UNDERSTANDING MOTIVATIONS BEHIND CARPOOL DRIVERS: WHAT MAKES THEM SHARE THEIR SEATS TO STRANGERS?

BY

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ABSTRACT

Knowledge is limited related to drivers' motivation to join online carpooling platforms despite the increase of such services in the sharing economy. This dissertation aims to explore the drivers' perceptions and motivations towards carpooling through the platform and then investigate how motivational factors affect their future intention to carpool via an extant platform in Thailand.

A mixed-methods research design was proposed with two phases of research: the exploratory study and the explanatory study. In the exploratory research, the carpooling literature was explored by means of a systematic literature review. It was found that identified psychological factors were not derived from the perspective of drivers. Technology Acceptance Model (TAM) together with such identified factors was used to develop a priori model. Data were collected using a series of qualitative methods and analysed using thematic analysis while content analysis was used to generalise results. Findings revealed aspects related to perceived usefulness, perceived ease of use as well as the drivers' motivations to carpool which were conceptualised into seven types based on consumer perceived value theory: economic, functional, hedonic, social, environmental, altruistic and merit. A conceptual model was proposed for the use in the second phase.

The second study aimed to investigate the impact of motivational factors and the element of TAM on the drivers' future carpooling decisions via the platform.

The literature was explored once again; meanwhile, the research hypotheses were proposed within an operative model. An explanatory empirical research was conducted by means of survey. Findings provided empirical data which were analysed with partial least square structural equation modelling. The results of analysis supported the most of proposed hypotheses. Perceived usefulness, perceived ease of use and the four value dimensions i.e. utilitarian, hedonic, environmental and altruistic had influences on the driver's future intention to carpool via the platform. Perceived usefulness played an important role as complementary mediation of the relationship between perceived ease of use and the driver's future intention as well as indirect-only mediation of the relationship between perceived value and the driver's future intention. Perceived ease of use was also found to influence the driver's future intention.

Regards theoretical contribution, the dissertation proposes a conceptual model for investigating the drivers' motivation to join online carpooling platforms. Managerial implications are suggested on how the platform should do to satisfy this group of drivers and how to generate revenues. Public policy interventions are recommended in terms of the ways to reduce single-occupancy vehicles. Policy implications are suggested as regards with how the Thai government should promote carpooling. Limitations and future research are noted and suggested.

Keywords: carpooling platform, motivations, perceived value, technology acceptance model, mixed-methods research design

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LIST OF ABBREVIATIONS

Symbols/Abbreviations	**Terms**
CFA	Confirmatory factor analysis
CPV	Consumer perceived value
COVID-19	Coronavirus disease
EM-TSA	Embedded two-stage approach
DIS-TSA	Disjoint two-stage approach
EFA	Exploratory factor analysis
FI	Future intention
PEOU	Perceived ease of use
PLS-SEM	Partial least square structural equation modelling
PU	Perceived usefulness
PV	Perceived value
RIA	Repeated indicator approach
TAM	Technology Acceptance Model
TPB	Theory of planned behaviour
TRA	Theory of reasoned action
TSA	Two-stage approach
SEM	Structural equation modelling

CHAPTER 1
INTRODUCTION

1.1 Research background

Sharing is "a phenomenon as old as humankind" and usually occurred within a family, close kin and friends (Belk, 2014a, p. 1595). Information technology has transformed traditional sharing to a new social phenomenon, also known as collaborative consumption. Collaborative consumption refers to "a peer-to-peer-based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services" (Hamari, Sjöklint & Ukkonen, 2016, p. 2048). One can observe many collaborative consumption practices in a variety of business platforms, for example, accommodation e.g. Airbnb, finance e.g. Kickstarter and Zopa, education e.g. Coursera and Skillshare, and transport e.g. Blablacar, Uber and Zipcar. Such platforms act as mediators utilising technology platforms to link 'stranger actors' to each other (Belk, 2014a; Kaplan & Haenlein, 2010).

Carpooling, the way a driver sharing seats in their private vehicle and driving for stranger riders, is not new to the literature. Since 1970s, carpool research has begun with an aim to encourage individuals to carpool in order to fulfil many purposes such as reducing resources consumption, mitigating traffic congestion, reducing car usage and improving the environment (Shaheen & Cohen, 2019). Since 2004, the technology-enabled ridematching has been integrated with mobile phones and online communities (Chan & Shaheen, 2012). A new business model utilising such ridematching technology has emerged. Carpooling platforms are such business models that play roles in providing information of service providers and customers as well as facilitating their interactions (Benoit, Baker, Bolton, Gruber & Kandampully, 2017). Carpooling via online platforms refers to a means of transport which the driver who does not aim at profit-making can share a common route and time in their private vehicle with passengers, who may or may not share expenses with them, via a platform (Guyader & Piscicelli, 2019; Standing, Standing & Biermann, 2019). BlaBlaCar, the world's leading carpooling platform, is an example.

An emergence of carpooling platforms has increased the number of 'carpoolers' who are stranger to each other and has gained the attention of academia and practitioners (Benoit et al., 2017; Olsson, Maier & Friman, 2019). One of many research streams regard carpooling focuses on people's motivations to carpool via platforms (Olsson et al., 2019). The research in this stream contributes not only to academics but also to businesses and policy (Neoh, Chipulu & Marshall, 2017; Neoh, Chipulu, Marshall & Tewkesbury, 2018). There has been a call for a better understanding of factors encouraging carpooling, as this may guide businesses on how to attract carpooling users (Standing et al., 2019). Failing to attract and maintain carpooling participants can put a platform's finances and its business sustainability at risk (Shaheen, Stocker & Mundler, 2017; see Täuscher & Kietzmann, 2017, for examples of failure cases).

Many carpool researchers noted that early carpooling studies did not focus on psychological factors, despite such factors having an influence on travellers' decisions to carpool (Amirkiaee & Evangelopoulos, 2018; Canning, Hughes, Hellawell, Gatersleben & Fairhead, 2010; Correia, Silva & Viegas, 2013; Neoh et al., 2017). Olsson et al. (2019) indicate that psychological factors have recently gained attention in academia. Neoh et al. (2017) indicates lack of psychological theory explaining carpooling motivations.

A systematic literature review of carpool research carried out in this dissertation shows that the literature lacks studies exploring drivers' perceptions and motivations towards carpooling via carpooling platforms. Consistent with others, researchers indicate lack of study considering the role of carpooling participants (Bachmann, Hanimann, Artho & Jonas, 2018; Park, Chen & Akar, 2018). The motivations, activities and resources differ across actors participating in an online platform (Benoit et al., 2017). In collaborative consumption practices, researchers indicate that the motivations of supply side or the providers of platforms are neglected in the literature (Aspara, Grant & Holmlund, 2020; Hazée et al., 2020). Logically, drivers are the first sharers and should be the focus, as they are at the supply side which is critical to the market system (Farajallah, Hammond & Pénard, 2019).

Furthermore, it is acknowledged that an individual's intention to carpool via online platforms is not only determined by their perceptions on how carpooling benefits them but also by the characteristics of platform (Olsson et al., 2019). There is a need to investigate how a platform can meet such providers' needs and how drivers' perceptions impact on their intention to use platforms (Leroi-Werelds, 2019; Olsson et al., 2019).

1.2 Context of study

It is acknowledged that individuals' perceptions and motivations towards a collaborative consumption platform are very specific to the context (Leroi-Werelds, 2019; Olsson et al., 2019; Zeithaml, Verleye, Hatak, Koller & Zauner, 2020). The context of this dissertation differs from other studies in the literature in that LILUNA − the carpooling platform that is the focus of the dissertation − charges user no fees and operates in Thailand where people may have different motivations from those in Western world.

A specific context that can influence individuals is a platform's business model. Many carpooling platforms charge service fees to users and this is why, generally, most of carpool drivers are concerned on cost-savings (Standing et al., 2019). Yet, evidence also shows that some drivers seemed less economically motivated and were motivated by other factors such as prosocial, socialisation and pro-environmental concern (Arbour-Nicitopoulos, Faulkner, Buliung, Lay & Stone, 2012; Devarasetty, Burris, Arthur, McDonald & Muñoz, 2014; Guyader, 2018). The drivers in LILUNA are the unit of analysis of this dissertation. Exploring such drivers may provide insights into their motivations to carpool. We could expect that such insights are less economically motivated.

Another interesting point is that LILUNA is a Thai start-up company where most users are Thais. Olsson et al. (2019) noted that motivational factors seem to be dependent on country and culture. Furthermore, the systematic literature review undertaken in this dissertation indicates that previous carpool studies were carried out in Western world. The specific cultural context of Thailand that differs from the countries in Western world may influence the drivers' thoughts.

1.3 Research problem

The overall objective of this dissertation is to explore the drivers' perceptions and motivations towards carpooling through the platform and then investigate how such motivational factors affect their future intention to carpool via the platform. This objective is achieved through empirical investigation of the following two research questions:

RQ1: What make carpool drivers using the platform share their seats and drive for strangers and what factors found in the literature and elements of the Technology Acceptance Model explain such behaviour?

RQ2: How important are these factors for the driver's future carpooling decisions via the platform?

Specific objectives to answer the first research question are:

1) to understand motivational factors for the drivers to carpool via a platform and

2) to propose a conceptual model for investigating the relationships between motivational factors and the drivers' future carpooling decisions via the platform.

A third specific objective to answer the second research question is:

3) to use the proposed conceptual model to identify the impact of motivational factors on the drivers' future carpooling decisions via the platform.

1.4 Research methodology

In order to answer the research questions, this dissertation is grounded on post-positivism (Fox, 2008; Hunt, 2010). Such paradigm is flexible and pragmatic in that it allows researchers to use the best approach of other paradigms to answer their research questions (Hunt, 2010; Maxwel & Mittapalli, 2010). Researchers can craft their skills and methodologies based on what they have experienced and learnt from previous studies (Seale, 1999).

The first research question and its research objectives are exploratory in nature while the second is explanatory in nature. The dissertation uses a mixed-methods approach (Golicic & Davis, 2011; Johnson & Onwuegbuzie, 2004). Research process is divided into two studies: (1) **exploratory** and (2) **explanatory**.

The first study is **exploratory** in nature because the literature provides not much evidence from the driver's perspective. Understanding and identifying motivational factors for drivers to carpool via the platform is the main goal. To obtain data regards drivers' perceptions and motivations towards carpooling via carpooling platforms, a series of qualitative methods and data collection techniques suggested by interpretivist paradigm are employed (Denzin & Lincoln, 2008). Such methods are long interview (McCracken, 1988), narrative technique (Mishler, 1991) and netnography (Kozinets, 2010).

All obtained data is analysed using thematic analysis (Braun & Clarke, 2006). The objective is to look for prior themes suggested in the literature and to identify emergent themes that might expand our current understanding of the drivers' motivations to carpool via online platforms. Semi-structured interview is employed to confirm identified themes emerged from the thematic analysis (Cachia & Millward, 2011). A content analysis is undertaken to generalise the results of thematic analysis to a wider population (Krippendorff, 1980). At the end of the exploratory phase, a conceptual model is proposed based on two theories: Technology Acceptance Model or TAM (Davis, 1989) and consumer perceived value or CPV (Holbrook, 1994). The proposed conceptual model is later used in the second study.

The second study is **explanatory** in nature because the aim is to determine the relative importance between the elements in TAM and CPV as well as the drivers' future carpooling decisions. A quantitative approach is used and consistent with the nature of positivist paradigm (Hunt, 2010). Data inquiry method used is survey with self-administrated questionnaire. Questionnaire development is adapted from the guideline suggested by Oppenheim (2000). Indicators for enquiry are borrowed from the literature. Before a real survey is conducted, a pilot study is employed to adapt the indicators to suit with the Thai context.

Exploratory factor analysis (EFA) is used to examine internal consistency of individual items (Hair, Black, Babin & Anderson, 2019). It also helps validate the translation of English-Thai language (Menezes et al., 2019). A multivariate analysis technique used is partial least squares structural equation modelling (PLS-SEM). It is used for examining the causal relationships and relative strengths between variables in the model as well as for determining the explanation and prediction powers of target construct (Hair, Hult, Ringle & Sarstedt, 2017; Hair, Risher, Sarstedt & Ringle, 2019). The obtained data is analysed based on the specification proposed in an operative model. A systematic evaluation of criteria is performed by following a two-step process: evaluation of the measurement model and the structural model (Hair et al., 2017; Hair, Risher, et al., 2019; Sarstedt, Hair, Cheah, Becker & Ringle, 2019). Lately, structural model robustness checks for PLS-SEM are carried out (Sarstedt et al., 2020).

1.5 Contribution of the research

It is expected that the research can provide an understanding of drivers' perceptions and motivations towards carpooling through a platform as well as can identify the influence of motivational factors in relation with their future intention to carpool via the platform. A proposed conceptual model may be used for further carpool research.

It is hoped that this research should contribute to academics, businesses and policy-makers involve with the IT-based carpooling context because the research present an insight into the impacts of motivational factors and the impacts of technological platform that can encourage the drivers' future carpooling decisions via the platform.

1.6 Structure of the dissertation

This dissertation is divided into four parts (Figure 1.1). The first part consists of background literature as well as research methodology and methods. The second part is the exploratory empirical research. The third part is the explanatory empirical research. The last part encompasses interpretations and conclusions.

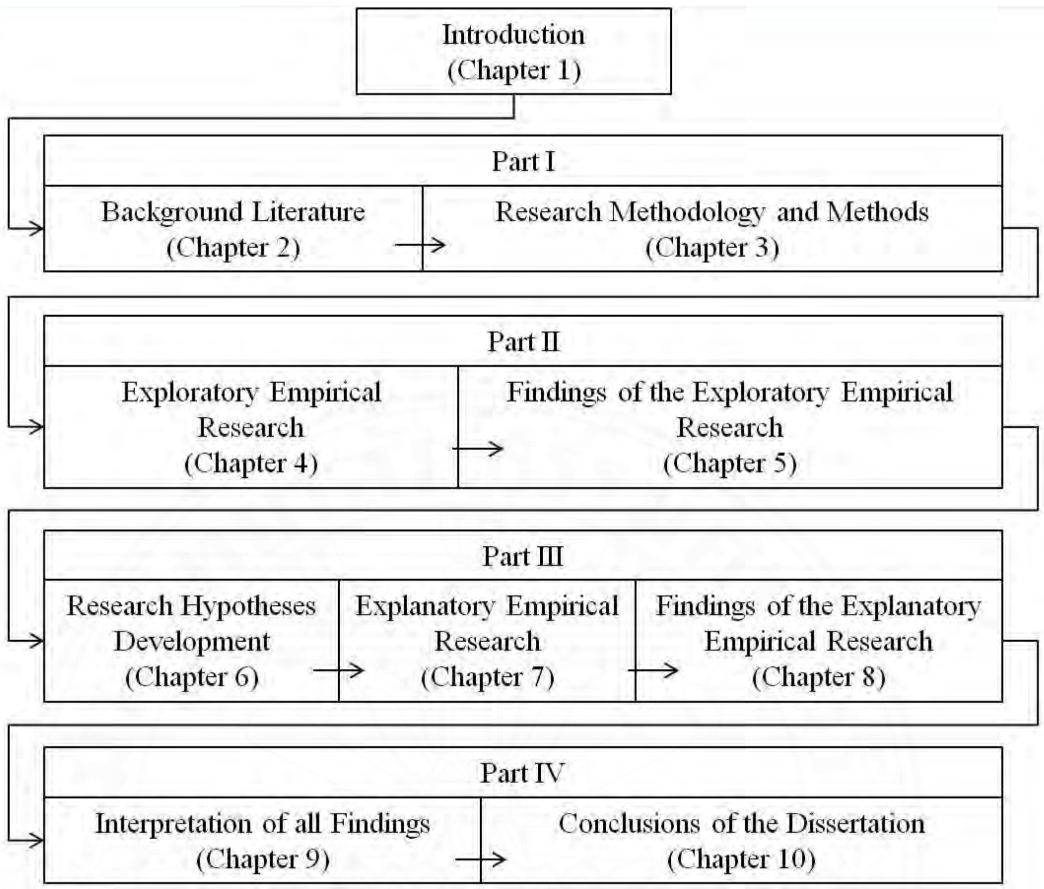


Figure 1.1: Structure of the research

1.6.1 Part I: background literature and research methodology

Chapter Two provides background literature in various topics including the collaborative consumption in transport, a review of carpooling and typologies of pooled services and carpooling as well as the behavioural science research approaches in transport. Next, a systematic literature review of carpool research is presented with findings. LILUNA which is the platform the dissertation is focusing is introduced. Research questions are set out next. A review of the characteristics of Thai people is also provided.

Chapter Three starts with the research philosophy of the dissertation. A mixed-methods research design for the research is introduced. Rationale for the use of such research design is provided.

1.6.2 Part II: exploratory empirical research

Chapter Four provides the research methodology undertaken in the exploratory research. Criteria used for selecting informants and data collection methods/techniques employed in this phase are shown next. Analysis methods, which include thematic analysis and content analysis are demonstrated and discussed at the end of the chapter.

Chapter Five presents findings of the exploratory research which include both qualitative (text-based) and quantitative (numerical-based). Such findings are discussed, compared and interpreted. All findings are conceptualised and used to derive a conceptual model, which is grounded on two theories: TAM and CPV.

1.6.3 Part III: explanatory empirical research

Chapter Six is about the explanatory research. It presents the theoretical background related to TAM and CPV in the context of carpooling and other collaborative-consumption-related contexts. The theoretical background is used for specifying the relationships among variables in the proposed conceptual model and for setting out research hypotheses.

Chapter Seven describes research methods undertaken in the explanatory phase. It starts with the development of questionnaire by using well-developed indicators borrowed from the literature. A pilot study is carried out in order to adapt the questionnaire to fit the Thai context. Details of survey carried out in this phase are described next. Next, the analysis part provides a process of EFA, rationale for the use of PLS-SEM as well as discussions regards model specifications and evaluation criteria used for evaluating the model. At the end of the chapter, methods for structural model robustness checks in PLS-SEM are presented.

Chapter Eight presents findings of the explanatory phase. It starts with the results of EFA and is followed by the results of PLS-SEM: the measurement model and the structural model. A summary of hypothesis testing is provided. At the end of the chapter, the results of structural model robustness checks are presented.

1.6.4 Part III: explanatory empirical research

Chapter Nine discusses interpretations of findings in terms of the relationships among variables in TAM and CPV as well as compares the findings from both exploratory and explanatory research.

Chapter Ten concludes the dissertation and discusses its various theoretical contributions and implications. Implications of the dissertation are discussed in terms of the implications for the platform and the interventions for policy-makers. At the end of the chapter, limitations of the dissertation and suggestions for further research are discussed.

1.7 Summary of the chapter

This chapter provides the foundation for this dissertation. The research context was introduced and followed by a set of research questions and objectives. The research methodology was briefly described and followed by structure of the dissertation. Research contributions were briefly declared. In the next part, the dissertation proceeds with a detailed of background literature.

CHAPTER 2
BACKGROUND LITERATURE

The purpose of this chapter is to provide background literature regards the scope the dissertation and to identify research gaps in the literature as well as propose research questions and research objectives.

2.1 Introduction

Chapter One set out the foundation of the dissertation: purpose for the study, a brief of research methodology and this study's relevance. Section 2.2 explains the concept of collaborative consumption and provides typologies of sharing in transport and carpooling services. The definition of carpooling is proposed.

Section 2.3 discusses the behavioural science in transport research. It highlights the importance of adopting the behavioural models and research methods emerged from other disciplines.

Section 2.4 presents a systematic literature review of carpool research. Findings are presented as a set of social psychological factors and research gaps for this dissertation. A historical review of carpooling in Thailand is presented. The carpooling platform that the focus of the dissertation i.e. LILUNA is introduced. Rationale why LILUNA and its drivers are interesting is given. The journey of this dissertation is also shared. Finally, research questions are set out.

Finally, Section 2.5 provides a review of the characteristics of Thai people and the role of Buddhism influencing the people of Thailand.

2.2 Collaborative consumption in transport

This section explains the concept of collaborative consumption and provides typologies of sharing in transport. This review not only help delimit the scope of dissertation, i.e. not merely focus on the carpooling context but expand the scope to other collaborative-consumption-related contexts, but also be useful when formulating research hypotheses and indicators. Framing and defining collaborative consumption is beyond the scope of the dissertation.

2.2.1 The sharing economy

Technological platforms emerged in the Internet era provide real time information by utilising algorithms for matching and scheduling consumers as well as facilitating payment methods and allowing crowd-source ratings (Schor & Cansoy, 2019). The terms 'sharing economy' and 'collaborative consumption' are born in the Internet era (Belk, 2014a). Other than such two terms, there are a number of terms used, for example, access-based consumption (Bardhi & Eckhardt, 2012), connected consumption (Schor & Fitzmaurice, 2015), peer-to-peer markets (Perren & Kozinets, 2018) and many others (see examples in Codagnone & Martens, 2016). Hereunder, the terms 'sharing economy' and 'collaborative consumption' are discussed, as these two terms are most relevant to the dissertation and widely stated interchangeably in a number of scientific journals and practitioners (Codagnone & Martens, 2016).

The first use of the term 'sharing economy' is unknown (Schor & Cansoy, 2019). Frenken and Schor (2017) define the sharing economy as "consumers granting each other temporary access to under-utilized physical assets ("idle capacity"), possibly for money" (p. 4-5). The sharing economy can be explained as an overlap between three economic trends: (1) the peer-to-peer economy (the sharing between peers through platforms) (2) the access economy (the shift from ownership to temporary access to goods and services) and (3) the circular economy (the efficient use of resources) (Frenken, 2017). Guyader and Piscicelli (2019) suggest that the term represents consumption practices that are related to acquiring and distributing idle resources, e.g. goods, services and spaces, for free or for a fee, and typically undertaken via online platforms or peer communities. Activities under the sharing economy can be goods exchange, labour services and any attempt to build social connection (Schor & Cansoy, 2019).

The term 'sharing economy' is an umbrella term and there is no agreement on what the sharing economy is and what activities should be included in the sharing economy (Acquier, Daudigeos & Pinkse, 2017; Codagnone & Martens, 2016). Defining the sharing economy is challenging, while many gaps remain underexplored (Perren & Kozinets, 2018). Some authors criticise the use of the term ‘sharing economy’ when referring to many sharing practices. For example, Belk (2007) argues that sharing by definition does not included financial remuneration. Botsman (2013) argues that the term ‘sharing economy’ lacks of a shared definition. Belk (2014b) separates ‘true’ sharing from ‘pseudo’ sharing – “commodity exchanges wrapped in a vocabulary of sharing” (p. 7). Belk (2017) argue that the term ‘sharing’, which is social desirability in nature, is used to wrap many “services for sale” e.g. short-term rental.

2.2.2 Collaborative consumption

The term ‘collaborative consumption’ was first appeared in Felson and Speath (1978). However, the definition is too broad and focuses on coordinated consumption such as two people speaking on the telephone and drinking beer with friends (Belk, 2014a). The term was later popularised by Botsman and Rogers (2010). Although the definition is narrowed down to activities such as traditional sharing, bartering, lending, trading, renting, gifting and swapping, Belk (2014a) argues that it is still too broad.

Belk (2014a) defines collaborative consumption, based on historical and cultural aspects, as the way “people [are] coordinating the acquisition and distribution of a resource for a fee or other compensation” (p. 1597). The term ‘other compensation’ includes “bartering, trading, and swapping, which involve giving and receiving non-monetary compensation” (p. 1597). This definition also excludes (1) gift giving which performs in transferring of ownerships (Belk, 2014a) and (2) sharing activities that share for free i.e. providers offer the free use of their possessions (Belk, 2014b). Therefore, platforms that involve in collaborative consumption practices are such as short-term car-rental platforms (Zipcar, Car2Go, Getaround and Relay Rides), carpooling matching platforms (Car2gether, Zimride and BlaBlaCar), taxi-like services (Uber and Lyft) and short-term accommodation platforms (Airbnb) (Belk, 2014a, 2017).

From Belk’s perspective, collaborative consumption is not (true) sharing sites. The examples Belk gives are casual carpooling in the San Francisco Bay area and others locations nearby public transport stops as well as home sharing such as Couchsurfing – a platform that helps travellers find a free room to sleep (Belk, 2014a). Belk (2017) extends that Couchsurfing is an example of sharing, as the platform “charges user no fees” as well as there is “no money changes hands and strong interpersonal bonds are often formed between [sharers] and [receivers] (Belk, 2017, p. 249-250).

However, Belk’s definition has drawbacks: the term ‘other compensation’, a platform business model and policy, and heterogeneity of users. Belk does not provide what the term ‘other compensation’ means. Compensation generally refers to money compensation which equals to money. It can be non-monetary compensation such as rewards and gifts (Waqas & Saleem, 2014) and psychological compensation, which could be a form of emotional benefits such as status and self-esteem (Roschk & Gelbrich, 2014). Belk (2007) argues that sharing includes giving and receiving but excludes gift giving i.e. commodity exchanging. As a result, Couchsurfing is classified as a sharing site. However, it is observed that travellers in CouchSurfing give non-monetary compensation such as a small gift for their hosts (Bialski, 2012). It seems that a host shares living space for no fees but receive a gift. We would not know whether Couchsurfing was a true sharing site or others.

A change in platform business model and policy makes Belk’s classification problematic. For example, BlaBlaCar used to provide matching service to users for free. Since 2013, it has charged a fee and this made many users felt being cheated by the platform’s policy that destroys the altruistic sense in the community (Guyader, 2018). Another example is Couchsurfing. The outbreak of coronavirus disease (COVID-19) makes Couchsurfing to charge a fee to all members who want to access to its platform (Couchsurfing, 2020).

It is acknowledged that different users have different needs. It is typical that a platform will have some users who desire to share without reciprocity and some others do not. For example, Guyader (2018) found that some BlaBlaCar users were prosocial whereas some others sought to make money. Burris and Winn (2006) found that not all casual carpool drivers did not receive money from sharing seats. If a sharing site consists of such two extream cases of users, should we judge it as 'true' or 'pseudo' sharing site?

In conclusion, Belk's definition provide some ideas about sharing behaviour and collaborative consumption practices but it is too narrow and has some unsolved issues. Solving such issues beyond the scope of the dissertation and is not discussed further.

As opposed to Belk (2014a) who see collaborative consumption from the perspective of consumer culture, Hamari et al. (2016) consider the phenomena as a social practices that mediated by information technologies. Collaborative consumption is "a peer-to-peer-based activity of obtaining, giving, or sharing access to goods and services, coordinated through community-based online services" (Hamari et al., 2016, p. 2048). Such definition was derived from mapping of the 254 platforms. It encompasses activities like sharing, purchasing (new or second-hand), renting, lending or borrowing, donating and swapping.

Compare with Belk's (2014a) definition, Hamari et al.'s (2016) definition is broader in that (1) it encompasses the consumption of goods and service and (2) includes the role of technological platforms serving as a market for the acquisition and distribution of idle assets. Carpooling platforms are also included within the scope of Hamari et al. (2016). For example, BlaBlaCar is a peer-to-peer carpooling platform that allows drivers to share seats in their vehicle to riders for a fee. Such fee is around 50% to 150% of a recommended price, which is automatically calculated by the platform based on the distance and the estimated cost of fuel and tolls (Farajallah et al., 2019).

We now have a clear understanding of collaborative consumption. Next we move our focus to sharing practices in transport context because we need to distinguish carpooling from many types of sharing in transport.

2.2.3 Sharing in transport

Due to the rapid development of information technology and the growth of sharing practices among consumer, the forms and definitions of sharing in transport are problematic. Practitioners and researchers use definitions loosely; in the literature, ridesharing, carpooling and carsharing are used interchangeably as a meaning for carpooling (Neoh et al., 2017; Tahmasseby, Kattan & Barbour, 2016). Typologies of sharing in transport are given hereunder to help us distinguish carpooling platforms from other types of sharing platforms in transport.

Standing et al. (2019) categorise sharing in transport into four: ridesharing, carpooling, carsharing and freightsharing. 'Ridesharing' is a "sharing of the driver's private vehicle with a passenger in a more open taxi-like system" (p. 2). This includes cabsharing, a sharing of taxi fee among passengers. Examples of ridesharing platforms are Uber, Lyft and UberPOOL. 'Carpooling', the focus of the dissertation, is "a sharing approach that is typically a not for hire arrangement but rather an agreement between people to share a journey" (p. 3). Carpooling services have two sub-categories: exchanging a service (passengers pay a fee) and donating (offering seats for free). 'Carsharing' is a "sharing of the vehicle on a for hire basis" that can be done via companies or by individuals (p. 3). Carsharing is thus a form of renting and lending a vehicle to others. 'Freightsharing' is business-to-business (B2B) sharing of transport and is beyond the scope of the dissertation.

From the perspective of shared mobility business models, Teubner and Flath (2015) distinguish sharing in transport into eight categories, based on two dimensions: asset provision and customer role (Figure 2.1). The asset provision has two sub-dimensions: (1) cars are owned by an organisation or (2) owned by individuals. The customer role also has two sub-dimensions: (1) customers rent a car as a driver role (active) and (2) customers ride a car or use a service as a passenger role (passive). It must be noted that Teubner and Flath's (2015) classification consider only the customer role rather the provider role i.e. individuals who provides cars in a taxi-like system and a carsharing platform as well as those who offer seats for carpooling.

Figure 2.1: Car-based shared mobility systems
Source: Teubner and Flath (2015, p. 313)

The ‘active’ group has three types of car-rental systems. Hertz and Avis are car-rental companies that provide a fleet of cars to customers who wish to use them. The companies operate within office hours and require customers to meet at an office to get the keys and use the cars. Zipcar and Car2Go are similar to the car-rental companies, except that the platforms allow customers to pick-up and drop-off a car anywhere within cities. Once customers complete a transaction via an app, they can get in a car that has the car key already inside. Getaround and RelayRides are car rental services where cars are provided by individuals. The platforms put together car owners who want to rent their cars and customers who need the use a car.

The ‘passive’ group has four types. A chauffeurs-like system includes taxi and other taxi-like services such as Uber and Lyft, where passengers have to pay for the use of services. The other two types are hop-on/off system. If the vehicles are owned by an organisation, it is shuttle services. If the vehicles are owned by individuals, it is carpooling via platforms. Examples are such as carpooling.com, Zimride and BlaBlaCar.

The following section introduces an evolution of carpooling. A short history of carpooling is narrated to give us a holistic view of carpooling from the origin to the present. Typologies of pooled services are described to let us know other forms of carpooling as well as help us distinguish carpooling from other pool services. Such typologies are presented to in order for narrowing down the unit of analysis and used to define the definition of carpooling for the dissertation.

2.2.4 Carpooling

Before an emergence of carpooling platforms, one may have heard i.e. 'hitchhiking' and 'casual carpooling'. Figure 2.2 illustrates an evolution of carpooling. Hitchhiking is the way passengers put their thumb out as vehicles pass by. In America, it has been a means of transport since 1910 (O'Brien & Dunning, 2014). In 1958, carpooling or so-called as 'organised hitchhiking' first appeared in France with an aim to provide a means of transport for young people who did not have personal vehicles (Shaheen et al., 2017). In America, during 1940s to 1980s, there was casual carpool (formed among strangers) and co-worker carpool (formed around employees, colleagues or friends), which was organised through bulletin boards (Chan & Shaheen, 2012). During that moment, people joined carpools as they wanted to access to vehicles and reduce travelling costs and times. Present day, casual carpooling can be seen, for example, in San Francisco, Washington D.C. and Houston areas, where drivers and passengers join together at certain spots in order to avoid traffic and access to high occupancy vehicle lanes (O'Brien & Dunning, 2014; Shaheen, Chan & Gaynor, 2016).

