4.1, it can be seen that goal-frames are represented as a multi-dimensional construct with perceived autonomy (PA), perceived competence (PC), perceived relatedness (PR), perceived usefulness (PU), perceived ease of us (PEOU), perceived enjoyment (PE) and inertia operating as conceptually distinct factors. The hypothesised cause-and-effect relations between all variables in this proposed model are based on theory and empirical research. With the hypothesized model completely specified, the next stage is to test data for meeting the assumptions underlying the structural equation modelling. The proposed conceptual model is shown in Figure 4.2.

Figure 4.2 The proposed conceptual model.



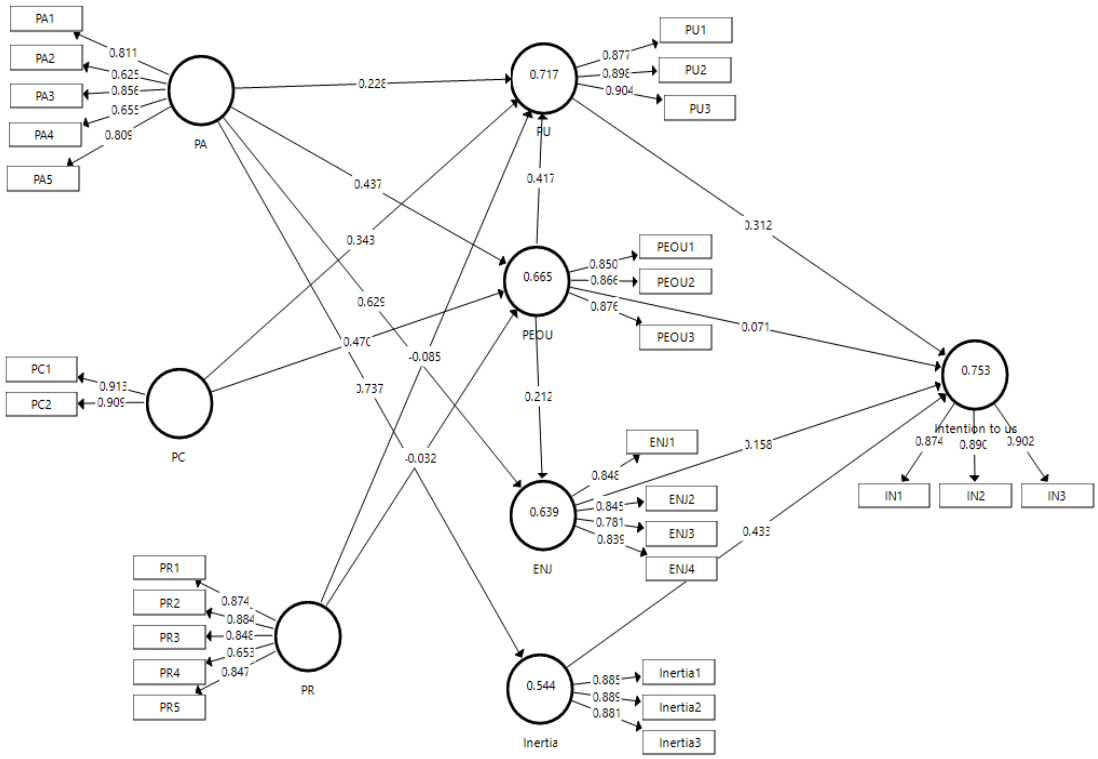
4.8.2 Step Two: Developing the Measurement Model

Despite the use of well-established scales, all used to operationalize the constructs must be evaluated through the measurement model (Hair et al., 2010). The purpose in developing the measurement model of SEM is twofold: (1) to identify items for use in formulating each construct; (2) to determine the number of indictors for use in measuring each construct (Byrne, 2013). As a result, the following section elaborates on the number of indicators and formulation of each construct in this hypothesised model.

Deploying the software packages of SPSS (version 26), the partial Least Square structural equation modelling (PLS-SEM) procedure in SmartPLS (version 3.0), this study performed rigorous data analyses to estimate model parameters. The major aim of PLS, widely applied in marketing and business research, is to maximise the explained variance of the dependent latent variables (Hair et al., 2011). PLS-SEM is particularly suitable for this study, as there is no assumption of normal distributions of population or scales (ibid). The software used in this study is SmartPLS 3.0 (Ringle et al., 2015). As suggested by Hair et al. (2011), t-statistics were computed using 5000 bootstrap samples. Bootstrapping is 'a nonparametric procedure that allows testing of the statistical significance of various PLS results, such as path coefficients' (Ringle et al., 2015). Before testing the model, it was deemed necessary to test validity, as well as reliability, of the construct measures. Two approaches were employed to assess reliability: Cronbach alpha scores and composite reliability. Both methods reflect the inner persistency of the scale elements measuring a particular factor (Fornell & Larcker, 1981). Convergent validity was evaluated by calculating the average variance that was derived for all measures. The derived average variances achieved the cut-off norm of 0.5 (Fornell & Larcker, 1981). Accordingly, discriminant validity was evaluated using two methods: A) the cross-factor loadings (Wynne W. Chin, Marcolin, & Newsted, 2003); and the square root of the average variance derived, as suggested by (Fornell &

Larcker, 1981). The loadings were all higher than 0.626; both Cronbach alpha scores, and composite reliability, were higher than the proposed cut-off value of 0.70; the AVE of all constructs was also higher than 0.5, as suggested in literature (Hair, Hult, Ringle, & Sarstedt, 2016). (See Table 4.13 and Figure 4.3)

Figure 4.3 Measurement Model Results



The researcher adopted Cronbach's alpha (a), composite reliability, and AVE to assess the internal consistency reliability of each construct with their respective observable variables (F. Hair Jr, Sarstedt, Hopkins, & G. Kuppelwieser, 2014). As shown in Table 4.13, all the item loadings are above the recommended 0.7, except PA2 (0.625), PA4 (0.655) and PR4 (0.653), and may be considered significant (Hair et al., 2016). It is well established that factor loadings should be greater than 0.6 for better results (Hulland, 1999; Truong & McColl, 2011). C.-F. Chen and Tsai (2007) also considered 0.6 as a cut-off for acceptable loadings in tourism context. Additionally, while exploring pro-environmental consumer behaviour, Ertz, Karakas, and Sarigöllü (2016)

considered factor loadings of 0.6 and above in their Confirmatory factor analysis. Therefore, this work adopts this criterion, but also as 0.6 is better than these studies cut-offs for factor loadings. Along in line, the standardised factor loading of all the items ranges was above the threshold limit of 0.6 and above, which is also suggested by Wynne W Chin, Gopal, and Salisbury (1997) and Hair et al. (2016).

Composite reliability (CR) exceeds the recommended level of a 0.7 threshold; the lowest CR is 0.874 (for PA). Therefore, measurement item internal consistency's reliability may be confirmed. Average variance extracted (AVE) values are above the recommended threshold level of 0.5 (Hair et al., 2016). The lowest value is 0.632 for PA. Therefore, convergent validity of the measures was verified.

Table 4.11 Factor Loadings and Reliability Measures for Constructs

Construct	Item	Loading	Alpha(α)	CR	AVE
PA	PA1	0.811	0.814	0.869	0.573
	PA2	0.625			
	PA3	0.856			
	PA4	0.655			
	PA5	0.809			
PC	PC1	0.913	0.795	0.907	0.830
	PC2	0.909			
PR	PR1	0.874	0.879	0.914	0.682
	PR2	0.884			
	PR3	0.848			
	PR4	0.653			
	PR5	0.847			
PEOU	PEOU1	0.850			

	PEOU2	0.866	0.830	0.898	0.746
	PEOU3	0.876			
	PU1	0.877			
PU	PU2	0.898	0.873	0.922	0.798
	PU3	0.904			
	ENJ1	0.848			
	ENJ2	0.845			
Enjoyment	ENJ3	0.781	0.848	0.898	0.687
	ENJ4	0.835			
	Inertia1	0.885			
Inertia	Inertia 2	0.889	0.862	0.915	0.783
	Inertia 3	0.881			
	IU1	0.874			
Intention to	IU2	0.890	0.867	0.915	0.783
continue use	IU3	0.902			

The discriminant validity was examined by comparing value of the square root of AVE of a construct with correlation coefficients associated with other constructs. A higher value of square root of AVE in comparison to correlation coefficients verifies the construct meets discriminant validity (Table 4.11) (Fornell & Larcker, 1981). As shown in Table 4.12, results illustrate that all items' loading in their respective construct are greater than loadings in other constructs. Therefore, discriminant validity can be confirmed.

Table 4.12 Construct Correlations and Square Roots of AVE

	Perceived Enjoyment	Inertia	Intention to use	Perceived autonomy	Perceived competence	Perceived ease of use	Perceived relatedness	Perceived usefulness
Perceived Enjoyment	0.829							
Inertia	0.784	0.885						
Intention to use	0.743	0.807	0.889					
Perceived autonomy	0.786	0.737	0.728	0.757				
Perceived competence	0.646	0.670	0.741	0.705	0.911			
Perceived ease of use	0.678	0.690	0.727	0.744	0.911	0.864		
Perceived relatedness	0.804	0.720	0.637	0.737	0.543	0.567	0.825	
Perceived usefulness	0.634	0.643	0.748	0.713	0.775	0.799	0.517	0.893

4.8.3 Step Three: Structural model Analysis

4.8.3.1 Testing Model Fit

Before proceeding to test the model, we tested model fit, using three model fitting parameters： (1) Standardised Root Mean Square Residual (SRMR), (2) the Normed Fit Index (NFI), and (3) the exact model fit (bootstrapped based statistical inference). The SRMR is defined as the difference between the observed correlation and the model implied correlation matrix, whereby values less than 0.08 (Hu & Bentler, 1998) are

considered a good fit. Henseler, Hubona, and Ray (2016) introduced the SRMR as a goodness of fit measure for PLS-SEM that can be used to avoid model misspecification. The second fit index is normed fit index (NFI), an incremental fit measure which computes the Chi-square value of the proposed model, comparing it against a meaningful benchmark (Bentler & Bonett, 1980). NFI values above 0.9 usually represent acceptable fit. The third fit value is an exact model fit, testing the statistical (bootstrap-based) inference of the discrepancy between empirical covariance matrix, and the covariance matrix implied by the composite factor model. Dijkstra and Henseler (2015) suggested the d_LS (i.e., the squared Euclidean distance) and d_G (i.e., the geodesic distance) as two different means to compute this discrepancy.

A model fits well if the difference between the correlation matrix implied by the model being tested, and the empirical correlation matrix, is so small it can be purely attributed to sampling errors; the difference between the correlation matrix implied by a model, and the empirical correlation matrix, should be non-significant (p >0.05). Henseler et al. (2016) that d_{ULS} and d_G < than the 95% bootstrapped quantile (HI 95% of d_{ULS} and HI 95% of d_G). Therefore, this study has a saturated model with no free paths, the saturated model(measurement) fit values and the estimated model (structural model) fit values were exactly the same. In this research, the SRMR value was 0.065 (< 0.08) and the NFI was 0.925 (>0.90) and the d_{ULS} < bootstrapped HI 95% of dULS and d_G < bootstrapped HI 95% of d_G indicating the data fits the model well.

In addition, before checking coefficient estimations, multicollinearity among variables in the model was examined. In table 4.13, multicollinearity issues among variables should be checked with variance inflation factor (VIF) as a value less than 5 acceptable (Ringle et al., 2015). Considering the variance inflation factor (VIF) values, results showed there were no multicollinearity issues in any of the constructs.

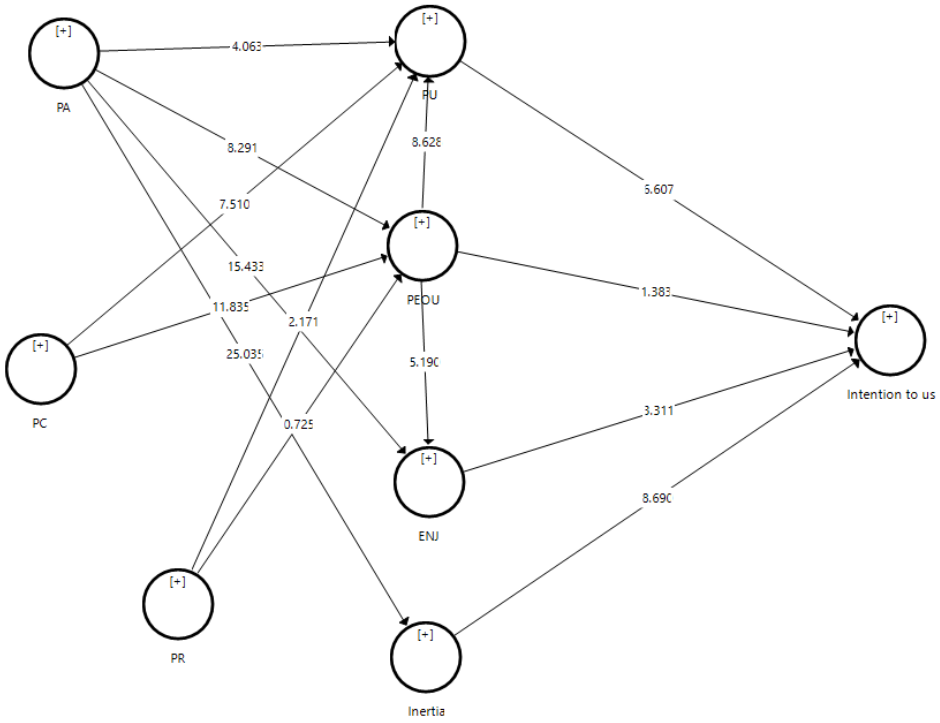
Table 4.13 Collinearity Statistics (VIF)

Item	VIF
PU1	2.127
PU2	2.438
PU3	2.551
PA1	1.917
PA2	1.634
PA3	2.158
PA4	1.681
PA5	1.895
PC1	1.772
PC2	1.772
PR1	2.968
PR2	3.190
PR3	2.503
PR4	1.347
PR5	2.224
ENJ1	2.038
ENJ2	2.026
ENJ3	1.774
ENJ4	2.042
Inertia1	2.260
Inertia 2	2.152
Inertia 3	2.173
IU1	2.110
IU2	2.278
IU3	2.485
PEOU1	1.778

PEOU2	1.932
PEOU3	2.049

4.8.3.2 Hypothesis Testing Results

Figure 4.4 Bootstrapping Results



To assess the structural model, Hair et al. (2016) suggest looking at the R^2, beta (β), and corresponding t-values, via a bootstrapping procedure with a resample of 5,000. Bootstrapping is 'a nonparametric procedure that allows testing the statistical significance of various PLS results, such as path coefficients' (Ringle et al., 2015). Two major criteria, the $R^2$and the significance of path coefficients are used in structural model evaluation (Hair et al., 2011). Estimation results are presented in Figure 4.4, indicating that aggregate path coefficients are statistically significant. R square values for intention to continue using smart tourism application, perceived ease of use,

perceived usefulness, enjoyment and inertia were 0.75., 0.66, 0.71, 0.64 and 0.54 respectively, indicating adequate explanatory power (Hair et al., 2011).