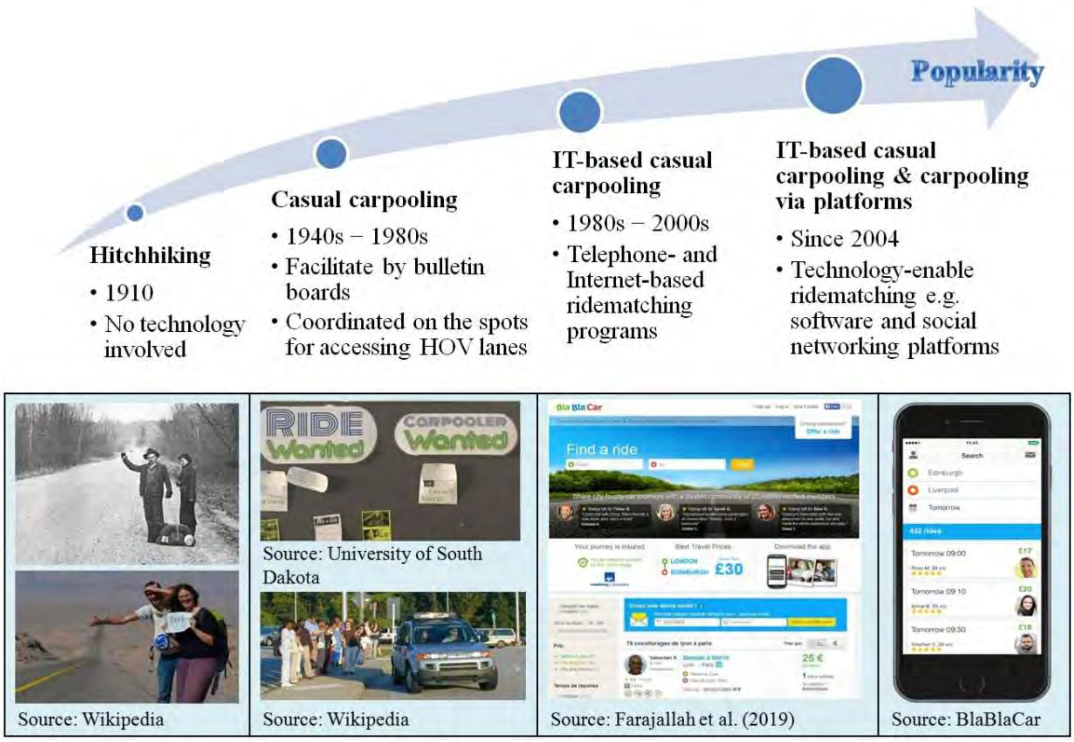


Figure 2.2: An evolution of carpooling

The first evolution of carpooling due to the advancement of technology was around 1980s up until 2000s (Chan & Shaheen, 2012). Telephone- and Internet-based ridematching programs have been introduced to travellers. Since 2004, the technology-enable ridematching has been integrated with mobile phones and online communities (Chan & Shaheen, 2012). Real-time ridematching enables travellers to request rides and offer seats in less than minute. A new business model has emerged. Companies become mediators who act as mediators between drivers and passengers (Perren & Kozinets, 2018). Y. Wang, Gu, Wang and Wang (2019) characterise such carpooling as an emerging online to offline (O2O) service facilitated by mobile internet and Global Positioning System (GPS) technology. This means that a carpooling matching occurs in an online platform, but a real carpooling occurs in an offline world.

The development of Internet-based technology has transformed the traditional hitchhiking into a more modern hitchhiking or “digitalized hitchhiking” (Guyader, 2018, p. 701). It is stated that hitchhiking is a foundation for carpooling and other forms of ridesharing (O'Brien & Dunning, 2014). A different period of time and the ongoing development of facilitating technology make carpooling evolve and impact traveller behaviour (Dong, Wang & Zhang, 2018). As technology advancing, carpooling used to be popular within particular groups becomes popular in larger communities (Standing et al., 2019). BlaBlaCar has become popular for a long distance carpooling service in 22 countries such as France, Germany, India, Mexico, Russia and the United Kingdom (blog.blablacar.com/about-us).

This section provides typologies of pooled services for us to make a clear cut between carpooling and other pool services. Shaheen and Cohen (2019) provide three categories of pooled services based on the technological facilitators and fee charged for a service (Figure 2.3). The first category is 'On-Demand Ride Services', which offers ridematching services with fees to travellers. It includes (1) microtransit which is operated under a private sector that offers transit to a group of travellers e.g. HopSkipDrive (2) ridesourcing and ridesplitting that facilitates matching between drivers and passengers e.g. Uber, Lyft, UberPOOL and Lyft Shared Rides and (3) taxi sharing which is a ridesplitting-like system operated under taxi scheme e.g. e-Hail service. The second category is 'Ridesharing' which consists of vanpooling and carpooling. Sub-categories of carpooling are mentioned shortly. The third category is 'Core Pooled Services' which encompasses non-app pooled service such as jitneys, public transit and shuttle services.

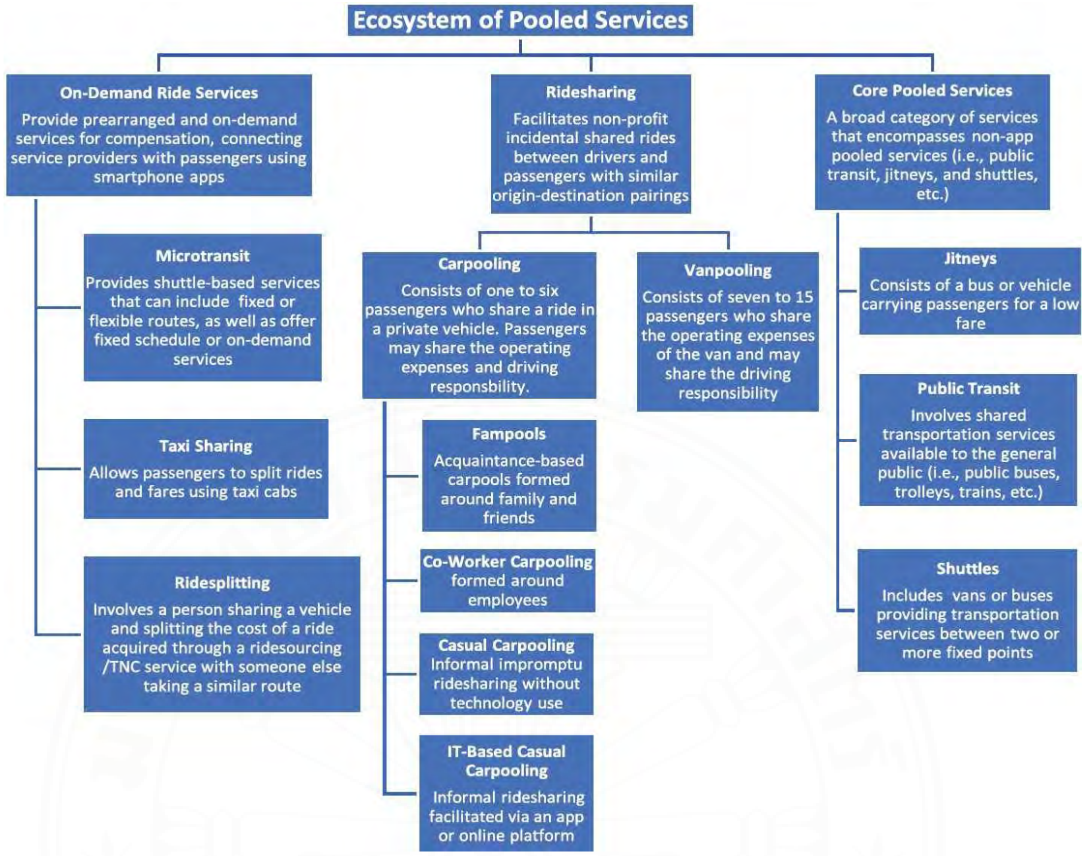


Figure 2.3: Types of ridesharing

Source: Shaheen and Cohen (2019, p. 3)

2.2.5 Typologies of carpooling

In carpooling literature, Teal (1987) first classifies carpooling participants as non-household and household carpool. Such classification is used in recent studies (Neoh et al., 2017; Shin, 2017). However, one can observe that it is too broad, as non-household participants can be co-workers, friends or strangers.

Based on the relationships between participants, Chan and Shaheen (2012) later suggest three types: organisational-based (formed around the members of carpool scheme or organisation), acquaintance-based (formed among family members or friends), and ad hoc or casual (formed around participants who have little relationship to each other). Yet, this demarcation might be problematic due to two points. It is not clear what the term ‘little relationship between participants’ means. Another is that the definition of acquaintance varies dependent on the level of interaction and intimacy among people (Lin & Dumin, 1986). The relationship between carpooling participants becomes dynamic as time goes on. Studies found that, at the beginning, carpoolers did not know each other and saw others as strangers; as time passed, they quickly became mutual friends (O'Brien & Dunning, 2014; Setiffi & Lazzer, 2018).

Recently, Shaheen and Cohen (2019) propose four types of carpooling relationships, as seen in Figure 2.3: fampools (formed around family members), co-worker carpooling (formed around employees), casual carpooling (informal impromptu carpooling without technology use) and IT-based casual carpooling (informal carpooling via online platforms). This dissertation focuses on the IT-based casual carpooling i.e. carpooling formation begins via an online carpooling platform. Next, definitions of carpooling stated in the literature are presented. The definition of carpooling for the dissertation is stated shortly.

2.2.6 Definitions of carpooling

Although study of carpooling has begun since 1970s (Ferguson, 1997), there is no agreed definition (Amirkiaee & Evangelopoulos, 2018; Arbour-Nicitopoulos et al., 2012; Bachmann et al., 2018; Neoh et al., 2017). The dissertation summarises definitions of carpooling based on two sources. A systematic review, which will be presented in Section 2.4, provides a number of articles mentioning carpooling definitions. To cover other articles beyond the result of systematic review, an extensive literature review via Google Scholar undertaken in May 2019 employs a search for publications containing a set of consecutive keywords: "carpool" and "carpooling" as well as "define" and "refer". After excluding fampools and vanpooling, an initial result indicated 40 articles. Only 10 articles were selected as they were published in recommended databases (Neoh et al., 2017): Scopus, Web of Science and Transport Research Board. Appendix A contains a definition stated in each article. If an article borrows a definition from other articles, it was not included in the table.

Carpooling, as an umbrella term, refers to a means of transport that two or more people are travelling together in the same car (Brownstone & Golob, 1992; Bruck, Incerti, Iori & Vignoli, 2017; Teal, 1987; Train, 1980). A trip purpose can be, for example, commuting, travelling between homes and educational places, and any regular trip or a longer one-off trip (Ivan, 2010; Javid, Mehmood, Asif, Vaince & Raza, 2017; Standing et al., 2019; Teal, 1987). A number researchers noted that a vehicle must be a private motor vehicle (Ferguson, 1995; Gheorghiu & Delhomme, 2018; Neoh et al., 2018; Teal, 1987). Furthermore, carpooling must not be a “hire arrangement but rather an agreement between people to share a journey” (Standing et al., 2019, p. 3). Drivers must not aim at profit-making (Guyader & Piscicelli, 2019) whereas passengers may or may not share the trip expenses (Standing et al., 2019).

Casual carpooling refers to “the sharing of a ride with a driver and one or more passengers, where the ridesharing between the individuals is not established in advance but coordinated on the spot.” (Kelly, 2007, p. 119). In this case, drivers pick up passengers waiting at a pre-set meeting point such as pick-up spots (Cohen & Kietzmann, 2014; Rahman & Al-Ahmadi, 2010). Regards IT-based casual carpooling, the only difference is that such carpooling is formed by a facilitating technology (Guyader & Piscicelli, 2019; Shaheen & Cohen, 2019).

IT-based casual carpooling or carpooling via online platforms used in the dissertation is defined according to Guyader and Piscicelli (2019) and Shaheen and Cohen (2019). It refers to *“a means of transport which the driver who does not aim at profit-making can share a common route and time in their private vehicle with passengers, who may or may not share expenses with them, via a platform”*. The term *“does not aim at profit-making”* points out that carpool formation must not be for hire arrangement and the drivers offer seats without a profit motive. Drivers may charge some expense to passengers but the charge must not exceed their trip cost. The term *“share a common route and time in their private vehicles with passengers”* clearly specifies that both have to travel together from one point to another point in the driver’s private vehicle i.e. not a shuttle bus or vanpooling. Lastly, the term *“via a platform”* stipulates that “the coordination between drivers and passengers is facilitated by [carpooling] platforms in exchange for a service fee and/or a commission or for free when operated by [non-profit organisations]” (Guyader & Piscicelli, p. 1061).

2.2.7 Relationships between carpooling participants

It is critical to discuss a bit about relationships between carpooling participants because the term ‘stranger’ is mentioned in a research question of the dissertation. The term seems to appear often in a study observing casual carpooling via high occupancy vehicle lanes (Buliung, Soltys, Bui, Habel & Lanyon, 2010; Mote & Whitestone, 2011). Studies investigating online carpooling platforms such as BlaBlaCar also mention ‘stranger’ (Guyader, 2018; Setiffi & Lazzer, 2018). However, no definition is given in any of these studies.

We have seen two classifications defined based on relationships. Chan and Shaheen (2012) describe that ‘ad hoc carpooling’ is similar to ‘casual carpooling’ where participants have little relationships to each other. Shaheen and Cohen (2019) define ‘casual carpooling’ as an informal impromptu carpooling without technology use whereas ‘IT-based casual carpooling’ is an informal carpooling via online platforms. Nielsen, Hovmøller, Blyth and Sovacool (2015) specify ‘ad hoc’ or ‘casual carpooling’ as carpooling where participants “do not know each other” (p. 114). There may be a reason why the literature differently defines ‘ad hoc carpooling’ or ‘casual carpooling’. From a psychological perspective, perceiving others as strangers is socially constructed and varies across people. From Lofland’s (1989) point of view, people can perceive others as strangers if they know the others only in terms of non-personal or occupational identity. In some case, people perceive others as strangers even they are living within the same house (Humphreys, 2005).

In the online carpooling context, carpooling participants are allowed to know each other before carpooling is formed. They can see each other’s picture, profile and detail of a trip. Therefore, trust is created and reduces the participants’ feeling of perceiving others as strangers (Guyader, 2018). However, the level of perceive others as strangers is vary not only due to the time participants spent together but also personal factors. For example, an individual’s purpose of carpooling may affect their perception of others as strangers. It is found the drivers who expected monetary gains from offering seats and the riders who expected to receive a taxi-like service perceived carpooling partners are strangers (Guyader, 2018). In contrast, an individual’s sense of community may reduce perception of others as strangers. Evidence shows that people of ethnic neighbourhoods were more likely to carpool and perceived others as neighbours rather strangers (Blumenberg & Smart, 2014; Haerewa, Stephenson & Hopkins, 2018; Shin, 2017).

One can see that defining the term ‘stranger’ from a psychological perspective is challenging, as the term is socially constructed. Unless, defining stranger as people who do not know each other may be unrealistic because carpooling participants, although do not physically meet each other, know each other from the information provided by platforms. In this study, such term is defined based on a physical aspect. The definition of stranger for the dissertation is defined as follows: (1) carpooling participants have not physically met each other before carpooling (2) they have no relationship to each other before using a platform and (3) they do not know each unless knowing others from the information provided by the platform.

2.2.8 Summary of this section

This section provides the scope of study from a broader view i.e. the sharing economy and collaborative consumption practices to a narrow view i.e. carpooling via online platform and the relationships between carpooling participants formed by online platforms (Figure 2.4). The focus of the dissertation is in the dashed area. The figure also highlights that carpooling via platform differs from carpooling without the use of platform. The participants of carpooling without the use of platform do not have a chance to communicate to each other prior to carpooling but this can be done in the context of carpooling via platform. Thus, the role of platform exists in the latter case and we may expect some influences of the platform’s characteristics on its users. This means that, in this dissertation, we may observe the usefulness of the app in terms of, for example, providing users a communication channel. The literature also found that such factor plays a role when people decide to use such technological platform (Wang et al., 2018).

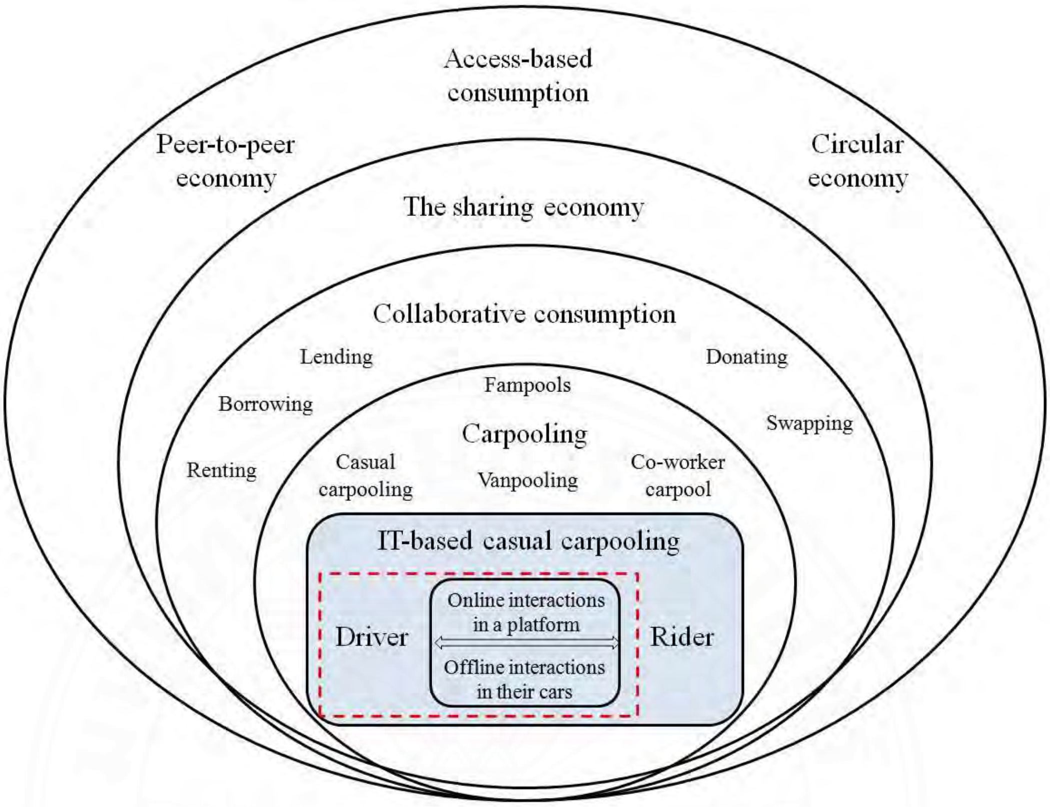


Figure 2.4: The scope of the dissertation

The definition of carpooling for the dissertation via online platforms is defined as *"a means of transport which the driver who does not aim at profit-making can share a common route and time in their private vehicle with passengers, who may or may not share expenses with them, via a platform"*. The dissertation focuses on the drivers who use the platform to offer seats to and driver for strangers. Such strangers are people who the drivers (1) have not physically met them before carpooling (2) have no relationship with them before using the platform and (3) do not know them beyond the information provided by the platform. The next section presents a review of research approaches in the transport and carpooling literature.

2.3 Behavioural science in transport research

The previous section set out the scope and the unit of analysis for the dissertation. This section portrays research approaches in transport and carpooling literature. Many research approaches are presented ranging from nature science (hard science) to social science (soft science). The random utility theory has long been the dominant theory used by transport researchers. Examples of research using utility-based theory are given. Apart from the utility-based model, the behavioural models and research approaches originated from the disciplines such as sociology and psychology are presented. Examples of study are given in order to highlight the importance of such model and methods.

2.3.1 Approaches for modelling traveller behaviour

Transport affects to and is affected by human (McFadden, 2007). Human are (1) consumers i.e. drivers, riders, vehicle buyers and shippers (2) business i.e. managers and employees and (3) policy-makers who determine policy and transport infrastructure. One aim of transport research in this field is to understand and predict consumer behaviour as well as to develop a model that can explain consumer behaviour. McFadden (2007) concludes that there are three approaches for modelling consumer behaviour: (1) physical analogy (2) utility theory and (3) behavioural models originated from other behavioural-related disciplines. Each approach is presented hereunder with examples of study.

The physical analogy is the way transport researchers borrow the theories of nature science, especially from the physical science, to understand and predict consumer behaviour. This approach is appropriate for a research question aiming to predict behaviour at a macro perspective (McFadden, 2007). An example of this approach is Jung, Wang and Stanley (2008) who employ the gravity model to explain a traffic flow on highway in relation with city populations and distances. However, the theory cannot provide insights into consumer behaviour (Hanson & Schwab, 1986). An activity-based approach was later introduced during 1970s as a less disaggregated-level theory (Van Acker, Van Wee & Witlox, 2010). An example is Hägerstrand (1970) who introduces the concept of space-time paths and space-time prism. Yet, time geography cannot be used to explain behaviour when consumers facing alternative travel mode choices (Schwanen & Lucas, 2011).

Transport researchers who desire to understand and predict consumer behaviour adopt the economic theory of rational behaviour, which assumes that an individual will choose a choice that maximise their preference (McFadden, 1986). The economic theory may be best appropriate for a study that deals with fuel efficiency and price models (McFadden, 2007). A challenge remains because transport mode choices are usually discrete i.e. sets of alternatives such as destinations, modes, routes and automobiles whereas the economic theory has continuous sets of alternatives (Horowitz, 1985). The random utility theory was, thus, proposed by Domencich and McFadden (1976).

The random utility theory assumes that an individual's preference among alternative choices can be explained by a utility function; thereby, the individual chooses a choice that maximises their preference (Train, 2009). Given a set of observed variables, a random utility model predicts the probability of many choices and let us know which choice is preferred than others (Horowitz, 1985). A choice is represented by the sum of deterministic and random components of a set of variables (Horowitz, 1985). These variables can be demographics, trip characteristics and attributes of choice e.g. time, costs, reliability, flexibility and convenience (McFadden, 1986; De Vos, Mokhtarian, Schwanen, Van Acker & Witlox, 2015; Schwanen & Lucas, 2011). From the perspective of Ben-Akiva and Lerman (1985), variables can be classified into three: (1) the characteristic of the choices e.g. cost, time, reliability, flexibility and convenience (2) the characteristic of individual e.g. sex, income, education and household structure and (3) the characteristic of the situation e.g. types of trip and weather conditions. The random utility theory is useful and has long been the dominant theory used by transport researchers, especially in the engineering and economic fields (De Vost et al., 2015).

In the carpooling context, researchers employ this theory to predict carpooling behaviour. For example, Ben-Akiva and Atherton (1977) predict household carpooling preference by using a multinomial logit model with a set of variables, namely, socio-economic characteristics, travel times and costs and situational characteristics such as employment status and location-related characteristics. Another example is Correia and Viegas (2011) who predict non-household carpooling stated preference by employing a binary logit model with a set of factors including trip characteristics, travel time including time driving to pick-up riders, travel costs, socio-demographic characteristics and workplace parking characteristics. A recent study investigates carpooling versus carsharing for commuting by using a logit model with socio-demographic, socio-economic and contextual characteristics as well as other factors including the availability of a carpooling service at work, the perception of the entourage (having family members, friends or colleagues who carpool) (Bulteau, Feuillet & Dantan, 2019).

A number of researchers in transport science (Anable, 2005; Van Acker et al., 2010; Schwanen & Lucas, 2011), including carpool research (Correia et al., 2013; Nielsen et al., 2015; Neoh et al. 2017; Bachmann et al., 2018), argue that transport research relies much on instrumental factors and discards other characteristics of individuals such as habits as well as emotional and symbolic factors. Van Acker et al. (2010) further argue that solely including instrumental factors in a model assumes that an individual’s preference to mode choices is rational. In fact, evidence shows that individuals sometimes choose a choice based on their habits and do not consciously the trade-off between choices (Verplanken, Aarts, van Knippenberg & van Knippenberg, 1994).

It is evident that subjective or psychological factors drawn on findings of other disciplines e.g. sociology and psychology can increase the explanatory and predictive powers of travel mode choices (Van Aker et al., 2010; De Vos et al., 2015). For example, it is found that individuals chose not to drive a car merely to show that they were pro-environmental travellers (Anable, 2005). Another study indicates that individuals chose to drive cars, as they perceived that cars could increase their symbolic status and give them positive feelings (Steg, 2005). Transport researchers have attempted to include subjective variables into a utility model. Koppelman and Lyon (1981) add attitudinal factors in their model and found a direct effect of attitudes towards travel mode choices on traveller behaviour. Schwanen and Mokhtarian (2005) predict travel mode choices using a multinomial logit model with psychological factors, namely, the status seeking, attitude towards travel freedom and pro-environmental concern. Johansson, Heldt and Johansson (2006) analyse travel mode choices using a hybrid choice model with socio-economic factors, trip cost, travel time and personality traits such as preferences for safety and environmental behaviour. Ettema, Gärling, Olsson and Friman (2010) include emotional factors into an experience utility model i.e. the utility model with an assumption that people seek to maximise their happiness.

In the carpooling context, several researchers use a utility-based model with subjective variables. For example, DeLoach and Tiemann (2012) use a multinomial logit model to predict the preference for carpooling against public transport and driving alone. They indicate that perceived socialisation (the value of time spending with friends) was higher for carpoolers than those who used public transport and single drivers. Shaheen et al. (2016) investigate casual carpooling in the San Francisco Bay area by using a multinomial logit model to explain traveller behaviour. The factors included in the model are demographic characteristics and psychological factors such as perceived convenience, perceived time- and cost-savings, pro-environmental concern and socialisation. Park et al. (2018) employ a binary probit model to investigate factors affecting carpooling decision of commuters travelling to a campus. Such factors are instrumental factors and attitudinal factors such as flexibility, perceived time- and cost-savings and pro-environmental concern.

Furthermore, there are applications of utility-based model regards stated preference. For example, Akar, Flynn and Namgung (2012) predict travel mode choices among students and staff of a university by analysing a multinomial logit model with the data derived from a stated preference survey that consists of demographics and attitudinal factors such as perceived safety, attitude towards the weather conditions, perceived convenience, perceived time- and cost-savings and pro-environmental concern. Tahmasseby et al. (2016) use both revealed and stated preference surveys as the input data to predict the usage of a university peer-to-peer carpooling program. A binomial logit model and ordinal logit model are used to analyse with the users' demographic characteristics, trip characteristics and psychological factors such as pro-environmental and sustainability concern.

2.3.2 Behavioural modelling approaches

The use of behavioural models that are not exactly based on rationality is increasingly popular among transport researchers (McFadden, 2007; Van Aker et al., 2010). Such models are proposed from the disciplines such as sociology, anthropology, psychology and neuroscience and are appropriate for a study investigating driving behaviour (McFadden, 2007). It is also recommended that transport researchers who are interested in traveller behaviour should borrow the knowledge originated from psychology and sociology disciplines (Schwanen & Lucas, 2011; Van Aker et al., 2010). The descriptive data obtained from the research methods of anthropology and sociology can also be used to generate ideas for measurements and hypotheses (Jorgensen, 2015).

Social psychology, a field under the psychology discipline, provides a number of theories for transport researchers. The Theory of Reasoned Action (TRA: Fishbein & Ajzen, 1975), the Theory of Planned Behaviour (TPB: Ajzen, 1991) and the Norm-Activation Model (NAM: Schwartz, 1977) are often used in transport research that aim to explain the decision making process of traveller (Van Acker et al., 2010).

TRA suggests that behaviour is the result of intention to perform the behaviour which is determined by attitude towards the behaviour and subjective norms (Fishbein & Ajzen, 2011). TPB extends TRA by including perceived behavioural control i.e. an individual's perceived ability to perform a particular behaviour (Fishbein & Ajzen, 2011). Figure 2.5 illustrates TRA and TPB. In this dissertation, TPB is used when defining the term 'psychological factor' which will be presented in Section 2.4. Apart from TPB, NAM focuses on pro-social or altruistic behaviour and assumes that an individual performs behaviour in order for the benefit of others rather oneself (Schwartz, 1977). In the dissertation, NAM is not used and will not be discussed further.

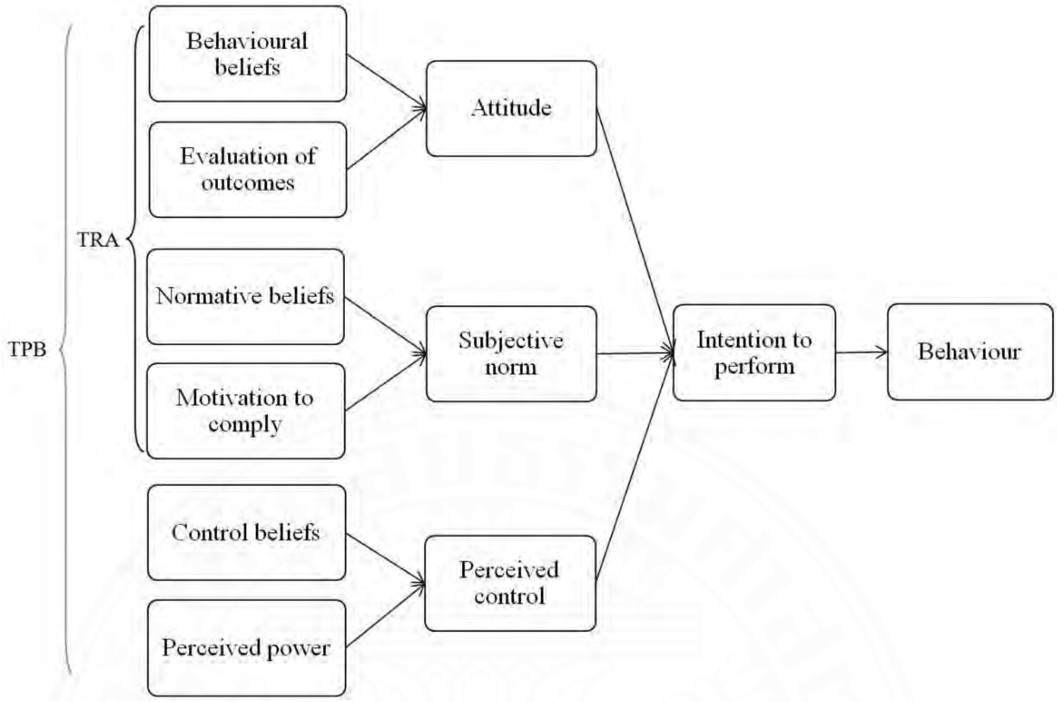


Figure 2.5: Theory of Reasoned Action and Theory of Planned Behaviour
Source: Adapted from Fishbein and Ajzen (2011)

Applications of such theories in transport research are, for example, Wall, Devine-Wright and Mill (2007) who employ TPB and NAM to investigate an individual's intention to use a car. In the carpooling context, Bachmann et al. (2018) use TPB to model the drivers' and passengers' carpooling decisions. Amirkiaee and Evangelopoulos (2018) employ TPB to predict the student's intention to carpool by using psychological factors e.g. socialisation, sustainability concern, perceived cost- and time-savings and trust.

Not only behavioural models, findings emerged from research methods and techniques originated in the disciplines such as sociology and anthropology can also contribute to knowledge in transport field (Schwanen & Lucas, 2011). Such methods are ethnographic interview, phenomenological interview, focus group and some others presented shortly. Unlike the utility-based model and other behavioural models, the objective of the use of such methods is to increase our understanding of traveller behaviour rather for explanation and prediction purpose (Schwanen & Lucas, 2011).

In transport research, several researchers adopt the approach borrowed from the sociology and anthropology disciplines. For example, Sam, Brijs, Daniels, Brijs and Wets (2018) use focus group with phenomenological interview to understand how travellers experienced the risk of public transport. Ross, Mitchell and May (2012) use in-depth interviews to explore individuals' motivations and barriers to develop innovations in transport.

Applications of such methods can be seen in the carpooling literature. For example, Nielsen et al. (2015) employ semi-structured interview and focus group with commuters and discover six segments of carpooling behaviour. Guyader (2018) conducts netnographic and ethnographic studies in order to explore the users of BlaBlaCar. His findings reveal three styles of carpooling practice: (1) communalist who desires to do prosocial behaviour and seeks a sense of belonging (2) consumerist who looks for convenience lifestyle and reputation and (3) opportunistic who seeks to make money from carpooling via the platform.

2.3.3 Summary of this section

Figure 2.6 summarises an evolution of research in the carpooling literature. The scope of dissertation is in the blue dotted line. Theories of nature science are used to reveal carpooling behaviour at an aggregated level. The utility-based model is the dominant theory and very useful when a study aims to understand and predict carpooling behaviour. Through the time, transport researchers have attempted to revise to improve the utility-based model by including other relevant variables. It can be concluded that the trend of carpool research moves towards an identification of subjective variables.

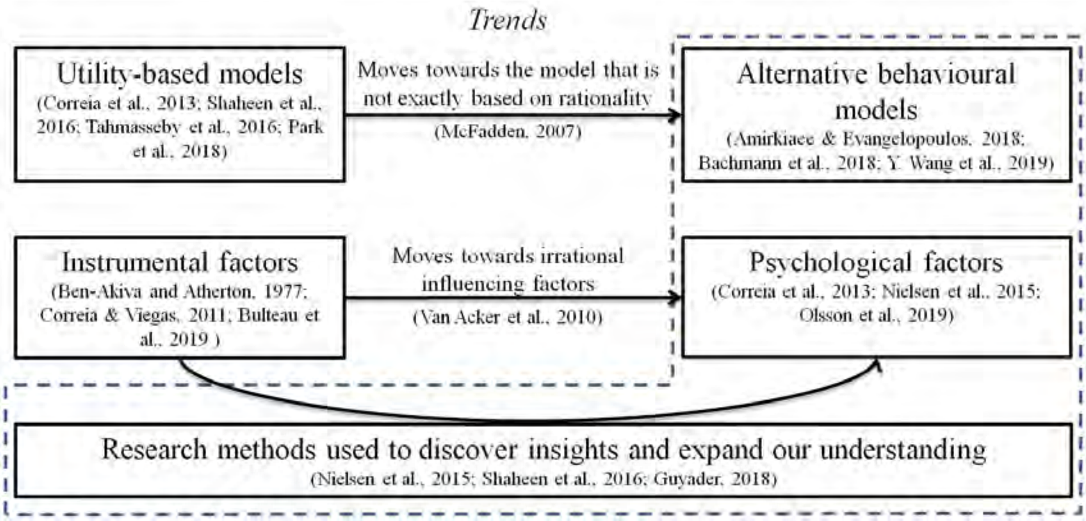


Figure 2.6: An evolution of research in the carpooling literature

The behavioural models, research approaches and research methods originated from the disciplines such as sociology and psychology as well as the insights drawn on the findings of such models and methods have increasingly become the attention of transport and carpool researchers. A number of studies in the transport and carpooling literature are given. The importance and contributions of employing these alternative models and research approaches have been highlighted. The next section presents a systematic review of carpool research.

2.4 Carpooling factors and research

The previous section described research approaches in transport and highlighted the importance of behavioural models and the methods developed by sociology and psychology disciplines. It is observed that the trend of transport and carpool research moves towards an identification of psychological factors encouraging carpooling decisions. In the carpooling literature, Olsson et al. (2019) indicate that psychological factors have recently gained attention in academia.

This section aims to identify psychological factors and theories used in carpooling literature. The first objective is to define the definition of psychological factor, as it is observed that there is inconsistency in defining the term ‘psychological factor' in both transport and carpooling literature. Once the terminology is proposed, a comprehensive literature review undertaken is demonstrated. The results of review derive as a set of social psychological factors. A synthesis of findings suggests research gaps that may be useful for the dissertation.

A historical review of carpooling in Thailand is also provided. The carpooling platform that the focus of the dissertation i.e. LILUNA is introduced. Rationale why the platform and its drivers are interesting is given. The journey of this dissertation is also shared. Finally, research questions are proposed.

2.4.1 Definitions used in transport and carpool research

The term 'psychological factor' and 'judgmental factor' are used interchangeably in the carpooling literature. Hereafter, the dissertation uses the term 'psychological factor' for referring to both. Hereunder, examples of the term used in transport and carpool research are presented.

In the transport literature, Creemers et al. (2015:33) define psychological factors as "the cognitive process involved in the modal choice of a [traveller]". López and Wong (2019) define as an individual's perception, preferences, values and attitudes. Thøgersen and Ebsen (2019) does not provide a definition but provided examples of psychological factors influencing the use of electric cars such as attitudes, beliefs, social and normative influences, perceived ease of use and uncertainty, and experiences. Sukor, Tarigan and Fujii (2017) provide examples of factors influencing motorcycle use such as attitude, moral obligation, feelings and perceptions such as fear and desire.

In the carpooling literature, some researchers propose a definition whereas some others provide examples of psychological factors. In Table 2.1, the observed definitions are categorised into two: (1) the studies that provide explicit definitions including examples of such factors and (2) the studies merely sharing examples of psychological factors. In the former group, it is observed that most definitions refer to psychological reasons while, in the latter group, the studies provides examples of factors such as personality factors, attitude and perceptions.

Table 2.1: Examples of the definition of psychological factors

Definition (authors)	Example of factors (authors)
The determinants of carpooling from a psychological perspective e.g. attitudes and subjective norms (Bachmann et al., 2018)	Attitudes, socialising, privacy, saving costs, reducing congestion and protection of the environment (Olsson et al., 2019)
The psychological reason why individuals choose a particular mode of travel outside of an automobile e.g. privacy and social preferences (Neoh et al., 2018)	Personality factors, attitude and other perceptions e.g. shyness, time saving, cost saving, enjoyment and environmental concern (Tahmasseby et al., 2016)
A commuter's psychological reason to carpool e.g. convenience, comfort, cost-saving and socialisation (Neoh et al., 2017)	Personality traits and attitudinal factors e.g. relaxation, comfort, low travel time and reliable travel time (Devarasetty et al., 2014)
Attitude towards carpooling, which refers to the degree on how much an individual perceives the benefits of carpooling (Delhomme & Gheorghiu 2016; Malodia & Singla, 2016)	
The concept of belief e.g. saving money, reducing congestion and socialisation (Abrahamse & Keall, 2012)	

It is also observed that some sections of the literature consider psychological factor in terms of attitudes towards carpooling, which is defined as the participants' perceptions on how much they perceive the benefits of carpooling (Delhomme & Gheorghiu 2016; Gheorghiu & Delhomme, 2018; Malodia & Singla, 2016). However, other researchers have posited that attitudes are personal favours of carpooling which differ from beliefs/perceptions about benefits obtained from carpooling (Amirkiaee & Evangelopoulos, 2018; Bachmann et al., 2018).

There are two recent reviews on factors encouraging carpooling. Neoh et al. (2017) and Olsson et al. (2019) conducted meta-analyses and grouped factors into external factors (third-party interventions and situational factors) and internal factors (socio-demographics and psychological factors). A list of factors is presented in Table 2.2.

Table 2.2: A list of factors encouraging people to carpool (compiled by the author from Neoh et al., 2017; Olsson et al., 2019)

Type of factor	Factors
Demographic factors	Age, income, number of people in household, marital status, education, number of cars in household
Judgmental (psychological) factors	Saving money, reduce congestion, reliability, saving time, environment/sustainability, comfort, convenience, socialising, trust
Interventions (policy intervention)	Parking availability, parking cost, finding potential partner, reserved parking, cost subsidy, guaranteed ride home, high occupancy vehicle lanes
Situational factors	Fixed/regular work schedule, commute distance, time commuting, population density, fuel costs

The dissertation uses the definition of psychological factors proposed by Van Acker et al. (2010). They develop a conceptual model of travel behaviour by linking theories stemming from transport and social psychology disciplines. Van Acker et al. (2010) define psychological factors, based on the Theory of Planned Behaviour (TPB: Ajzen, 1991), as the three determinants to an individual's intention to choose carpool: attitude, subjective norm and perceived behavioural control. Attitude refers to the degree on how much an individual perceives that carpooling is a good or bad idea. It is determined by an individual's perception/belief about the benefits of carpooling. Subjective norm is an individual's normative beliefs, which refers to perceived social pressure i.e. behaving in a certain manner. Personal norm is included as another type of normative beliefs that can influence one's travel decisions (Bachmann et al., 2018). It refers to one's expectations based on internalised values. Perceived behavioural control means an individual's perceived ability to perform carpooling.

These definitions have been used by several carpooling researchers (Amirkiaee & Evangelopoulos, 2018; Bachmann et al., 2018; Tischer & Dobson, 1979). In this dissertation, psychological factors are defined as an individual's beliefs about carpooling: (1) their perceptions/beliefs about the benefits of carpooling and (2) their normative beliefs. Perceived behavioural control is not the focus of the dissertation, as it is related to the people's capabilities to perform behaviour (Ajzen, 1991). These definitions will be used in a systematic literature review presented in the next section.

2.4.2 A systematic literature review of carpool research

A systematic literature review can ensure a comprehensive and transparent summary of the literature (Grant & Booth, 2009; Tranfield, Denyer & Smart, 2003). It provides a series of standard techniques that minimises bias and error, and is appropriate for a study focusing on what is known, what remains unknown and what should be future research questions (Booth, Papaioannou & Sutton, 2012; Tranfield et al., 2003). A systematic literature review undertaken in the dissertation was conducted following the guideline provided by Booth et al. (2012).

For practical purposes, the articles included had to be written in English. Only peer-reviewed articles were included because the dissertation's aim is to compare the results. Grey literature e.g. conferences, book chapters, dissertations may not meet accepted academic peer-reviewed standards and their methodologies may be poorly reported (Egger, Juni, Bartlett, Holenstein & Sterne, 2003; Sterne, Egger & Moher, 2008). A substantial difference in quality between peer-reviewed articles and grey literature may make their results difficult to compare (Egger et al., 2003). The definitions of psychological factors proposed in the previous section as well as the factors appear in Table 2.2 helped guide the author when exploring the carpooling literature. If articles did not study carpooling and did not study psychological factors for carpooling, they were excluded. Studies that did not present any empirical results were not taken into account. All included studies could employ qualitative and/or quantitative data collection approach. Further, it is suggested that articles can be assessed by relying on the quality rating of a particular journal (Tranfield et al., 2003). Only articles published in a journal that is listed in the Web of Science or SCImago Journal Rank were included.

In Figure 2.7, the flow of studies throughout the review process is shown. A comprehensive literature search was conducted using four databases: namely, Web of Science, Scopus, Transportation Research International Documentation (TRID) and ProQuest. The Institute for Scientific Information's (ISI) or Web of Science is the oldest and well-known database for academia. Scopus is comprehensive and multidisciplinary database in nature more than the ISI (Meho &Yang, 2007). Transportation Research International Documentation (TRID) is a large online database of transport research information provided by Transport Research Board (TRB). It provides access to more than 1.25 million records of transport research worldwide (TRID, 2020). ProQuest was also included as it is a large database host (Meho & Yang, 2007).

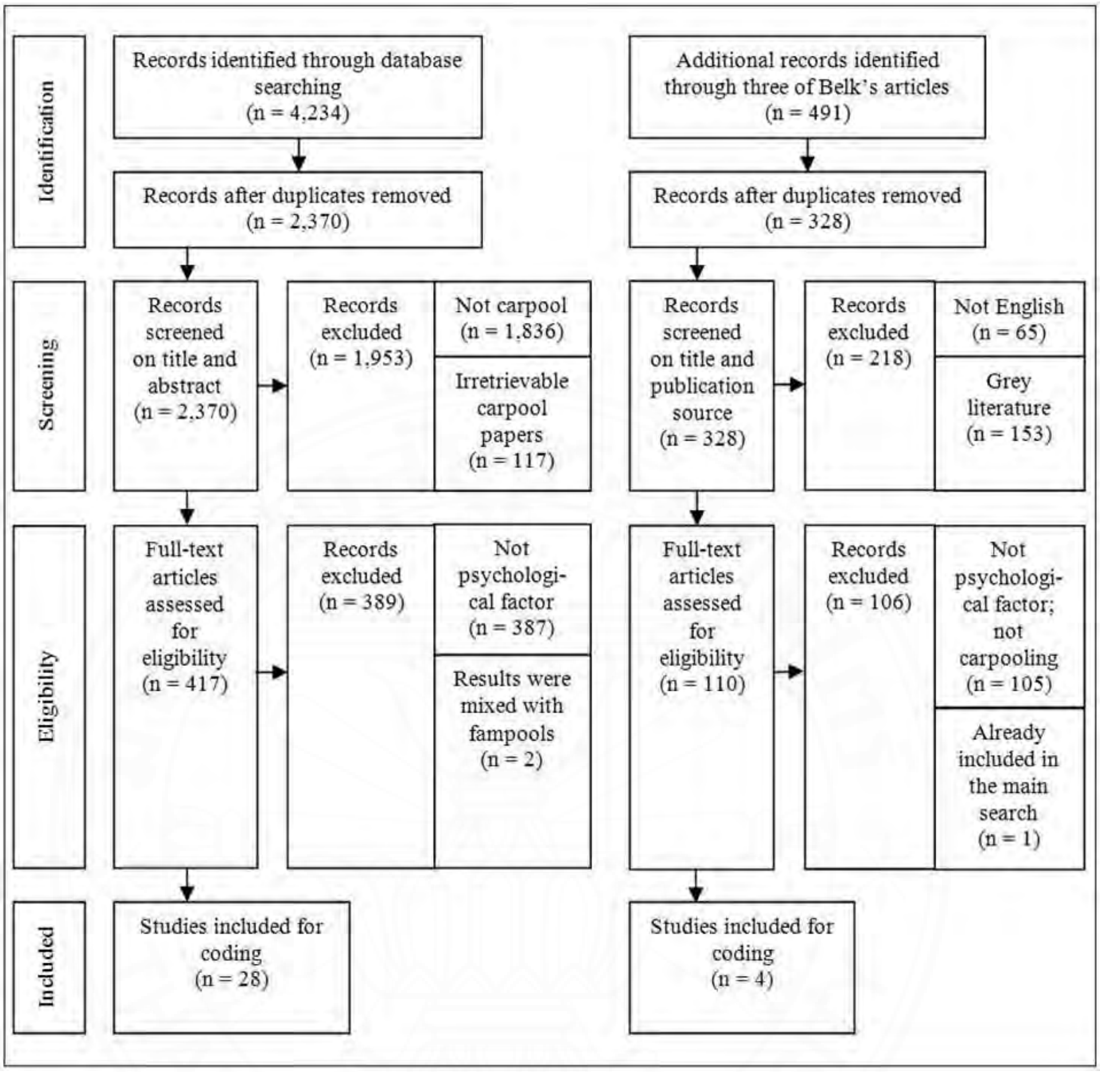


Figure 2.7: Publication identification, screening, eligibility and inclusion

A filter for year of publication was used to include articles up to and including 2019. Other filters used were as follows: (1) topics (titles, abstracts and keywords) (2) English and (3) journal articles. Keywords suggested by Neoh et al. (2017) and Tahmasseby et al. (2016) were used: ‘carpool*’, ‘rideshar*’, ‘liftshar*’ and ‘carshar*’.

Carpooling means sharing one’s private car (Dickinson et al., 2018). Searching keywords such as ‘share’ and ‘sharing’ in the four databases indicated around a million records (ISI = 400,528; TRID = 15,000, Scopus = 406,948 and ProQuest = 89,552). It is observed that Belk’s articles are cited in some carpooling studies (Amirkiaee & Evangelopoulos, 2018; Dickinson et al., 2018; Standing et al., 2019). An extensive literature search based on Belk's articles was conducted via Google scholar. Three of Belk's seminal papers (Belk, 2007, 2010 & 2014a), contributing about 87 percent of the total citations, were searched using the keyword 'carpool*' via Google scholar's function viz. 'Search within citing articles'.

The systematic search via the four databases identified 4,234 records, which were reduced to 2,370 records after removal of duplicates. Screening of the articles' titles, keywords and abstracts excluded 1,953 records that did not study carpooling and were irretrievable. Full-text screening of 417 articles, based on the pre-defined inclusion criteria, was completed by the author. The majority of excluded articles studied the technology behind carpooling such as algorithm and optimisation, infrastructures such as toll lanes and high occupancy vehicle lanes, traffic management and environmental effects. There were 28 articles included for coding from this method.

The search via Google scholar identified 491 records, which were reduced to 328 records after duplicates were removed. An initial screening excluded 218 non-English-language and non peer-review articles. Full-text screening of 110 articles was completed by the author. Excluded articles studied other contexts such as carsharing e.g. Zipcar, taxi-like systems e.g. Uber and rental services e.g. Airbnb. Guyader (2018)'s paper was already included in the previous search. There were four articles from the Google search included for coding.

Data was extracted independently by two coders using the following coding schemes: authors, year, publication, research objectives, theories, research methods, countries, samples, participants' role preferences, hypotheses, and results. The first code was the author whereas the second was a Ph.D. candidate carrying out a dissertation involves logistics and transport. Cohen's kappa statistic (Neuendorf, 2017) was used to assess the degree of agreement (inter-rater reliability) between the two coders; the score of 0.97 indicated good inter-rater reliability. Disagreements were resolved by consensus or in consultation with the dissertation advisor. Table 2.3 provides a summary of the 32 total studies analysed through narrative synthesis.

Table 2.3: Summary of included studies

No	Authors	Country	Data collection	IT-based carpooling	Role preferences
1	Horowitz & Sheth (1977)	USA	Interview and survey	No	n/a
2	Margolin et al. (1978)	USA	Interview and survey	No	n/a
3	Tischer & Dobson (1979)	USA	Survey	No	n/a
4	Levin (1982)	USA	Experiment	No	n/a
5	Young (1995)	USA	Survey	No	n/a
6	Li et al. (2007)	USA	Survey	No	n/a
7	Buliung et al. (2010)	Canada	Survey	Carpool Zone	n/a
8	Canning et al. (2010)	UK	Survey	No	n/a
9	Correia & Viegas (2011)	Portugal	Survey	No	n/a
10	Mote & Whitestone (2011)	USA	Interview	Slug-line.com	Driver and passenger
11	Abrahamse & Keall (2012)	New Zealand	Survey	Let's Carpool	n/a
12	Akar et al. (2012)	USA	Survey	No	n/a
13	Arbour-Nicitopoulos et al. (2012)	Canada	Survey	No	Driver

Table 2.3: Summary of included studies (continue)

No	Authors	Country	Data collection	IT-based carpooling	Role preferences
14	Correia et al. (2013)	Portugal	Survey	No	n/a
15	Devarasetty et al. (2014)	USA	Focus group and survey	No	Driver
16	O'Brien & Dunning (2014)	USA	Interview	No	Driver and passenger
17	Nielsen et al. (2015)	Denmark	Interview and focus group	No	n/a
18*	Bálint & Trócsányi (2016)	Hungary	Survey	Oszkár	n/a
19	Delhomme & Gheorghiu (2016)	France	Survey	No	n/a
20	Malodia & Singla (2016)	India	Survey	No	n/a
21	Shaheen et al. (2016)	USA	Interview and survey	No	Passenger
22	Tahmasseby et al. (2016)	Canada	Survey	Face-Porter	Driver and passenger
23*	Arteaga-Sánchez et al. (2018)	Spain	Survey	BlaBlaCar	n/a
24	Bachmann et al. (2018)	Switzerland	Survey	An online platform	Driver and passenger

* Article identified via the Google scholar search

Table 2.3: Summary of included studies (continue)

No	Authors	Country	Data collection	IT-based carpooling	Role preferences
25	Dickinson et al. (2018)	UK	Interview and survey	A mobile app	n/a
26	Gheorghiu & Delhomme (2018)	France	Survey	covoiturage.fr; 123envoiture.com	n/a
27*	Guyader (2018)	Germany, Belgium, France, Sweden	Netnography, participant observation, interview	BlaBlaCar	Passenger
28*	Haerewa et al. (2018)	New Zealand	Interview and auto-ethnography	No	Driver and passenger
29	Park et al. (2018)	USA	Survey	No	Driver and passenger
30*	Barbosa & Fonseca (2019)	Portugal	Interview	No	n/a
31	Y. Wang et al. (2019)	China	Survey	DiDi Hitch	Passenger
32	Z. Wang et al. (2019)	China	Survey	DiDi Hitch	Passenger

* Article identified via the Google scholar search

As the results of search are multidisciplinary in nature, narrative synthesis was adapted because it is appropriate for use with results from different types of empirical research (Booth et al., 2012). The result of final coding was presented to the advisor using tabulation. To create an overview in the many psychological factors and make them comparable, the factors were grouped based on the definitions provided by each study. Synthesis was driven according to the guideline questions as provided by Greenhalgh et al. (2005). Four questions were addressed: (1) what are the theories that researchers used to conceptualise psychological factors (2) what are the commonalities of the research findings, conflicting results and possible explanations (3) what are the overall key findings and implications for practice and policy and (4) what are the main gaps and directions for further research. Triangulation was used in order to derive answers to the synthesis questions. The findings from this synthesis are presented next.

2.4.3 Findings of the systematic literature review

Table 2.4 summaries the peer-review journals publishing the selected articles. It is observed that most of studies are in transport-related journals.

Table 2.4: A list of peer-review journals

Discipline	Journal	Articles
Transport	Journal of the Transportation Research Board	6
	Transportation Research Part A: Policy and Practice	6
	Transport Policy	3
	Transportation Planning and Technology	3
	Transportation Research Part D: Transport and Environment	3
	Transportation Research Part F: Traffic Psychology and Behaviour	2
	Transportation	2
	Transportation Research Part C: Emerging Technologies	1
	Journal of Advanced Transportation	1
	Hungarian Geographical Bulletin	1
Non-transport	International Journal of Market Research	1
	Journal of Consumer Marketing	1
	Journal of Services Marketing	1
	Kōtuitui: New Zealand Journal of Social Sciences Online	1

As observed in Table 2.3, Horowitz and Sheth (1977)'s paper was the first to investigate psychological factors encouraging carpooling. About 84% of the articles were published in transport-related journals and four-fifths of the articles were published during the 2010s. Twelve articles (37.50%) investigated carpooling motivations under the context of online platforms. About 84.38% of the articles were conducted in North America and Europe. A self-report survey was the main method used by most of the articles (78.13%). Eight articles (25%) employed mixed or multi methods research design.

In Table 2.5, a compilation of the definitions derived from the reviewed studies is presented. There are 16 psychological factors which can be grouped into a single category except for 'convenience'. Convenience was found to have two meanings: (1) convenience in terms of comfort and (2) convenient location and time. Neoh et al. (2017) and Olsson et al. (2019)'s papers, as shown in Table 2.2, did not include the following nine psychological factors: descriptive norms, pleasant and enjoyment, empathy, information sharing, personal norms, helping others, self-determination, sense of belonging and social status.

Table 2.5: Definitions of psychological factors reported in the literature

Factor	Definition(s)
Convenience in terms of comfort	Having package space; avoiding crowding in public transport; seats are always available; not having to drive; relaxing; perceiving oneself as a customer of a service provided by drivers; comfort when sitting in a large car; softer seats and better temperature than public transport
Convenient location and time	Do not have to wait for public transport; more cars available than public transport; flexible and reliable time schedule; less time waiting in traffic; a variety of pickup and drop-off times; many pickup locations, ease of getting to a destination; no need to transfer

Table 2.5: Definitions of psychological factors reported in the literature (continue)

Factor	Definition(s)
Cost saving	An inexpensive travel means; cheaper than public transport and private car; reduced operating costs such as fuel, toll and maintenance costs; shared costs between commuters and drivers; gaining benefits that can be expressed numerically as an amount of money
Descriptive norms	People who are important to me and like to carpool
Environmental concern	An eco-friendly and sustainable travel means; saved energy consumption; reduced traffic congestion and pollution
Empathy	Shared experience
Helping others	Altruism; the opportunity to be helpful and to offer neighbourly goodwill; helping neighbours
Information sharing	Exchanging opinion; sharing vital information
Personal norms	An obligation to be a carpooling driver because of having a driving licence; an obligation towards something moral
Pleasant and enjoyment	Enjoying travelling with others; feeling pleasure when carpooling with others
Self-determination	A desire to reinforce the community' value
Sense of belonging	Feeling towards the community; a sense of community; a sense of unity
Social status	Perceiving that carpooling via online platforms is the way to differentiate individuals from those using traditional carpooling; gaining a high status by acting with professionally; social recognition; feeling accepted by society; gaining others' positive impressions
Socialisation	Sociability and socialising; meeting new persons and future good friends; friendship and companionship
Time saving	Shortens travel time compared to public transport; save time when using HOV lanes

Table 2.5: Definitions of psychological factors reported in the literature (continue)

Factor	Definition(s)
Trust	Carpoolers are truthful and will not take advantage of me; carpoolers keep their promises; people are fair and helpful, do not take advantage and not compromise the wellbeing of others; having confidence in people

In Table 2.6, 11 psychological factors are identified from 20 studies that did not clearly specify the respondent's role preferences. Thirteen studies (40.63%) clearly specified respondents' role preferences. Levin (1982) was the first to investigate drivers and passengers separately. Role preferences increasingly became the focus of researchers after 2011. Sixteen factors identified from the 13 studies are shown in Tables 2.7 and 2.8. Twelve factors were found to be applied for both the driver and passenger roles. Empathy was reported as a motivation only applied for the driver whereas convenient location and time, convenience in terms of comfort and social status were reported as motivations only applied for the passenger. Levin (1982) found that passengers did not concern on cost saving while Park et al. (2017) and Tahmasseby et al. (2016) indicated that cost saving was not the driver's motivation. Research gaps that may be used to guide a proposition of research question for the dissertation are presented and discussed in the following section.

Table 2.6: Psychological factors as reported in the studies that did not specify role preferences

Identified factor	Studies in Table 2.3
Cost saving	1, 2, 3, 5, 6, 8, 9, 11*, 12, 14, *17*, 18*, 19, 20, 23*, 26*, *30*
Convenient location and time	1, 3, 6, 11*, 12, *17*, 18*, 20, 26*
Socialisation	2, 11*, 12, 14, *17*, 19, 23*, *30*
Environmental concern	1, 6, 8, 14, 19, 20, 23*, 26*
Time saving	1, 6, 11*, *17*, 19, 20
Pleasant and enjoyment	1, 2, 6, 20, 23*
Convenience in terms of comfort	6, 14, *17*, 19
Helping others	2, *30*
Sense of belonging	25*, *30*
Trust	23*, *25**
Descriptive norms	26*

* Participants were the users of IT-based carpooling platforms.

In Italics: the results were derived mainly from qualitative methods.

Table 2.7: Psychological factors as applied to both drivers and passenger

Identified factor	Studies in Table 2.3 (for driver role)	Studies in Table 2.3 (for passenger role)
Cost saving	4, 15	21, 22*, *27**, 28, 29, 31*, 32*
Time saving	*10**	*10**, 21, 22*, 32*
Pleasant and enjoyment	*10**, *16*	*10**, *16*, 31*
Sense of belonging	*10**, *28*	*10**, *27**, *28*
Socialisation	*10**, 15, 29	*10**, *27**
Environmental concern	13, 22*	21, 22*
Personal norms	24*	24*
Trust	24*	24*
Descriptive norms	24*	24*
Information sharing	*28*	*27**, *28*
Helping others	*16*	*27**
Self-determination	*28*	*28*

* Participants were the users of IT-based carpooling platforms.

In Italics: the results were derived mainly from qualitative methods.

Table 2.8: Psychological factors specific to a particular role

Identified factor		Studies in Table 2.3
For carpooling driver	*Empathy*	*16*
For carpooling passenger	Convenient location and time	4, 21, 29, 32*
	Convenience in terms of comfort	4, 21, *27**, 32*
	Social status	*27**, 31*

* Participants were the users of IT-based carpooling platforms.

In Italics: the results were derived mainly from qualitative methods.

Apart from casual carpooling, it is acknowledged that an individual's intention to carpool via online platforms is not only determined by their perceptions on how carpooling benefits them but also by the characteristics of platform (Olsson et al., 2019). There is also a need to investigate how a platform can meet such drivers' needs and how drivers' perceptions impact on their intention to use platforms (Leroi-Werelds, 2019; Olsson et al., 2019).

Research on motivations to carpool through carpooling platforms may be classified based on two criteria: (1) whether a study focus on motivations to carpool or motivations to use a carpooling platform or both (Arteaga-Sánchez, Belda-Ruiz, Ros-Galvez & Rosa-Garcia, 2018) and (2) whether the drivers or the passenger are the focus (Bachmann et al., 2018). The included articles appear in Table 2.3 were classified according to the three criteria and are presented in Table 2.9. It is observed from the table that most studies investigate the motivations to carpool but not the motivations to use a platform, except for Arteaga-Sánchez et al. (2018) and Wang et al. (2018) who investigate both types of motivations.

Table 2.9: Research on motivations to carpool via platforms

Authors	Characteristics of platform			Psychological factors			Platform	Country
	D	R	X	D	R	X		
Buliung et al. (2010)	-	-	-	-	-	✔	Carpool Zone	Canada
Mote & Whitestone (2011)	-	-	-	✔	✔	-	Slug-line.com	USA
Abrahamse & Keall (2012)	-	-	-	-	-	✔	Let's Carpool	New Zealand
Bálint & Trócsányi (2016)	-	-	-	-	-	✔	Oszkár	Hungary
Tahmasseby et al. (2016)	-	-	-	✔	✔	-	Face-Porter	Canada

'D' denotes drivers; 'P' denotes to passengers; 'X' denotes not specify.

* A study prior excluded from the systematic literature review is included back as it is relevant to IT-based carpooling.

In Italics: the results were derived mainly from qualitative methods.

Table 2.9: Research on motivations to carpool via platforms (continue)

Authors	Characteristics of platform			Psychological factors			Platform	Country
	D	R	X	D	R	X		
Shaheen et al. (2017)*	-	-	-	✔	✔	-	BlaBlaCar	France
Arteaga-Sánchez et al. (2018)	-	-	✔	-	-	✔	BlaBlaCar	Spain
Bachmann et al. (2018)	-	-	-	✔	✔	-	A online platform	Switzer-land
Dickinson et al. (2018)	-	-	-	-	-	✔	A mobile app	UK
Gheorghiu & Delhomme (2018)	-	-	-	-	-	✔	covoiturage.fr; 123envoiture.com	France
Guyader (2018)	-	-	-	✔	✔	-	BlaBlaCar	Germany, Belgium, France, Sweden
Wang et al. (2018)*	-	✔	-	-	-	-	DiDi Hitch	China
Y. Wang et al. (2019)	-	-	-	-	✔	-	DiDi Hitch	China
Z. Wang et al. (2019)	-	-	-	-	✔	-	DiDi Hitch	China

‘D’ denotes drivers; ‘P’ denotes to passengers; ‘X’ denotes not specify.

* A study prior excluded from the systematic literature review is included back as it is relevant to IT-based carpooling.

In Italics: the results were derived mainly from qualitative methods.

In the carpooling technology literature, Technology Acceptance Model (TAM) is employed to explain antecedents of carpooling behaviour and to predict carpooling decision (Arteaga-Sánchez et al., 2018; Wang et al., 2018). It is acknowledged that TAM is a common and robust model used to understand consumer acceptance of an innovative technology (Davis, 1989; Legris, Ingham & Collerette, 2003; King & He, 2006). TAM is developed from the Theory of Reasoned Action (TRA: Fishbein & Ajzen, 1975) and is used to explain the potential user's intention to use a technological innovation (Davis, 1989). TAM has become the frequently-used model because of its understandability, simplicity and adaptation. One of many extended versions of TAM (see King & He, 2006) is the simplified TAM showed in Figure 2.8. Two determinants – perceived usefulness (PU) and perceived ease of use (PEOU) – are predicting the dependent variable behavioural intention, which TRA assumes to be closed to actual behaviour (Fishbein & Ajzen, 2011). PU refers to the degree to which a person believes that using a particular system would enhance his or her job performance whereas PEOU refers to the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

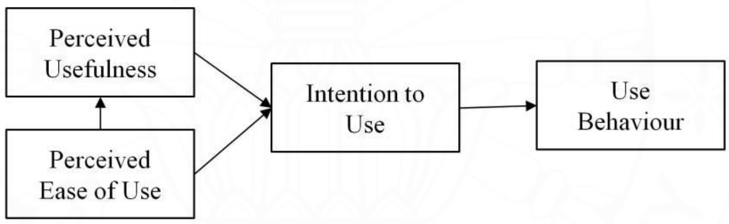


Figure 2.8: The simplified version of Technology Acceptance Model
Source: Adapted from Davis (1989)

Two related studies employing TAM are observed. First, Arteaga-Sánchez et al. (2018) investigate the passengers' intention to use BlaBlaCar. They consider PU as one of many determinants to satisfaction and intention to use the platform. In their study, PU refers to "an individual believes that using a particular system would enhance his or her performance" (p. 5). The other determinants are perceived economic benefits (save time and cost), service quality, social value (socialising and meeting new people), trust (users are truthful and will not taken advantage of others), and environmental impact (save natural resources).

Second, Wang et al. (2018) use the simplified TAM with perceived risks, environmental awareness and personal innovativeness to investigate passengers' perceptions towards the use of DiDi Hitch – a carpooling service provided by a Chinese transport company. In their study, PU refers to passengers' perceptions as regard to how a platform is useful to them in obtaining goals whereas PEOU refers to a platform that is easy and simple. At this point, the dissertation uses the definitions of elements in TAM as are defined according to the above-mentioned studies.

2.4.4 Research gaps

It is clearly observed that the literature lacks studies exploring drivers' perceptions and motivations towards carpooling via carpooling platforms. This research gap is also noted by many researchers (Aspara et al., 2020; Bachmann et al. 2018; Farajallah et al. 2019; Hazée et al., 2020; Leroi-Werelds, 2019; Neoh et al., 2017; Olsson et al., 2019; Park et al., 2018). Logically, drivers are the first sharers and should be the focus (Farajallah et al. 2019). The decision to carpool via carpooling platforms should be determined by the drivers' perceptions on how much carpooling can bring benefits to them and their perceptions towards the use of carpooling platforms (Leroi-Werelds, 2019; Olsson et al., 2019). It is also observed that the carpooling literature provides some evidence about psychological factors encouraging carpooling decision. The psychological factors identified in Table 2.5 to 2.8 will be used when the author conducts a study. Hereunder, three additional research gaps for the dissertation that revealed from the narrative synthesis are presented.