Results show that: Perceived autonomy is positively related to Perceived usefulness (β=0.228, $p<0.001$), Perceived ease of use (β=0.437, $p<0.001$), Perceived enjoyment (β=0.629, $p<0.001$) and Inertia (β=0.737, $p<0.001$). Therefore, H1a, H1b, H1c and H1d are supported.

Secondly, Perceived competence is positively related to both Perceived usefulness (β=0.343, $p<0.001$) and Perceived ease of use (β=0.470, $p <0.001$). Therefore, H2a and H2b are supported.

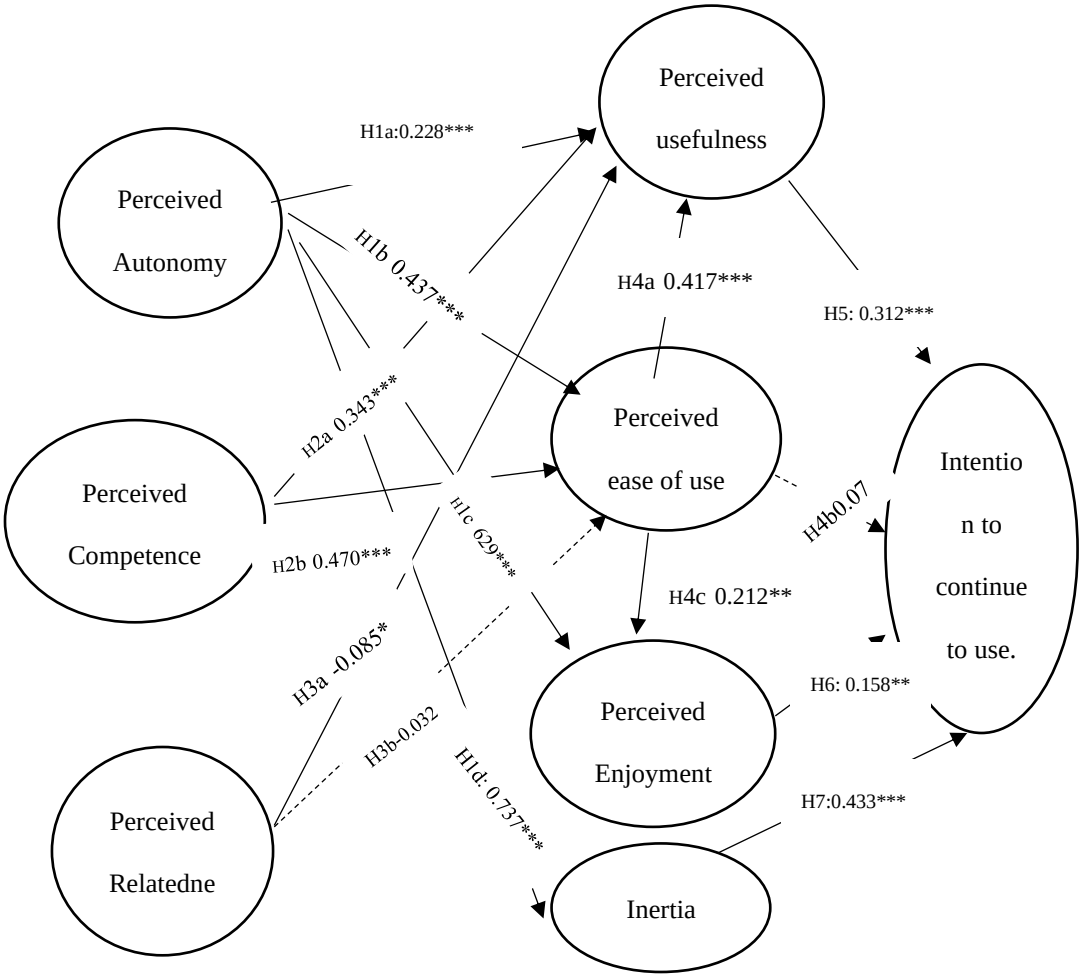
Thirdly, Perceived relatedness is negatively related to Perceived usefulness (β=-0.085, $p<0.05$), and Perceived ease of use (β= -0.032, $p=0.469$). Therefore, H3a and H3b are not supported.

Fourth, Perceived ease of use is positively related to Perceived Usefulness (β= 0.417, $p <0.001$), perceived enjoyment (β= 0.212, $p<0.001$) and Intention to continue use (β= 0.071, $p=0.167$). Therefore, H4a was supported and H4b was not supported.

Fifth, Perceived usefulness is positively related to intention to use (β=0.312, $p<0.001$). Therefore, H5 is supported; sixth, Perceived enjoyment is positively related to Intention to use (β=0.158, $p <0.01$). Therefore, H6 is supported. Finally, Inertia is positively related to intention to continue use (β=0.433, $p <0.001$); H7 is supported.

Inspection of the path coefficients in Figure 4.5 present assessment of the initial hypotheses listed at the outset of this findings chapter. Outcomes of this assessment are displayed in Table 4.14.

Figure 4.5 the results of structural mode



Significant Path

Non-significant Path

(***significant at p < 0.001; **significant at p < 0.01; *significant at p <0.05)

Table 4.14 Structural Parameters

Hypotheses		Path coefficients	Direction	Significance level	Decision
H1a	Perceived autonomy → Perceived usefulness	0.228	Positive	p<0.01	H1a accepted
H1b	Perceived autonomy → Perceived ease of use	0．437	Positive	p<0.01	H1b accepted
H1c	Perceived autonomy → Perceived Enjoyment	0.629	Positive	p<0.01	H1c accepted
H1d	Perceived autonomy → Inertia	0.737	Positive	p<0.01	H1d accepted
H2a	Perceived competence → Perceived usefulness	0.343	Positive	p<0.01	H2a accepted
H2b	Perceived competence → Perceived ease of use	0.470	Positive	p<0.01	H2c accepted
H3a	Perceived relatedness → Perceived usefulness	-0.085	Negative	p=0.026	H3a accepted
H3b	Perceived relatedness → Perceived ease of use	-0.032	Negative	p=0.454	H3b rejected
H4a	Perceived ease of use → Perceived usefulness	0.417	Positive	p<0.01	H4a accepted
H4b	Perceived ease of use → Intention to continue use	0.071	Positive	p<0.01	H4b rejected
H4c	Perceived ease of use → Perceived enjoyment	0.212	Positive	p<0.01	H4c accepted
H5	Perceived usefulness → Intention to continue use	0.312	Positive	p<0.01	H5 accepted

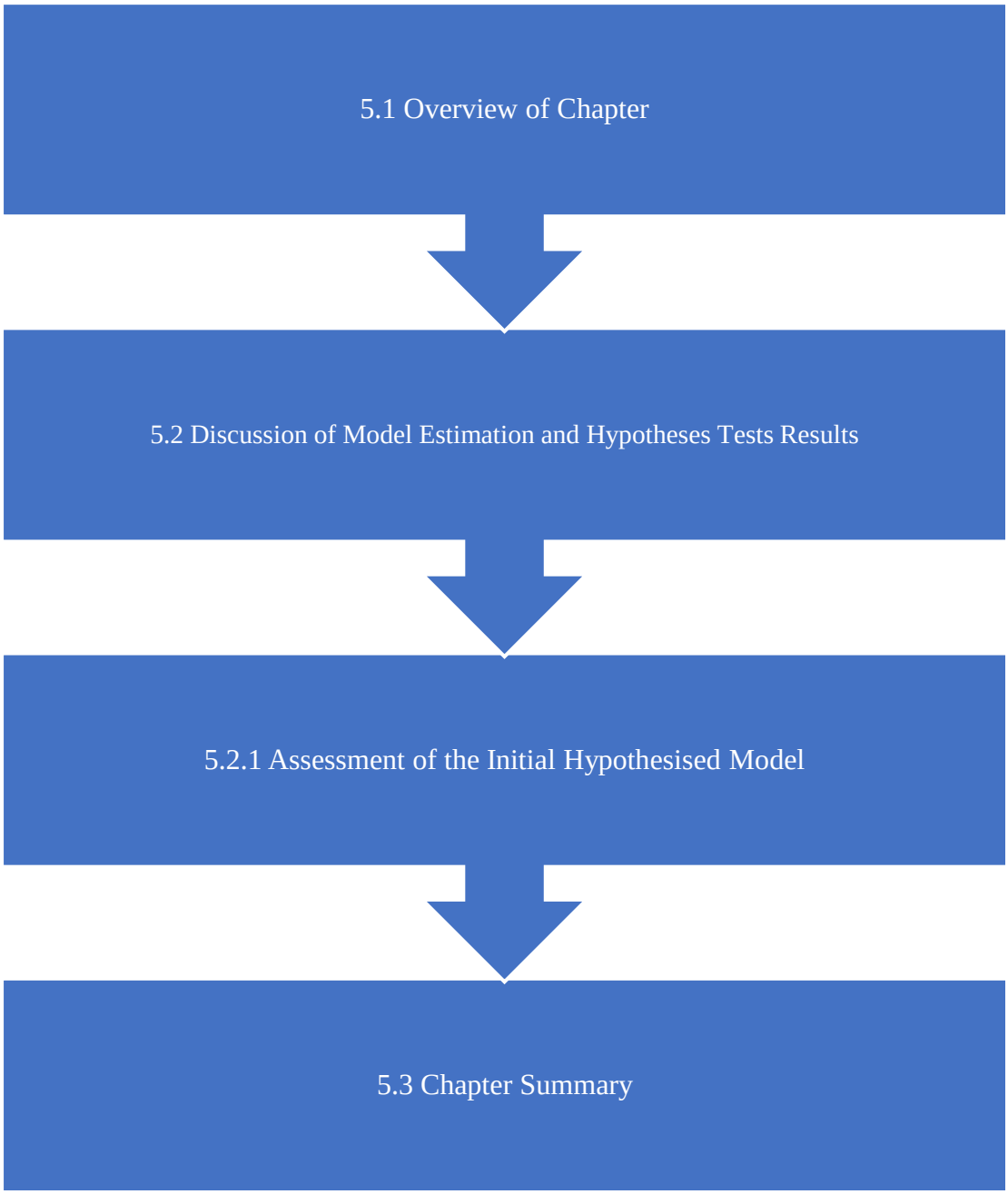
H6	Perceived enjoyment → Intention to continue use	0.158	Positive	p<0.01	H6 accepted
H7	Inertia → Intention to continue use	0.433	Positive	p<0.01	H7 accepted

4.9 Chapter Summary

In this chapter, the demographic information of respondents is summarised, suggesting that participant profiles reflect a number of recent studies relevant to mobile applications. Given the similarity of profiles, a degree of inference can be made; it also introduced types of data analysis used and demonstrated reliability and validity of the main survey constructs. Each proposition was explicitly stated, tested, and conclusions were provided.

In the next chapter, assessment of the final statistical model is discussed by further involving appropriate synthesis with extant consumer marketing literatures. In doing so, an indication will be given of the extent to which the study upholds, adapts, or rejects, established literature regarding consumer behaviour in a smart tourism application context.

Chapter 5: Discussion



5.1 Overview of Chapter

This chapter summarises the empirical results of the theoretical model estimated in Chapter 4, the hypotheses, and previous literature. Specifically, the chapter presents a critical evaluation of findings provided by structural equation modelling, assessed in tandem with extant marketing literature, to develop an insight into the impact of this research. The motivation for this empirical study stemmed from the theoretical literature outlined in Chapter 2, where little is known about the extent to which self-determination influences consumer intention toward smart tourism applications (Mileva, Assenova, Petrov, & Gyaurova, 2021; Santos-Júnior, Almeida-García, Morgado, & Mendes-Filho, 2020). Moreover, the results presented in Chapter 4 are applied to the research goals described in Chapter 1. As such, the research questions and objectives are outlined in Table 5.1 as well as the hypotheses tested in Chapter 4. This chapter starts with a discussion of the initially proposed hypothesised relationships and their implications, followed by a discussion of the statistically significant paths established by SEM analysis. Following this, the results relating to the initially proposed research questions are discussed. Finally, conclusions are drawn highlighting this study's individual contribution to the assessment of smart tourism applications intention to use behaviour.

Table 5.1 Research Objectives and Hypotheses

Research Objectives	Hypotheses
Objective 1: To critically review the extant literature relating to antecedents and consequences of technology acceptance in mobile application consumption behaviour.	H1a: Autonomy has a positive impact on perceived usefulness. H1b: Autonomy has a positive impact on perceived ease of use. H1c: Perceived Autonomy has a positive impact on perceived enjoyment. H1d: Autonomy has a positive impact on inertia.
Objective 2: To clarify which of the motivation factors (perceived autonomy, perceived competence, and perceived relatedness) have the most influential effect on technology acceptance (perceived usefulness and perceived ease of use) and turn on consumer intention to continue use.	H2a: Competence has a positive impact on perceived usefulness. H2b: Competence has a positive impact on perceived ease of use.
	H3a: Perceived Relatedness has a positive impact on perceived usefulness. H3b: Perceived Relatedness has a positive impact on perceived ease of use.
Objective 3: To examine the relationships between intrinsic factors (perceived enjoyment and inertia) and the consequence of technology acceptance (intention to continue use) for smart tourism application.	H4a: Perceived ease of use positively affects the perceived usefulness in smart tourism app.