2.4.4.1 A need to employ a variety of data collection methods

Surveys were carried out for most of the studies reviewed. It is observed that only 12 (37.50%) studies investigated carpooling psychological factors by employing alternative research methods. Of the nine factors that had not been included in the previous review studies, four factors (empathy, information sharing, social status, self-determination) were discovered by articles employing alternative methods. This suggests that employing alternative methods may lead to the discovery of new factors. For example, Guyader (2018) and Haerewa et al. (2018)

employed ethnography to reveal respondents' meanings of motivational factors and derived two new factors viz. information sharing and self-determination.

An understanding of carpooling motivations requires a variety of data collection methods (Nielsen et al., 2015). It is observed that some studies employed a mixed-methods research design: using the results obtained from the first research method to guide the following surveys which aimed to test a set of formulated hypotheses. Margolin et al. (1978) and Shaheen et al. (2016) provide examples of such an approach.

Regards carpooling via online platforms, the characteristic of carpooling via online platforms is very distinct from traditional or casual carpooling. Carpooling matching occurs in an online platform, but real carpooling occurs in an offline world (Y. Wang et al. 2019). Research on carpooling via online platforms should employ a specific method or a mixed-methods research design that is designed to observe online phenomena. Guyader (2018) is a good example who employs netnography to observe online conversions and opinions of BlaBlaCar's users.

2.4.4.2 A need to collect more data from non-Western countries

Olsson et al. (2019) noted that motivational factors seem to be dependent on country and culture. It is observed from the findings of systematic literature review that most of the studies were carried out in Western countries, except, Wang, Wang, Wang, Wei and Wang (2018), Y. Wang et al. (2019) and Z. Wang, Chen, Chen and Wang (2019) who observed DiDi Hitch, a carpooling platform operated by a Chinese company: DiDi Chuxing Technology. There may be an opportunity for the dissertation to contribute to knowledge in transport, as it is carrying out in Thailand.

2.4.4.3 A need to further explore psychological factors

Few studies have investigated carpooling psychological factors based on psychological theories or concepts (Neoh et al., 2017). For example, Amirkiaee and Evangelopoulos (2018) and Bachmann et al. (2018) used TPB. Dickinson et al. (2018) employed the concept of social capital proposed by Putnam (1995) to investigate a sense of belonging. Y. Wang et al. (2019) used the concept of social value proposed by Sheth, Newman and Gross (1991) to define a sense of belonging whereas 'pleasant' and 'enjoyment' were defined based on concepts of hedonic and utilitarian values proposed by Babin, Darden and Griffin (1994). Barbosa and Fonseca (2019) used the term altruism under the consumer perceived value theory to investigate the perception of carpooling as a way to help others.

As for the concept of socialisation and empathy, the literature the author examined does not provide any psychological theory. Socialisation was only stated in terms of an individual's need or an activity in carpooling such as socialising, social interaction and making friends (Akar et al., 2012, Arteaga-Sánchez et al., 2018; Mote & Whitestone, 2011; Tahmasseby et al., 2016). Empathy was stated without referring to any theory (O'Brien & Dunning, 2014).

Regards conflicting results of psychological factors, it is acknowledged that cost saving is the primary factor for people to carpool (Chan & Shaheen, 2012; Standing et al., 2019). However, a recent study found that highlighting cost saving although can increase the carpooling enrolment rate among employees by 23%, their actual carpooling rate was very low (Kristal & Whilland, 2020). In contrast, Bulteau et al. (2019) found that colleagues and employers had an influence on an individual's decision to carpool. Some researchers believe that motivating people to carpool is better when highlighting with social and altruistic factors (Riggs, 2017; Shoshany Tavory, Trop & Shiftan, 2019).

Perceived environmental concern was found to have no effect on carpooling intention (Buliung et al., 2010; Canning et al., 2010) while Arbour-Nicitopoulos et al. (2012) and other studies in Table 2.3 indicated the effect of such factor. The carpooling literature the dissertation explored does not provide an explanation why some respondents believe carpooling as environmental and why some do not. It might be possible that a high score on perceived environmental concern is due to the effect of socially desirable bias (Malodia et al., 2016).

Up until now, we know the background literature and several research gaps. The next section presents a historical review of carpooling technology in Thailand and describes rationale why the dissertation chooses LILUNA and its drivers as the unit of analysis.

2.4.5 Carpooling in Thailand

Carpooling was first introduced to Thailand around 1997. At that time Thailand encountered Asian financial crisis and forced the Thai government to reduce importing fuels (Lauridsen, 1998). Carpooling is one of many options that the government issued in order to campaigning people to reduce their fuel consumptions (Ryt9, 1998). In 2015, the Thai government had an idea to relieve traffic congestion in Bangkok by introducing a high-occupancy vehicle lane together with bus rapid transit (OTP, 2015). In 2017, the Thai government has discontinued such bus rapid transit due to a low volume of users, accumulated loss, ineffective traffic flows and illegally used of the lane by single-occupancy vehicles (Naewna, 2017).

In 2007, a website-based carpooling platform, 'friendincar.com', was first introduced but it was discontinued in 2010 due to a lack of users (Rudjanakanoknad, 2011). During 1998 to 2010, carpooling programs in Thailand were initiated in small organisations but were not successful and discontinued (Rudjanakanoknad, 2011).

In 2016, GrabHitch – an online carpooling platform available for a smart phone – was first introduced by Grab Thailand, a company owned by a Singaporean multinational ride-hailing organisation. GrabHitch allows Grab's drivers to share travel expense with passengers (grab.com/th/hitch). Ideally, a passenger requesting for a ride via the platform should pay a 50-baht fixed price through online payment methods. As it was a pilot project, Grab gained no revenue from this operation (Positioningmag, 2016). In December 2019, the author contacted Grab and found that the service had been discontinued.

There were other carpooling platforms found by start-up companies in Thailand. Paiduay was found and discontinued within a year due to lack of users and revenues to maintain businesses (Pensute, 2018). Shareways is another platform operating in Thailand but it focuses on corporate carpooling (pambashare.com).

2.4.6 LILUNA

Since 2017, Mr. Natthaphong Jaravijit founded LILUNA, a Thai start-up carpooling company in Thailand. LILUNA is also a name of smart phone application available in the IOS and Android's app stores. The platform promotes users with keywords such as cost-saving, reducing traffic congestion, environmental sustainability and socialisation (lilunago.com).

2.4.6.1 How LILUNA works

To use the app, one has to register either by manually filling personal information in a form provided by the app or by registering using one's own Facebook account (Figure 2.9, left). Registered users can see the seats offered by drivers as well as can use the app's functions. Those who desire to offer a ride need to upload their driving licence and vehicle tax disc (Figure 2.9, right).

Figure 2.9: The app's registration pages

Source: LILUNA

After a registration for a driver have been done, the driver can post their trips by filling information which includes origin-destination, trip date and time, a number of seats the driver wants to share, requested fee which can be any number even zero Baht, a car brand and model, vehicle plate number, car colour, a type of carpool – i.e. casual carpool or a particular group such as Chula-carpool – and further information (Figure 2.10). A driver can note to riders any other information by typing a text in 'FURTHER INFORMATION' (hereafter refers to *'the driver's trip note'*).

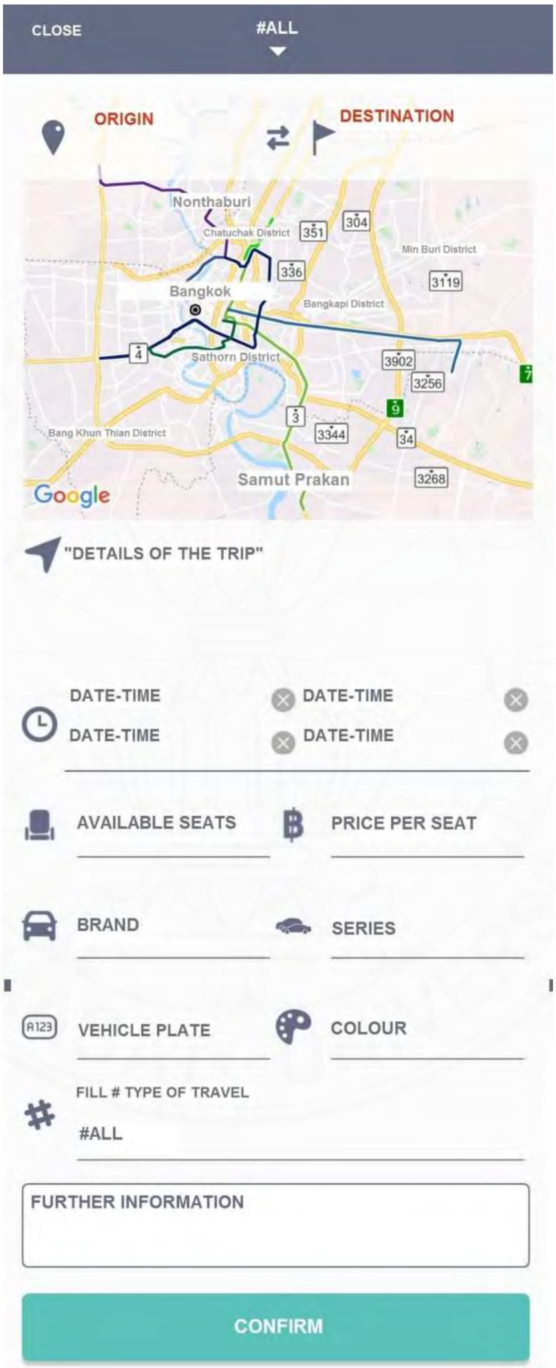
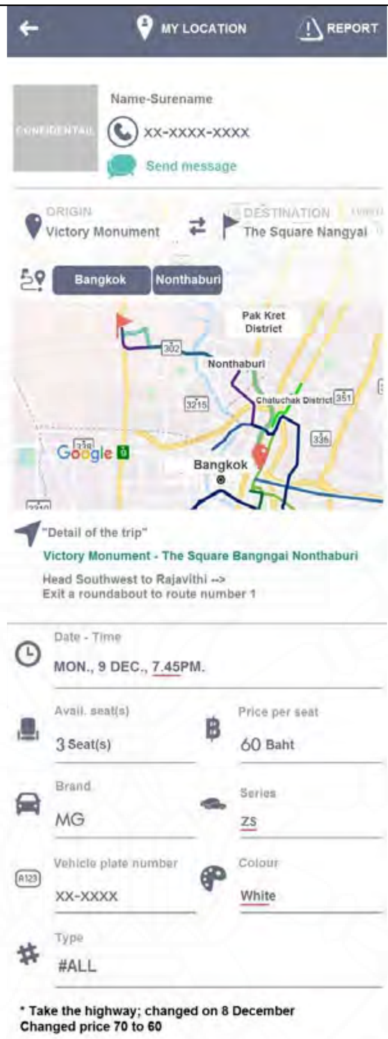


Figure 2.10: An interface page for a driver

Source: LILUNA

The app's homepage

A completed post



A message page

The left side is the app's homepage; the middle is a page detailing a driver's shared seats; the right side is a message

Figure 2.11: The app's homepage, a completed post and a message page

Source: LILUNA

Once a driver has completed posting a trip, such trip will be appeared in the app's homepage, which can be observed by registered users as shown in Figure 2.11. A rider who looks for a ride must first check whether seats are available by observing the work "Left … Seat (s)" (Figure 2.11, the left side). For example, a trip from Victory Monument to the Square Bangyai had one seat left. A rider can click on such post to see more details, except a driver's vehicle plate number (Figure 2.11, the middle). It is observed that this driver had shared three seats, which were already occupied by two riders; see the word "Avail. Seats". The post also contains a figure of route and the detail of route. By click on the arrow icon appears near the word "Detail of the trip", it shows an estimated distance calculated automatically by Google Map's distance matrix application programming interface. A rider who would like to join this trip can click on the button 'ASK FOR A RIDE'. If a rider or any user wants to communicate with the driver without jointing a ride, they can click on the button 'Send message' which will bring them to a chat box where both sides can communicate. One can also call to the driver by clicking on a 'call' icon, which will provide the driver's phone number (Figure 2.11, the right side).

2.4.6.2 Why use LILUNA?

LILUNA and its drivers are interesting in two aspects: (1) LILUNA has many registered users (2) LILUNA charges its users no fees and does not control the drivers' decisions regards price setting and (3) being a forum type, LILUNA may provide managerial implications.

Registered users were around 100,000 users, as informed by LILUNA. While other operators had discontinued, the author observed that during 2017 to 2019 LILUNA had approximately 10 rides offered daily. Users were at peak during on holidays such as Songkran day and New Year weekend. The author believes that LILUNA should be able to provide a number of potential and unique informants for the research.

First is that LILUNA charges users not fees. This means that the drivers may perceive the platform as an altruistic site. As a result, we may found some drivers who are less economically motivated. Some other psychological factors may be revealed from the data and may contribute to current knowledge.

Because LILUNA does not control the driver's choice of price setting, drivers can propose any price even zero Baht. In Figure 2.12, it is observed that one driver shared three seats for free whereas some others charged a very cheap price. For example, the driver who planned to drive from Bangkok to Nakhon Phanom charged only 10 Baht per seats. It must be noted that the aim of the dissertation is not to look for altruistic drivers and not to differentiate those who charge a price from those who do not. It aims to explore the driver's perceptions and motivations. A variety of drivers should benefit the exploration and leads discover of insights beyond what we know in the literature.

Figure 2.12: Posts appearing in the app's page

Source: LILUNA

Perren and Kozinets (2018) classify platform business model based on two dimensions: (1) the way the company utilises a technological platform as an intermediary that manages, facilitates and coordinates the exchange between actors and (2) the degree of social integrations between the actors. Four typologies of platform model include: (1) forums (minimising a platform's involvement but allowing actors to interact freely) (2) enablers (minimising a platform's involvement and actors to coordinate) (3) matchmakers (taking controls of actors exchanges and allowing actors to interact freely) and (4) hubs (taking controls of actors exchanges but limiting actors to coordinate).

LILUNA is a forum type, as it minimises its involvement with users and acts like a marketplace for drivers and riders to communicate, coordinate and form carpools. Drivers and riders use the information of each opponent to decide whether to request for a ride (for riders) or to accept passengers' requests (for drivers). It is also noted that managers of the forums type face a problem of monetisation (Perren & Kozinets, 2018). This research is carried out in collaboration with LILUNA. Three challenges LILUNA is facing are as follows.

(1) The company wants to know whether the platform should charge service fees to users or not and, if it has to be, who should be charged.

(2) The company needs to know how to encourage the current drivers to share seats and needs managerial guideline on how to increase the number of new drivers.

(3) The company has provided businesses with a corporate carpool program. Due to a low number of drivers participating in corporate carpool programs, the company needs a set of tools that can be used to investigate the drivers' perceptions and motivations in advance before it proposes a corporate carpool program to its business-to-business customers.

2.4.7 Research questions

This section shares the journey of dissertation and shows how the outbreak of coronavirus disease (COVID-19) has an impact on the dissertation. The idea behind the dissertation was generated from the author's observation. In 2017, the topic about sharing economy had been the talk of the town among researchers, businesses and people in Thailand. Medias showed many start-up companies competing to each other to win a reward. LILUNA was one of those companies and has caught the attention of the author. The author observed the platform and found some carpool drivers shared seats in the platform for free or a very cheap price. This led to an initiation of simple research question: *why the drivers in the platform share their seats and drive for strangers?* An initial aim of the dissertation was to explore the drivers' perceptions and motivations towards carpooling through the platform.

After the literature has been explored, extant studies of psychological factors encouraging carpooling decisions pointed out that we do not know much about carpool drivers. This aim of the dissertation was to discover other motivational factors. The dissertation's research design initially adopted was a mixed-model research design, which consists of a set of data collection methods i.e. data scraping, netnography, ethnography, focus group and long interview as well as two analysis methods: content and thematic. Data scraping has been undertaken since November 2019 whereas ethnography and long interviews had been carried out during January to February 2020.

COVID-19 has hit in Thailand since January 2020 and the situation got worst in March 2020. It substantially and fundamentally changes what the author can do to get the data via ethnography. Ethnographic interview and participant observation cannot be used due to social distancing. Researchers in the rest of the world are also facing such difficulty and trying to look for other substantive methods to replace ethnography (Howlett, 2020; Lobe, Morgan & Hoffman, 2020).

After consulting with the advisor, consensus was made as that the research question, research objectives as well as research design and research methods need to be revised. Rationale remains quite the same: we do not know much why drivers of platform are sharing seats and carpooling. A proposed conceptual model is about their perceptions, motivations and future intentions to carpool via the platform. It is also about how the perceptions allow the author to determine how drivers will use the platform in the future.

The author adopts a mixed-methods research design as suggested by mixed-methods methodologists (Creswell & Creswell, 2018; Golicic & Davis, 2011; Johnson & Onwuegbuzie, 2004) and divides the dissertation into two studies: exploratory research and then explanatory research. The gaps that (1) carpool research has not been done from the driver’s perspective and (2) it has not investigated both the motivations to carpool and the effect of technological platform through Technology Acceptance Model (TAM).

The various considerations discussed in this chapter are shown as a priori conceptual model of the driver’s motivation to carpool via the platform. This model is adapted from the simplified TAM proposed by Davis (1989) and is shown in Figure 2.13. The simplified TAM is used due to two main reasons: (1) it is a well-developed theory and robust model used for investigating consumer acceptance of an innovative technology (Davis, 1989; Legris et al., 2003; King & He, 2006) and (2) it has been used, tested and validated in the carpooling context (Arteaga-Sánchez et al., 2018; Wang et al., 2018).

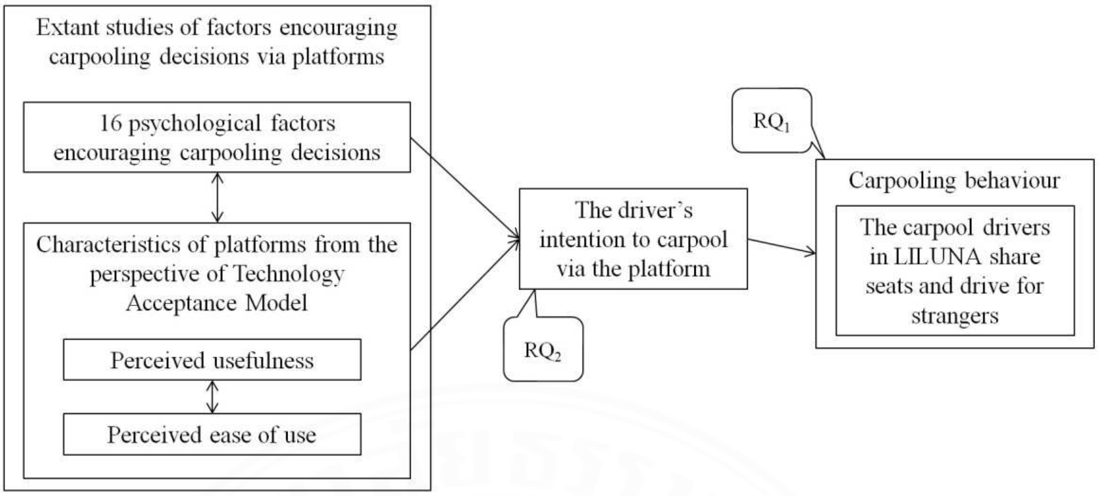


Figure 2.13: A priori conceptual model used to study the driver's motivation to carpool via the platform

Extent studies of psychological factors encouraging carpooling decisions were used to shape the research question. The first aim of the dissertation is to explore the drivers' perceptions and motivations towards carpooling through the platform. Based on the fact that we do not know much about the driver's perspective, the first research question is proposed:

RQ1: What make carpool drivers using the platform share their seats and drive for strangers and what factors found in the literature and elements of the Technology Acceptance Model explain such behaviour?

In order to answer this research question, first is to understand the driver's perceptions and motivations towards carpooling through the platform. It is hoped that the a priori conceptual model, as shown in Figure 2.13, can be used as a theoretical point of departure for such exploration. It is also hoped that the findings should provide insights to be used to revise the a priori conceptual model and propose a conceptual model for investigating the relationships between motivational factors and the drivers' future carpooling decisions via the platform. Therefore, the specific objectives can be described as follows:

(1) to understand motivational factors for the drivers to carpool via a platform and

(2) to propose a conceptual model for investigating the relationships between motivational factors and the drivers' future carpooling decisions via the platform.

In addition to the first aim of the dissertation, the second aim is to investigate how motivational factors affect the driver's future intention to carpool via the platform. The second research question is then proposed:

RQ2: How important are these factors for the driver's future carpooling decisions via the platform?

In order to answer this research question, a proposed conceptual model drawn on the findings of the exploratory research will serve as a foundation for developing an operative model which will be used for investigating the relationships between motivational factors and the drivers' future carpooling decisions via the platform. Therefore, a third specific objective to answer the second research question is:

(3) to use the proposed conceptual model to identify the impact of motivational factors on the drivers' future carpooling decisions via the platform.

2.4.8 Summary of this section

This section presented a systematic literature review which derived the results as 16 social psychological factors. Such factors together with the simplified TAM were employed to propose a priori conceptual model. The a priori conceptual model will be used as a theoretical point of departure in the exploratory empirical research. The results of systematic literature review also suggested three additional research gaps that are useful for the dissertation.

This section also narrates a history of carpooling in Thailand and introduces LILUNA as the platform being the focus of dissertation. Drivers of LILUNA are the unit analysis of the research. Rationale why LILUNA and its drivers are interesting is given. Finally, the research questions for the dissertation are set out. Because this research is carried out in Thailand, the next section reviews the cultural context of the country and the characteristics of Thais.

2.5 The Thai context

The previous section reviewed psychological factors encouraging carpooling decisions and proposed research gaps for the dissertation. It also indicates that most carpool research was undertaken in the non-Western world. As the dissertation is carried out in Thailand, there may be some influential factors related to Thai characteristics that could affect drivers' thoughts and their behaviour. A background of Thai people should help facilitate the author in exploring and discovering insights regard Thai carpooler's motivations. It is, thus, critical to have a short review of the characteristics of Thai people. Comparing the findings of this dissertation with other studies conducted in other cultures is beyond the scope of the dissertation. This section starts with a review of the collectivist characteristics of Thai people and is followed by the role of Buddhism that influences Thai people.

2.5.1 The collectivistic characteristic of Thai people

At a national-level perspective, Hofstede's (1980, 1991) results show that Thailand is a highly collectivist culture. The recent score of Thailand is 20, out of 100, which is classified as a highly collectivist culture (hofstede-insights.com, accessed 5th May 2021). Collectivist people is understood as "a person's feelings, emotions, attitudes, ideologies, self-concepts and actions related to the belief that the basic unit of survival lies not in an individual but in a collective" (Hui & Triandis, 1986; Hui, Triandis & Yee, 1991, p. 147). People in such collectivistic culture are integrated into a larger in-group e.g. extended families and clans who support each other and protect the group's interest against another in-group (Hofstede, 2011). The characteristics of collectivist people are provided in Table 2.10.

Table 2.10: A psychological perspective of collectivist people (adapted from Hui & Triandis, 1986)

Category	Characteristic
Consideration of implications of one's own decisions/actions for others	Consider the implication of one own action for wider collectives
Sharing material and non-material (i.e. intangible) resources	Value interdependence Maintain social relationship through resources sharing, lending, borrowing and giving
Susceptibility to social influence	Pay more attention to the influencing persons Conform with in-groups to avoid being rejected Attached to their in-groups unless an in-group extremely costs to oneself Value harmony
Self-presentation	Concerned with gaining approval of oneself Feel shameful if they are fail to get it Value face-saving
Sharing of outcomes	Believe they are sharing others' outcomes One's person misbehaviour/failure can harm many others and is a disgrace to in-groups
Feeling of involvement in other's lives	Feel involved with other people's lives, as they believe that the latter's outcomes can affect oneself (e.g. parents are involved in most of their children's choice of friends, jobs, studies etc.)

The characteristics of Thai people are noted in the literature but few have explained them in detail. Komin (1991) first describes the characteristics of Thais in an in-depth perspective (Table 2.11). Knutson, Komolsevin, Chatiketu and Smith (2003) classify Thailand is a collectivist culture with high-context culture. They describe that Thais value much on social and interpersonal harmony, pleasant relationship and selflessness as well as desire to create gratitude, as a foundation of interpersonal relationship. Yablo and Field (2007) found that Thais value affiliation over achievement which leads Thais to seek friendships, love and social acceptance. Recent studies also confirm that Thai people remains collectivist, even the younger generation (Buriyameathagul, 2013; Farrell & Phunsoonthorn, 2020).

Table 2.11: Characteristics of Thais (adapted from Komin, 1991)

Cluster	Characteristic	Explanation
Ego orientation	Face-saving	Have a high level of self-esteem, big ego, a deep sense of independence, pride and dignity
	Criticism-avoidance	Have difficulty in dissociating one's opinion from the 'ego' self
	Considerate 'Kreng jai'	Feel reluctant to impose upon another person, consider another person's feelings, take every way not to cause discomfort and inconvenience for another person
Grateful relationship orientation	'Bunkhun' (indebted goodness) and exploitation	Interactions are honest and sincere, interested in deep reciprocal relationship
	'Saang bunkhun' (foster gratitude)	Create gratitude and power of social connection
Smooth interpersonal relationship orientation	Cognition of social interaction and the social smoothing	Place a high value on other-directed social interaction; prefer smooth, kind, pleasant and no-conflict interpersonal interaction
	Thai's personality and the suppression of emotional expression	Have non-assertive, polite and humble personality; express feelings through appearance, manners and interpersonal approach

Table 2.11: Characteristics of Thais (adapted from Komin, 1991) (continue)

Cluster	Characteristic	Explanation
Flexibility and adjustment orientation	Flexibility over principle and ideology	Prefer flexible, responsive and adaptive to situations and opportunities.
	Flexibility and corruption	Principles, rules, policies and agreements can be exempted or ignored if personal relationship, self, and/or in-group's interest are outweighed
Religio-psychical orientation	Psychological function of some religious concepts	Believe in Buddhism but do not have a deep understanding; do not consciously push effort to reach nirvana and do not fully believe in reincarnation
	Perception of the concept of Karma (consequences of action)	Believe in the consequences of good and bad deeds; accept one's outcomes as a result of past deeds; use Karma concept as a defense mechanism in situations associated with negative events
	Superstitious beliefs and behaviours	Believe in spirits and astrology and usually practice a variety of magical and superstitious behaviours
Education and competence orientation	Knowledge for social status and salaries	Perceive education as a means for social climbing up and a way to gain prestige and higher salaries rather than a way to seek knowledge
	'Form' over 'content'	Good grades and honorary degrees are indicators of prestige; honours and possessions rather than intellectual knowledge and the content and substance
	'Form' and material possession	Value good form, appearance and material possession

Table 2.11: Characteristics of Thais (adapted from Komin, 1991) (continue)

Cluster	Characteristic	Explanation
Interdependence orientation	Collaborative behaviour	Collaborative behaviour is a dominant behavioural pattern and reinforces the sense of community
	Altruism	Value helping behaviour
Fun-pleasure orientation Achievement-task orientation	Fun-pleasure orientation as a differential perception	View life as something to enjoy with very little thought about the future (elite class); value about earning a living (labour class)
	Nature of achievement motivation of the Thai	Consider hardworking achievements much lower than social relationship; value prestige and social recognition as goals for success in life

2.5.2 The role of Buddhism

Thailand is is influenced by Theravada Buddhism (Komin, 1991; Niffenegger, Kulviwat & Engchanil, 2006). More than 95% of population believe in Buddhism where most of them are Theravada Buddhism (McAleer, 2016). Theravada Buddhism has two religions: Kammatic and Nibbanic. The former puts an importance on achieving rebirth (Aronson, 1979). In order for obtaining a better rebirth, individuals have to do a lot of good deeds when they are alive. The latter puts an importance on achieving enlightenment and nirvana − a state of freedom from suffering and rebirth (Kraisornsuthasinee, 2012). It is found that monks were associated with Nibbanic Buddhism whereas general people were associated with Kammatic Buddhism (Aronson, 1979; Khienwong, 1995; Komin, 1991).

A belief such Karma influences Thais' though, behaviour and the way they live. Kammatic Buddhism cultivates the collectivistic values among Thais as well as teaches Thais the importance of prosocial behaviour and the consequence of doing such good deed (Yablo & Field, 2007). In order to obtain a good deed, people have to share, give and donate personal resources, also known as Dāna (Khienwong, 1995). Such good deed reciprocates one by improving one's own karmic status (Komin, 1991). The consequence of doing good and bad deeds is the law of

Karma and can be understood as “Do good, receive good; do evil, receive evil” (Hughes, 1984, p. 316). In other words, the law of Karma assumes that the consequence of doing good and bad deeds equals to “the sum of both good and bad deeds one achieves during life” (Atmivanandana & Lawler, 2003, p. 234).

2.6 Summary of the chapter

This chapter provided background literature that encompasses a number of topics. The concept of collaborative consumption, typologies of sharing in transport and carpooling services, as well as the definition of carpooling for the dissertation were discussed. A review of the behavioural science in transport research highlighted the importance of adopting the behavioural models and research methods emerged from other disciplines. A systematic literature review of carpool research was presented derived the findings and research gaps that are useful for the dissertation. LILUNA was introduced as the platform which the research is focusing on. Research questions were proposed based on the background literature. In the last section, a review of Thai people and the influence of Buddhism were presented.

The next chapter presents the dissertation’s research methodology and methods. It introduces the philosophy of science and clarifies the philosophy underlying the dissertation. A mixed-methods research design is proposed base on the research questions and objectives.

CHAPTER 3
RESEARCH METHODOLOGY AND METHODS

Chapter Two discussed the background literature that shaped the research questions. The purpose of this chapter is to introduce the philosophy underlying the dissertation and briefly describe the research methodology and methods of this dissertation. This chapter starts with an introduction of the philosophy of science and is followed by and the philosophy underlying this dissertation. Based on the research questions and objectives proposed in the previous chapter, a mixed-methods research design is introduced. It separates the dissertation's methodology and methods into two: the exploratory research and the explanatory research.

3.1 Philosophy of science

In a broad sense, philosophy is an activity a researcher carrying out in order to understand things of the world (Godfrey-Smith, 2003). Such things could be reality, knowledge, mind, matter, truth and logic of abstract phenomena. Science offers scientific methods which can be used to answer research questions in terms of nature causations i.e. what exists and what happens (Ladyman, 2002). The answers derived from scientific methods are so called scientific knowledge that is confirmed by empirical evidence, as oppose to everyday knowledge (Chalmers, 2013).

At epistemological level, knowledge, evidence and rationality are questioned whether it is correct or wrong (Chalmers, 2013). This is the way we question "how things really are and how things really work" (Guba & Lincoln, 1994, p. 108). Yet, answering such questions is a challenge because researchers who believe in different paradigms see entities differently and answer their research questions in a different way. At ontological level, we question "what is the form and nature of reality" (Guba & Lincoln, 1994, p. 108). A research has their particular world view and perceives the nature of reality based on the paradigm they believe (Williams & May, 1996). Paradigm is "a set of basic beliefs" and "represents a world view that defines, for its holder, the nature of the 'world,' the individual's place in it, and the range of possible relationships to that world and its parts" (Guba & Lincoln, 1994, p. 107). Because "the philosophical underpinnings of each paradigm can never be empirically proven or disproven", each paradigm shields from being subverted (Scotland, 2012, p. 9).

Research paradigm shown in Figure 3.1 consists of four philosophical questions. The first two components are ontological and epistemological questions. The other two components are methodology and methods. A researcher who believes in a particular paradigm adopt the research approaches and designs exist in that paradigm (Guba & Lincoln, 1994) Methodology is the question about how can we are finding out whatever we believes can be known (Guba and Lincoln, 1994). As a result, the chosen methodology influences the strategy of research methods, which are the procedures we employ in order to answer our research questions.