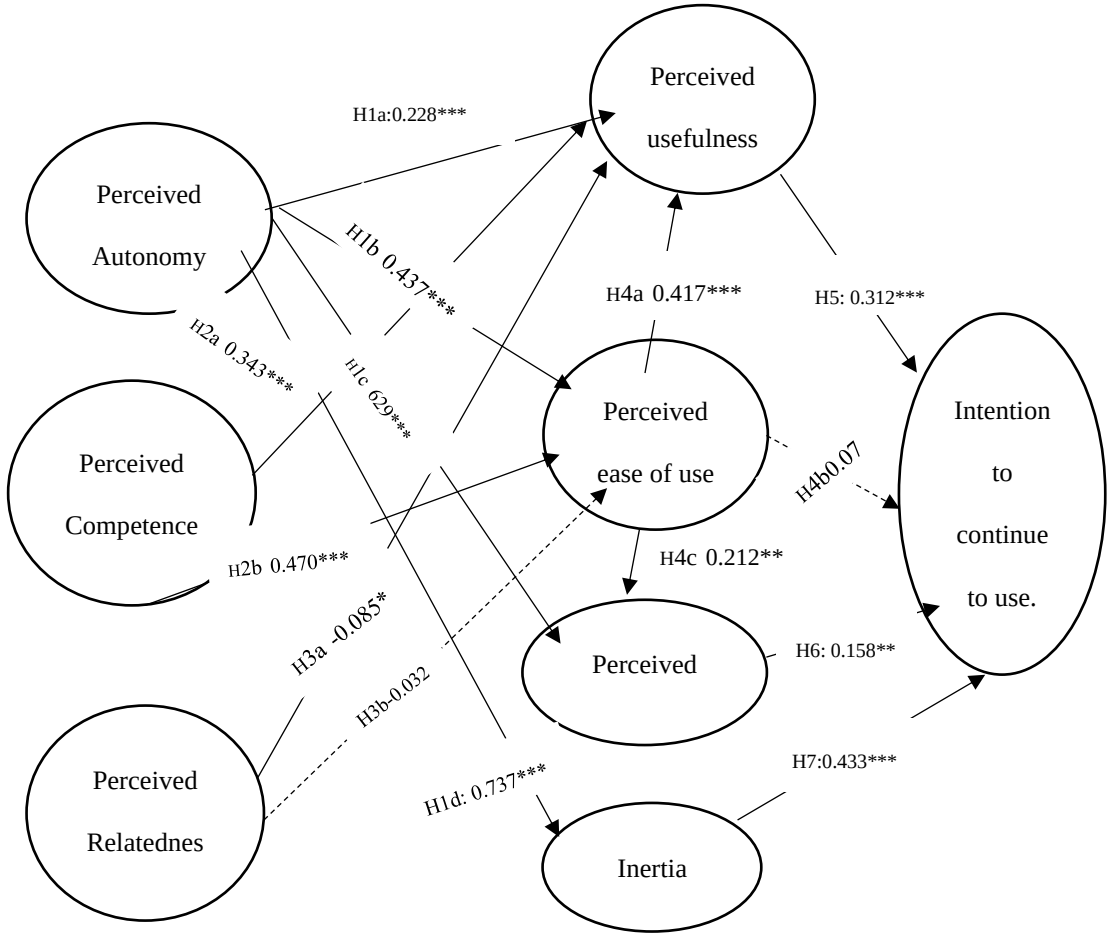
Objective 4: Develop a suitable methodology to collect and analyse data addressing the research questions; analysing and presenting the findings of the analysis in a comprehensive way to enable later discussion and synthesis. **Objective 5**: To discuss the findings in the context of existing literature and address gaps in earlier studies. **Objective 6**: Demonstrate how the thesis achieved the primary research aim and identify the contributions, limitations, and areas for further research.	H4b: Perceived ease of use positively affects the intention to use in smart tourism app. H4c： Perceived ease of use positively affects the perceived enjoyment in smart tourism app . H5: Perceived usefulness positively affects the intention to use smart tourism apps. H6: Perceived enjoyment positively affects the intention to use smart tourism apps. H7: Inertia has a positive impact on the intention to use smart tourism application.

5.2 Discussion of Model Estimation and Hypotheses Tests Results

The purpose of this research was to address the lack of research on individual behaviour factors in driving consumer intention to use smart tourism applications. The empirical results of this study provide a clear theoretical understanding of how intrinsic motivation factors impact technology acceptance and influence consumers' intention to use behaviour in smart tourism applications.

Based on the TAM model, the literature on applying the TAM model in other contexts (Hajiheydari & Ashkani, 2018; Hubert et al., 2017; E. Park et al., 2014; Rafique et al., 2020), a proposed framework of factors influencing user intention to continue use of smart tourism applications. The model was established to test the actual users of smart tourism applications, as illustrated in Figure 5.1. The baseline model extended TAM by incorporating individual motivation factors (perceived autonomy, perceived competence, and perceived relatedness); it also adds a further two factors (perceived enjoyment and inertia) that directly affect users' intention to use smart tourism applications. The results of the structural equation modelling analysis indicate that a total of seven hypotheses of the initially hypothesised model (see Figure 5.1 below) empirically support the development of consumer intention to use behaviour in smart tourism applications. In summary, the proposed model demonstrates a good fit. As summarised in Table 5.1, based on self-determination theory, perceived autonomy and perceived competence have a significant effect on perceived usefulness and perceived ease of us toward smart tourism applications. Similarly, perceived usefulness, perceived enjoyment, and inertia all have a positive impact on users' intention to continue using smart tourism applications. In addition, eleven out of the fourteen hypotheses are supported indicating that the research model provides significant explanatory power to meet the research purpose.

Figure 5.1: The Proposed Conceptual Model: Consumer Intention Behaviour for Smart Tourism Applications.



Significant Path

Non-significant Path

(***significant at p < 0.001; **significant at p < 0.01; *significant at p <0.05)

5.2.1 Assessment of the Initial Hypothesised Model

Perceived Autonomy

The research findings demonstrate that autonomous users of smart tourism applications perceive the applications more useful and easier to use; moreover, they have a stronger intention to use smart tourism applications in the future.

Perceived autonomy refers to the desire of people to regulate and self-control their own behaviour (Ryan & Deci, 2020). According to Ryan and Deci (2020), autonomy is described by genuine behaviours and acts that originate from, and are completely supported, by the self. This research investigates users' intrinsic motivation to use technology when they possess increased control through interesting tasks, such as more expertise and resources, and a closer relationship with other users, which, in turn, enhances their competence to perform tasks. The findings of this study advance the research on technology acceptance by identifying perceived autonomy as a predictor of perceived usefulness and perceived ease of use towards smart tourism applications. Despite the fact that researchers have recognised the value of incorporating motivational factors into technology adoption (Fagan, Neill, & Wooldridge, 2008; Pedrotti & Nistor, 2016), not many studies exist with few exceptions (Y. Lee et al., 2015; Nikou & Economides, 2017; Zhou, 2016). They have discovered a significant relationship between SDT and Technology Acceptance, which may be applied to understand consumer behaviour intentions; although this factor is yet to be evaluated properly, a number of studies have noticed a potential positive effect on consumers' intention behaviour. Most notably, the relationship between perceived autonomy, perceived usefulness ($\beta=0.228$, $p<0.001$), and perceived ease of use ($\beta=0.437$, $p<0.001$) were statistically significant.

Studies by Turkay and Adinolf (2015) and Nikou and Economides (2017) found that providing choices rather than external rewards increased intrinsic motivation when autonomy or self-control were evident. Perceived autonomy has a significant positive effect on perceived usefulness and perceived ease of use in the context of mobile-based assessment application. These findings suggest that users find technology more useful and easier to use when they are in control; moreover, they have a stronger intention to use mobile-based assessment applications. Therefore, H1a and H1b posited that perceived autonomy has a positive impact on perceived usefulness and perceived ease of use toward smart tourism applications are supported.

H1c notes the positive impact of perceived autonomy on perceived enjoyment. A significant relationship is also identified between perceived autonomy and perceived enjoyment (β=0.629, $p<0.001$). This finding indicates that perceived autonomy has a positive effect on users' perceived enjoyment toward smart tourism applications. As such, users can autonomously choose the services or features they prefer (such as searching, sharing, or participating in travel activities) and they can enjoy the process. This result is consistent with the findings from task-oriented contexts such as in organisations (Boezeman & Ellemers, 2009; Millette & Gagné, 2008), games and entertainment (K. Kim et al., 2015; Neys JLD, 2010; Pe-Than, Goh, & Lee, 2014; Peng, Lin, Pfeiffer, & Winn, 2012), and online environments (Tamborini et al., 2010). where it has been found that individuals who perceive a greater sense of enjoyment are shown to be more motivated by the amount of control over the tasks.

Furthermore, other studies highlight when autonomy is satisfied, individuals feel psychologically well and enjoyed the whole process more (Adie et al., 2008; Ryan & Deci, 2017). As Ryan and Deci (2002, p. 8) explain, “when autonomous, individuals experience their behaviour as an expression of the self, such that, even when actions are influenced by outside sources, the actors concur with those influences, feeling both initiative and value with regard to them”. As a result, autonomy involves behaviours

that are motivated by interests and integrated values; when users experience their actions as expressions of self, they feel their initiative and value even when their actions are influenced by external influences. Autonomy is not defined by the absence of external influences, but by one's consent to such influences or inputs (Mileva et al., 2021; Ryan & Deci, 2017)Mileva et al., 2021).

Ryan et al. (2006) examined the effect of autonomy on users' persistent intention to play games. However, users using game applications can only play in predefined episodes provided by the game service provider. In this research, smart tourism applications offer a variety of activities, such as online and offline social activities, economic activities, and unknown travel activities determined by the user's choices. People experience more control over themselves and their environment in the activities, giving users the freedom to make their own decisions. Such perceived autonomy enhances intrinsic motivation (enjoyment) and drives the consumer's intention to continue using smart tourism applications. In addition to the aforementioned activities, smart tourism applications offer many other services such as information on transport, hotels, attractions, restaurants, shopping, local entertainment, etc. Consumers are free to choose a travel route or create a personalised trip based on their own experience, habits, or preferences. This autonomy means that the perceived autonomy may vary depending on the user's experience or choice of activity format; a person who feels they have more autonomy will feel better about themselves and be motivated to do the action. Thus, the user's perceived autonomy could influence enjoyment, which, in turn, influences their intention to continue using smart tourism applications.

Perceived Competence

According to Johnmarshall Reeve (2018), perceived competence is a psychological need that cultivates feelings of having the ability to obtain useful information and

master technology. This study therefore hypothesises that Perceived Competence has a positive impact on perceived usefulness (H2a) and perceived ease of use (H2b).

Perceived competence refers to a desire to be effective when performing an activity (Deci et al., 1989; Deci & Ryan, 2010; Elliot & Thrash, 2002). According to Ryan and Deci (2020), perceived competence represents an individual's confidence in their ability to complete a task effectively and achieve their objectives, thus increasing motivation. The relationship between perceived competence and perceived usefulness (β=0.343, $p<0.001$), and perceived ease of use (β=0.470, $p<0.001$), are found to be statistically significant, demonstrating the primary role of intrinsic factors in technology acceptance. This is also in line with the rationale of Self-determination theory (Richard & Deci, 1985; Ryan & Deci, 2000), according to which perceived competence directly impactors on the perceived usefulness and perceived ease of use information systems and technology. In addition, the results indicating that perceived competence has a positive influence on perceived usefulness and perceived ease of use are both congruent with Fathali and Okada (2018), who argued that when consumers believe they are able to use learning technologies, their acceptance and intention to use the technology increases.

Morover, Rezvani, Khosravi, and Dong (2017) and Y. Lee et al. (2015) support a positive relationship between perceived competence, perceived usefulness, and perceived ease of use - when users are intrinsically motivated to use a technology, users' perception of the usefulness and ease of use for the technology is enhanced simultaneously. In the context of smart tourism applications, consumers complete a task through their own skills, experience, and knowledge such as making a travel plan, thereby increasing their confidence using mobile applications.

However, according to Nikou and Economides (2017), although perceived competence has a direct positive effect on perceived ease of use, no significant relationship was

evident related to perceived usefulness. Low levels of students' perceived competence and skills does not affect students' perceived usefulness; a low level of competence would allow increased opportunities to improve knowledge or mobile application skills (Nikou & Economides, 2017). This research finding highlights the convenience of most mobile applications; complex travel decisions, bookings, and experiences are made simple. As such, this research finding suggests that perceived competence is not an important intrinsic motivation; nevertheless, further research is needed to further demonstrate this contradictory result.

As Ryan and Deci (2002, p. 7) explain, competence is not "an attained skill or capacity, but rather is a felt sense of confidence and reflectance in action". Perceived competence has been confirmed in various contexts in the study of technology acceptance. For example, the use of virtual reality technology in tourism (Y. C. Huang et al., 2016), the acceptance of Massive Open Online Courses application (Khan et al., 2018; Sun, Ni, Zhao, Shen, & Wang, 2019), and purchase intention in online shopping (Gao, Liu, Liu, & Li, 2018b). In this study, smart tourism applications include many functions and services, including smart check-ins and check-outs. Visitors can enjoy reduced accommodation costs and save time by using automatic check-in codes or face recognition. Most notably, Lau (2020) suggests such services have functions such as booking, inquiry, payment, issuing check-in passwords, and printing transaction receipts. When a new feature or service is introduced, users feel that these new services or features provide access to more useful information or knowledge or easy to use can increase the intention to continue use, that is, users feel confident, and competence will affect the perceived usefulness and ease of use. This study clearly demonstrates that perceived competence plays a critical role in perceived usefulness and ease of use toward smart tourism applications.

Perceived Relatedness

In addition to perceived autonomy and perceived competence, perceived relatedness impacts intrinsic motivation and might lead to different types of outcomes such as perceived usefulness and perceived ease of use (Ryan & Deci, 2020). This research hypothesised that Perceived Relatedness has a positive impact on perceived usefulness (H3a) and perceived ease of use (H3b) toward smart tourism applications.

Perceived relatedness refers to interactions and shared experiences with other people (Ryan & Deci, 2020). Relatedness is achieved when consumers feel connected to others through technology (Sundar et al., 2012). The empirical results of this research demonstrate an association between perceived relatedness and perceived usefulness (β=-0.085, $p<0.05$), pointing to a significant negative path. The study reveals that perceived relatedness has a negative influence on perceived usefulness. In previous research, Venkatesh (2000) and Roca and Gagné (2008) consider that perceived relatedness originates from social influence; specifically, both studies imply that feeling related to others is useful for consumers to use smart tourism applications. Racero, Bueno, and Gallego (2020) also suggest that collaborations and communications with others can reduce fears and increase shared knowledge related to technology which positively affects usefulness and ease of use; this result differs from other mobile technology consumption literature.

Moreover, Roca and Gagné (2008) found that perceived relatedness was not significantly related to the central TAM concepts of perceived usefulness. These results might be due to the fact that although it is important to be connected to others in the context of mobile applications. However, the smart tourism applications in this study have more travel-related services than just social features, therefore users might consider obtaining better services or accessing required information more important than being related with others. Furthermore, users who use smart tourism applications

to share travel experiences or reviews may not be professionals, thus it is possible that users feel less motivated to communicate with others due to their lack of expertise. In other words, the less users communicate with others, the more they will be motivated to obtain useful information by themselves. Therefore, relatedness has a negative relationship with perceived usefulness.

This study has revealed that there is no significant relationship between perceived relatedness and perceived ease of use toward smart tourism applications (β= -0.032, p=0.469). This suggests that perceived relatedness neither positively nor negatively impacts on perceived ease of use toward smart tourism applications. Based on Self-determination theory (Ryan & Deci, 2020), perceived relatedness is defined as a user's desire to "interact with, be connected to, and experience caring for other people". Although perceived relatedness is less dominant than perceived autonomy and competence, it has a significant impact on intrinsic motivation (Ryan & Deci, 2000). This result is inconsistent with the previous literature in relationship marketing, which suggests that perceived relatedness has a positive influence on perceived ease of use (T.-S. Hew & Syed A. Kadir, 2017; Nikou & Economides, 2017). According to Roca and Gagné (2008), relatedness as a form of social influence, and Nikou and Economides (2017) argue that when users feel related to their classmates and teacher, they perceive learning and assessment as an easier task to do and therefore possess a stronger intention to use mobile-based assessment. Bitrián, Buil, and Catalán (2021) provide empirical evidence of the potential that gamification increases user engagement through relatedness; user engagement leads to greater intention to use toward mobile apps. However, in this research, perceived relatedness does not affect users' perceived ease use toward smart tourism applications. In the context of the present study, unfamiliar users from across the country are an important source of personal influence on the use of smart tourism applications. Interactions between users and others could contribute to the exchange of information about their travel experiences or the latest travel information, however it may not impact perceived ease of use or the convenience of the

technology. In addition, users may relate to each other if they seek similar information through the app; it does not matter whether the app is easy to use. However, further research is required.

Perceived Ease of Use

Studies into technology intention to continue to sue have considerable relied in Davis' TAM in understanding the impact of two relevant technology features, namely perceived ease of use and perceived usefulness. In this study, H4a and H4b state perceived ease of use positively affects the perceived usefulness and intention to continue using smart tourism applications.

Perceived ease of use (PEOU) is defined as the degree to which a person believes using a system will be free of effort (Fred D. Davis, 1989). In the context of smart tourism applications, the perceived ease of use can be defined as the extent to which a person believes that using smart tourism applications will be free of effort. An example of perceived ease of use is the ease of acquiring skills using smart tourism applications. This association is supported as the direct relationship between perceived ease of use and perceived usefulness was found to be positive and statistically significant ($\beta = 0.417$, $p < 0.001$). This finding corroborates previous research that perceived ease of use has a direct, positive effect on consumer perceived usefulness toward mobile applications (Manis & Choi, 2019; Mehra, Paul, & Kaurav, 2020; Venkatesh & Davis, 2000). When users perceive ease of use of technology, they can also perceive usefulness of technology. In this research, users are likely to deem smart tourism applications useful if they are easy to use.

However, Sagnier, Loup-Escande, Lourdeaux, Thouvenin, and Valléry (2020) argue that there is no significant relationship between perceived ease of use and perceived usefulness in virtual technology. Perceived ease of use has less or no effect on

technology acceptance when the technology is relatively easy to use in the research. This means that perceived ease of use has no effect on perceived usefulness when participants are asked to follow instructions to complete a task.

According to (Fred D Davis, 1989), technology becomes useful when its usage becomes easy, and perceived ease of use determines perceived usefulness. Furthermore, within the different application categories, young consumers spend more time using mobile applications that provide multimedia and entertainment, such as games, social networks, and lifestyle applications (Mehra et al., 2020). Suki and Suki (2017) and Özbek, Günalan, Koç, Sahin, and K Kas (2015) conducted studies on mobile booking applications in several areas of hospitality and discovered that perceived ease of use and usefulness had a direct positive link with the intention to use mobile technology. They explain that people might consider using mobile hotel booking if the effort to use technology is accessible and it is helpful to them; as such, the easier mobile application technology is, the more efficient and useful it is perceived to be.

Smart tourism applications are multi-functional applications that can be used to obtain information including online bookings and travel planning. As a result, users can improve their level of efficiency by easily accessing useful information through these functions and technologies. Furthermore, smart tourism applications include services such as transportation, restaurants, searching travel information, hotel booking, shopping, and social and entertainment services. For example, when consumers travel to an unfamiliar country, GPS is a very important requirement throughout the process; consumers may be unable to access the destination information they require if the GPS is complicated to use; simple technology therefore enables consumers to save time. As a result, it is assumed that technology that appears to be simple and convenient encourages its use rather than technology that appears to be complex.

There is no significant causal path found between perceived ease of use and intention to continue to use (β= 0.071, p=0.167) in this research. Perceived ease of use neither positively nor negatively impacts consumer intention to use smart tourism applications. Surprisingly, this result is inconsistent with previous studies in technology acceptance which suggests that the adoption of a new technology depends on whether it is easy to use (Mathew & Soliman, 2021; Stocchi et al., 2019; tom Dieck & Jung, 2018).

Based on technology acceptance model (TAM), and Yoo et al. (2017) demonstrated that perceived usefulness and ease of use have positive influences in the prediction of future consumer intentions, the results showed that customers' future intentions are determined by perceived usefulness and ease of use both had strong effect on future intentions. Furthermore, Stocchi et al. (2019) and Jung et al. (2015) determined that perceived ease of use positively impacts intention to use. This unexpected result is not entirely surprising. According to Fred D. Davis (1989), perceived ease of use has direct influence attitude, it has not influence behaviour intention to use toward technology. By comparison, the result of ease of use in this current study was consistent with the findings of Thomas, Parsons, and Whitcombe (2019) and Baptista and Oliveira (2015), all of whom suggested that perceived ease of use has insignificant influence on users' behavioural intention to use technology. In addition, there are multiple considerations as to why ease of use may not be an influential factor for users. Thomas et al. (2019) study examined university students' perceived ease of using technology. The study found that university students felt capable of using technology; thus, the perceived ease of the technology did not affect their intention to continue to use it. Moreover, the results of their research demonstrate that 57.5% of the respondents were under the age of 30, and most of the respondents were undergraduate students (49.9%). Therefore, it is possible that they do not feel that the use of technology is a factor that they consider important.

In addition, the relationship between ease of use and intention to continue to use technology may have been significant if participants were surveyed about their intention to use other technologies (e.g., virtual reality, intention to use robots while travelling, etc.); future research may explore this idea in more detail. Furthermore, there are several considerations as to why ease of use may not be an influential factor in intention to use in this study. One explanation for this finding might be that developers are determined to simplify mobile applications making them easier to use, particularly the ones targeting tourists. Additionally, data collected through a web-based questionnaire and questionnaires submitted via smartphones, thus, it may be a necessary condition in navigating a smart tourism application but bot a sufficient criterion to lift consumers' intentions. Nevertheless, the use of technology was an insignificant factor for the participants' intention to continue use. However, this approach was intentional and contributes to the reliability of this study findings. As a result, perceived ease of use has no significant impact on the intention to continue using the applications. Finally, Weng, Zailani, Iranmanesh, and Hyun (2017) note users are more likely to routinely use mobile apps when they improve their knowledge and their perceived usefulness is formed. Thus, mobile app users will become familiar with its features, perceived ease of use will lose its important in intention to continue using mobile apps. In addition, other factors such as inertia and perceived enjoyment will become more important in intention to continue using smart tourism applications.

Perceived ease of use was assumed to have a positive effect on perceived enjoyment on smart tourism applications (H4c). A significant relationship is identified in the study between perceived ease of use and perceived enjoyment toward smart tourism applications ($\beta = 0.212$, $p<0.001$). This study confirmed that users' perceived ease of use plays a critical role in predicting and determining perceived enjoyment, and this result confirms prior studies which found that perceived ease of use positively impacts consumers' perceived enjoyment (H. J. Hur, Lee, & Choo, 2017; Merikivi, Tuunainen, & Nguyen, 2017; A. K. Tang, 2019). According to the findings of the empirical study,

one of the factors influencing enjoyment in mobile application games is the convenience of use of the system interface (Merikivi et al., 2017). This finding is echoed in H. J. Hur et al. (2017) study, in which a stronger perception of the ease of use of a mobile app increases the perception of its usefulness and playability, which will subsequently increase the perception of enjoyment while using mobile apps.

Since smart tourism applications are mostly used on the move or with a purpose, ease of use plays a key role in driving an enjoyable experience. Smart tourism applications should be easy to use enabling users to search for information rather than dealing with any user interface issues. Smart tourism applications are also used to relax, for example by looking at other users' travel logs when they are unable to go out on a trip. Users perceive that the system will make their experience more enjoyable; moreover, their perception of the complexity of application systems is inversely related to the degree to which they feel involved and their sense of enjoyment. Thus, simple systems that create an easy to use experience increases users' enjoyment.

Perceived Usefulness

This study hypothesised that Perceived usefulness has a positive impact on the intention to use smart tourism applications (H5). The factor of perceived usefulness was the second significant factor influencing consumers' behavioural intention to use smart tourism applications ($\beta=0.312$, $p<0.001$). According to Fred D. Davis (1989), perceived usefulness (PU) is defined as the degree to which a person believes using a particular system will enhance their job performance.

The results indicate that perceived usefulness affects users' intention to use smart tourism applications. This result is consistent with previous studies and suggests that the intention behaviour of a new technology or system depends on whether it is useful (AbuShanab & Pearson, 2007; Natarajan et al., 2017; Pham & Ho, 2015; San Martín &

Herrero, 2012; Venkatesh et al., 2003a). In the current study, the positive relationship between usefulness and behavioural intention implies that consumers use the smart tourism applications to obtain the travel-related information or services they need (e.g., transportation, hotels, restaurants, and popular attractions). Furthermore, the usefulness of smart tourism applications in planning a trip or travel guides were a predictor of behaviour intentions, although some of the services were in the form of entertainment. For example, Rahimizhian, Ozturen, and Ilkan (2020) state that 360-degree technology that features in mobile applications (virtual travel before the consumer's actual trip) can influence users' perceptions of future travel. Additionally, Chuang (2020) notes the positive influence of perceived usefulness of mobile application travel guides on intention behaviour. Participants believed that they used smart tourism applications to obtain more information or services. Thus, consumers tend to use the application system to achieve positive outcomes.

Perceived Enjoyment

As introduced in this research theoretical framework, consumers are likely to continue using technology based on factors of perceived enjoyment (H6). Consumers' intention to continue to use a technology is enhanced when they deem using the mobile application an enjoyable experience.

A path between perceived enjoyment and intention to use is found in this study to be significant at 1% (β=0.158). The application of the model indicates that the factor of perceived enjoyment plays a significant role in smart tourism applications. Perceived enjoyment was the third significant factor influencing consumers' behavioural intention to use smart tourism applications. Perceived enjoyment is defined as the fun, or pleasure, derived from use of a technology (Fred D Davis et al., 1992a; Venkatesh et al., 2012). According to Y.-H. Fang (2019), due to the ubiquitous convenience of

mobile applications, consumers' perceived enjoyment is fundamental to the success in the application.

Following the recommendations of Choi et al. (2019) and Agrebi and Jallais (2015), this research extends knowledge about the hedonic motivator in the study of technology acceptance in a different context. In this research, perceived enjoyment has a strong effect on users' intention to use a technology. The results indicating that perceived enjoyment has a positive influence on behavioural intentions, support previous literature (Choi et al., 2019; X. Fang et al., 2005; June Lu et al., 2017; Nysveen et al., 2005). Moreover, Hirschman and Holbrook (1982) argue that consumers evaluate a new IT product either to solve a problem or to seek 'fun, fantasy, arousal, sensory stimulation, or enjoyment'. This has been confirmed in various contexts in the study of technology acceptance; for example, 360-degree technology to promote tourism destination (Rahimizhian et al., 2020), smart tours on mobile guide application services (Chuang, 2020), the use of driverless cars (Kyriakidis, Happee, & de Winter, 2015), the acceptance of web-based information systems (Mun & Hwang, 2003), and intention to play virtual reality games (Jang & Park, 2019). Consumers found that they enjoyed using smart tourism applications which they could use anytime and anywhere to obtain the services or information they require. In addition, some smart tourism applications (feizhu, Mafengwo) provide personalised services. The data from the preliminary study also indicates that consumers are more comfortable and stress-free when they use smart tourism applications before, during, or after a trip to make travel plans, search for travel-related information, book tickets, or engage in holiday activities. They believe that the features and services offered by the smart tourism applications are sufficient to complete the trip, thus they will continue to use the app when they travel in the future. Consumers generally agreed that they enjoyed using smart tourism applications. Thus, perceived enjoyment could increase the intention to use smart tourism applications.

Inertia

H7 proposes that inertia positively affects the intention to continue using smart tourism applications. The results of this study indicate that inertia is the most significant factor influencing consumers' behavioural intention to continue using smart tourism applications (β=0.433, $p<0.001$). Inertia is defined as the various outcomes of previous experience; it has three dimensions including affective-based inertia, behavioural-based inertia, and cognitive-based inertia (T.-C. Lin, Huang, & Hsu, 2015). This study confirmed that inertia plays a critical role in predicting behavioural intention, a result that confirms previous research (Lafley & Martin, 2017; W.-T. Wang, Ou, & Chen, 2019). W.-T. Wang et al. (2019) reveal a distinct mechanism that drives the continued use of mobile-services, mobile-service user inertia toward the incumbent mobile-services. However, the results of the effect inertia on intention to continue using behaviour does not support the findings of previous research (Gong et al., 2020; A. Li, Sun, Guo, Guo, & Guo, 2021; Y.-Y. Wang, Wang, & Lin, 2018). Previous studies indicate that inertia negatively affects consumers' intentions to use new information technology or mobile applications. For example, (Y.-Y. Wang et al., 2018) demonstrate that inertia has a negative impact on users' intentions to upgrade to a new-generation system. Moreover, A. Li et al. (2021) found that inertia negatively influences users' intention to explore the Faintness App. Thus, the findings of this research were unexpected; they suggest that inertia positively influence users' intention to continue using smart tourism applications.