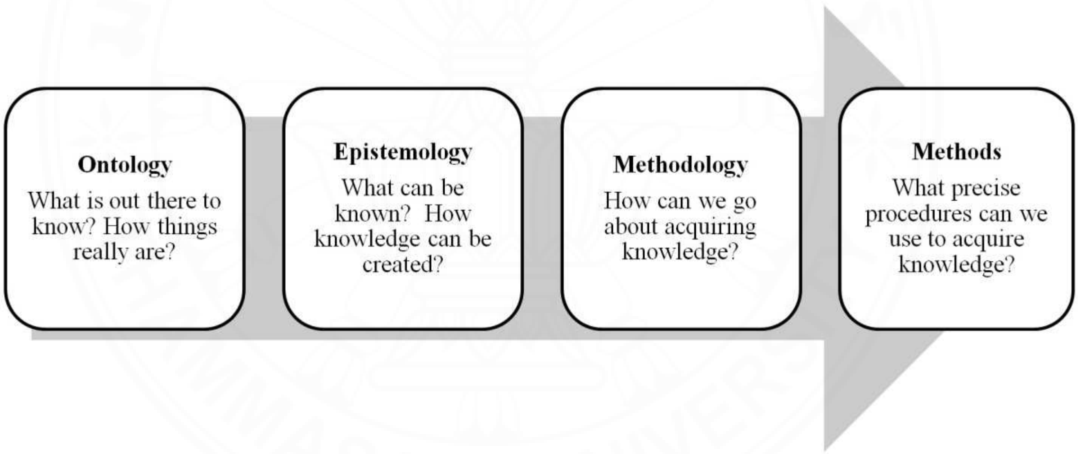


Figure 3.1: Four philosophical questions
Source: Adapted from Guba and Lincoln (1994) and Scotland (2012)

Science is divided into two: (1) natural science e.g. physics, chemistry and biology has the natural world as the objects of study and (2) social science e.g. such as psychology, sociology and economics has human and social world as the objects of study (Ladyman, 2002). The following section presents the philosophy of social science.

3.2 Philosophy of social science

Philosophers in social science have long been believed that social science can adopt the methods originated in natural science to produce knowledge for the social world (Williams & May, 1996). Common things between these two sciences are that both share a common history and philosophical issues e.g. the subject matter and the capability of science in producing objective knowledge (Hunt, 1993; Williams & May, 1996). Only one difference between both is the objects of study (Williams & May, 1996; Ladyman, 2002; Hunt, 2010).

In social science, there are two extremely distinct paradigms: positivist and interpretivist. The differences between such two extreme paradigms are shown in Table 3.1 in terms of ontology and epistemology. Positivism has basis on logical empiricism and sees natural science and social science sharing common logical, epistemological and methodological manners (Hunt, 2010). Positivists believe the interdependence between reality and individuals as well as believe that phenomena can be explained, predicted and generalised via laws and law-like statements (Hunt, 2010). In contrast, interpretivists see that social science is incapability to produce any law because the meanings provided by individuals are subjective and realities are mentally perceived (Hudson & Ozanne, 1988).

Table 3.1: Differences between positivist and interpretivist paradigm (Hudson & Ozanne, 1988)

Assumptions		Positivist	Interpretivist
Ontology	Nature of reality	Objective and tangible Single Fragmentable Diversible	Socially constructed Multiple Holistic Contextual
	Nature of social beings	Deterministic Reactive	Voluntaristic Proactive
Epistemology	Knowledge generated	Nomothetic Time-free Context-independent	Idographic Time-bound Context-dependent
	View of causality	Real causes exist	Multiple, simultaneous shaping

3.2.1 Post-positivism

Present days, philosophy of science is dominated by scientific realism or (realist) post-positivism (Fox, 2008). Post-positivism is an alternative paradigm to positivism and non-postivism (Maxwell & Mittapalli, 2010). Although the paradigm holds most of assumptions of positivism, it relaxes some assumptions such as classical positivism (the belief is true with certainty) and falsification (theories can never be proven) (Hunt, 2010; Scotland, 2012). In fact, post-positivism has been introduced in order to "reconcile the tension between positivism and various forms of relativism" (Maxwell & Mittapalli, 2010; O'Reilly, 2004, p. 55). Based on Guba and Lincoln (1994) and Hunt (2010), it can be summarised that post-positivism has four set of beliefs.

(1) Objective and independent reality

The world exists independently of things being perceived. The reality is objective but not an absolute objectivity. Realities can be subjective and multiple if the subjects are human and social phenomena. In psychology where researchers deal with unobservable entities e.g. attitudes, motives, goals and intentions, such entities can be accessed through the subject's introspective reports and their verbal responses. Researchers can assess causal relationships not only via experimental and correlational methods but also via observations through human behaviour and people's verbal responses as well as other text-based methods. Such methods can be to produce empirical evidence that can be used to explain social phenomena. However, bias always exists and we can reduce only the known sources of bias.

(2) Imperfect knowledge

Science can develop knowledge about the world. Yet, such knowledge is imperfect apprehendable, tentative and can be known with probabilistic not with certainty. If the truth tested by hypothesis is true, it offers us to believe that the truth is likely to be true and vice versa. Knowledge is non-falsified hypotheses and can be accumulated together and generalised. Knowledge produced is theory-laden i.e. we see what we want to see, what our paradigm leads us to see and what theories tell us to see. What we can do is to declare our value assumptions fully.

(3) Knowledge must be validated

Knowledge produced must be held all of us i.e. impersonal or interpersonal objectivity. The quality of inquiry is judged by "rigor" which comprises of "internal validity (isomorphism of findings with reality), external validity (generalisability), reliability (in the sense of stability), and objectivity (distance and neutral observer). Knowledge must be tested whether it represents, corresponds and accords with the world or not. Bias can be found in research findings and researchers must try to minimise it. Employing triangulation or carrying out a study using other research methods is a recommended approach to minimise bias in findings. For the case of text-based methods, "a text is valid (legitimate) if it is sufficiently grounded, triangulated, based on naturalistic indicators, respondent validation, carefully fitted to a theory, comprehensive in scope, credible in terms of member checks, and so on" (Denzin, 1997, p. 7).

(4) Theories exist things exist

The long-term success of theories suggests that things exist. In psychology, theories have long been tested and generalised. This suggests that entities such as attitudes, motives, goals and intentions exist.

Post-positivists are open to other research methods such as observations and other text-based methods. However, such methods were often originated within interpretivist paradigm. Because the dissertation will employ a data collection method/technique of interpretivist, understanding interpretivism is critical and makes the author aware of biases and limitations of each borrowed method. The next section introduces the world view of interpretivists.

3.2.2 Interpretivism

The ontological position of interpretive paradigm is relativism, which assumes that realities are subjective, different from one to another person and mediated by our perceptions (Guba and Lincoln, 1994). Reality is thus individually and socially constructed (Geertz, 1973). The epistemological position of interpretive paradigm is subjectivism, which assumes that the world exists dependently on our perceptions and interpretations. Thus, realities are constructed based on a person (Scotland, 2012). The aim of inquiry is to understand the constructions i.e. knowledge that people and the inquirer hold (Guba & Lincoln, 1994).

At the methodological level, interpretivists believe that individual constructions i.e. knowledge can be known only through interaction between researchers and respondents. Thus, findings are created as the investigation proceeds where researchers are facilitators of inquiry process (Guba & Lincoln, 1994). The quality of inquiry can be achieved through trustworthiness as shown in Table 3.2. It is developed based on positivism paradigm by paralleling internal validity with credibility, external validity with transferability, reliability with dependability and objectivity with conformability (Denzin & Lincoln, 2008). Holt (1991) asserts that trustworthiness is appropriate for post-positivist research.

Table 3.2: Trustworthiness (adapted from Guba & Lincoln, 1994; Stewart, 1998)

Criterion	Description	Techniques help improve quality
Credibility (Internal validity)	Adequate and believable representations of the constructions of reality studied	Prolonged engagement and persistent observation Triangulation of data sources and methods Member checks
Transferability (External validity)	Working hypotheses can be employed in other contexts	Triangulation across sites through purposive sampling Seeking limiting exceptions or disconfirmation observations
Dependability (Reliability)	Interpretations are constructed in a way which avoids instability other than the inherent instability of a social phenomenon	Observation over time and explanation of change
Conformability (Objectivity)	Ability to trace a researcher's construction of an interpretation by following the data and other records kept	Triangulation across sources and methods

Many interpretivists assert that, as post-positivism and interpretivism hold different paradigm at each end, both paradigms are 'incommensurable' in that the meaning proposed by one paradigm cannot be fully translated into and compared with the meaning proposed by another paradigm (Anderson, 1989; Ozanne & Hudson, 1989). However, Hunt (2010) argues that 'incommensurable' implies that two paradigms should produce conflicting knowledge such as did by Ptolemy (Earth-centred) and Copernicus (Sun-centred) but it is observed that, through time, no paradigm produces any conflicting knowledge. In fact, both paradigms share similar values i.e. "they both adhere to the fundamental purpose of science: to try to learn the truth about the world" (Stewart, 1998, p. 12). In fact, “sometimes qualitative studies add to what we know from quantitative research, and sometimes it is just the reverse. Therefore, rather than rivals, qualitative studies complement quantitative research” (Hunt, 2010, p. 283).

3.2.3 Paradigm of the research

This dissertation is grounded on scientific realism or (realist) post-positivism with reasons. First, post-positivism is flexible in research methodology, research design, research method and analysis method (Hunt, 2010; Maxwel & Mittapalli, 2010). It is pragmatic in that it allows researchers to choose the best approach of other paradigms (Maxwel & Mittapalli, 2010; Seale, 1999). Researchers can craft their skills and methodologies based on what they have experienced and learnt from previous studies (Seale, 1999).

Research design is determined by the nature of phenomena and that of research questions and objectives (Golicic & Davis, 2011; Johnson & Onwuegbuzie, 2004). The proposed research questions and objectives of this dissertation suggest that a research design for the dissertation should very pragmatic. The first research question is qualitative research objective and exploratory in nature and needs a set of research methods that can facilitate an understanding of the drivers’ meanings, feelings and experiences. The second is quantitative research objective and explanatory in nature and needs a set of methods that are mathematical-based and able to produce findings in terms of ranking and statistical testing of influential factors. It is observed that a mixed-methods research design is suite with the proposed research questions and objectives. Such research design has also been employed by transport researchers as noted in the background literature.

3.3 Mixed-methods research design

The idea of combining methods is not new and used for evaluating research, also known as the multitrait-multimethod matrix, (Campbell & Fiske, 1959) and for investigating issues that little was known (Campbell & Stanley, 1966). Later, using more than one method in investigating a phenomenon, also known as data triangulation and methodological triangulation, was popularised by Denzin (1978).

Some scholars note that mixed-methods research has been introduced as the way to end the paradigm wars between “qualitative and quantitative research” by integrating the use of methods of both positivism and non-positivism (Gage, 1989; Hammersley, 1992; Maxwell & Mittapalli, 2010, p. 146).

Mixed-methods research refers to “research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches […] in a single study or a program of inquiry” (Tashakkori & Creswell, 2007, p. 4). Because all methods have bias and weakness, combining qualitative and quantitative findings can neutralised such weaknesses of each form of data as well as provides researchers with more completed evidence, more certain findings and more confidence in the truth we investigated (Creswell & Creswell, 2017). It must be noted that mixed-models and mixed-methods design differ from multi-methods. The former involves the mixing of the two types of data whereas the latter involves a set of qualitative inquiry or a set of quantitative inquiry (Morse, 2003).

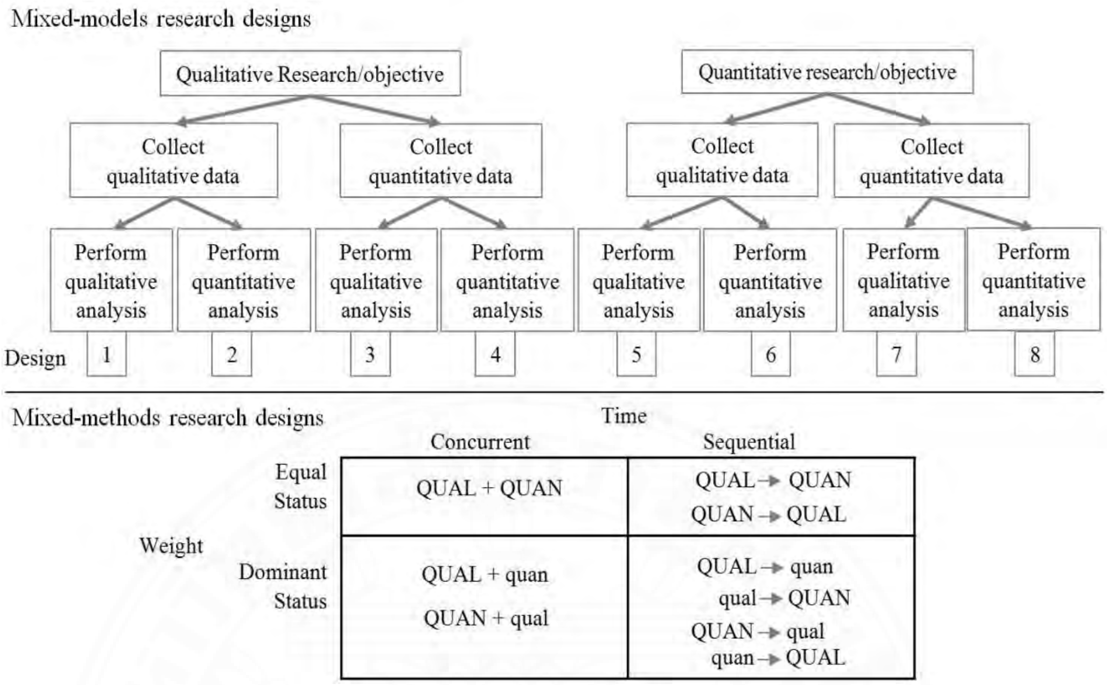
Some scholars argue that mixed-methods research has grounded on pragmatism – emphasising on applications and solution to problems rather than antecedences as in post-positivism (Creswell & Creswell, 2017; Morgan, 2014). Giddings and Grant (2007) argue that mixed methods research is underpinned by positivism and should be rather called as pragmatic post-positivism. Johnson and Onwuegbuzie (2004) classify mixed-methods research according to the priority or weight between qualitative and quantitative study. The debate on whether mixed-methods approach should be classified to which paradigm beyond the scope of dissertation and will not be discussed further.

In fact, research design should be viewed as actual conceptualisations and practices employed in a specific study (Maxwell & Mittapalli, 2010). Researchers of any paradigm, including scientific realism, can employ a mixed-methods research design as an approach to produce knowledge in their fields (Johnson & Onwuegbuzie, 2004; Maxwell & Mittapalli, 2010). The mixed methods research process carrying in this dissertation follows that guideline provided by Johnson and Onwuegbuzie (2004) as shown hereunder: (1) determining the research question (2) determining whether a mixed design is appropriate (3) selecting a mixed-method research design (4) collecting the data (5) analysing the data (6) interpreting the data (7) legitimating the data and (8) drawing conclusions.

The first two points have been addressed. Next the mixed-method research design undertaken in this dissertation is presented. Step 4 to 8 will be described in each empirical study i.e. exploratory and explanatory research.

3.3.1 Types of mixed-methods research designs

Johnson and Onwuegbuzie (2004) clearly distinguish between mixed-models and mixed-methods research designs, as shown in Figure 3.2. A mixed-models research design is a mixture between qualitative and quantitative inquiries within/across the stage of research process (design 2 to 7). A mixed-methods research design is similar in that qualitative mini-study and quantitative mini-study are undertaken together in one overall research but the findings of each method have to be integrated at some point in the research. In sequential manner, a qualitative study is carried out to inform a quantitative study. In concurrent manner, a qualitative study is conducted concurrently with a quantitative study and the findings of both are integrated during the interpretation. The two fundamental decisions have to be made based on ‘weight’ and ‘timing’. ‘Weight’ is a level of reliance determined to each method i.e. equal or unequal whereas ‘timing’ denotes which method is antecedent to another i.e. sequential or concurrent.



‘QUAL’ or ‘qual’ denote qualitative; ‘QUAN’ or ‘quan’ denote quantitative; ‘+’ denotes concurrent; ‘→’ denotes sequential; capital letters denote high/low priority and vice versa.

Figure 3.2: Mixed-models research designs versus mixed-methods research designs
Source: Adapted from Johnson and Onwuegbuzie (2004)

A graphical framework provided Golicic and Davis (2011) may be more understood (Figure 3.3). They describe four research purposes for mixed-methods research designs: (1) development i.e. one study informs a subsequent study meanwhile findings are compared (2) initiation i.e. a less heavily weighted study informs a subsequent main study meanwhile a discussion is derived mainly from the main study (3) complementarity i.e. two or more studies observe the same phenomenon meanwhile results are concurrently reported and (4) interpretation i.e. a second study is concurrently uses to explain or confirm the main study meanwhile results are concurrently reported.

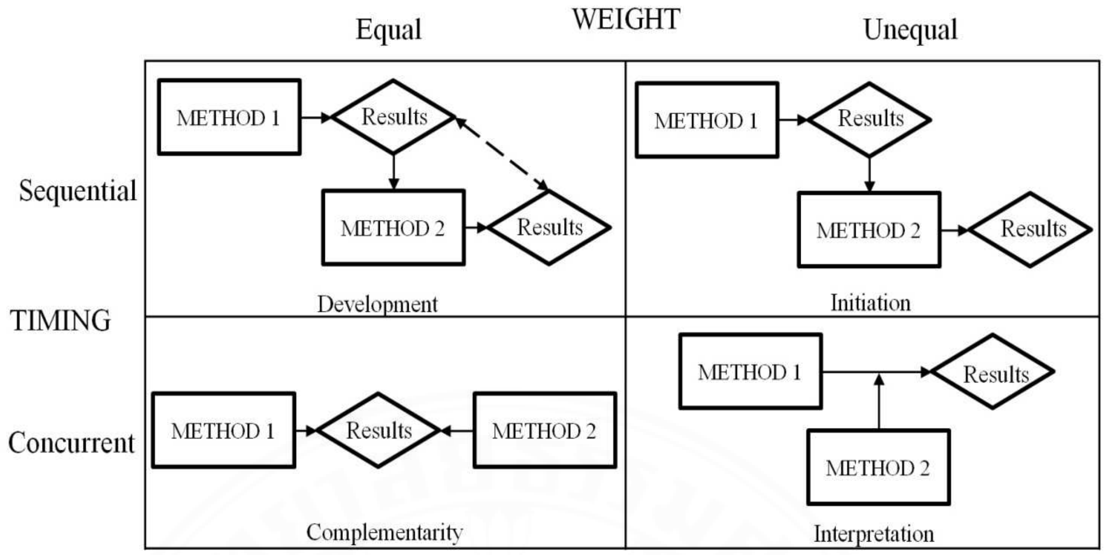


Figure 3.3: Mixed-models research designs

Source: Adapted from Golicic and Davis (2011)

3.3.2 The mixed-methods research design of the research

The author was inspired by two studies in the carpooling literature that employ a mixed-methods research design (Margolin et al., 1978; Shaheen et al., 2016). These researchers employed a qualitative method and used findings to guide the following surveys which aimed to test a set of formulated hypotheses. By adapting Golicic and Davis's (2011) and Johnson and Onwuegbuzie's (2004) frameworks, the mixed-methods research design of the dissertation is proposed as a 'Development Design' (Figure 3.4).

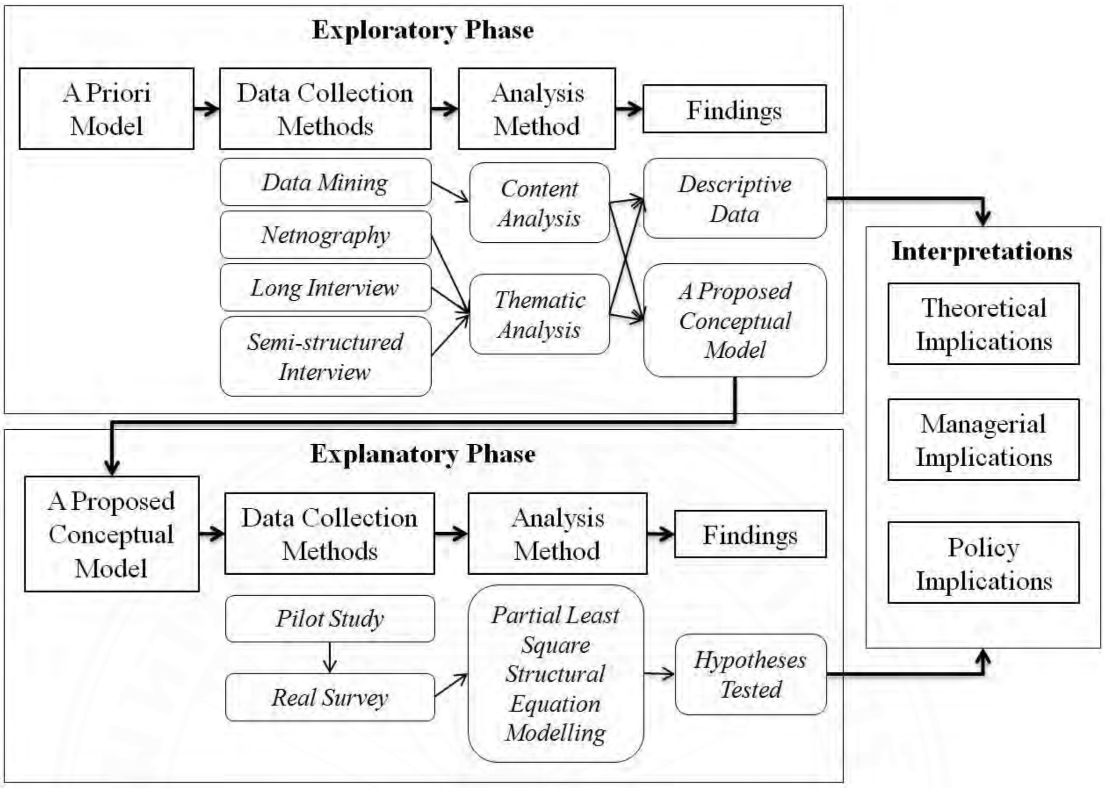


Figure 3.4: The mixed-models research design undertaken in the dissertation

Figure 3.4 illustrates the mixed-methods research design of the dissertation which is a 'Development Design'. Because we do not know the driver's perspective regards motivations, perceptions and intention to carpool via a platform, an exploratory empirical research should be initiated based on a priori conceptual model. By means of interviews and netnography as well as thematic analysis, the research will be conducted and should provide insights which can be used to revise the a priori conceptual model and propose a conceptual model. The proposed conceptual model is, therefore, the information that the former study informs to the latter one: the explanatory empirical research. The explanatory study will be carried out with an aim to test hypotheses by means of survey method. The finding of the explanatory study together with those of the explanatory research then will be integrated and used for interpretations and for delivering implications.

3.4 Summary of the chapter

This chapter described the philosophy underlying the dissertation. Scientific realism or (realist) post-positivism is flexible in research methodology, research design, research method and analysis method. It is also pragmatic in that it should allow the author to choose the best approach of other paradigms. A mixed-methods research design undertaken in the dissertation is also illustrated. The research design is divided into the exploratory and the explanatory study. The next chapter provides the research methodology of the exploratory research.

CHAPTER 4
EXPLORATORY EMPIRICAL RESEARCH

The mixed-methods research design undertaken in the dissertation separates the dissertation's empirical research into two studies: exploratory and explanatory. The purpose of this chapter is to introduce research methods and explain the research process undertaken for the exploratory empirical study. The research undertaken in the exploratory research is presented (Figure 4.1). It is divided into five steps: (1) data scraping (2) determining carpooling population (3) collecting empirical data (4) thematic analysis and (5) generalising the identified themes to the population. The next section describes how the author scraping the data.

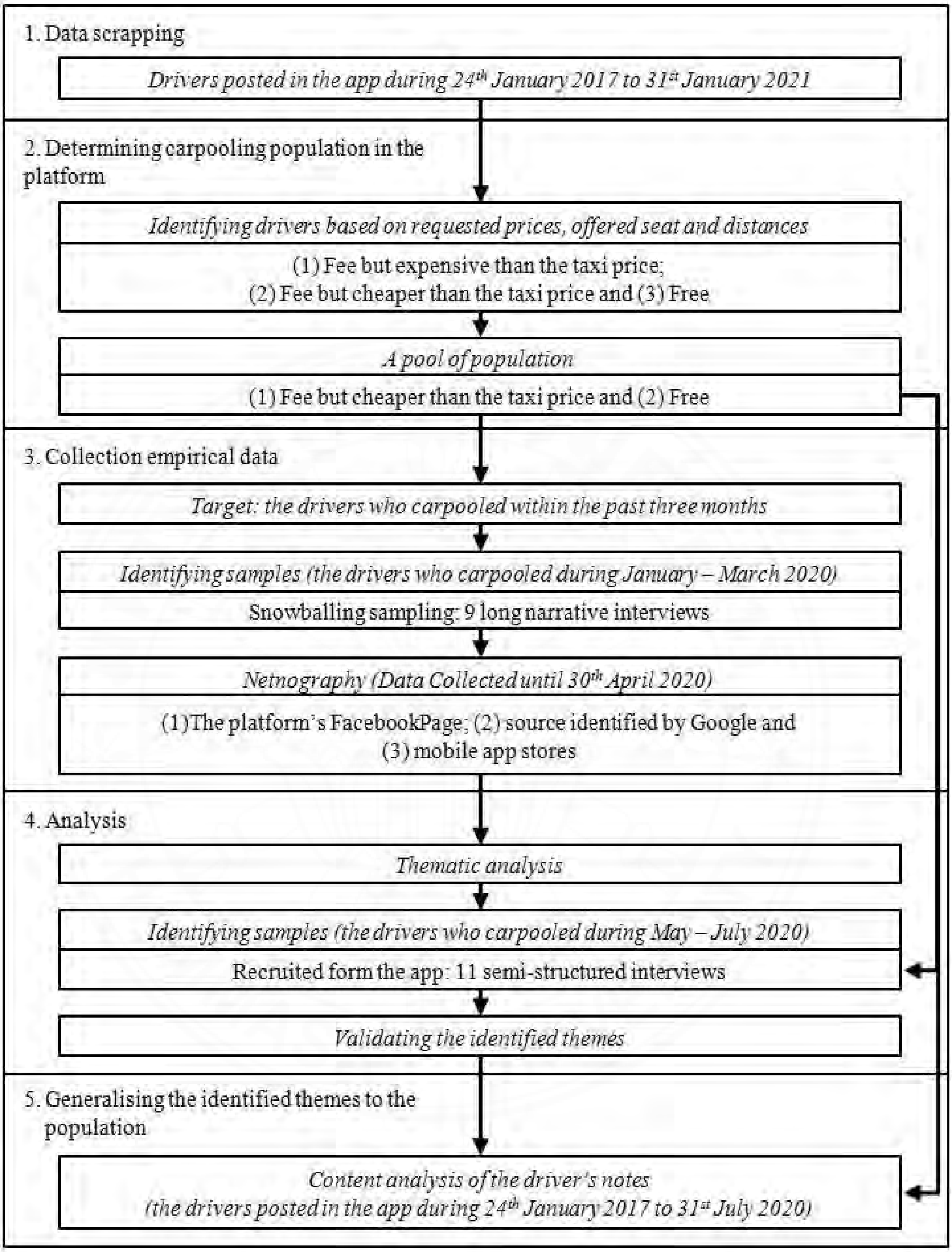


Figure 4.1: The research strategy undertaken in the exploratory empirical study

4.1 Step 1: data scrapping

The app's homepage publicly provides information about trips shared by drivers. To collect all drivers' posts, the author employed scraping technique i.e. an approach to extract data from an electronic source. This technique is legal and does not violate ethical issue as if those who produce data grant researchers an access (Krotov, Johnson & Silva, 2020). The author has been granted by LILUNA to collect the data appearing in the app (Appendix B); meanwhile the author has intended to conceal all drivers' identities (Kozinets, 2015).

Table 4.1 shows the types of the scrapped data that were derived from two methods. In November 2019, a research assistant who has an experience of data scraping technique using computer algorithm was asked to perform a data collection (hereafter *'the algorithm method'*). All drivers' posts and their information appearing on the app, since 2017 up until 10^{th} January 2020, were collected. The new data appeared after 10^{th} January 2020 to the end of March 2021 was daily collected by another research assistant using a manual scraping technique (hereafter *'the manual method'*). Data scrapped were origin-destination, distance, trip date and time, numbers of shared seats and seats left, requested fee, a car brand and model, car colour, a type of carpool, and the driver's trip note. The data scrapped by the manual method was validated by the author. Such data was re-checked by comparing every 18^{th} scrapped data with the factual data appearing in the app. The number of 18 was an average post per day, which was calculated by dividing the total posts drawn from the algorithm method (19,933) with the total days (1,085).

Table 4.1: Three sets of scrapped data

Set	Method	Time period	Days	Total posts	Used the data in			
					Exploratory study			Explanatory study
					S2	S3	S5	
1	Algorithm	24 Jan 2017 to 10 Jan 2020	1,085	19,933	✔	✔	✔	n/a
2	Manual	11 Jan 2020 to 31 Jul 2020	203	1,444	✔	✔	✔	✔
3	Manual	1 Aug 2020 to 31 Jan 2021	184	826	n/a	n/a	n/a	✔

‘S2’ denotes a set of data was used in ‘Step2: determining carpooling population’; ‘S3’ denotes a set of data was used in ‘Step3: collecting empirical data’; ‘S5’ denotes a set of data was used in ‘Step5: generalising the identified themes to the population’.

4.2 Step 2: determining carpooling population

Three types of carpooling drivers were observed: (1) drivers sharing seats for free (2) drivers sharing seats for fee but seemed to be less than their trip costs and (3) drivers who aim for profit-making. This initial observation was found similar to Guyader (2018) who indicates three types of drivers in BlaBlaCar: communalist, consumerist and opportunistic. Because LILUNA charges users no fees, drivers can request any price they desired. The definition of carpooling via online platforms proposed in Chapter Two posits that the drivers must not *“aim at profit-making”*, which means that they can charge some expense to riders but the charge must not exceed their trip cost. Yet, defining a cut point for the term ‘trip cost’ is challenging. A cost per trip, in layman’s terms, may be calculated by three variables including fuel price, trip distance and average fuel efficiency, as shown hereunder.

$$\text{Cost per trip (Baht)} = \frac{\text{Fuel price (Baht per litre)} \times \text{Trip distance (Kilometres)}}{\text{Average fuel efficiency (Kilometres per litre)}}$$

Employing such formulae to calculate a cut point has four limitations. First, the initial observation of the data indicated many types of car brands and models varying from a new model to 20-year-old cars. Another is that private cars in Thailand use many kinds of fuels such as gasohol, diesel, liquefied petroleum gas, and compressed natural gas (EPPO, 2018). The data scrapped does not inform the type of fuel they used. Next, a fuel price may be estimated based on some assumptions e.g. a price given by PTT Public Company Limited, we would never know from the data that which day a driver put in gasoline. Finally, assuming a cost per trip from the perspective of layman's terms is not realistic. Table 4.2 shows that cost components for the use of privately owned car can have many other costs rather than fuel cost. Determining a cut point using this approach is, therefore, not only impractical but also permeated with many known biases that cannot be reduced easily.

Table 4.2: Motor vehicle costs (adapted from Litman, 2009)

Dimension	Variable cost	Fixed cost
Market costs	Fuel Short term parking Vehicle maintenance Toll and highway fees	Vehicle purchase Vehicle registration Insurance payments Long-term parking facilities Vehicle maintenance
Non-market costs	User time and stress User crash risk	n/a

The author used a taxi price as a cut point for distinguishing the drivers offering seats without a profit motive from those aiming at profit-making. The author is also aware that a taxi price is already added with profit. However, it can be argued that the current rate of taxi price cannot generate enough profit to taxi drivers. News reports that taxi drivers often demand the government to increase the rate (Thairath, 2019; The Standard, 2019). This is because the rate is determined by Department of Land Transport and is an institutional policy standard, which may not be used to reflect the real taxi price. Besides, the rate has been revised for three times in which the last time was in 2019 (The Standard, 2019). Furthermore, it is found that most of taxis use liquefied petroleum gas (LPG) and compressed natural gas (CNG) whereas most of private cars use gasohol and diesel, which have higher prices than LPG and CNG (EPPO, 2018). Thus, using the rate of 2019 as a cut point should not create severe bias. The rate of 2019 is presented in Table 4.3.

Table 4.3: The 2019 taxi price rate (Department of Land Transport)

Distance range	Price per kilometre (Baht)
Within 1 kilometre	35.00
1 – 10 kilometres	6.50
10 – 20 kilometres	7.00
20 – 40 kilometres	8.00
40 – 60 kilometres	8.50
60 – 80 kilometres	9.00
More than 80 kilometres	10.50

Initially, drivers were classified into those offering seats for free (hereafter '*Free*') and those offering seats in exchange a fee (hereafter '*Fee*'). To create a cut point between aiming and not aiming at profit-making, a calculation method was developed as following:

Potential revenues generated from a trip (Baht) = The number of seats offered × The fee requested per seat.