According to Y.-Y. Wang et al. (2018) and (Pitta, Franzak, & Fowler, 2006), inertia is due to passive patronage without a real cognitive evaluation of the options and subsequent behaviours. However, earlier preliminary results report respondents engage in a conscious comparison of services which informs their intention to continue to use a specific service. In this study, consumers discovered apparent differences between apps based on their selling points after conscious comparison. For example, Ctrip offer

cheaper alternatives to book travel tickets compared to other apps. Therefore, such behaviour activates inertia, however, in the context of a particular mobile applications, this does not mean that consumers will become dependent on the existing system in a long time, but probably more dependent on a particular service or function in smart tourism applications.

In this research, most of the smart tourism applications operate in a similar way or provide similar services. Consumers use the services in different applications based on various requirements and prior comparisons. For example, Ctrip, Mafengwo, and Feizhu offer hotel bookings, ticket bookings, and travel tips. Consumers may not complete hotel and airline reservations and review travel tips on the same application. Specifically, consumers may experience more convenience and cheaper travel tickets on Ctrip based on the preliminary comparison. Consumers do not rely on the same application, relying instead on the services provided by different applications depending on their current needs. If using smart tourism applications becomes habitual for consumers, they are highly likely to continue using them; however, inertia has no significant effect on influencing how often they use the applications. Thus, the finding of this research suggests that inertia does affect consumers' behavioural intentions to continue using smart tourism applications.

Inertia is described by Polites and Karahanna (2012) as the attachment to and persistence of established behavioural patterns; it is a conscious choice to stay within the status quo even when better alternatives or incentives to change exist. A significant positive association between perceived autonomy and inertia is confirmed by this study ($\beta=0.737$, $p<0.001$). This result is similar to the findings of previous studies (Colapietro, 2016; Deci & Ryan, 2004; Gardner & Lally, 2013). For example, Gardner and Lally (2013) explore the role of self-determined motivational regulation in determining inertia. They found that the past behaviour was more predictive of inertia among participants whose motivation was determined by intrinsic interest in engaging

in perceived autonomy. The result of this research illustrates that perceived autonomous control is strongly correlated with inertia.

Perceived autonomy is described as consumers having more autonomy to choose the smart tourism applications or the services offered within the applications. In other words, perceived autonomy reflects the extent to which users believe that they possess sufficient autonomy, ability, and resources to use smart tourism applications (Bala & Venkatesh, 2016). In addition, according to the earlier qualitative results, respondents learn useful information when they freely choose a service (e.g., watching virtual videos); as such, they will continue to use smart tourism applications to obtain information in the future. Likewise, they perceive that by feeling more control over themselves and environment when using a smart tourism application, they have a desire to intention to continue using it.

Participants in this research experimented with the various smart tourism applications and compared them to identify which application was more suited to their needs. In this process, consumers will discover that different smart tourism applications have unique selling points. Therefore, as consumers habitually use these services, they may become cognitively inertial, emotionally inertial, or behaviourally inertial. Therefore, perceived autonomy allows consumers to make a conscious choice to remain in the application they are using. Thus, the proposed Perceived Autonomy has a positive impact on inertia (H1d) in this study is established.

5.3 Chapter Summary

This chapter has examined the similarities and differences between the study's findings and the extant consumer marketing literature. Following a preliminary review of the contributions developed from this thesis, and have been presented in order answer research questions of this thesis:

RQ1: What are the key factors influencing intention to continue using smart tourism applications?

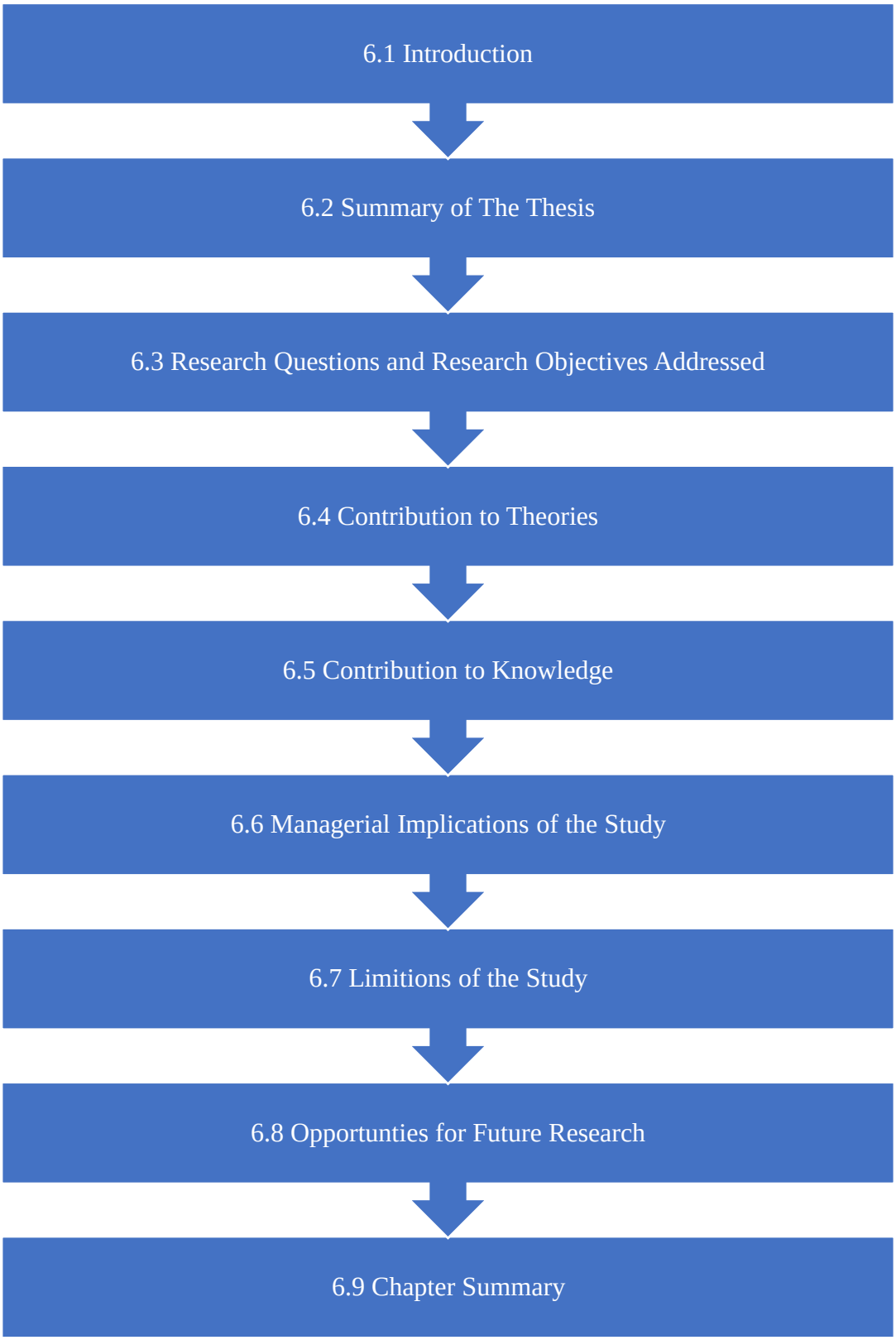
RQ2: What intrinsic motivational factors influence consumers' intention to continue using smart tourism applications

The results provide evidence that consumer perceived autonomy has direct effects on perceived usefulness, perceived ease of use, perceived enjoyment, and inertia; conversely, there are indirect effects on intention to use smart tourism through perceived usefulness, perceived enjoyment, and inertia. The findings are consistent with our expectation that positive outcomes are more associated with an autonomous motivating style than a controlling style (Baard et al., 2004; Deci & Ryan, 1985a, 1987; Deci et al., 2001; Grolnick & Ryan, 1987). In the context of online environments, the satisfaction of autonomy contributed to individuals' experiences of enjoyment and continued behaviour (Neys JLD, 2010; Tamborini et al., 2010). Most notably, perceived competence directly effects perceived usefulness and perceived ease of use, whereas there are indirect effects on intention to use smart tourism applications through perceived usefulness. Perceived relatedness has direct effects on perceived usefulness and indirect effects in intention to use through perceived usefulness. The results further confirm the important role of intrinsic motivation factors, suggesting that perceived autonomy, competence, and relatedness effect individual behaviour (Dahl & Moreau, 2007; Hoffman & Novak, 2012; C.-P. Lin et al., 2009; Schepers et al., 2012).

The results reveal that perceived usefulness positively influences intention to use, indicating useful information in smart tourism applications is crucial. Perceived enjoyment is an intrinsic motivation that emphasises the usage process and reflects the fun or pleasure derived from using a technology or system as a predictor of consumers' behaviour intentions. Most notably, inertia is the most important factor influencing consumer intention to use smart tourism applications.

The following chapter completes the thesis by synthesising and providing a clear answer to the research questions in order to address the primary research aim. Chapter 6 will bring the thesis to a close by summarising areas for potential studies and contributions to knowledge, evaluating the initial research goals in detail, and acknowledging the study's strengths and limitations.

Chapter 6 Conclusion



6.1 Introduction

This chapter will follow the data analysis presented in Chapter 4 and the detailed interpretation of those findings in Chapter 5. The conclusion will relate these discussions to the research questions and research objectives that have guided the associate study. Inferences from the data are made where appropriate, synthesising existing literature on mobile application, self-determination theory, the technology acceptance model, perceived enjoyment, and inertia introduced in Chapter 2. This chapter will consider the overall strengths and limitations of the study, identifying areas for future research. The study provides practical implications for developers of smart travel apps by outlining the psychological characteristics from a consumer perspective.

6.2 Summary of the Thesis

Smart tourism has become an irresistible trend of the global tourism industry. Mobile applications have not only affected everyday life, but they have also significantly influenced the tourism industry and the travel behaviour of consumers (Gupta, Dogra, & George, 2018). An increasing number of companies are interested in developing smart technologies in tourism across the world. Governments and enterprises have taken various measures to boost the tourism economy and the entire tourism industry has changed and innovated to adjust accordingly.

The development of tourism, especially smart tourism, concerns technological innovation and consumers' intention to continue using technology. Smart tourism consists of a number of research areas; this study selects the 'hottest' mobile apps in China in recent years to examine the factors that influence users' intent to continue using smart tourism applications. As mobile technology advances and consumer travel requirements increase, comprehensive tourism application that meet tourists' personalised demands realise the sharing of tourism, and social resources are becoming

increasingly popular with consumers. Thus, it is crucial to understand the factors underpinning consumers' intention to continue using smart mobile applications.

Various technology acceptance models are extensively used by researchers in different research contexts, serving as necessary theoretical frameworks to investigate the factors affecting consumer acceptance of technologies. This research selected self-determination theory (Richard & Deci, 1985; Ryan & Deci, 2000) as a conceptual framework that is focused on understanding the key drivers of motivation factors. This theoretical framework links with several psychological theories, such as the technology acceptance model (Fred D Davis, 1989) and theories on enjoyment and inertia (Polites & Karahanna, 2012).

In Chapter 1 (specifically Table 1.1) a number of objectives were developed for this thesis:

- Research Objective 1: To critically review extant literature relating to antecedents and consequences of technology acceptance in mobile application consumption behaviour.
- Research Objective 2: To clarify which of the motivation factors (perceived autonomy, perceived competence, and perceived relatedness) have the most influential effect on technology acceptance (perceived usefulness and perceived ease of use), and consumers' intention to continue to use applications.
- Research Objective 3: To examine the relationships between the intrinsic factors (perceived enjoyment and inertia) and the consequence of technology acceptance (intention to continue use) for smart tourism applications.
- Research Objective 4: Develop a suitable methodology to collect and analyse data addressing the research questions; analysing and presenting the findings of the analysis in a comprehensive way to enable later discussion and synthesis.
- Research Objective 5: To discuss the findings in the context of existing literature and address the gaps in earlier studies, contributing to existing knowledge.

Research Objective 6: Demonstrate how the thesis achieved the primary research aim and identify the contributions, limitations, and areas for further research.

Chapter 2 outlined a review of relevant literature regarding mobile applications and mobile application technology in the tourism industry (section 2.2). Mobile devices have provided convenience and easiness to contemporary consumers (Groß, 2016; Ozturk, Bilgihan, et al., 2016). Smart tourism applications are developed to address barriers to travel, providing real-time and updated tourism information to support users (R. J. H. Wang et al., 2015). The literature review contains four sections: an overview of mobile applications, self-determination theory, technology acceptance theory, and perceived enjoyment and inertia. In summary, many previous studies on ICT or mobile applications focus on social media and shopping sites, while very few pay specific attention to smart travel mobile applications. Researchers have found that technological intrinsic factors are more likely to influence consumer satisfaction and enjoyment. Factors that influence consumers' intention to continue a specific type of behaviour include extrinsic and intrinsic factors. Therefore, intrinsic factors are more influential on consumers' intention to continue behaviour compared to extrinsic factors.

Chapter 3 discussed the research methodology used to investigate the factors influencing users' acceptance and intention to continue in the smart tourism context. Pragmatism was adopted as the research philosophy enabling quantitative data collection from users' perspectives (Creswell & Creswell, 2017). The research described in this thesis used a quantitative method to collect and analyse quantitative data (Creswell & Creswell, 2017). Quantitative data was collected and analysis to verify the findings from the literature. Finally, questionnaires were used to ascertain users' perceptions.

Chapter 4 presented the details of data collection and analysis for the quantitative study, followed by the corresponding findings. The eleven participants came from different

social groups, including students, employed staff, and freelancers with prior experience using smart tourism applications. The interviews sought information about previously used smart tourism apps, the rationale behind using them and how they were used, and the factors affecting their use. The analysis investigated whether there was useful information outside the theoretical framework that would entail revision of the theoretical instrument before conducting the quantitative study.