The 'potential revenues generated from a trip' for each driver was compared with the taxi rate, which taken into account of distance. 'Fee' drivers were classified further into two: (1) drivers who requested a fee lower than the taxi price and (2) drivers who requested a fee higher than or equal to the taxi price. The latter was excluded from the population, as this dissertation focuses on the drivers who did not aim at profit-making. In the population pool, there were two types of drivers based on carpooling experience: those who had experienced carpooling via the platform and those who shared seats via the platform but had not been matched. It can be observed by subtracting the seats left from the total shared seats. A zero value means that a driver had no seat occupied in that trip. Next, the dissertation proceeds with empirical data collection.

4.3 Step 3: collecting empirical data

Based on the fact that we do not know much about the driver's perspective, the first research question is reiterated: *what make carpool drivers in the platform share their seats and drive for strangers, can the sixteen psychological factors found in the literature and the elements in Technology Acceptance Model be used to explain such behaviour, and are there any other factors that are important?*. Two objectives are proposed: to understand motivational factors for the drivers to carpool via a platform, and to propose a conceptual model for investigating the relationships between motivational factors and the drivers' future carpooling decisions via the platform.

It is noted earlier that an understanding of carpooling motivations requires a variety of data collection methods (Nielsen et al., 2015). Furthermore, observing carpooling via online platforms should need a research method that allows researchers to explore the online realm (Guyader, 2018). Therefore, research methods to be used in the exploratory empirical research should provide insights into the drivers' perceptions and motivations in terms of their experience of using the platform and of carpooling. A qualitative collection of data was based on two methods: long interview and netnography.

4.3.1 Long interview

Long interview is an interview method proposed by Grant McCracken, a methodologist in anthropology. McCracken (1988) suggests that the method provides researchers an access to the experiences and the mental world of an individual. It facilitates an understanding of how participants define a meaning of the phenomena and how they experience it. Further analysis based on the data obtained by long interview can provide new understandings that may not be able to discover by the numerical intensive research (McCracken, 1988). Thus, long interview was used, as the main method for collecting the data about motivations and perceptions, to discover the drivers' perceptions, motivations and experiences of carpooling via platform.

In approaching informants, a purposive strategy is appropriate rather a random strategy, as the former will lead a researcher to a particular group of people who are the interest of research (Hammersley & Atkinson, 2007; Jorgensen, 2015; McCracken, 1988). Nine informants were contacted using snowballing sampling through LILUNA and comprised the drivers who had experienced carpooling via the platform during January to March 2020. Four informants were contacted face-to-face at the first time during January to February 2020, the time before Covid-19 hits. The other five were interviewed via Zoom during March 2020. All informants were informed of the research purpose and asked to consent (Appendix B).

After rapport was established with informants, they were asked in Thai with open-ended, loosely-structured and non-directive manner questions (Spradley, 1979). Questions were probing questions (see Appendix C), rather 'why' or 'what do you mean by that?' because the latter is pushing informants to give reasons rather than reveal real meanings (Spradley, 1979). Exploratory questions were first asked whereas the following questions were emerged from an informant's answers of the previous question (McCracken, 1988). The author listened to informants in a nonjudgmental manner and restated what the informant said before asking them about what they said (Spradley, 1979).

A narrative interview technique is useful when the domain of research is not known to researchers (Morse, 2012). Methodologists in phenomenology have developed the narrative interview technique to be used to facilitate an interviewer to see informants' particular events (Thompson, Locander & Pollio, 1989). Narrative is "a story that tells a sequence of events that are significant for the narrator and his or her audience. […] It has a plot, a beginning, a middle and an end [which come in terms of relative] events in a temporal, causal sequence" (Denzin, 1989, p. 37). Thus, the narrative technique brings a researcher to be a good listener who is interested in understanding of the informants' live experiences and how they make sense of their experiences (Mishler, 1991). A narrative interview technique was, thus, employed together with the long interview in order to facilitate the author's understanding of the driver's carpooling experiences and meanings. Fieldnotes were created along each interview. All interviews were audio recorded, with permission from informants, and transcribed verbatim in Thai language.

Table 4.4: The informants participated in long interview sessions

#	First appeared	Total time offering	Total matched	Average distance in kilometres	Average price charged in Baht	** Sessions (approx. total duration)
1	Sep 2019	50	4	59.87	0	1 (2 hr)
2	Jul 2017	16	2	43.53	15.93	1 (1 hr)
3	Jan 2020	4	1	127.50	0	3 (4 hrs)
4	Dec 2019	8	2	296.31	*400.00	3 (3 hrs)
5	Apr 2019	115	7	25.92	32.61	2 (2 hrs)
6	May 2017	28	13	314.40	100.00	2 (2 hrs)
7	Dec 2019	18	4	281.11	52.55	1 (1.30 hr)
8	Dec 2019	6	2	365.20	300.00	1 (1 hr)
9	Jan 2020	3	1	956.46	600.00	1 (1 hr)

'#' denotes informant.

* The informant requested a price but did not charge riders.

** The time recorded excludes the author's introductory speaking (e.g. research questions and the respondent's right) and the research debriefing.

Table 4.4 illustrates the profiles of nine informants who participated in the long interview sessions. It must be noted that this table is derived from the data during 24 January 2017 to 31 July 2020 when the long interviews were undertaken. It is observed that most informants had carpooling experiences and their trips were a long-distance carpooling. Three of them shared riders for free, except *Informant-4* who requested a price but did not charge. Some informants were interviewed more than once. An average time for total interview sessions for each informant was ranging from one to four hours. For example, *Informant-3* was participated three interview sessions, which totally lasted for four hours.

4.3.2 Netnography

Nethnography is a research method that allows researchers to study online social phenomena as in a natural setting (Kozinets, 2010). Netnographers utilise available online data sources such as social networking sites (Facebook, YouTube and Wikipedia), microblogs (Twitter, blogs, forums) and other communicative sites found by using search engines (Kozinets, 2015). Participant observation can be done as in a form of online fieldwork, which produces output are such as text messages, photo, pictorial and video (Kozinets, 2015). Furthermore, netnography allows researchers to conduct a study in unobtrusive manner, as it is an "option of invisible lurking" (Kozinets, 2010, p. 56).

Kozinets (2015) classifies types of netnographic data into three: archival data, elicited data and fieldnote data. Archival data is the existing data collected from social media communities which is often an historic record. Elicited data is a co-created data between researchers and community members such as online discussions and conversations that have researchers' involvements. Fieldnote data is researchers' notes of their participations, reflections and interactions when they are observing an online community.

A critical ethical issue is concerned with whether people who create online data permit researchers to use such data for the purpose research or not. Kozinets (2015) notes that the "use of spontaneous conversations [as well as] existing documents or records that are publicly available [makes] this research qualifies for a human subjects exemption" (Kozinets, 2015, p. 141). In this dissertation, netnographic data were gathered from public online sites. LILUNA can be also considered as a public online site because anyone can download, register and see drivers' posts.

Netnography was conducted, as it can help gather online social phenomena regard carpooling via LILUNA. Archival data were collected from social networking sites including the platform's Facebook Page, the app's IOS and Android app stores, and other communicative sites that involved with the platform and were indicated by a search using Google. Fieldnotes were taken when the online realm was explored. Table 4.5 illustrates the netnographic sites.

Table 4.5: Netnographic sites

Sources		Amount of data	Description
LILUNA's Facebook-page	Review page	42 posts	People reviewed about the app and talked carpooling.
	Public posts	209 posts	People reviewed their uses of the app.
	Homepage	1,020 feeds	People interacted with the posts created by the platform.
Video interviews	Television program	1 record (50 min)	A television program in Thailand invited the owner of the platform to present his developed mobile application. Audiences provided comments and stated their intention to use the app
	Video promotions made by the platform	2 record (5 min)	The platform's owner interviewed his users.
	An interview recorded by a public page	1 record (23 min)	The record is an interview between an interviewer and a driver, who made an appointment via the app.
	An interview recorded by a large university in Thailand	1 record (5 min)	The university interviewed the app's users.

Table 4.5: Netnographic sites (continue)

Sources		Amount of data	Description
Online search via Google	Public posts and comments in three public Facebook pages	562 posts	Three Facebook pages were identified: two of IT-related pages and one crime-related page. People commented about the app and carpooling.
Mobile app stores	IOS	49 comments	Users commented about the app and carpooling.
	Android	111 comments	

4.4 Step 4: analysis

4.4.1 Thematic analysis

A thematic analysis “is a method for identifying, analysing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail” (Braun & Clarke, 2006, p. 79). Scientific realists can employ thematic analysis to theorise “motivations, experiences and meanings in a straightforward way” (Braun & Clarke, 2006, p. 87). The method has been also used for transport research (Ross et al., 2012; Bejarano, Ceballos & Maya, 2017).

In this dissertation, the aim is to look for prior themes suggested in the literature i.e. 16 psychological factors and to identify emergent themes that might expand our current understanding of carpooling via online platforms. A thematic analysis was carried out following guidelines provided by Braun and Clarke (2006): (1) familiarising the data as well as noting down initial ideas (2) generating initial codes (3) searching for themes as well as gathering all data relevant to each potential theme (5) reviewing themes by checking if the themes work in relation to the coded extracts and the entire data set, and (6) defining and naming themes. Netnographic archival data, interviews data and fieldnotes were reviewed iteratively in triangulation fashion. Interesting information and ideas were noted in memos. Initial codes were developed by putting together fragmented data, ideas, fieldnotes and memos that represented similar features. Themes were later developed by collating similar codes and classifying them into a theme. This process reduced the data set but keeping themes link to the original data. Identified themes which include codes and relevant data were compared to each other in a tabulation format. Before naming the identified themes, semi- structured interviews were carried as described hereunder.

4.4.2 Semi-structured interview

Semi-structured interviews were conducted in order to confirm that no important details were omitted as well as to confirm identified themes emerged from analysis (Cachia & Millward, 2011). Thirty-four potential informants who shared seats in the app were contacted during May to July 2020. Eleven informants (32% response rate) participated in semi-structured interviews via telephone. Their profiles are shown in Table 4.6. These informants were asked in Thai with a fixed set of probing questions adapted from the questions used in long interviews: what make you use LILUNA and what do you think about carpooling via the app? Some informants were asked with other questions based on their answers. All interviews were audio recorded, transcribed verbatim in Thai and used in triangulate with the identified themes and other sources of data. All identified themes were named with regard to all codes and relevant data. A set of selected data, codes and identified themes were presented to 12 informants and two admin officers of LILUNA who have responsible for monitoring LILUNA’s Facebook Page. They agreed with the syntheses. All findings were translated to English, validated using back translation (Chen & Boore, 2010) and are presented in the next chapter.

Table 4.6: The informants participated in semi-structured interview sessions

#	First appeared	Total time offering	Total matched	Average distance in kilometres	Average price charged in Baht	* Sessions (approx. total duration)
10	Apr 2019	21	11	359.98	216.66	1 (30 min)
11	Jan 2020	3	1	715.50	400.00	1 (30 min)
12	Jan 2020	25	2	569.64	424.00	1 (20 min)
13	Apr 2019	27	3	184.26	277.77	1 (1 hr)
14	Oct 2019	18	2	103.33	110.79	1 (10 min)
15	Jan 2020	7	1	271.29	208.42	1 (30 min)
16	Jan 2020	2	1	419.00	200.00	1 (25 min)
17	Aug 2019	20	1	98.68	111.50	1 (25 min)
18	Dec 2019	3	2	164.33	50.00	1 (15 min)
19	Jan 2020	4	1	221.25	125.00	1 (15 min)
20	Jul 2019	11	2	772.18	72.00	1 (50 min)

'#' denotes informant.

* The time recorded excludes the author's introductory speaking (e.g. research questions and the respondent's right) and the research debriefing.

It must be noted that the aim of long interview versus semi-structured interview were not similar. While the former was used for gathering the main data source, the latter was used to confirm the identified themes. It is observed in Table 4.6 that some interviews were last about 10-15 minutes. A critical question is that are they valid to be used? The literature regards interview method does not provide any recommended duration. This is because an interview's length depends on the aim of research, the context and the time-availability of each informant (Cachia & Millward, 2011; Sobo, 2005). An interview may be lengthy around one to eight hours if we want to explore experience (McCracken, 1988; Corcoran & Stewart, 1998; Martin, 2007). It could be short, for example 10-15 minutes if we just want to identify the components obtained from the literature (Francis & Baker-Henningham, 2020; Sobo, 2005). Thereby, all interview data were valid to be used for a particular purpose of study. Furthermore, because triangulation is benefiting to any qualitative research, all interview data were also used in triangulation with the netnographic data. These data were empirical evidence provided to support propositions and arguments, which are presented in the findings.

4.5 Step 5: generalising the findings to the population

Content analysis is a systematic technique for coding, categorising and compressing large amounts of textual data into content categories that are developed based on explicit rules of coding (Krippendorff, 1980). It can be used to identify “who say what” and then derive findings in terms of the frequency of its occurrence (Vaismoradi, Turunen & Bondas, 2013). Content analysis has two types: induction and deduction. The former has an aim similar to thematic analysis while the latter involves testing of identified categories (Elo & Kyngäs, 2008). The content analysis undertaken in this dissertation was a deductive content analysis. The aim was to test whether the themes identified from the results of thematic analysis can be found in the population or not. In other words, we look for how many carpool drivers in LILUNA mentioned words related to the identified themes. Data used were the drivers’ trip notes. The procedure carried out was followed the guideline provided by Elo and Kyngäs (2008) and Neuendorf (2017).

Drivers’ statements in the drivers’ trip notes were varied, for example, trip purposes, detail of trip, car rules for riders, and reasons for sharing seats. A codebook, which was developed from the results of thematic analysis, was used to train a coder with a selected 1,000 posts with the drivers’ trip notes (approx. 10% of sample). The aim was to look for keywords/sentences about the drivers’ reasons for sharing seats. The codebook was improved iteratively. Disagreements were solved by consensus. Finally, the author and the coder independently coded all notes (10,259 drivers’ trip notes) using the final version of codebook. Cohen’s kappa statistic was used to assess the degree of agreement between the two coders (Neuendorf, 2017). The score of 0.87 indicated good inter-rater reliability. Disagreements were solved by the advisor. The result of content analysis is presented in the next chapter.

4.6 Summary of the chapter

This chapter discusses the research process carried out in the exploratory empirical research. Data scraping technique was carried out to collect drivers' posts appeared in the app. A cut point was developed and used to distinguish the drivers with profit motive from those who offered seats without a profit motive. The latter group was the unit of analysis for the dissertation.

Empirical data was collected using two methods: long interview and netnography. While the former method facilitated the author's understanding of the informants' meanings and experiences of carpooling, the latter allowed the author to explore the online realm. A thematic analysis was employed to analyse the obtained data and derived a number of identified themes. Such themes were used to develop a codebook which was later employed in a content analysis. The next chapter presents the findings of the exploratory research

CHAPTER 5
FINDINGS OF EXPLORATORY EMPIRICAL RESEARCH

Chapter Four demonstrated the research process carried out in the exploratory study. The purpose of this chapter is to provide the findings derived from the exploratory empirical research. It starts with an overview about the drivers in the app and is followed by the role of platform from the driver's perspective. Motivations to carpool via the platform are described next and then the result of content analysis is reported. Finally, theoretical discussions are given and a conceptual model is proposed based on all findings.

5.1 An overview regards the drivers in the app

LILUNA is a forum type, which minimised its involvement with users and acted like a market place for drivers and passengers to communicate, coordinate and form carpools. Drivers and riders could see information of each and used such information to decide whether to request for a ride (for the passengers) or to accept riders' requests (for drivers). They could communicate through a private chat provided in the app and use the chat to coordinate and form a carpool. Once carpool completed, riders paid fees to a driver privately without any involvement of the platform. LILUNA did not gain revenue from the users. This phenomenon is observed in the platforms opening in new markets (Täuscher & Kietzmann, 2017). Since it did not charge service fees, there were two observed types of drivers (Table 5.1). About 95 percent of posts in the app were aimed for incentives ('Fee') while the remainders were not ('Free').

Table 5.1: Drivers offering seats in the app from 2017 to the end of July 2020

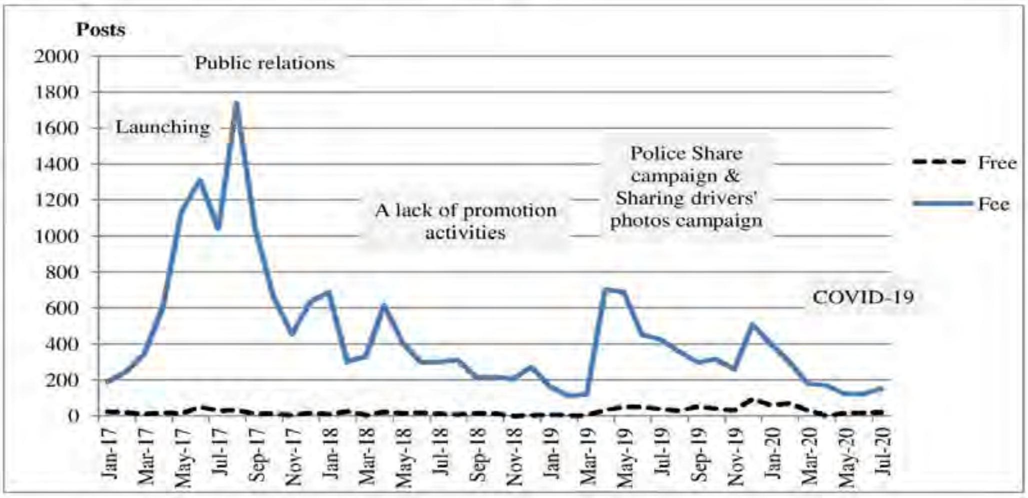
	Total	Fee		Free
		Higher than the taxi price	Lower than the taxi price	
Number of posts	20,455	2,268	17,159	1,028
Percentage of total posts	100	11.09	83.89	5.03
Number of IDs*	4,719	676	4,159	409
Percentage of total IDs*	100	14.33	88.13	8.67

* One driver can post in both categories

Findings revealed five phases of the platform’s timeline (Figure 5.1): launching, public relations through news and media, a lack of promoting activities, ‘Police Share’ and ‘Sharing Drivers’ Photos’ campaigns, and the coronavirus disease (COVID-19) outbreak. The ‘Police Share’ and ‘Sharing Drivers’ Photos’ campaigns could gain the drivers’ attentions.

Informant-1: *I feel more secure since the [Police Share] campaign has launched. Criminals should be fear of. They should know that polices are involved.*

Informant-3: *I saw others have their photos on the platform’s Facebook. I want to join this.*



Police Share campaign is a carpooling campaign that encourages police officers to share their motorcycle seat with people.

Figure 5.1: Number of posts.

During the COVID-2019 pandemic, ‘Free’ drivers showed a huge drop. Some informants stated they desired social distancing rather carpooling whereas some others perceived the situation as an opportunity for receiving some cash as public transport between cities had limited for a period. The latter case was also observed in BlaBlaCar Europe where the regions severely impacted by the COVID-2019 had few trips with high prices (Ivaldi & Palikot, 2020).

Informant-1: *I have kids and don’t want that risks. The COVID-2019 makes me stop posting.*

Informant-5: *[Carpool] is not a career, right? So, those posting at this risky time want money. But not me! Why I have to take risks? Before [COVID-19], I saw many free offered seats. But now they want money.*

Informant-6: *Transports between cities are closed. Just get someone in your car, travel together and get some cash.*

Informant-15: *During the COVID-2019, people don’t go outside their homes. My revenue from Grab decreases but I want to save fuel costs. The city [I went to] is closed. Buses are limited. People can’t easily go anywhere. I picked them with cheaper prices than Grab did.*

5.2 The role of platform

The role of platform was critical to the informant's decision making. Some informants, even they desired to share their empty seats to strangers, had not been carpooling prior to the emergence of LILUNA. This suggests that the platform was a trigger for them to share seats to strangers. For the case of Thailand, when there was no platform, there was no facilitator that triggered people to carpool.

Informant-1: *I want to do this [sharing seats to strangers] for long time. LILUNA satisfies my need. I have not seen any app that can provide me an activity like this. Posting on my Facebook Page, I got only my friends. We carpool every time we match.*

Informant-3: *I have never picked up strangers […] but I saw people waiting at a bus stop and though whether they can go with me. It would be good if we know each other and travel together. Indeed, I have thought of some apps like LILUNA. There should be an app or an online group allowing me to do this [sharing seats to people waiting at a bus stop]*.

Drivers perceived the platform was useful as regard to four important aspects: providing passengers' information, facilitating communication, improving decision making and reducing a feeling of shame (Table 5.2). The app provided basic information of potential passengers to the driver, which allowed the drivers to communicate with the passengers, screen them before deciding whether to accept a passenger's request for a ride. A difference between carpooling via carpooling platforms and carpooling without the use of platform is that the technology has impact on consumer decision-making process (Dong et al., 2018). Informants who had experienced casual carpooling extended that carpooling via the app was intentionally rather accidentally.

Informant-6: *Picking up a hitchhiker was accidental. I just wanted to help him. I wasn't wandering around a city to pick him up. But carpooling via the app was intentionally. We made an appointment. I knew where to go get them, could plan to get them or even made a detour*.

Table 5.2: Drivers' perceptions towards the app

Theme	Code	Selected sentences (Sources)
Perceived usefulness	Passengers-related information	"I looked at his picture and searched his name in Google." (*Informant-1*) "The app has information about passengers. I can screen them in advance." (*FB*)
	Communication	"I chatted with her then made a call to set a meeting point." (*Informant-3*) "I can contact a passenger through a chat or a call. It's easy to set an appointment." (*FB*)
	Better decision making	"I can decide whether to accept passengers or not. But in casual carpooling I have to decide within seconds." (*Informant-4*) "I listened to their talking styles. I rejected those who were so demanding." (*Informant-12*) "I knew from his chat that he flirted with me. I rejected him." (*Informant-17*)
	Reducing a feeling shame	"The app helped me find passengers. I felt shame ('na taek') when invited strangers but they denied." (*Google*)
Perceived ease of use	User experience	"It is easy to use." (*FB, Informants*) "The chat room is easy to use." (*FB, Informants*) "I can fill-in data easily." (*FB*)
Attitude	Attitude	"The app is good. I like it." (*FB, Informants*) "Such a good idea!" (*FB, Informants*) "I like the app." (*FB, Informants*)
Subjective norm	Social norm	"My boyfriend was born in Western where carpool app is not new. He convinced me to try it" (*Informant-3*)

'*FB*' denotes the platform's Facebook Page.

The app also played an important role in reducing a chance of the emotional hurt of shame. Thais compare this feeling to the physical hurt of being hit on the face i.e. broken face or ‘na taek’ (Komin, 1991; Ukosakul, 2003). Such feeling is in accordance with the collectivist characteristics in which collectivist people care much about loss of face and often feel shameful if they are fail to get the approval of the collectives (Hofstede, 2011; Hui & Triandis, 1986). Evidence shows that when collectivist individuals do something wrong of fail to achieve something, they often feel shameful and embarrassment, which are threatening to one’s face and leads them to find any remedy to reduce such negative emotions (Lewandowska-Tomaszczyk & Wilson, 2017). Some drivers of LILINA stated this situation might occur when they invited stranger passengers to sit in their cars but were denied. Such denial may make them feel loss of the approval from the stranger passengers. The drivers who expected such failures did not know how to resolve such situation and did not want to share seats without the use of platform. The platform, thus, acted as a mediator between the drivers and strangers (Benoit et al., 2017). Instead of being one who was actively wandering around to find potential stranger passengers, LILUNA allowed the drivers to play a passive role in that they were waiting for any passenger who would first contact the drivers.

Apart from perceived usefulness (PU), keywords were observed about perceived ease of use (PEOU) of the app and the concepts of attitudes and subjective norms. The latter two concepts were not included in our a priori model. However, such concepts are observed in other extended Technology Acceptance Model or extended TAM (King & He, 2006). In summary, TAM helped understand drivers’ perceptions towards using the app. Yet, some themes/factors did not appear to be discussed in the literature.

5.3 Motivations to carpool via the platform

Table 5.3 summarises the drivers’ motivations to carpool. Several identified factors are already suggested in the literature on casual carpooling: save cost, road safety, save time, gaining friends and friendship, socialising, a sense of belonging, helping others and save the environment (Tahmasseby et al., 2016; Shaheen et al., 2017). The results extend our understanding of such factors.

Table 5.3: Drivers' perceptions towards carpooling via the app

Theme	Codes	Selected sentences (Sources)
Saving costs	Sharing toll fees and fuel costs	"It was about sharing the costs. I did charge him fuel cost but toll fees." (*Google*) "I could go to the destination by letting passengers paid the fuel cost" (*FB*) "I saved my money. Didn't have to pay all by myself." (*Informant-12*)
Beverages/meals	Buying drinks, coffee, snacks and meals	"I said I'm not charging you money. Just buy me a meal" (*Informant-4*) "He bought me a lunch and beverages. I didn't request. It was his goodwill." (*Informant-7*)
Saving time	Saving time as a consequence of traffic congestion reduction	"It would make us travel faster, as cars reduced" (*Informant-20*)
Road safety	Passengers helping watch the roads, cars and routes	"She warned me twice before I would crash the front car" (*FB*) "She helped me watch cars and the roads. [...] This reduced my accidental risks" (*Informant-4*) "Got someone sitting and talking with. I wasn't fall asleep. Driving alone and opening music didn't help." (*Informant-16*)

'*Google*' denotes the sources found from Google search; '*FB*' denotes the platform's Facebook Page.

Table 5.3: Drivers' perceptions towards carpooling via the app (continued)

Theme	Codes	Selected sentences (Sources)
Helping driving	Passengers helping driving	"I wanted companion to talk and help me drive." (*Informant-9*)
Not feeling lonely	Not feeling lonely as a consequence socialising	"Talking made me not feeling lonely" (*FB*) "Companion made me not feeling lonely." (*Informant-13*) "Driving alone is lonely." (*Informant-14*)
Friends for future benefits	Getting friends for future benefits; companion/friends could be future customers	"We are friends. But I could get customers […] I talked and asked about their careers. They could become my customers." (*Google*) "Friendship is a starting point. In the next time I visit their cities, they may suggest me sightseeing places." (*Informant-11*)
Friends for socialising	Gaining friends for socialising; feeling enjoy and pleasure when socialising with carpooling participants	"We had a good friendship." (*FB*) "It was a sitcom. We made jokes along the way." (*FB*) "Meeting new friends, especially women, Haha!" (*FB*) "We had not even slept but were talking and making jokes. It was a very funny trip" (*FB*)
Nostalgic thoughts	Enjoying thinking of my old-days casual carpooling	"[Carpooling] reminds me when I was a hitchhiker. I was them. I know their feelings." (*Informant-4*)

'*Google*' denotes the sources found from Google search; '*FB*' denotes the platform's Facebook Page.

Table 5.3: Drivers' perceptions towards carpooling via the app (continued)

Theme	Codes	Selected sentences (Sources)
Opening to new experiences	Enjoying first-time carpooling; enjoying knowing new experiences	"I was excited. It was my first time driving for strangers" (*FB*) "I met people working in different careers. We talked and exchanged information" (*FB*) "It was my first time singing with strangers in my car" (*FB*)
Helping others	Helping passengers save cost, giving them more comfort and convenience and getting them their destinations faster	"I didn't accept money […] I had to go there anyway. Money isn't worth in my carpooling. It is about helping." (*Informant-1*) "I helped him reduce travel costs. Sitting in my car was comfort than in buses and quicker in getting to his destination." (*Informant-2*) "I want to help people. I thought of such kind of app so long. The app must be used for helping people!" (*Informant-3*)
Empathy	Feeling empathy towards passengers	"I and my wife travelled in a full-loaded car. I knew how hard it was. When I saw them I saw myself in the past." (*Informant-7*) "People might be fear of Southern guy. I used to be fear of them. I understand travellers' feelings." (*Informant-17*)

'*FB*' denotes the platform's Facebook Page.

Table 5.3: Drivers' perceptions towards carpooling via the app (continued)

Theme	Codes	Selected sentences (Sources)
Feeling good after helping	Feeling pleasure when helping strangers	"I was so happy that I helped people" (*FB*) "When I delivered her, I felt so good. I use the app because I want to help people." (*Informant-3*)
Belonging	Feeling pleasure as a consequence helping	"We live in the same city. We have to help each other" (*FB*) "We are Thais; we help Thais" (*TV*)
Self-image	Wanting passengers to admire at drivers	"I was so nice to her. She should like me." (*Informant-17*)
Saving the environment	Reducing traffic-related air pollution	"My carpooling helped reduce cars on the roads and pollution" (*FB*) "I had a part in reducing the world pollution" (*FB*)
Merit	Helping strangers to gain merits or to get good reciprocates in the future	"Sharing [seats] is merit making. I believe good things will come to me in the future." (*Informant-5*) "Helping [sharing seats] is merit making." (*Informant-16*)

'*FB*' denotes the platform's Facebook Page; '*TV*' denotes the perception of the audiences in a television program.

5.3.1 Monetary/non-monetary and functional benefits

Cost saving is the primary factor for carpooling (Standing et al., 2019). One informant insisted that passengers had to pay as sitting in his car increased his responsibility.

Informant-2: *My responsibility increases. I have to wake up on time. I can't be lazy, as I could miss the meeting time.*

Some carpooling drivers seem less economically motivated (Guyader, 2018). Results show that some drivers did not need money but could drive for free or for other non-monetary compensation such as meals and beverages.

Informant-13: *I just share seats and don't want money. [...] Passengers told me they didn't have money. I said just come and buy me a cup of coffee.*

Informant-14: *Fees are set like arbitrary. I don't want money.*

Road safety was stated in terms of "Make my trips safer" in (Shaheen et al., 2017, p. 191). Our results show that some drivers felt safer when they had passengers helping them watch cars and the roads and preventing them to fall asleep. Helping the driver driving the car was the other topic emerged.

5.3.2 Relationships between carpooling participants

One reason a driver looks for someone to sit beside them is that driving alone for a period of time makes drivers feel lonely; i.e. persons temporally withdrawn from social contacts can feel lonely (De Jong Gierveld, Van Tilburg & Dykstra, 2006). Meeting people, finding companions and gaining friends were observed many times in our data. Based on Spencer and Pahl (2006), there were two observed types of 'friends' in carpooling: (1) 'associates' are friends who meet in a carpooling context and share common activities e.g. travelling and socialising and (2) 'useful contacts' are friends who exchange information and have a willingness to give advices in the future. The 'associates' was observed in most of carpooling cases we explored. A relationship between carpooling participants is dynamic rather static. Participants started from strangers and increased intimacy along the way.

Informant-3: *At first, we did talk much. Later, we told our stories […] talked more about our private lives and lovers […]. Then, our talking didn't stop! HaHaHa! She started to call me 'jae' [older sister].*

Interestingly, some drivers expected their relationship to be developed beyond the aforementioned. I.e. they expected some passengers to be their future customers.

Informant-15: *I got some money [from carpool] but my [Grab] customer base is increased. I accept few revenues now but may gain future customers. Revenues [for Grab] will increase.*

The concepts about nostalgic thoughts and opening to new experiences were emerged. Nostalgia is an emotional stage which refers to a personally experienced past (Wildschut, Sedikides, Arndt & Routledge, 2006). One informant stated that carpooling reminded him about his old-day hitchhiker. Opening to new experiences was observed in our result. In the literature, this theme is indicated from the passenger's perspective (Guyader, 2018). For some drivers, it was their first time to carpool and do activities in the carpool e.g. singing, hearing stories and making joke with strangers. Carpooling provided chances for drivers to know new interesting information and increase their self-confidence, which have impact on their lives.

Informant-3: *I was in my comfort zone. Doing things must be perfect. Would I carpool with strangers? Never ever! [...] Now I am what I'm. Travelling with strangers is more challenge.*

Informant-7: *He told me his online business and suggested me to do so. I have been thinking about it since then.*

5.3.3 Helping, empathy and consequences

Helping passengers is stated in Shaheen et al. (2017) in terms of "Help others to get around" (p. 191). Helping is also observed from the passenger's perspective (Guyader, 2018) and in O'Brien and Dunning (2014) who studied casual carpooling. This study's results show that drivers helped stranger passengers save travel costs, made them more comfortable, provide a convenient service, and got them their destinations faster.