The questionnaires, which were modified based on initial pilot testing, had two sections. The first section contained basic questions about the respondent and their usage of smart tourism applications. The second section contained the main questions about the specific hypothesised factors phrased so that respondents were asked about their usage of the mobile applications concerned. The targeted population of the survey were Chinese users who had previously used smart tourism applications. Non-probability sampling was used to achieve the targeted population, and the questionnaires were distributed through wenjuanxing and social media (WeChat); the researcher received 421 valid questionnaires and all data were analysed using SPSS software and SmartPls software. Descriptive analysis was applied to the data from the basic questions, while the data from the main questions was subject to structural equation modelling (SEM) analysis to test the hypotheses. The last part of this chapter presents the quantitative findings using SEM analysis and the results of the tests on hypotheses. The quantitative findings were analysed to answer the research questions (see Section 6.4 below). Confirmatory factor analysis (CFA) was used to assess the measurement models of this research's conceptual framework for smart tourism application continue intention. The analysis of the measurement model found that eight constructs proposed were undimensional, reliable, and exhibited convergent and discriminant validity. Structural equation modelling (SEM) analysis was then used to test all of the proposed hypotheses. Goodness-of-fit statistical tests indicated that data fitted the structural model within statistically acceptable bounds. Before the CFA and SEM analysis by using SmartPls3,

the exploratory factor analysis (EFA) was applied to identify the number of factors and interpret what they present using SPSS 26.

Chapter 5 presented the discussion of the significance of the main study's findings by relating them to existing literature on users' intentions to continue using information technology, particularly in the mobile application context. Finally, this final chapter demonstrates how the thesis achieves the primary research aim and identifies this thesis' contributions and limitations. Revisiting the objectives introduced in Section 1.5, this section confirms that the study has addressed the research objectives and has followed a structured research process to achieve the primary research aim. The research questions and the contribution of each one is discussed below with reference to the intended contribution outlined in Section 1.5.

6.2.1 Summary of the Key Findings

This suggests that most of the Chinese consumers for the smart tourism apps are younger generation, having higher education. This profile, as indicated earlier, accords with that of previous Chinese studies relevant to smart tourism consumption (I.-C. Chang et al., 2016).

First, in the context of online environments, autonomy contributed to individuals' experiences of enjoyment and continued behaviour (Adie et al., 2008; Ryan & Deci, 2017). In this research, the results indicate perceived autonomy has a positive effect on users' perceived enjoyment toward smart tourism applications; consumers who feel they have more autonomy will feel better and experience more enjoyment while using smart tourism applications. Perceived competence has a direct effect on perceived usefulness and perceived ease of use; whereas perceived usefulness has an indirect effect on intention to use smart tourism applications. Additionally, perceived relatedness has a direct effect on perceived usefulness and an indirect effect on intention to use the

application through perceived usefulness. The results further confirm the important role of intrinsic motivation factors, suggesting that perceived autonomy and competence have an effect on individuals' behaviour (Dahl & Moreau, 2007; Hoffman & Novak, 2012; C.-P. Lin et al., 2009; Schepers et al., 2012).

Second, based on TAM, one aspect of the study investigated how the technology acceptance factors of perceived ease of use and usefulness affect the consumers' behavioural intentions to use smart tourism apps. The results revealed that perceived usefulness positively influences intention to use, indicating that useful information in smart tourism apps such as the travel tips, enhances effectiveness and productivity (Venkatesh et al., 2003a).

Third, this study demonstrates that the results provide evidence that perceived enjoyment directly affects intention to use; the relationship between perceived enjoyment and intention to continue use is significant. This finding resonates with F. D. Davis, R. P. Bagozzi, and P. R. J. J. o. a. s. p. Warshaw (1992b) as perceived enjoyment positively effects intentions to continue to use new technologies. Furthermore, perceived enjoyment is an intrinsic motivation that emphasises the usage process and reflects the fun or pleasure derived from using a technology or system as a predictor of consumers' behaviour intentions (Venkatesh et al., 2012). Building on previous research (Turel et al., 2011), perceived enjoyment is important in hedonic or semi-hedonic technology settings since the mere intrinsic joy of using the technology is a significant determinant of user perceptions and behaviours. In this study, the results further confirm the perceived enjoyment plays an important role in technology acceptance (Fred D Davis et al., 1992a; Igbaria, Guimaraes, & Davis, 1995).

In addition, there is very interesting finding in this research. In a way, consumers are not concerned about not being able to use technology to obtain a required outcome, however technology needs to be easy to use for them to enjoy using it. The result

revealed that perceived ease of use has an indirect relationship with intention to continue to use. In addition, perceived ease has a significant effect on perceived enjoyment, and perceived enjoyment has a significant effect on intention to continue. These findings indicate that due to the special context (mobile application), mobile app users become familiar with its technology; thus, ease of use is not an important factor for users' intention to continue to use the application. Moreover, the smart tourism applications are sometimes used for pleasure, for example, to relax by looking at other users' travel logs when they are unable to go out on a trip. If the smart tourism applications are considered easy to use, the time would be spent pleasantly (Merikivi et al., 2017).

Fourth, this study shows that the result provides evidence that inertia has significant direct effects on the intention to use the application. The relationships among inertia, intention, and behaviour have been controversial (Bhattacherjee, Limayem, & Cheung, 2012; Limayem et al., 2007b; Venkatesh et al., 2012); others have considered it to be a moderator of intention and actual behaviour (Guo & Barnes, 2011; S. S. Kim, Malhotra, & Narasimhan, 2005; Limayem et al., 2007b). Some other studies have insisted that inertia has relatively little conceptual overlap with intentions, thus providing potentially additional explanatory power regarding continued IT usage (W.-K. Lee, 2014; Limayem et al., 2007b). Our findings support findings presented in (Gefen, Karahanna, & Straub, 2003; Liao et al., 2006) that inertia can impact the behavioural intention to use technology when the use of an information system becomes routine.

6.3 Research Questions and Research Objectives Addressed

As mentioned in Chapter 1, the aim of this review was to contribute to filling some of the gaps in the existing literature and to achieve the primary research aim of:

To investigate intrinsic factors influencing consumers' intention to continue using smart tourism applications.

In section 1.7 of Chapter 1, a series of research objectives were developed to answer the primary aim of the research and ensure the current study followed a structured research process. Three objectives are reviewed one by one in the next section below.

Research Objective 1: To critically review the extant literature relating to antecedents and consequences of technology acceptance in mobile application consumption behaviour.

A thorough review of literature in Chapter 2 was undertaken to ensure a comprehensive understanding of the research background and to help formulate the research questions to be subsequently tested in this research. The researcher reviewed the literature in the fields of marketing, consumer psychology, and inertia in the context of technology acceptance, as well as existing studies on mobile application. The main factors that could potentially have a significant influence on the intention to continue using smart tourism applications were then identified. In this research, the baseline model extended TAM by incorporating individual motivation factors which were perceived autonomy, perceived competence, and perceived relatedness, and added perceived enjoyment and inertia that directly affect users' intention to use smart tourism applications. The conceptual model presented in this study is used to support the main research based on the theoretical discussion presented in the literature review. The model attempts to suggest the intrinsic factors that influence users' intention to continue using the app. Therefore, Chapter 2 contributes to the completion of research objective 1.

Research Objective 2: To clarify which of the motivation factors (perceived autonomy, perceived competence, and perceived relatedness) have the most influential effect on technology acceptance (perceived usefulness and perceived ease of use), and turn on consumers' intentions to continue to use the application.

In chapter 4, the SEM includes various statistically significant paths (as detailed in section 4.). According to the findings, consumers' perceived autonomy has direct implications on perceived usefulness, perceived ease of use, perceived enjoyment, and inertia. However, perceived autonomy has an indirect impact on intentions to use smart tourism via perceived usefulness, perceived enjoyment, and inertia. Previous research has shown that perceived autonomy, competence, and relatedness have an impact on individual behaviour (Dahl & Moreau, 2007; Hoffman & Novak, 2012; C.-P. Lin et al., 2009; Schepers et al., 2012). These findings are consistent with our expectation that positive outcomes are more associated with autonomous motivating styles than a controlling style (Baard et al., 2004; Deci et al., 2001). Individuals' level of satisfaction and likelihood to continue using the application were influenced by their contentment with their autonomy online (Neys JLD, 2010; Tamborini et al., 2010). Furthermore, perceived competence has a direct impact on perceived utility and perceived ease of use; conversely, it has an indirect implication on consumers' intentions to use smart tourism applications through perceived usefulness. Most notably, although the effect of perceived relatedness on perceived ease of use is evident, perceived relatedness has a direct negative effect on perceived usefulness. However, perceived relatedness was unrelated to the primary TAM notions of perceived usefulness by Roca and Gagné (2008). These findings might be attributable to the fact that, while being linked to others is significant in the context of mobile apps, it is not essential.

Research Objective 3: To examine the relationships between the intrinsic factors (perceived enjoyment and inertia) and the consequence of technology acceptance (intention to continue use) for smart tourism applications.

In this research, the context of mobile applications, perceived enjoyment, and inertia might represent intrinsic motivation for the user's intention to continue using smart tourism applications. This study reports findings that suggest there is a positive association among perceived enjoyment, inertia, and consumers' intentions to continue

to use smart tourism applications. In addition, the results indicate that perceived enjoyment has a positive influence on behavioural intention, which supports the findings of existing literature (Choi et al., 2019; X. Fang et al., 2005; June Lu et al., 2017; Nysveen et al., 2005). This study also confirms that inertia plays a critical role in predicting behavioural intention (Wang et al., 2019).

Research Objective 4: Develop a suitable methodology to collect and analyse data addressing the research questions.

This research objective focused on the development of an appropriate methodology to answer the research questions introduced in Chapter 1. These two research questions required the development of a research methodology that would a quantitative study. The quantitative study explained that description of the questionnaire and data collection and identified that relevant measurements. The result of the statistical analysis conducted based on research model and hypotheses.

Research Objective 5: To discuss the findings in the context of existing literature and address the gaps in previous studies to contribute to existing knowledge.

The results of the quantitative study were used to answer the research questions to contribute to existing theory, knowledge, and practice in smart tourism, mobile applications, and consumer behaviour.

Research Objective 6: Demonstrate how the thesis achieved the primary research aim and identify the contributions, limitations, and areas for further research.

Chapter 7 describes how the thesis accomplishes the major research goal and outlines the contributions and limits of this thesis. The chapter also validates the findings of the study in line with the research objectives by following a systematic research method to

reach the primary research goals (see table 5.1). The research questions and their respective contributions are described below in relation to the desired contribution outlined in Section 1.7.

6.4 Contribution to Theories

This research contributes to the knowledge of both academicians and managers in the field of smart tourism in China, which is important given its current market value (Gupta et al., 2018) and predicted growth (CNNIC. 2021). The results of the analysis provide a conceptual and theoretical contribution, offering practical insights into mobile applications in the smart tourism industry. This research combines the technology acceptance model and SDT as a theoretical foundation and adds perceived enjoyment and inertia based on the characteristics of smart tourism applications; the thesis also constructs a model of intention to continue using smart tourism applications and investigates the intrinsic motivational factors that affect consumers' intention to continue using smart tourism applications.

Most notably, the study significantly contributes to existing knowledge of intrinsic motivation and technology acceptance through its extension of the technology acceptance framework to mobile applications. Perceived usefulness, perceived enjoyment, and inertia were identified as the main factors that directly influence users' intention to continue using smart tourism applications. Factors in the self-determination theory (perceived autonomy and perceived competence) were identified as those indirectly affecting users' perspective of changing their behaviours to use smart tourism applications. Two new factors (perceived enjoyment and inertia) were identified to extend the theoretical technology acceptance framework. Compared with the findings of technology acceptance models adopted in the technology context, the findings from this study indicated the different effect of the key influential factors on user acceptance of smart tourism applications. These factors were perceived autonomy, perceived

competence perceived enjoyment and inertia; factors directly increasing the intention to continue using smart tourism application were perceived enjoyment and inertia.

6.5 Contribution to Knowledge

First, this study contributes to previous literature focusing on education and gaming by combining TAM and SDT in the context of smart tourism. Smart tourism is unique because the majority of users using these applications are tourists; tourists often seek new adventures. Thus, enhanced autonomy and perceived competence can positively influence tourists' intention to continue using smart tourism applications. The results provide evidence that consumers' perceived autonomy has direct effects on perceived usefulness, perceived ease of use, perceived enjoyment, and inertia; indirect effects on their intention to use smart tourism through perceived usefulness, perceived enjoyment and inertia. The findings are consistent with our expectation that positive outcomes are more associated with autonomy motivating style than with a controlling style (Baard et al., 2004; Deci & Ryan, 1985a, 1987; Deci et al., 2001; Grolnick & Ryan, 1987). Mover, the results indicate that between perceived relatedness and perceived usefulness have significant negative path. This finding is different to that of many other studies on technology acceptance (Nikou & Economides, 2017; Venkatesh, 2000). The context of this study is smart tourism applications, it has more travel-related services than just social features, thus, users may have perceived access to better services or access to the information they needed as more important than relationships with others. Therefore, this research makes an important contribution to knowledge by the significance of knowledge of intrinsic factors that affect users in the smart tourism application context. The outcome of interacting with TAM the framework indicated the importance of considering the intrinsic factors because of the significant results of the intrinsic factors in the theoretical framework.

Secondly, the research findings presented in this study extend previous mobile application studies by demonstrating the importance of adopting user inertia as an

inseparable critical factor for the formation and sustention of the dependence of mobile application consumers on the mobile application that they currently use. Our contributions regarding the adoption of perceived autonomy and inertia are twofold.

First, although prior research emphasises the significant effect of perceived autonomy on the formation of user/consumer inertia, studies that specifically address and examine such effect are scarce, limiting our understanding of how individuals' inertia regarding a mobile application is developed and sustained. In this study, the validation of the direct effect of perceived autonomy on inertia in the smart tourism application context have highlighted the importance of enhancing user perceived autonomy to further promote the inertia development process.

Second, user inertia is important because it has a significant effect on consumers' intention to continue using smart tourism applications; moreover, user inertia mediates the indirect positive effects of consumers' perceived autonomy using smart tourism applications. This study empirically validates the important role of inertia in minimising consumer intent to switch to alternatives by increasing consumer autonomy. Furthermore, inertia is generally depicted in previous technology acceptance literature in terms of consumers' resistance to new technologies. Nevertheless, this study examines the influence of inertia on consumers' intention to continue to use the same applications. From a continue using perspective and enjoyment, not to resist new technologies but actually to continue using existing technologies is a contribution.

Thirdly, since smart tourism applications are mostly used on the move or with a purpose, ease of use plays a key role in driving an enjoyable experience. In addition, smart tourism applications are sometimes used as a pleasure, for example, to relax by looking at other users' travel logs when they are unable to go out on a trip. If the smart tourism applications are considered difficult to use, the time would not be spent pleasantly.

To summarise, this study contributes to existing knowledge of user technology acceptance in smart tourism by identifying additional factors that influence users to accept applications. Moreover, the study considers intrinsic factors particular to Chinese smart tourism, which, in turn, will inform mobile application providers' of users' behaviours and intentions to improve the design of mobile applications. This study therefore enhances the understanding of user acceptance of mobile applications and the factors that directly and indirectly influence user acceptance of smart tourism applications. Finally, this research informs the basis for future research on technology acceptance in other areas of smart tourism.

6.6 Managerial Implications of the Study

The study provides a better understanding of consumer acceptance and intention to continue to use smart tourism application technology. These findings are particularly useful for mobile application providers as they can improve the implementation of smart tourism applications; the suggested framework can help mobile application providers establish effective marketing strategies and understand consumers' requirements. Providing consumers with a useful smart tourism application is one of the basic objectives of the service provider. Strategies must be in place to ensure applications are simple to use and a variety of features and services allow consumers to obtain useful information, thereby increasing their intention to continue using the mobile application.

From this research, perceived ease of use has an indirect relationship with intention to continue to use. Perceived ease has a significant effect on perceived enjoyment, and perceived enjoyment has a significant effect on intention to continue. Therefore, this indirect relationship urges service providers to design their smart tourism applications as simple as possible for users to use and continue use, in terms of flow of the application operation and interface.

Additionally, the results of this research indicate that inertia exhibit strong influences on smart tourism application consumers' intentions to continuance. In this study, consumers' inertia may differ from their intention to continue using other ICT, and consumer inertia to smart travel applications does not mean that they will not change to another application at all. Some consumers might be dissatisfied with the features or services of their present smart travel application, but still maintain their behavioural status quo because they believe that either the other application does not have substantial advantages to motivate switching actions, or the cost and risk of switching is higher than "doing nothing". Businesses should not be misled by consumers' inertia; they should implement approaches that contribute to satisfying the requirements of smart travel application users, increasing their perceived autonomy, and motivating them to make a conscious choice over which application they should use. This leads to an attachment to the app and allows consumers to continue using the service. These mechanisms may include the provision of upgraded personalised services and more autonomy to facilitate the exchange of information between users and application providers.

Furthermore, once consumers have formed their habits and inertia it is very difficult to change them. Traditionally, when it comes to travel-related issues, users are more likely to use search engines to obtain information. However, with the development of smart terminal technology, the widespread use of smart mobiles provides opportunities for the development of mobile terminals. Therefore, in order to increase the frequency of use, smart tourism applications need to increase user stickiness in due course, so that users adopt smart tourism applications to search for relevant information when they encounter tourism-related problems. The initial stickiness of users to the formation of habits is something that needs to be cultivated. Firstly, smart tourism application products should start by meeting specific user needs, analysing user behaviour, targeting product design functions, standardising page designs, and improving user experience. For example, smart tourism applications may be introduced through a

variety of preferential activities and personalised services to increase user stickiness, which, in turn, leads to consumers frequently using the application. Secondly, smart tourism applications should maximise the convenience, reduce the cost of use, provide multi-scenario applications, and offer price concessions to attract users and develop inertia of use.

Smart tourism applications are information systems that serve all aspects of tourism, and as such, perceived enjoyment significantly influences intentional behaviour. The results indicate that perceived enjoyment is another crucial determinant of users' behavioural intention to continue using smart tourism applications. Therefore, smart tourism app providers should consider enjoyment factors when designing apps or upgrading content and services. For example, in the interface and interactive design the introduction of entertainment elements, according to the positioning of the tourism application design bright colours, fonts, graphics, increase interactive, entertaining features; secondly, the introduction of timely social functions in the tourism application, allowing users to travel on the tourism app to meet travel experts, invite travel partners together; in addition, it can be carried out with user participation in offline activities, such as for the popular tourism destinations to carry out thematic activities. Finally, gamification is an important factor in perceived enjoyment; as such, gamified smart tourism applications will enhance users' experience using the app, thereby influencing how often they use it.

In this study, perceived competence is defined as the ability to perform and complete a task or activity. The results show that perceived competence has a positive effect on perceived usefulness and perceived ease of use, and thus influences users' willingness to continue using smart tourism applications. Firstly, organisations may offer training to users in order to enhance their IT skills and competence using smart tourism applications. This may be in the form of formal training or simple guides on the platform that users can navigate to learn more about the application. In addition, smart

tourism application providers may offer promotions to reward active users who frequently use the application or recommend a friend.

6.7 Limitations of the Study

There are some limitations to this research and opportunities for future research. First, the use of a non-probability sampling approach to gather data was one of the limitations of this study. This research selected specific participants with knowledge and experience of using technology. Nevertheless, future studies may expand the sampling to wider demographic groups in a longitudinal study. The use of non-probability sampling, especially convenience sampling, was consistent with previous research in the field of technology adoption, including the acceptance of mobile applications. According to Creswell and Creswell (2017), a convenient sample is suitable since the researcher must use naturally formed groups, such as volunteers. Additionally, this technique saves time and simplifies the process of expanding the sample. A total of 421 participants were included in the quantitative sample using non-probability sampling, which is adequate for performing a multi-variable analysis and maintaining the precision and generalisability of the data (R. Kumar, 2018).

Second, the questionnaire had more than 33 questions for 8 variables which may risk cognitive overload. However, it is easily justify check for reliability, and accuracy this study have pilot tested the question is to make sure that data is reliable environment. M. Saunders, Lewis, and Thornhill (2009) further recommend using a series of statements scales in a questionnaire with both positive and negative statements to encourage respondents to read and consider each argument carefully.

Third, the quantitative research found a sample of smart tourism application users by sending online questionnaires on social media, and the possible sampling results might have been influenced by the characteristic of sending questionnaires via social media, such as WeChat and Tencent. Since social media users are younger on average than

people in a normal distribution, the results might have been skewed. However, as WeChat users account for over 80% of China's population (Leiphone, 2018), it appears that the bias associated with utilising WeChat to send out surveys is lower than that associated with other social media platforms in China.

Forth, the study's focus on Chinese consumer data and thus the generalizability of the present findings should be cautiously interpreted; the specific market environment and cultural factors may impact the findings in other national or cultural contexts. Further research should be conducted to validate the model and improve its generalisability by extending it across diverse cultural settings.

Finally, participation in the quantitative study was voluntary and any participant who completed the questionnaire could receive a 20rmb (20p) reward. This might lead to self-selection bias (e.g., participants with a strong interest in mobile applications or participants who just want to receive a reward). Nevertheless, the incentive to participate had a small impact on the study due to the low monetary value and it was essential for data collection.

6.8 Opportunities for Future Research

The findings of this study offer new insights into smart tourism applications for future research. First, as this research framework considered a set of contextual factors specific to the smart tourism context, researchers should be cautious about the contextual factors that may apply in other smart technology contexts. Future investigation and experimentation of the theoretical framework established in this research is strongly recommended in relation to research on smart tourism applications developed by other counties. As a few studies have applied the conceptual models (TAM/SDT) in smart tourism contexts, it is also recommended that the theoretical framework is further investigated and tested on other types of technology from other smart tourism domains to evaluate the extent to which these results can be generalised.

Second, other psychological causes should be investigated further in order to understand the development of customers' intentions to continue usage behaviour. In addition to inertia, researchers could investigate the following forms of inertia and their antecedents: inertia can be spontaneous, forced, or unobtrusive (Schwarz, 2012); future studies could also link different types of inertia to consumers' intentions. Furthermore, researchers could integrate switching costs as an economic consideration (Polites & Karahanna, 2012) into the model for empirical analysis, to investigate the origins of rational decision-making of status quo bias.

Third, future studies could explore consumers' acceptance of other smart tourism technologies as well as their intention to continue using technologies. This study collected data on Chinese consumers, however, there are other countries that could be replicated to obtain a better understanding. Smart tourism is a dynamic and evolving area that is expected to have an impact in the tourism sector. As technology develops, further research can adopt this research model. In addition, future research may need to consider more of the findings in this research when researching other smart tourism areas, such as tourism destinations, VR tourism. Researchers should be careful about contextual variables that might be relevant to other mobile application contexts since the framework of this analysis considers a series of contextual factors unique to the field of smart tourism applications. In the light of studies on smart tourism applications developed in other countries, further investigations and experimentation with the theoretical paradigm developed in this study are highly encouraged. This research also advocates further investigation and testing of the theoretical construct on other types of technology in other smart tourism contexts to ascertain the degree to which these findings are generalisable, given that only a few studies have applied the conceptual model (TAM) to the field of smart tourism.

Forth, the current study has not investigated moderators in the theoretical model. According to Venkatesh et al. (2003a), gender and age are the most common

moderators identified regarding intentions to use technology. It would be interesting to investigate the interaction between the user demographic variables of gender and age based on their moderating effect on the relationship between independent and dependent variables. In this research, people over 51 years old accounted for only a small group (5%) within the sample.

Fifth, this research identified an insignificant relationship between perceived relatedness and perceived ease of use; a finding that differs from existing mobile technology consumption literature. According to Racero et al. (2020), collaborations and communications with others can reduce fears and increase the sharing of knowledge related to technology, which positively affects usefulness and ease of use. Therefore, some more in-depth investigation of these factors could provide novel insights as to why these factors have a negative relationship in the context of smart applications.

Finally, Kshetri (2007) highlights that personal background and experience, such as the economy and personal expectations, will affect both smart tourism application providers and customers; future research should explore how these factors influence intentions to use smart tourism apps and the overall frequency of use. For example, economic barriers (e.g., a lack of usable ICT systems and payment security support), risk barriers (e.g., insufficient personal data protection), and personal awareness barriers (e.g., a lack of awareness of the benefits of smart technologies) may all be explored. Investigating factors that may negatively affect consumer acceptance of smart tourism applications would be more comprehensive in order to generate a complete understanding of the acceptance of smart tourism applications.

6.9 Chapter Summary

The chapter has included a summary of the major findings of the study discussed in this study, evaluating each of the four research objectives and linking the results to current

literature. The chapter has highlighted the study's original contribution to knowledge, which can be summarised as:

- Addressing the research gap in the literature by investigating intrinsic motivational factors and how it relates to smart tourism application consumption behaviour.
- Adding to the existing knowledge of inertia by assessing the behavioural intentions of consumers toward smart tourism applications.
- Testing the self-determination theory and confirming that both perceived autonomy and perceived competence play a significant role in technology acceptance in the smart tourism applications consumption behavioural context.
- Offering a new insight into consumers' intention to continue usage behaviour literature.

The aim of our analysis is to encourage other researchers to contribute to current knowledge in consumer marketing by using a quantitative study to comprehensively analyse related behaviour in new and exciting market settings, especially in developed economies.

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Appendices

Appendix A-Consent Form

Faculty of Business and Law
Informed Consent Form for research participants

Informed Consent Form for research participants

Title of Study	An investigation of the intrinsic motivational factors that affect intention to continue using smart tourism applications
Person(s) conducting the research:	Jin Guo
Programme of study:	Business and Management PGR
Address of the researcher for correspondence:	Newcastle Business School City Campus East Newcastle upon Tyne NE1 8ST
Telephone:	07768884271
E-mail:	jin.guo@northumbria.ac.uk
Description of the broad nature of the research:	This research is part of my doctoral study. The research is for academic purpose only and not for commercial purpose. The main aim of this study is to understand the intrinsic factors that affect consumers' intention to continue using smart tourism applications. While mobile applications present huge potentials for consumers and are important to organization's success, the study on some areas of tourism industry remains under-explored, e.g., internal motivations to continue use. Therefore, understanding factors that affect intention to continue using smart tourism applications is

	important if firms are to effectively achieve their business objectives. The researcher expected to fill in this research gap by using a quantitative method to detect key factors and verify their relationships. Thus, the collected data will be analysed by statistical methods via Smartpls and SPSS to guarantee high quality of results. The proposed conceptual model will expand the TAM-typed framework in the literature of human-technology interactions.
Description of the involvement expected of participants including the broad nature of questions to be answered or events to be observed or activities to be undertaken, and the expected time commitment:	1. Participation in this survey is voluntary without coercion or under any pressure. 2. Participants can withdraw their permission at any time and are encouraged to be honest as possible with their answers. 3. Participants can access the information and are able to contact with the researcher at any time. 4. The expected interview time is an hour for each participant. 5. The questionnaire will be posted on a Chinese market research survey website for 3 weeks.
Description of how the data you provide will be securely stored and/or destroyed upon completion of the project.	1. To protect participants' right to anonymity and confidentiality, a coding system will be adopted to identify the participants instead of using their real name or personal ID. 2. The data will be password- protected and only can be assessed by a researcher. 3. Hard copy of the questionnaire is not required. Electronic records will be stored in logical files structures and indexed using logical file. 4. The expected time of storing the data is approximate the length of completion of project adds to 5 years.

	Arrangements for the archiving of electronic materials will be made within the Environment and Engineering Faculty.

Information obtained in this study, including this consent form, will be kept strictly confidential (i.e. will not be passed to others) and anonymous (i.e. individuals and organisations will not be identified unless this is expressly excluded in the details given above).

Data obtained through this research may be reproduced and published in a variety of forms and for a variety of audiences related to the broad nature of the research detailed above. It will not be used for purposes other than those outlined above without your permission.

Participation is entirely voluntary, and participants may withdraw at any time.

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this study on the basis of the above information.

Participant’s signature: Student’s signature:

Date: Date:

Appendix B-Participant Debrief

Participant code: 8997

Northumbria University
NEWCASTLE

PARTICIPANT DEBRIEF

Name of Researcher: Jin Guo

Name of Supervisor (if relevant): Dr Chrysostomos Apostolidis

Project Title: An investigation of the intrinsic motivational factors that affect intention to continue using smart tourism applications

What was the purpose of the project?