Informant-6: *They reached their destinations faster. For them, sitting in my car was comfort and saved time than getting a bus.*

Informant-12: *It was about helping them save travel costs.*

Empathy is a determinant of helping and refers to the ability to vicariously experience the emotional state of others (Penner, Dovidio, Piliavin & Schroeder, 2005). In the carpooling context, empathy is stated once in O'Brien and Dunning (2014). Our results revealed many sources of driver's empathic feeling.

Informant-2: *I wanted to help travellers. I travelled a long distance using vans and buses. It took time and was terrible. I understand their feelings.*

Helping made drivers feel good and happy. It could increase the driver's sense of belonging. Some drivers expected that good things may be reciprocated after doing good deeds.

Informant-5: *I didn't think of money. I was so happy when the mission [carpooling] was completed. [...] I didn't know him before but believe that we are Thais. We were travellers on the same way, same origin and destination. We had shared together.*

Informant-7: *My parents taught me. We think and do good deeds we get good deeds.*

Self-image was indicated in Y. Wang et al. (2019) but from the passenger's perspective. They found that using DiDi Hitch helped improve the respondents' social status and social recognition. In this study, some informants stated that they were helping passengers in order to gain self-image/reputation. This is in line with the concept of self-presentation which refers to the behavioural strategy individuals perform to convey desired social images to other people (Levin et al., 2013). Collectivist individuals are also concerned with gaining approval of oneself through self-presentation (Hui & Triandis, 1986).

Informant-5: *He may recognise me. Neighbours may talk like... Hey! It's good that she helped you. HaHaHa!*

5.3.4 Save the environment

The literature suggests that drivers could perceive 'save the environment' but it does not provide reason why they perceive that. An a priori belief was that drivers should not be a part of saving the environment if they do not stop driving. Some informants insisted that, in a matched carpool, they helped reduce traffic-related air pollution.

Informant-20: *If other drivers came together in my car, this could reduce three cars, traffic congestion and pollution. I was a part of such reduction.*

5.3.5 Accumulating merits

Merit was an emergent theme. In Buddhism, merit refers to virtue resulting from deeds intended to achieve a better live and a better rebirth (Shi, 2019).

Thai Buddhists devote much to accumulate good merit through acting generosity e.g. donating and giving (Ariyabuddhiphongs, 2009). Some informants believed helping others through carpooling is a way to gain merits and accumulate such merits for their better life. The perception of the concept of good Karma in terms of good deeds or merits, which are the characteristics of Thai people (Komin, 1991), played an important role in the informants' perception towards sharing carpool seats.

Informant-8: *I think it gave me merit. Money is not necessary. […] I drove for passengers and hoped to gain merits.*

5.4 The result of content analysis

In Table 5.4, the quantitative results of content analysis are presented. Most themes/factors found in the thematic analysis can be found in the carpooling population in the app. Most stated factors are about finding friends/companions, cost saving, socialising, need someone help drive and road safety.

Table 5.4: The result of content analysis

Unit: words

	Based on posts		Based on IDs	
	Fee (lower than the taxi price)	Free	Fee (lower than the taxi price)	Free
Total posts	17,159	1,028	4,159	409
Posts with notes	9,785	474	n/a	n/a
Carpool motivations	741	71	431	52
Find friends/companions	565	40	356	30
Save costs	400	-	235	-
Socialising; not feeling lonely	62	25	52	17
Helping driving	45	1	17	1
Road safety	26	4	23	4
Beverages/meals	5	3	4	2
Saving the environment	5	-	2	-
Helping others	2	4	1	4
Belonging	2	-	1	-
Save time	1	-	1	-

5.5 Theoretical discussions

5.5.1 Comparing the findings

Comparing Table 5.4 with 5.3, it is observed that nostalgic thoughts, opening to new experiences, empathy, feeling good after helping were not showed up. One possible explanation is that drivers may state only their top-of-mind recalled reasons in their trip notes. Further, nostalgic thoughts, opening to new experiences and empathy relate more to the drivers’ past experiences of carpooling while feeling good after helping is rather a consequence of helping. Such themes could be not popped up when the drivers informed about their trip details. Another possible explanation is that a trip note is merely a small portion that a driver has to fill their data in. This means that a driver may not pay much attention about it and this is observed from the ratio between 'Total posts' and 'Posts with notes' i.e. about 50 percent of all drivers did not fill this data.

Themes related to self-image and merits were not found in the result of content analysis. This may be because the characteristics of Thailand as a collectivistic country with high-context culture (Moemeka, 1998). Thai people exhibit high levels of rhetorical sensitivity but low levels of noble self in their interpersonal communication (Komine, 1991). The drivers may try to avoid filling texts that may lead them to the emotion of disrespect and 'losing face' (Komine, 1991). No driver would like tell others in a public space that they desire to share seats because they want the others to admire at them and want to gain merits.

Further, keywords related to PU and PEOU were not observed may be because drivers already used the app and wanted to state only their reasons for sharing seats and carpool. Y. Wang et al. (2018) suggest that once users were familiar with the app they tend not to perceive that the app is easy to use. Logically, if one wanted to find a rider, one would give texts that inform riders rather talk about how the app is good and how it is useful.

In summary, the results presented all above provide evidence to support most of what this dissertation aims to explore. In order for drivers to use the app and share their seats via the app, they must have good perceptions towards using the app and good perceptions towards carpooling i.e. perceived that carpooling can provide benefits for them (Olsson et al., 2019). Next, identified themes are conceptualised and used to revise the a priori model.

5.5.2 Consumer perceived value

The aim of this section is to conceptualise all identified themes and integrate them into the a priori conceptual model. PU and PEOU are the basic constructs in TAM and need not to be conceptualised. Attitudes and subjective norm have not been included in the a priori model in the first place and will not be mentioned further. All remains are thus the themes presented in Table 5.3. The author iteratively considered all remains themes with codes and relevant data as well as reconsidered the carpooling literature. It was found that consumer perceived value could be used to explain all identified themes.

Consumer perceived value (CPV) refers to an individual's evaluation of object and has a multidimensional construct consisting attributes that represent a complex phenomenon (Holbrook, 1994). CPV is subjective, personal, context-dependent and multidimensional because "consumption experiences involve more than one aspect of value simultaneously" (Zeithaml et al., 2020, p. 6). This is a reason why there are many dimensions of value because scholars believing in different paradigms propose aspects of value differently. For example, in interpretivist paradigm, Holbrook (1994), from a perspective of phenomenology, proposes eight value dimensions: efficiency, play, excellence, aesthetics, status, ethics, esteem and spirituality. In positivist paradigm, Sheth, Newman and Gross (1991) propose five value dimensions: functional, social, emotional, epistemic and conditional. Hereunder, CPV will be mentioned in terms of perceived value (PV) because the dissertation focuses on the driver but not the passengers who are the customer of platform.

In the carpooling literature, two studies provide some constructs of PV. Arteaga-Sánchez et al. (2018) suggest four value dimensions: economic (save money), social (meet people and have fun with others) and environmental (save resources and the environment). Y. Wang et al. (2019) suggest three value dimensions: utilitarian (save money and improve trip performance), hedonic (enjoy and relax) and social (social recognition).

In the business literature, Kumar and Noble (2016) propose four constructs. Functional value is the perception about the practical/utilitarian aspect. Esthetical/hedonic value is the perception of attractiveness and pleasure. Social value is the perception of social status and self-esteem. Altruistic value is the perception of how products/services enable ones in helping others and the society at large including saving the environment.

Merit may be new to Western culture where a neoclassical economic system is based on monetary value. However, merit is a value judgement as it is a form of gift economy (Shi, 2019). Merit can be gained by giving something valuable e.g. money, time or a helping hand (Ariyabuddhiphongs, 2009). Thus, individuals believe that merit represents the value of wholesome deed, which is used to promote oneself (McGarrity, 2015).

Based on these studies, all remain themes were linked to the concepts of value by considering the compatibility between types of value, themes, codes and relevant data. Table 5.5 illustrates six themes: utilitarian, hedonic, social, environmental, altruistic, and merit.

Table 5.5: Conceptualising

Codes	Theme	CPV
Sharing toll fees and fuel costs	Saving costs	Utilitarian-oriented value
Buying drinks, coffee, snacks and meals	Beverages/meals	
Saving time as a consequence of traffic congestion reduction	Saving time	
Passengers helping watch the roads, cars and routes	Road safety	
Passengers helping driving	Helping driving	
Not feeling lonely as a consequence socialising	Not feeling lonely	Hedonic-oriented value
Getting friends for future benefits; companion/friends could be future customers	Friends for future benefits	
Gaining friends for socialising; feeling enjoy and pleasure when socialising with carpooling participants	Friends for socialising	
Enjoying thinking of my old-days casual carpooling	Nostalgic thoughts	
Enjoying first-time carpooling; enjoying knowing new experiences	Opening to new experiences	
Feeling empathy towards passengers	Empathy	
Feeling pleasure when helping strangers	Feeling good after helping	
Feeling pleasure as a consequence helping	Belonging	

‘CPV’ denotes consumer perceived value theory

Table 5.5: Conceptualising (continue)

Codes	Theme	CPV
Wanting passengers to admire at drivers	Self-image	Social-oriented value
Reducing traffic-related air pollution	Saving the environment	Environmental-oriented value
Helping passengers save cost, giving them more comfort and convenience and getting them their destinations faster	Helping others	Altruistic-oriented value
Helping strangers to gain merits or to get good reciprocates in the future	Merit	Merit-oriented value

‘CPV’ denotes consumer perceived value theory

5.5.3 A proposed conceptual model

In Figure 5.2, a conceptual model is proposed by combining results with the simplified TAM and the construct of PV suggested in the literature. It is proposed that determinants of intention to carpool via the platform and actual carpooling behaviour should have two main types of predictors: (1) the predictors related to the app i.e. PU and PEOU and (2) the predictors related to motivations to carpool. The latter group is the benefits brought by carpooling rather the performance of the app. It consists of six constructs. Utilitarian value is the perception about money and other non-monetary objects that represent monetary value, the perception about time-savings as well as other perceptions regard the driving performances. Hedonic value is the perception on experiential and emotional benefits. Social value refers to the perception about social status, prestige and social approval. Altruistic value is the perception of how carpooling enables ones in helping other individuals. Environmental value is the perception of how carpooling enables ones in saving the environment. Merit is the perception about the merit gained from sharing seats and driving for strangers.

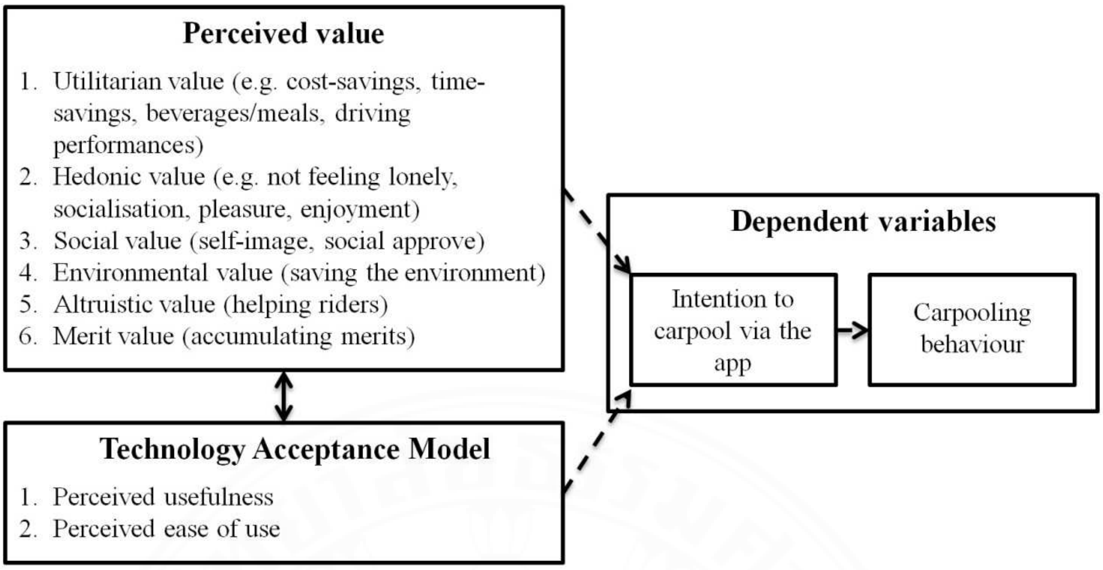


Figure 5.2: A proposed conceptual model

According to Barnes and Mattsson (2017), it is expected that there may be interrelationships between the predictors in TAM and PV. Dependent variables are also proposed in the proposed model. However, such interrelationships and dependent variables did not appear in the results of the chapter. This is because the aim of this research focuses on exploring antecedences to carpooling behaviour.

It is clearly observed that the proposed conceptual model did not take into account of the cost of being a carpool driver. The author was aware that the cost or risk of being a carpool driver can have an impact on the driver's decision to share seats, as noted in many studies e.g. Nielsen et al. (2015) and Y. Wang et al. (2019). However, the research questions of the dissertation focus on the motivations rather barriers. This means that we should focus on the benefits rather than costs. From a philosophical stand point, there are two sets of belief regards the benefit-cost consumption analysis. The first group is the positivists who believe in the multidimensional conceptualisation of benefit-cost consumption. They view perceived benefit-cost as an evaluation of trade-off between perceptions of benefit and sacrifice i.e. give-versus-get or intuitive calculation (Zeithaml et al., 2020). The evaluation is comprised of a set of many constructs regard benefits or costs. Once the constructs are identified, they should be analysed simultaneously. The second group is the positivists, who believe in the higher-order conceptualisation of benefit-cost consumption, and interpretivists. They view perceived benefit-cost as similar to the previous view but each type of perception/construct regards either benefit or cost can be conceptualised as higher-abstraction levels. A higher-order dimension of benefits comprises of different types of benefits whereas a higher-order dimension of costs comprises of different types of costs (Zeithaml et al., 2020). This means that researchers can observe a particular higher-order construct i.e. the benefits or the costs side of the value equation Khalifa (2004). This dissertation is grounded in the latter philosophical standpoint because such standpoint should allow the author to dedicate times to investigate a more depth level of benefit side.

5.6 Summary of the chapter

This chapter provides the findings of the exploratory empirical study. Such findings were presented in terms of an overview about the drivers, the role of the app and the identified motivational factors. At the end of this chapter, theoretical discussions were given and a conceptual model was proposed based on the findings.

The next chapter proceeds with the development of hypotheses proposed to explain the relationships among constructs appearing in the proposed conceptual model for the explanatory empirical research.

CHAPTER 6
RESEARCH HYPOTHESES DEVELOPMENT

Chapter Five reported the findings of the exploratory empirical research and derived a proposed conceptual model. The purpose of this chapter is to develop research hypotheses for the explanatory empirical research based on the proposed conceptual model presented in the previous chapter. This chapter proceeds with the development of hypotheses that specify the relationships between the constructs appear in the proposed conceptual model. It starts with the basic knowledge about structural model and the differences between formative and reflective measurement model. The concept of perceived value is reinitiated and is followed by the proposition of operative model for the dissertation. Operative definitions and hypotheses are proposed next. The proposed operative model will be used for empirical testing in the next chapter.

6.1 Structural model

One can observe the proposed conceptual model, as presented in the previous chapter, has many constructs interrelated to one another. This form of model is often called multiple equation models. There are basic elements for a typical structural equation model: (1) construct variables which are unobservable and cannot be measured directly (2) measured variables (manifest variables) which are directly measured observations or raw data that are used to reflect the meanings of constructs (3) relationships between constructs which are hypotheses that are defined in terms of casual relationships and (4) error terms that are used to reflect an inability of constructs in explaining measured variables (Hair, Black, et al., 2019). In a typical model, constructs are linked to one another based on hypotheses. Each construct is measured by manifest variables which are expected to be highly correlated, as the manifest variables reflect the meaning of its construct. However, there is another type of model that manifest variables determine the meaning of its construct. The issue has been noted in the measurement literature as regard to the causal direction between construct and its manifest variables.

A reflective measurement theory assumes that the construct causes its measured variables (Figure 6.1, the right side); whereas a formative measurement theory assumes that the manifest variables cause the construct (Figure 6.1, the left side) (Hair, Black, et al., 2019). Researchers often face with the specification of reflective measurement model which is consistent with psychometrics theory and is the dominant theory in social science (Hair, Black, et al., 2019). In a reflective measurement model, the arrows point out from a reflective construct to its manifest variables i.e. the reflective construct causes manifest variables. An error term pointing to a manifest variable reflects an inability of the reflective construct to explain the manifest variable. All manifest variables of a reflective construct are highly correlated with each other and interchangeable. Dropping out or adding in a highly correlated manifest variable should not change the meaning of reflective construct. Examples of such model are personality traits, attitudes and behavioural intention. Another good example is an investigation of "symptoms [or manifest variables] such as shortness of breath, tiring easily, wheezing, and reduced lung functioning would be considered indicators that would reflect the [reflective construct] of emphysema. The symptoms do not cause the disease [reflective construct]. Rather, the disease causes the symptoms." (Hair, Black et al., 2019, p. 729). If the disease is getting worse, symptoms are getting worse as well.

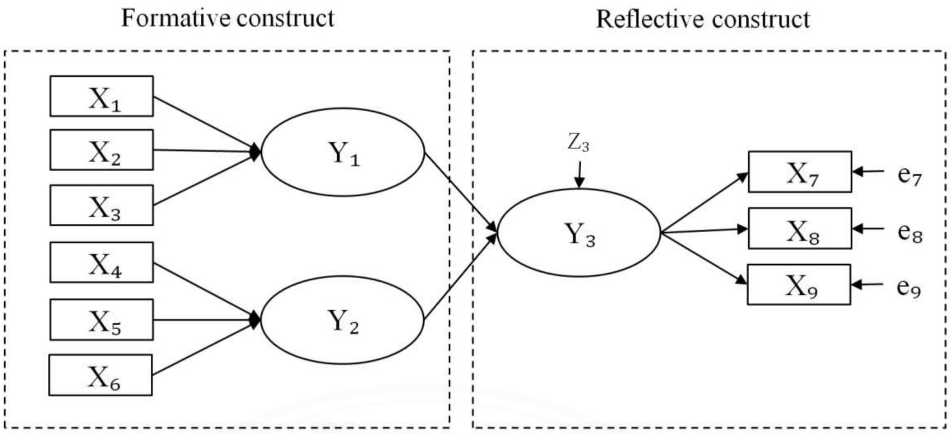


Figure 6.1: Structural model
Source: Adapted Hair et al. (2017)

A formative measurement model has become popular in recent years (Hair, Black, et al., 2019). In Figure 6.1 (left), a formative measurement model is specified by the arrows that point out from a manifest variable to its formative construct i.e. the manifest variables affect the formative construct. A formative construct is viewed as a composite index or aggregate index where each manifest variable "is a potential contributing cause" (Hair, Black, et al., 2019, p. 729). If any of manifest variables is improved, the formative construct is improved but not vice versa. In a formative measurement model, the manifest variables do not share commonality because they are characteristics of the construct and, therefore, should not be discarded. Dropping out a manifest variable can affect the overall nature of the construct. Under the formative measurement theory, the manifest variables do not share commonality. Examples of the formative measurement model are illustrated in Table 6.1. Another good example is wellbeing. The measurement of wellbeing of society "depends on health, income, occupation, services, environment, etc., and not vice versa. Therefore, if any one of these [manifest variables] improves, well-being will increase (even if the other [manifest variables] do not change) (Mazziotta & Pareto, 2019, p. 454). The increase of well-being will not necessarily increase all the other manifest variables.

Table 6.1: Examples of formative construct (adapted from Hair, Black, et al., 2019)

Construct	Example of measure	Explanation
Social class	Educational level, occupational prestige, income	Social class does not cause the measures but each measure is considered a partial cause of social class
Bankruptcy index	Retained earnings, working capital, equity, sales to assets	Key financial measures can be thought of as causing bankruptcy
Emphysema index	Cigarette consumption, exposure to toxins, chronic bronchitis	These measures will form, rather than reflect, the tendency that one will have emphysema.

From now on we know basic ideas about structural model, manifest variables and the ideas of reflective and formative. Next, the concept of perceived value is reinitiated.

6.2 Perceived value redux

6.2.1 An evolution of the value concept

Perceived value (PV) is an individual's subjective evaluation of consumption behaviour (Zeithaml et al., 2020). In the past, researchers conceptualised perceived value as a unidimensional construct e.g. a cognitive trade-off between the quality and price relationship (Agarwal & Teas, 2001) and a trade-off between giving versus getting (Brady & Robertson, 1999). Later on, Holbrook (1994) proposes a set of PV from an experiential approach and this seminal work has an impact on the belief of many researchers. Since then PV has been viewed as multidimensional, as consumption experiences are simultaneously affected by more than one value dimension (Holbrook 1994; Sheth et al. 1991).

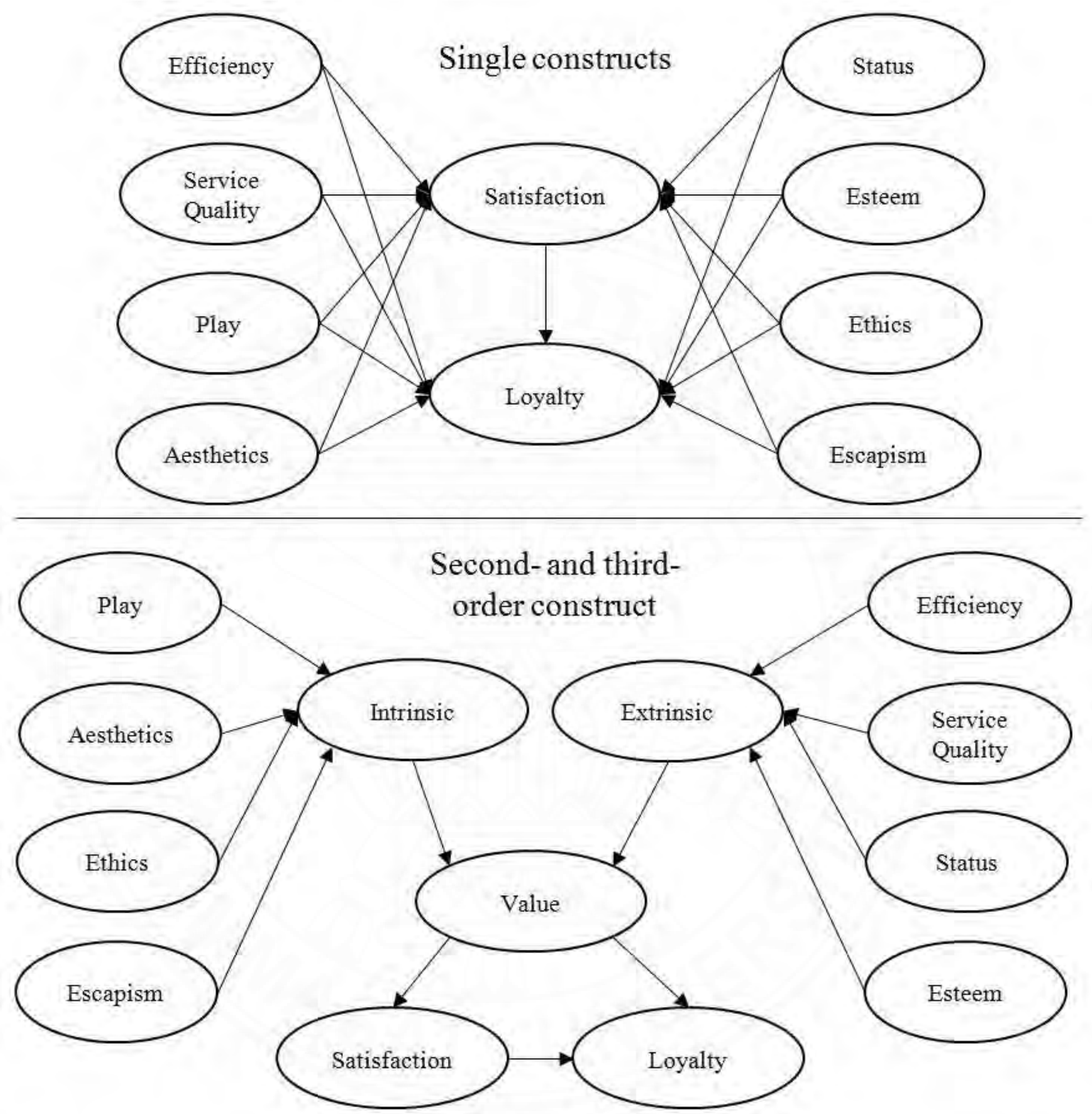
Zeithaml (1988) posits that the value should be viewed as a higher-level abstraction that consists of a set of lower-level value dimensions. For example, an individual can perceive many types of lower-level value e.g. perceived quality and perceived sacrifices and these lower-level value dimensions reflect the higher-level PV. In other words, the perceived value is a higher-level abstraction that is described by perceived sacrifice and quality. Since then researchers consider PV as a multidimensional construct that consists of various value dimensions (Zeithaml et al., 2020).

Evidence also shows that there is no a general set of lower-level value dimensions that can be used for every contexts being studied, as PV is inherently situation specific i.e. a different context has a different set of PV (Leroi-Werelds, 2019; Zeithaml et al., 2020). Researchers can contribute theoretically to the literature by adding the complexity in terms of types of value as well as can provide managerial implications once we know insights into what consumer perceive about value (Zeithaml et al., 2020).

6.2.2 Perceived value as a higher-order formative construct

Generally, a reflective construct representing one value dimension e.g. utilitarian and hedonic are unobservable and need to be measured by a set of manifest variables. Therefore, a set of highly correlated manifest variables is given in order to represent the meaning of such dimension. This is consistent with the reflective measurement theory. An assumption is that the change in the manifest variables should not affect the change in the reflective construct. However, it has been noted that PV should be viewed as a higher-order abstraction consisting many lower-level value dimensions.

There has long been a debate over whether a lower-order construct representing value should be specified as a reflective or formative element of a higher-order construct of PV. Consensus seems to move towards to the formative construct of PV (Leroi-Werelds, 2019; Sánchez-Fernández & Iniesta-Bonill, 2007; Zeithaml et al., 2020). This means that the value dimensions are independent and "relating additively and contributing incrementally to choice" (Sheth et al, 1991, p. 163). The arrows, thus, point out from the lower-order reflective constructs to the higher-order abstraction of PV. Such kind of model is called Type-II model i.e. the second-order construct has first-order constructs as formative indicators whereas the first-order construct itself has reflective indicators (manifest variable). Theoretically, the Type-II model is appropriate for a multidimensional composite construct that consisting of non-contingent dimensions (Jarvis, MacKenzie & Podsakoff, 2003).



The eight value types modelled as eight single constructs pointing to two dependent constructs (above), The eight value types modelled as two second-order constructs that points a third-order construct determining two dependent constructs (below).

Figure 6.2: Structural models of perceived value

Source: Adapted from Gallarza et al. (2017)

The formative multidimensional nature of PV has been validated in many studies. For example, Gallarza, Arteaga, Del Chiappa, Gil-Saura and Holbrook (2017) propose second-order constructs and a third-order construct of the service value scale proposed by Holbrook's typology. Figure 6.2 illustrates Gallarza et al.'s (2017) work. It is observed that, instead of modelling each value dimension by pointing a single dimension to each of two dependent constructs i.e. satisfaction and loyalty, the eight value dimensions are aggregate into two second-order constructs i.e. intrinsic and extrinsic. These second-order constructs are then pointing at a single third-order construct i.e. PV.

In transport context, Carlson, Rosenberger III and Rahman (2015) conceptualise PV of group travel as a second-order formative construct constituted by six value dimensions i.e. monetary, functional, emotional, social, novelty, and convenience. In the carpooling literature, Y. Wang et al. (2019) have proved that perceived value of carpooling can be conceptualised as a formative second-order construct that consists of underlying value dimensions i.e. utilitarian, hedonic and social. Next, an operative model is proposed with hypotheses and the definition for each construct.

6.3 Hypotheses

The second research question is brought back here: *How important are the motivational factors for the driver's future carpooling decisions via the platform?* Based on this research question, the specific objective is to employ the proposed conceptual model, as shown in Figure 5.2, to investigate and identify the impact of the elements in Technology Acceptance Model (TAM) and perceived value (PV) for the drivers' future carpooling decisions via the platform. Therefore, in this section, hypotheses and the definition for each construct will be proposed. An operative model with relationships between constructs is presented in Figure 6.3. Relevant literature and discussions are provided hereunder.

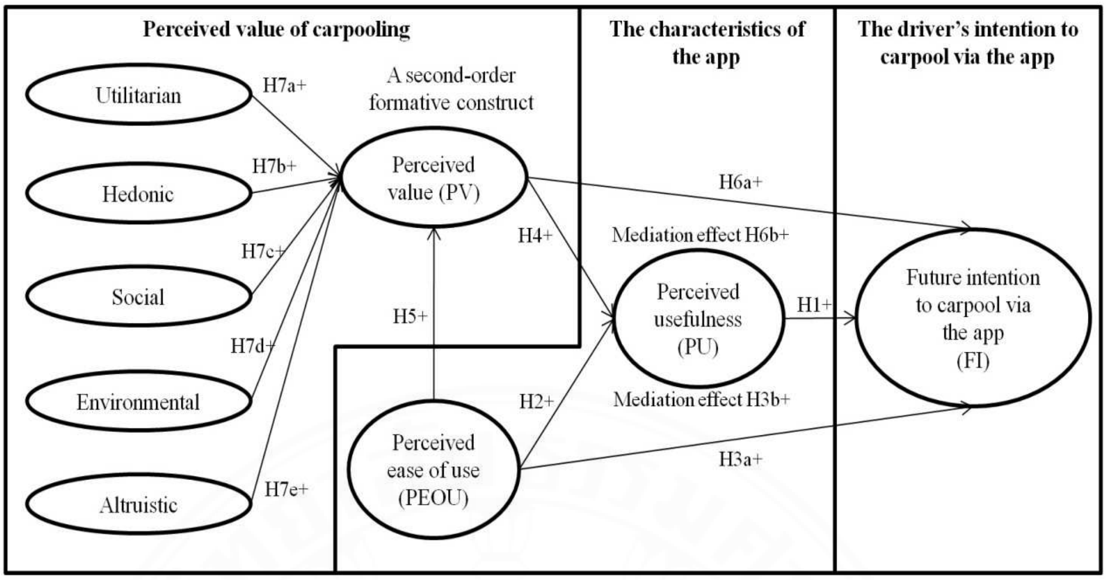


Figure 6.3: A proposed operative model

6.3.1 Perceived usefulness and perceived ease of use

Davis, Bagozzi and Warshaw (1989) note Technology Acceptance Model can used as a method "for evaluating systems, predicting how users will respond to them, and improving user acceptance" (p. 982). In the context of carpooling, Wang et al. (2018) define perceived usefulness (PU) based on Davis (1989) as "the extent to which a consumer thinks that using a ride-sharing service is useful to obtain goals such as to lower the expenditure on commuting, increase ride experience and trip convenience, reduce greenhouse gas emissions and energy consumption, and mitigate traffic congestion" (400-401). This means that PU is an individual's evaluation about a carpooling platform in which how they perceive potential benefits that the platform offer to them. Regards to perceived ease of use (PEOU), Wang et al. (2018) define it as "the extent to which a consumer thinks that using a ride-sharing service is not too difficult" (p. 400).

In this dissertation, PU and PEOU are adapted from Davis (1989) and Wang et al. (2018) because the former is used for job performance while the latter is for carpool passenger. PU refer to the driver's perception of how using the app for carpooling is useful to obtain personal goals related to carpooling e.g. lowering trip cost, reducing energy consumption and socialisation with carpool participants. PEOU refers to the driver's perception of how using the app for carpooling is not too difficult or free from effort.

An individual decides to use a system as if they perceive that the system can bring benefits to them and is easy to be used (Davis, 1989). In transport research, a series of previous research indicates that PU is positively associated with the user's future intention to use a platform (Barnes & Mattsson, 2017; Li & Wen, 2019; Mola, Berger, Haavisto & Soscia, 2020; Wang et al., 2018; Wu, Liao, Wang & Chen, 2019) meanwhile PEOU is positively associated with PU (Cheng & Huang, 2013; Mola et al. 2020; Wang et al., 2018; Wu et al., 2019). Moreover, it is indicated that PU plays an important role in mediating the positive effect of PEOU on the future intention to use mobility as a service (Mola et al. 2020). However, the literature points out a conflicting result of the direct effect PEOU on behavioural intention. Whereas Cheng and Huang (2013) and Wang et al. (2018) indicate insignificant result of such effect, Wu et al. (2019) indicate a significant positive effect of PEOU on the future intention towards the use of autonomous electric vehicles. Hence, in the context of carpooling via platform and from the perspective of driver, the hypotheses are proposed:

H1: Perceived usefulness is positively associated with the driver's future intention to carpool via the app.