The main aim of this study is to understand the intrinsic factors that affect consumers' intention to continue using smart tourism applications. While mobile applications present huge potentials for consumers and are important to organization's success, the study on some areas of tourism industry remains under-explored, e.g., internal motivations to continue use. Therefore, understanding factors that affect intention to continue using smart tourism applications is important if firms are to effectively achieve their business objectives. The researcher expected to fill in this research gap by using a quantitive method to detect key factors and verify their relationships. Thus, the collected data will be analysed by statistical methods via smartPls and SPSS to guarantee high quality of results. The proposed conceptual model will expand the TAM-typed framework in the literature of human-technology interactions.

2. How will I find out about the results?

The data will be analysed approximately 3 weeks after taking part of the interview. The final study will be completed on 27/07/2021. The researcher will email you a general summary of the results if you would like to know.

3. If I change my mind and wish to withdraw the information I have provided, how do I do this?

If you wish to withdraw your data, then please email the researcher named in the information sheet within 1 month of taking part and given me the code number that was allocated to you (this can be found on your debrief sheet). After this time, it might not be possible to withdraw your data as it could already have been analysed.

The data collected in this study may also be published in scientific journals or presented at conferences. Information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, all data will be anonymous (i.e., your personal information or data will not be identifiable).

All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed 60 months (the length of completion of the research adds to 5 years) following the conclusion of the study. If the research is published in a scientific journal, it may be kept for longer before being destroyed. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point will your personal information or data be revealed. Insurance companies and employers will not be given any individual's personal information, nor any data provided by them, and nor will we allow access to the police, security services, social services, relatives or lawyers, unless forced to do so by the courts.

If you wish to receive feedback about the findings of this research study, then please contact the researcher at jin.guo@northumbria.ac.uk

This study and its protocol have received full ethical approval from Faculty of Environment and engineering Ethics Committee. If you require confirmation of this, or if you have any concerns or worries concerning this research, or if you wish to register a complaint, please contact the Chair of this Committee, stating the title of the research project and the name of the researcher.

Thanks again for your participation.

Appendix C- Questionnaire for main Study (English Version) Questionnaire

Thank you very much for agreeing to participant in this survey. The purpose of this research work is to understand customers' intention to continue to use smart tourism applications. The whole questionnaire contains three parts and will takes you approximately 10 minutes to complete.

The information provided by you in this questionnaire will be used for research purpose only and not for commercial purpose. The results generated by this study will contribute to the literature in the human-technology interactions studies. You will also get some knowledge about automated vehicles through this survey.

You participated in this survey voluntarily without coercion or under any pressure.

You can withdraw your permission at any time and are encouraged to be honest as possible with your answers.

Your right to anonymity and confidentiality will be protected during the whole process of data collection.

You can access the information and are able to contact with the researcher at any time.

If you are understanding the above statements, please click the right box shown in the follows:

o I am totally understanding above statements and agree to join in this survey

o I do not want to join in this survey Thank you so much!

Part 1

Please reading the following statements carefully. Select the most closed description that can reflect how strongly you agree or disagree with each statement.

1=Strongly disagree

2=Disagree

3=Somewhat Disagree

4=Neither disagree nor agree

5=Somewhat agree

6=Agree

7=Strongly agree

1. Have you ever used smart tourism apps when trying to find out travel information (e.g. tourism experience, restaurants, accommodations, entertainment, etc.)?

o Yes

o No

2. How many smart tourism apps in your Mobile? (Smartphone, Tablet)

o 0

o 1–2

o 3–4

o 5–6

o ≥7

3. How many days did you use smart tourism app per week?

o every day

o 1 days

o 2-3 days

o 4-5 days

4. Did you travel at least once in the last 12 months?

o Yes

o No

5. Do you use at least one smart tourism apps for more than one month?

o Yes

o No

6. Which smart tourism apps have you used?

o Mafeng wo

o Quna er

o Xiecheng

o Feizhu

o Airbnb

o Tripadvisors

o others

Part 2

Please use the following scale in your rating to indicate how you agree/disagree (1-7; 1=strongly disagree, 7=strongly agree)

7. Perceived Ease of Use

PEOU1: My interaction with the Smart tourism app is clear and understandable.

PEOU2: It is easy for me to become skilful at using the Smart tourism app.

PEOU3: I find the Smart tourism app easy to use.

8. Perceived Usefulness

PU1: Using the Smart tourism app enhances my effectiveness.

PU2: The Smart tourism app is useful for my travel.

PU3 Using the Smart tourism app increases my productivity.

9. Perceived Autonomy

PA1: I feel a sense of choice and freedom while participating in the Smart tourism app.

PA2: I feel pressured during the Smart tourism app.

PA3: The Smart tourism app provides me with interesting options and choices.

PA4 There is not much opportunity for me to decide for myself how to do the Smart tourism app

PA5 When I am in this user's smart tourism app, I feel that my choices are based on my true interests and values

10. Perceived Competence

PC1: I think I am pretty good at the Smart tourism app.

PC2: After working at the Smart tourism app for a while, I felt pretty competent.

11. Perceived Relatedness

PR1: I have the opportunity to be close to others when I participate in the Smart tourism app.

PR2: I feel close to others when I participate in the Smart tourism app.

PR3: I feel connected with other travellers or users when I participate in the Smart tourism app.

PR4: I feel really distant to other travellers or users when I participate in the Smart tourism app.

PR5. When I am in smart tourism app, I feel loved and cared about

12. Perceived Enjoyment

ENJ1: Using smart tourism apps provides me with a lot of enjoyment.

ENJ2: I have fun using smart tourism apps.

ENJ3: I use the smart tourism apps to combat boredom

EHJ4: I use smart tourism apps because it is entertaining

13. Inertia

Inertia1-I prefer using this app of smart tourism as it makes me feel comfortable

Inertia2-I prefer using this app of smart tourism as I have got used to it

Inertia3-I prefer using this app of smart tourism as this what I am used to

14. Intention to continue to use

1: I intend to continue using smart tourism app in the future

2: I plan to continue using smart tourism all in the future

3: I will continue to search smart tourism apps that I am interested in

Part 3 Personal data

36. Please select your age groups

o 20 or under

o 21-30
o 31-40
o 41-50
o 51-60
o 61 or over

37. Please select your gender

o Female o Male

38. Please select your education background

o High school or less
o University / college
o Graduate / professional degree

39. Please select your employment status

o Student
o Self-employed/Owner
o full-time employee
o part-time employee
o Retired
o Others

Thank you very much for your time to complete this questionnaire!

Appendix F-Questionnaire for main Study (Chinese Version)

智慧旅游应用调查问卷 您好!此份问卷旨在调查大众对智慧旅游应用的看法以及是否会继续使用。您需要完成

三部分简短的问卷来表达您的看法和态度，总共约用时 10 分钟。

此问卷不会涉及任何风险。同时，此次研讨论的目的将有助于日后的学术研 究。我们也希望您可以从中获取对于无人驾驶车的进一步了解。所有数据将以 不记名的方式收集与保存，并将受到严格的保密。此数据仅作为学术研究所 用。最后收集到的数据仅以整体的方式出现在学术期刊上。

此次研究纯属自愿参与，您有权随时终止并退出问卷测试，不会产生任何负面 后果。您也可以拒绝回答任何不愿意回答的问题。

o 我完全清楚以上所述内容并同意参与此次研究

o 我不愿意参与此次研究

第一部分 请回答以下问题，选出您认为最合适的回答。

1=非常不同意 2=不同意 3=不太同意 4=不确定 5=有点同意 6=同意 7=非常同意

1. 有没有用智慧旅行 App 去搜索旅游的相关信息（比如，游记，住宿，餐厅，娱乐活动等）

   o 有

   o 没有

2. 在你的手机里有多个关于智慧旅行的 App？

   o 0

   o 1–2

   o 3–4

   o 5–6

   o ≥7

3. 每天玩手机的时间是多久？

o 不到一小时

o 1-3 小时

o 3-6 小时

o 超过 6 小时

4. 在过去的 12 个月里，有没有旅行？

o 有

o 没有

5. 有在出去旅行的时候，有没有使用过智慧旅行 App？

o 有

o 没有

6. 你用过下列哪个智慧旅行 App？

o 马蜂窝

o 去哪儿

o 携程网

o 飞猪

o 爱彼迎

o 其他

第二部分

对以下关于智慧旅行 APP 的描述，您的认同程度是？（1-7；1=完全不认同，7=完全认同）

7. 使用智慧旅行 APP 的时候，使用体验清晰易懂

非常不同意

8. 很容易熟练使用智慧旅行 App
9. 智慧旅行 App 用起来很简单
10. 智慧旅行 App 可以提高旅行过程中的效率
11. 智慧旅行 App 对于我的旅行非常有用
12. 智慧旅行 App 可以提高旅行计划准备的效率

13. 当我在使用智慧旅行 App 的时候，我可以选择我想要看的内容和想要的服务。
14. 当我使用智慧旅行 App 时，我有一种压力存在。
15. 为我提供了很多有趣的服务。
16. 我没有太多的机会去决定自己使用智慧旅行 App 中的不同服务
17. 当我使用智慧旅行 App 时，我选择的服务和内容都是我感兴趣的。
18. 我认为我有能力去使用智慧旅行 App。
19. 在使用智慧旅行 App 一段时间后，我觉得自己完全有能力更好的使用智慧旅行 App。
20. 我不是太会使用智慧旅行 App。
21. 当我使用旅行智慧旅行 App 时，我有机会跟其他用户建立一个很好的关系。
22. 当我使用智慧旅行 App 时，我感觉我跟其他用户像朋友一样。
23. 当我使用智慧旅行 app 时，我觉得自己与其他旅游者或用户很好的联系在一起。
24. 当我使用智慧旅行 app 时，我觉得自己和其他旅游者或用户真的很疏远。
25. 当我使用智慧旅行 App 时，我感觉到我是被重视的。
26. 使用智慧旅行 App 给我带来了很多的乐趣
27. 我喜欢使用智慧旅行 App。
28. 当我无聊的时候我会使用智慧旅行 App。
29. 因为智慧旅行 App 里有很多有趣的内容和服务，所以我很喜欢使用它。
30. 我更喜欢使用这个智慧旅行 App，因为它让我感觉很舒服。
31. 我更喜欢使用这个智慧旅行 App，因为我已经习惯了它。
32. 我更喜欢使用这个智慧旅行 App，因为这是我所习惯的。
33. 我打算在未来继续使用智慧旅行行 App
34. 我会继续经常使用智慧旅行 App
35. 我会继续使用智慧旅行 App 来搜索自己感兴趣的信息。

第三部分 个人信息

36. 您的年龄是

o 20岁以下
o 21-30
o 31-40
o 41-50
o 51岁以上

37. 您的性别是

o 女
o 男
o 不想回答

38. 您的教育程度是

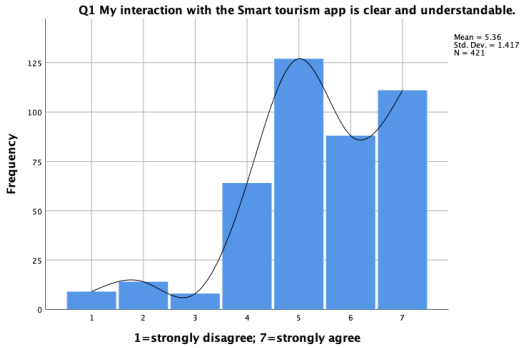
o 高中及以下
o 大学
o 学士/ 硕士

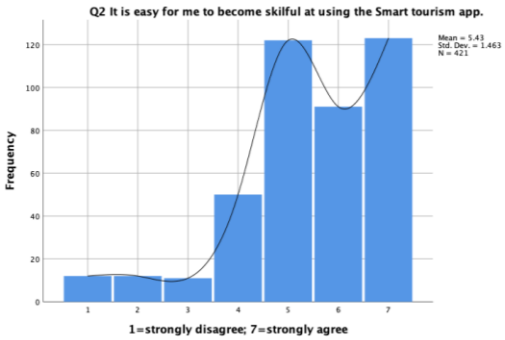
39. 您的职业是

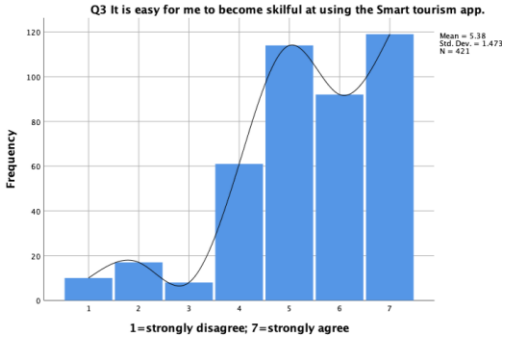
o 学生
o 全职工作
o 兼职工作
o 自己创业
o 自由职业
o 其他

Appendix G – Univariate normality testing of each constructs

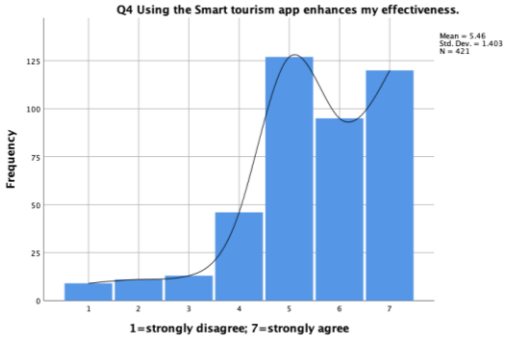
Perceived ease of use

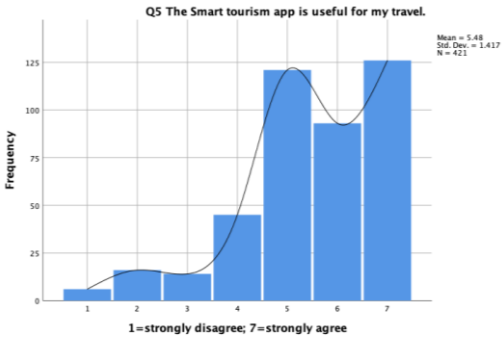


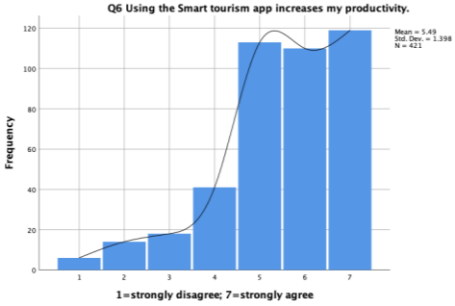




Perceived usefulness







Perceived Autonomy