H2: Perceived ease of use is positively associated with perceived usefulness.

H3a: Perceived ease of use is positively associated with the driver's future intention to carpool via the app.

H3b: Perceived usefulness is a mediator between perceived ease of use and the driver's future intention to carpool via the app.

TAM has been criticised for not reflecting the nature of individuals' adoption of technology (King & He, 2006; Legris et al., 2003). Studies thus extend the TAM by adding more antecedents to increase explanatory power (see King & He, 2006). Next, the dissertation proceeds with an extension of TAM by introducing PV.

6.3.2 Perceived value

Woodruff (1997) defines PV as "customer's perceived preference for and evaluation of those product attributes, attribute performances, and consequences arising from use that facilitate (or block) achieving the customer's goals and purposes in use situations" (p. 142). In this dissertation PV is defined, based on Woodruff (1997), as the driver's perceived preference for and evaluation of (1) carpooling activities and (2) consequences arising from such carpooling that facilitate the achieving of the driver's goals and purposes of carpooling.

In the carpooling literature, it is noted that the driver's decision to carpool via a carpooling platform is determined not only by the drivers' perceptions on how much carpooling can bring benefits to them but also by the characteristics of platform (Olsson et al., 2019). To the best of the author's knowledge, there is no empirical evidence proving such claim. Because this issue is new, there are few empirical studies in other collaborative consumption contexts.

In the context of bike sharing system, Ma, Zhang, Ding and Wang (2018) has proved that in order to motivate users to use the technology, it requires two components: (1) the characteristics of the bike sharing system (PU and PEOU) that is designed to support bike sharing activity and (2) the users' perceptions towards value dimensions that are obtained from sharing bikes. However, Ma et al. (2018) empirically test the effect of such two components on trust attitude and sujective well-being and did not investigate the relationship between such two components. Recently, Barnes and Mattsson (2017) and Li and Wen (2019) can empirically prove the relationship between PU and some of value dimensions.

Barnes and Mattsson (2017) found the positive effects of three value dimensions on PU of users of a carsharing platform. The higher is the users' perceptions towards the economic, social and environmental value, the greater they perceive that the platform is usefulness. Li and Wen (2019) also found the significant positive effects of economic and convenience value (i.e. time-savings) on the PU of the platform. Logically, PV is a multidimensional composite construct that constituted by a set of value dimensions, which are independent to one another but together are characteristics of such PV construct (Sheth et al., 1991; Zeithaml et al., 2020). If the value dimensions appear in Barnes and Mattsson (2017) and Li and Wen (2019) were aggregated into a higher-order construct called PV, such PV would have a positive effect on PU as well. Thus, based on this logic, the hypotheses are proposed:

H4: Perceived value is positively associated with perceived usefulness.

Furthermore, drivers and passengers have to use the app for coordinating and forming a carpool trip. It is possible that the more the app is easy to be used, the more users perceive the value of carpooling. Recently, Kim and Kim (2020) also found a significant positive effect of PEOU on PV. Hence, based on this logic, a hypothesis is proposed:

H5: Perceived ease of use is positively associated with perceived value.

Regards the effect of PV on future intention, Y. Wang et al. (2019) indicate that PV, as a higher-order construct constituted by three value dimensions, is positively associated with the user's willingness to use ride-sharing platform. Furthermore, Barnes and Mattsson (2017) and Li and Wen (2019) found a mediating role of PU between value dimensions and the user's future intention to use a platform. Logically, PU acts as a "processor of perceptions about the value of sharing" (Barnes & Mattsson, 2017, p. 4). The higher is the PV, the higher is future intention to join a platform. Thus, a hypothesis is proposed:

H6a: Perceived value is positively associated with the driver's future intention to carpool via the app.

H6b: Perceived usefulness is a mediator between perceived value and the driver's future intention to carpool via the app.

6.3.3 Value dimensions

The definitions of utilitarian and hedonic value of carpooling are adapted from Y. Wang et al. (2019) and Chiu, Wang, Fang and Huang (2014). The definition of social value of carpooling is defined based on Y. Wang et al. (2019) and Sheth et al. (1991). In this study, utilitarian value refers to the extent to which the driver's perception about whether their needs of functional benefits are satisfied or whether carpooling contributes to utilitarian, functional, or physical performance. Hedonic value refers to the extent to which the driver's perception of experiential and emotional benefits, positive feelings, and affective states generated from carpooling and from activities during carpooling. Social value refers to the extent to which the driver's perception of how carpooling can bring them prestige, social status, social approval, and recognitions. In the carpooling literature, Y. Wang et al. (2019) indicate the importance contributions of such three value dimensions on the higher-order construct PV. Thus, hypotheses are proposed:

H7a: Utilitarian value is a formative first-order dimension of perceived value.

H7b: Hedonic value is a formative first-order dimension of perceived value.

H7c: Social value is a formative first-order dimension of perceived value.

Zhang, Xiao and Zhou (2020) define environmental value as the value of reducing pollutant emission and resource depletion when using the produce/service. In this dissertation, environmental value of carpooling is defined the driver's perception of how carpooling contribute to the environment. Arbour-Nicitopoulos et al. (2012) indicate that carpoolers perceived carpooling is an environmentally-friendly means of transport. Further, Arteaga-Sánchez et al. (2018) found that the higher users are concerned for the environmental impact the greater they are likely to use BlaBlaCar service. Thus, a hypothesis is proposed:

H7d: Environmental value is a formative first-order dimension of perceived value.

Altruistic value dimension is first proposed by Holbrook (1994) and later by others (Zeithaml et al., 2020). Altruistic value is the perceived value derived from an individual's action intentionally aimed to help others and involve other-directed motivations (Smith, 1996). Smith (1996) further posits that one problem of using this value dimension is that a truly altruistic act is rare and impossible to identify in reality. Penner et al. (2005) also support this notion with many empirical studies. Therefore, most researchers propose altruistic value as a general concept related to helping behaviour. In the context of blood donation, Previte, Russell-Bennett, Mulcahy and Hartel (2019) define the term as the benefit that an individual experiences from helping and assisting others. In the context of product design, Kumar and Noble (2015) define it as an individual's perception as regard to how the product design enables them to help others and the society at large. In this dissertation, altruistic value of carpooling is defined based on these researchers. It refers to the driver's perceptions of how carpooling enables them in helping passengers and of a sense of benefit that is experienced from helping through sharing carpool seats.

In a blood donation context, Previte et al. (2019) found that altruistic value has a positive direct effect on the consumers' intention to spread positive comments to others (eWOM). In other words, the more individuals perceive their donations can help others, the more they recommend the blood service to others. In the carpooling context, Barbosa and Fonseca (2019) use the term altruism under the consumer perceived value theory to investigate the perception of carpooling as a way to help others. It is possible that the higher the drivers perceive carpooling can help riders, the more they intent to carpool. Based on all above-mentioned logic, a hypothesis is proposed:

H7e: Altruistic value is a formative first-order dimension of perceived value.

Merit value, as appears in Figure 5.2 of Chapter Five, is already included in the altruistic value. This is because the proposed definition of altruistic value also encompasses a sense of benefit that is experienced from helping through sharing carpool seats. Any consequence arising from an action can increase an individual's perception of a certain value (Woodruff, 1997). For example, socialisation occurring in a carpool trip makes an individual feel good, and later on increases their perceived hedonic value (Y. Wang et al., 2019). In the same vein, the driver's perception of gaining merit is emerged at the same time they perceive altruistic value.

6.4 Summary of the chapter

This chapter provided the background of structural model as well as formative and reflective measurement model because these are critical to our understanding of PV construct that is formative multidimensional in nature. An operative model that specifies relationships between construct is proposed. Operative definitions and hypotheses are then clarified in support with relevant literature. The next chapter presents the explanatory empirical research.

CHAPTER 7
EXPLANATORY EMPIRICAL RESEARCH

In Chapter Six, an operative model was proposed for the use of empirical testing. The purpose of this chapter is to describe the research method used to collect empirical data and to introduce the analysis methods that are employed to assess the obtained data and test the hypotheses.

7.1 Introduction

This chapter presents the research methodology of the explanatory research. The aim of this study is to determine the relative importance between the elements in Technology Acceptance Model and perceived value as well as the drivers' future carpooling decisions.

Based on the second research question and its specific research objective, a quantitative approach was used and consistent with the nature of positivist paradigm. Data inquiry method used is survey with self-administrated questionnaire. Questionnaire development is adapted from the guideline suggested by Oppenheim (2000): (1) developing items (2) carrying out a pilot study and modify the measures and (4) collect data in a real survey.

The first step has been completed in the previous chapter. Thus, this chapter begins with the development of questionnaire by using well-developed indicators borrowed from the literature. A pilot study via semi-structured interviews is presented next and followed by the details of survey using the questionnaire. In the analysis part, a process of EFA, rationale for the use of PLS-SEM as well as discussions regards model specifications and evaluation criteria used for evaluating the model are provided. At the end of the chapter, methods for structural model robustness checks in PLS-SEM are presented.

7.2 Questionnaire development

This dissertation borrowed the well-developed indicators provided in the literature. Three items for perceived usefulness (PU) were adapted from Barnes and Mattsson (2017) whereas three items for perceived ease of use (PEOU) were adapted from Wang et al. (2018).

Regards the five value dimensions, three items for utilitarian value were adapted from Carlson et al. (2015), Hamari et al. (2016), Arteaga Sánchez et al. (2018) and Y. Wang et al. (2019). Four items for hedonic value as well as three items for social value were adapted from Hamari et al. (2016), Y. Wang et al. (2019) and Ma et al. (2018). Four items for environmental value were adapted from Hamari et al. (2016), Koller et al. (2011) and Zhang et al. (2020). For altruistic value, two items were drawn from Barnes and Mattsson (2017) and Previte et al. (2019) whereas the other two items related to merit were borrowed from Ariyabuddhiphongs (2009). Regards the future intention (FI), three items were adapted from Hamari et al. (2016). A 7-points Likert scale anchored between the scores of 1-7 (strongly disagree to strongly agree) was used as suggested by Lissitz and Green (1975). Questions for the scores were used as similar to Hamari et al. (2016).

All borrowed items were iteratively considered in regard with the appropriateness for the driver’s perspective and the Thai culture. The items were then translated verbatim from English to Thai language by the author. There were two wordings that were difficult to be defined. In Thai language, enjoy, fun and pleasure have almost the same meanings. The Thai meaning of these words, thus, were adopted from Leesuksawat, Jangchud, Jangchud, Dhamvithee and Prinyawiwatkul (2019) and Ngoenchai, Alonso, Suwonsichon, Suwonsichon and Prinyawiwatkul (2019). These researchers study emotional lexicon of Thai language. Another challenge is the term ‘sustainable transport’. In Thai language, Transport and Traffic Policy Plan Office defines it as ‘kaan deun tang yhang yang yuen’.

The questionnaire is structured as six sections: (1) introduction (2) definition of carpooling (3) perceived usefulness and perceive ease of use (4) perceived value dimensions (5) future intention to carpool via the app (6) trip characteristics (7) demographic and (8) debriefing. The introduction explains the purpose of study as well as the respondent's right, privacy and consent. Respondents have to declare that they are a driver who has offered seats at least one time via LILUNA. The next section provides the definition of carpooling: a means of transport where you share seats in your own car to riders via LILUNA and intend to travel with them from one location to another. You may or may not ask the riders to share you some expense. The third section asks respondents about their opinions towards LILUNA with the items of PU and PEOU. The next section contains 18 items representing value dimensions and used for inquiring their reasons for carpooling. In the fifth section, the introduction sentence informs respondents that their answers here must by assumed that the activities return to normal after the coronavirus disease pandemic. Then, three questions for FI are presented. Next, a number of questions regards the trip characteristics and demographic are them followed. In debriefing, the respondents can fill a desired reward and their contacts in which to allow the author to contact back and give a reward for completing a survey. Survey monkey was used to design the questionnaire. A 'random questions' function provided by Survey Monkey was used with three sections: 3, 4 and 5.

A pilot study via semi-structured interviews was carried out in order to validate the translated items and wordings used in each item as well as to check whether respondents could understand or not. Survey monkey was also used in the pilot study. Eight respondents and a co-founder of LILUNA were participated in the pilot study. The author conducted an in-depth interview via phone call. Each respondent participated in an interview ranging between 20 minutes to 50 minutes. Some respondents were participated more than one time. After iteratively revising the questionnaire, a final version was derived.

The item asking 'Carpooling via LILUNA is enjoyable' and 'Carpooling via LILUNA is fun' were excluded because all respondents agreed that enjoyable and fun have to same meaning. The item asking 'Carpooling via LILUNA is a sustainable means of transport' was excluded because some respondents did not know the meaning. One of them argued that the term is made up as a beautiful word but has no practical meaning in the context of carpooling. Some other respondents argued that they understand the meaning but they could not provide a clear explanation for the term. Overall the respondents commented that they felt some items were redundant e.g. the three remain items for hedonic value. However, when the author asked them to explain how it was redundant, they finally agreed that such items were not quite similar. The final version was sent to all nine respondents. Consensus was achieved. No other comments added. On average, all respondents completed the questionnaire within five minutes. Table 7.1, 7.2 and 7.3 illustrate the items and references. The final version of questionnaire was translated to English language by the author and then re-checked the quality of translation by a researcher. Both English- and Thai-language are presented in Appendix D.

Table 7.1: Items for perceived usefulness and perceived ease of use

Construct	Modified items	Reference: context
Perceived usefulness	LILUNA is of benefit to me. The advantages of LILUNA outweigh the disadvantages. Overall, using LILUNA is advantageous to me.	Barnes & Mattsson (2017): carsharing via platform
Perceived ease of use	Using LILUNA is clear and understandable. Using LILUNA is easy to me. I have no problems using LILUNA.	Wang et al. (2018): passengers carpooling via platform

Table 7.2: Items for perceived value

Construct	Modified items	Reference: context
Utilitarian value	I have a chance to reduce the cost of my trip. It improves my trip performance such as riders help watch the cars/roads. The performance of my trip/driving is better than driving alone.	Carlson et al. (2015): group Hamari et al. (2016): Sharetribe Arteaga Sánchez et al. (2018): passengers carpooling via platform Y. Wang et al. (2019): passengers carpooling via platform travel behaviour
Hedonic value	Carpooling via LILUNA is exciting. Carpooling via LILUNA is fun. Carpooling via LILUNA is pleasant.	Hamari et al. (2016): Sharetribe Ma et al. (2018): bicycle sharing Y. Wang et al. (2019): passengers carpooling via platform
Social value	Carpooling via LILUNA improves my image within communities. By carpooling via LILUNA, I make a good impression on people in communities. By carpooling via LILUNA, I earn respect from people in communities.	Hamari et al. (2016): Sharetribe Ma et al. (2018): bicycle sharing Y. Wang et al. (2019): passengers carpooling via platform

Table 7.2: Items for perceived value (continue)

Construct	Modified items	Reference: context
Environmental value	Carpooling via LILUNA is an environmentally friendly means of transport. Carpooling via LILUNA is an efficient way of using fuel energy. By carpooling via LILUNA, I contribute to the reduction of environmental pollution.	Koller et al. (2011): automobiles Hamari et al. (2016): Sharetribe Zhang et al. (2020): energy-saving appliances
Altruistic value	I'm helping riders in LILUNA. I'm benefiting riders in LILUNA. Sharing seats with riders is a good thing to do which yields good benefits to me in the future. The more often I share seats with riders the more I feel I would receive good things.	Barnes and Mattsson (2017): carsharing Previte et al. (2019): blood donation Ariyabuddhiphongs (2009): beliefs in Buddhism

Table 7.3: Items for future intention

Construct	Modified items	Reference: context
Continuance intention to carpool via the app	All things considered; I expect to carpool via LILUNA in the future. In the future, I see myself carpooling via LILUNA more frequently. I intend to increase carpooling via LILUNA if possible.	Hamari et al. (2016): Sharetribe

7.3 Survey

Target population for a survey was derived two sources. The first set was derived from the scraped data set i.e. the drivers who shared seats in the app during 1 June 2020 to 31 January 2021. The other set was contacted via the app by the author. In sum, there were 861 drivers who shared seats via the app during June 2020 to February 2021. Target drivers were those who did not charge a price or charged a price less than the taxi price. One was excluded if they have at least one trip's price equal to and greater than the taxi price. The respondents participated in the pilot study were also excluded.

The survey was carried out during 20-28 February 2021 using Survey Monkey. The author and the other three research assistants, who were trained for conducting the survey, called to 861 drivers using a phone number provided in the app. A total of 672 respondents were reached. A research introduced oneself to a respondent, asked for their available time, informed the purpose of research, and asked them to complete an online survey. After hung up the call, a survey link was sent to the respondent mobile phone as a text messaging.

A total of 287 respondents participated in the online survey (33.33%) whereas only 270 responses were completed (31.36%). The derived data was cleaned as suggested by Hair, Black et al. (2019). Nine straight lining was first excluded. An analysis of outlier using plot box was employed and detected seven outliers. These seven respondents were excluded. A total of 254 responses remained for further analysis (29.50%). Demographic data and descriptive statistic were analysed using SPSS version 23. The results are provided in Appendix E.

The data obtained need to be analysed using a statistical method in order to test the proposed hypotheses. First to do was to check whether items represent collectively in expressing a proposed construct because the items were adapted from the literature written in English and were translated in to Thai and used in the Thai context. To do this Hair, Black et al. (2019) suggest researchers to perform an exploratory factor analysis because it can help researchers summarise the obtained data and see how each item statistically classified into a construct.

7.4 Exploratory factor analysis (EFA)

Exploratory factor analysis (EFA) was performed using SPSS version 23 in order to examine whether items represent collectively in expressing a construct (Hair, Black et al., 2019) and confirmed the quality of translation of English-Thai language (Menezes et al., 2019). It is noted that mixing independent and dependent variables in a single-time factor analysis is not appropriate (Hair, Black et al., 2019). Thus, an EFA was carried out for two times: (1) the elements regard PU and PEOU (6 items) and (2) the elements of value dimensions (16 items).

Evaluations criteria for EFA are provided in Table 7.4. Hair, Black et al. (2019) suggest such check list. EFA assumption test was carried out by assessing the measure of sampling adequacy (MSA) and Bartlett's test of sphericity (Hair, Black et al., 2019). Hair, Black et al. (2019) further suggest that choosing the number of factors should be started with using eigenvalues but a derived number is reliable when there are 20 and 50 items to be considered. If the number of manifest variables are less than 20 and we can expect that this method would "extract a conservative number of factors (too few)" (Hair, Black et al., 2019, p. 141). Next, the total variance explained and the variance explained for each factor were checked. Rotation approach was performed according to the literature. Principle component analysis and varimax rotation were used for PU and PEOU (Davis et al., 1989; Wallace & Sheetz, 2014) as well as the value dimensions (Sweeney & Soutar, 2001). Next, a score of factor loadings and communalities were assessed.

Table 7.4: Evaluation criteria for exploratory factor analysis (EFA) (adapted from Hair, Black et al., 2019)

Issue	Approach	Interpretation
Assumption EFA	Measure of sample adequacy (MSA)	>0.50
	Bartlett's test of sphericity	significant <0.50 to indicate sufficient correlations among the variables
Choosing the number of factors	Latent root criterion (eigenvalues)	Choose the factors with eigenvalues > 1
		Reliable when the number of variables is between 20 and 50 and communalities above 0.40
		Applied as a first step and then use other criteria in combination
	A priori criterion	Predetermined based on the literature, as to test a hypothesis about the number of factors to be extracted
	Percentage of variance criterion	Cumulative variance explained ≥60% where each factor accounts for >5%
	Scree plot	Retain all factors preceded an inflection point
Assess factor loadings	Factor loadings	Factor loadings ≥0.40 are considered significant
	Communalities	Variables should have communalities ≥0.50

The next step was to investigate the relationships between constructs whether they would behave similar to the proposed hypotheses. The author needed to investigate how motivational factors i.e. PU, PEOU and the five elements of value dimensions influence the driver's future intention to carpool via the app.

7.5 Partial least squares structural equation modelling (PLS-SEM)

There are many analysis methods suggested in literature e.g. univariate, bivariate and multivariate analyses (Hair, Black et al., 2019). However, the operative model for the dissertation is constituted by many hypotheses in which multiple variables need to be analysed simultaneously. Structural equation modelling (SEM) is suggested for use in investigating causal multiple relationships and multiple manifest variables in each construct (Hair, Black et al., 2019).

Initially, the author intended to analyse the obtained data using covariance-based structural equation modelling (CB-SEM). However, after exploring the PLS literature, the author found Sarstedt, Hair, Ringle, Thiele and Gudergan (2016) who argue that analysing the reflective–formative measurement model (Type-II) with CB-SEM will derive a bias result. Therefore, a multivariate analysis technique used in this dissertation was PLS-SEM. Rationale is provided shortly. The aim of the analysis was to examine the causal relationships and relative strengths between variables in the model as well as to determine the explanation and prediction powers of target constructs (Hair et al., 2017; Hair, Risher et al., 2019).

7.5.1 Rationale for the use of PLS-SEM

Multiple indicators and multiple causes (MIMIC) is a CB-SEM approach to model formative measures. Yet, it is appropriate for causal indicators, not composite indicators (Hair, Black et al., 2019). Hair, Black et al. (2019) further suggest researchers to use PLS-SEM to specify a model containing a higher-order construct (HOC) e.g. Type-II model. It is also suggest that the models that contain formative constructs should not be analysed using CB-SEM but PLS-SEM (Sarstedt et al., 2016; Hair, Risher et al., 2019). Sarstedt et al. (2016) perform a simulation and found that PLS-SEM, compare with CB-SEM, provided smaller bias estimation values and is recommended for modelling HOC models.

Furthermore, it has been noted early that perceived value is a composite/formative construct. PLS-SEM can handle the construct defined by composite indicators (Hair, Risher et al. 2019). Sarstedt et al. (2016) also suggest that, if the data is composite in nature and either reflectively or formatively measured by indictors, one should use PLS-SEM, not CB-SEM.

Finally, it is observed that the obtained data was non-normal (Appendix F), as indicated by significance values derived from Kolmogorov–Smirnov and Shapiro–Wilk tests (Hair, Black et al., 2019). PLS-SEM can treat non-normal data very well (Hair, Risher et al. 2019).

Before carrying out a PLS-SEM analysis, Jamie, Rahman, Rahman, Wyllie and Voola (2021) suggest that one may need to confirm the Type-II models. Next, such analysis is presented and is followed by the model specification for Type-II models.

7.5.2 Model specification for Type-II in PLS-SEM

First, the author performed a confirmatory factor analysis that is used to validate the use of Type-II model. Jamie et al. (2021) suggest researchers to confirmatory factor analysis to validate the Type-II models by comparing a proposed model with a unidimensional model. Further, the reflective–formative nature or Type-II is exhibit if the correlation between all lower-order constructs (LOC) is less than 0.70 (Jamie et al., 2021). A confirmatory factor analysis with maximum likelihood estimation was carried out using AMOS version 24. It was observed that the operative model of the dissertation is a Type-II model.

In the PLS literature, there are three approaches for modelling Type-II models: repeated indicators approach (RIA), two-stage approach (TSA) and hybrid approach (HA) (Figure 7.1). SmartPLS-3 was used to analyse the Type-II model of the dissertation, as suggested by Hair et al. (2017) and Hair, Risher et al. (2019).

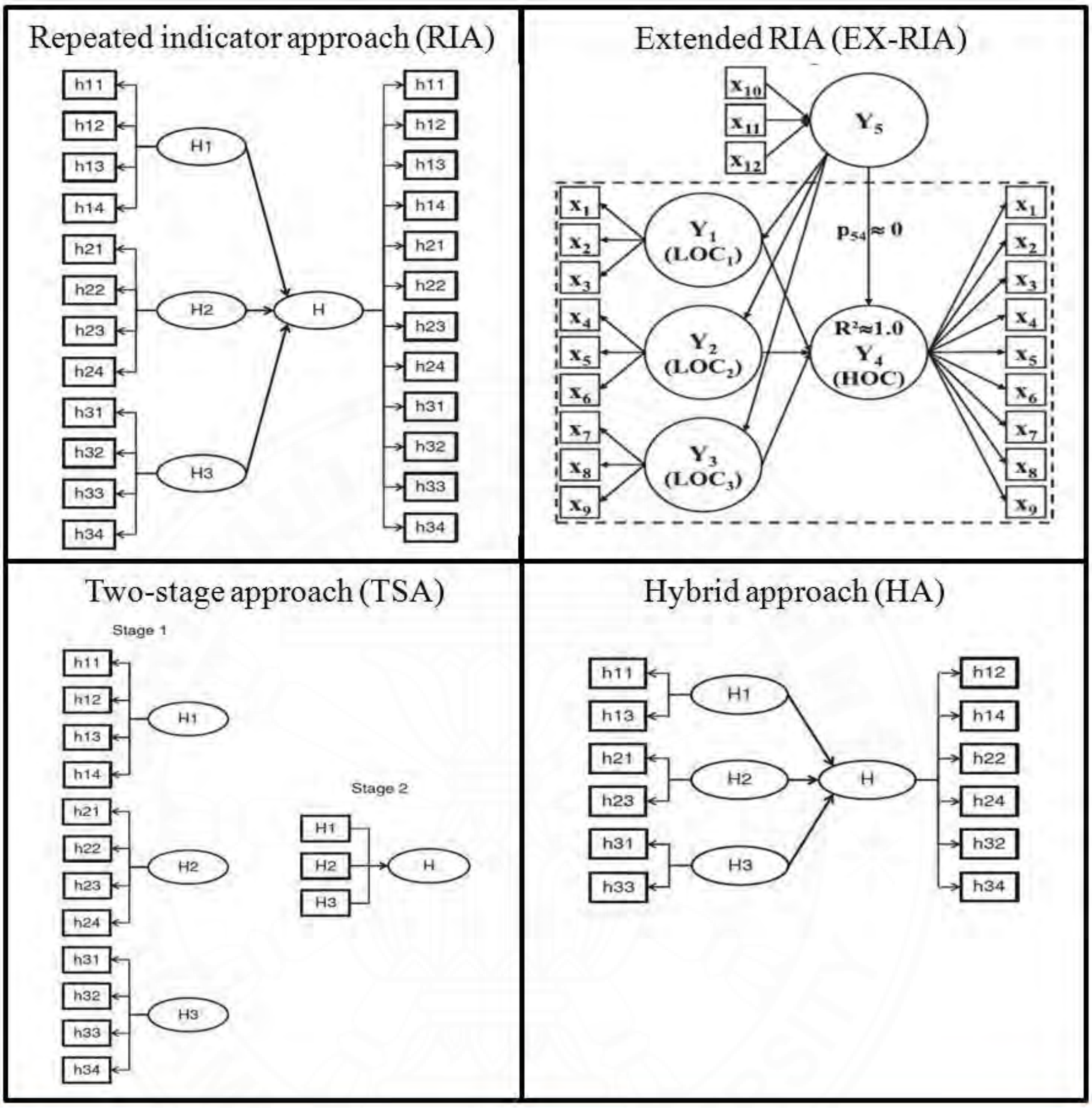


Figure 7.1: Three approaches for modelling Type-II models

Source: Adapted from Van Riel, Henseler, Kemény and Sasovova (2017) and Sarstedt et al. (2016)

RIA treats all items in the LOCs as indicators in its HOC. One has to randomly select the items of LOC into the HOC. We can expect R^2 value of 1 because all of HOC variance is explained by the LOCs' items (Hair et al., 2017). However, RIA is not appropriate for a model that has another construct as antecedent to the HOC. A result will yield R^2 value close to 1 and a very low value of path coefficient between the antecedent construct and the HOC because almost all of HOC variance is explained by the items of LOCs (Van Riel et al., 2017). Thus, RIA is not appropriate for this dissertation because, in the operative model, PEOU is antecedent to PV. We will not be able to interpret the relationship between these two constructs.

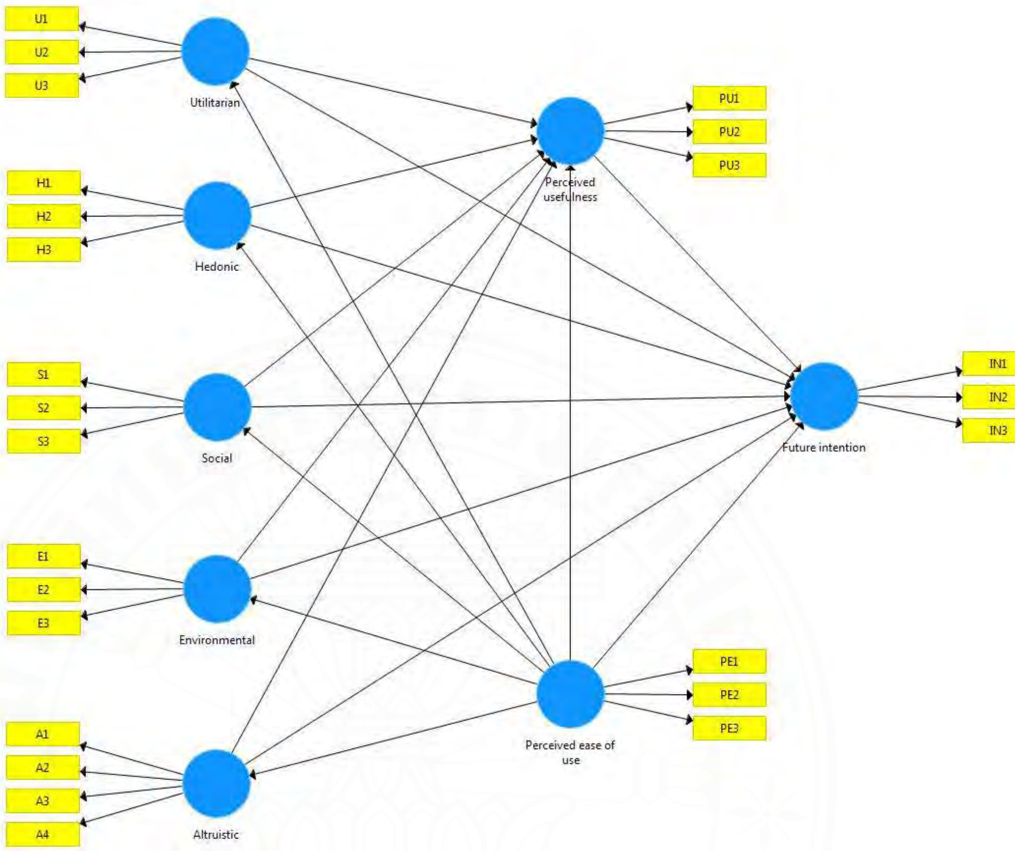
Regards EX-RIA, the relationships between the antecedent construct and the LOCs are specified but we will not interpret the direct relationships between them, instead, will interpret the antecedent construct's total effect on the HOC (Sarstedt et al., 2019). The author had tried EX-RIA. Yet, in the measurement model evaluation stage, the path coefficient of social value dimension to perceived value yielded insignificant. The literature provides no guideline for treating this case. The EX-RIA was not carrying forward.

HA is close to RIA but one has to randomly select the items of LOCs into the HOC. Yet, HA remains unclear on how to perform when a LOC has an odd number of items (Van Riel et al., 2017). HA was not appropriate for use in this research because most of the LOCs have three items.

TSA is therefore the last choice. Sarstedt et al. (2019) suggest that TSA can be modelled by two approaches: disjoint two-stage approach (DIS-TSA) and embedded two-stage approach (EM-TSA). Sarstedt et al. (2019) further suggest that EM-TSA and DIS-TSA derive quite similar results and there is no compelling reason for preferring one over the other. The author had performed both EM-TSA and DIS-TSA and found quite similar results. From now on, DIS-TSA will be presented.

The steps for specifying DIS-TSA was followed by Sarstedt et al. (2019). The first step of DIS-TSA was considered only the LOCs i.e. modelling all LOCs in PLS-SEM without the HOC and then specified the path model by directly linking the LOCs to other constructs that the HOC was related (Figure 7.2, above; hereafter *Step-1-Specification*). PLS-Algorithm was performed using path weighting scheme, 300 iterations, and stop criterion: 10^{-7} (Hair et al., 2017). Only latent scores of LOCs (i.e. value dimensions) were recorded as new variables (Hair et al., 2017; Sarstedt et al., 2019). In step two, such recorded scores were used as the indicators in the HOC (Figure 7.2, below; hereafter *Step-2-Specification*).

Step One



Step Two

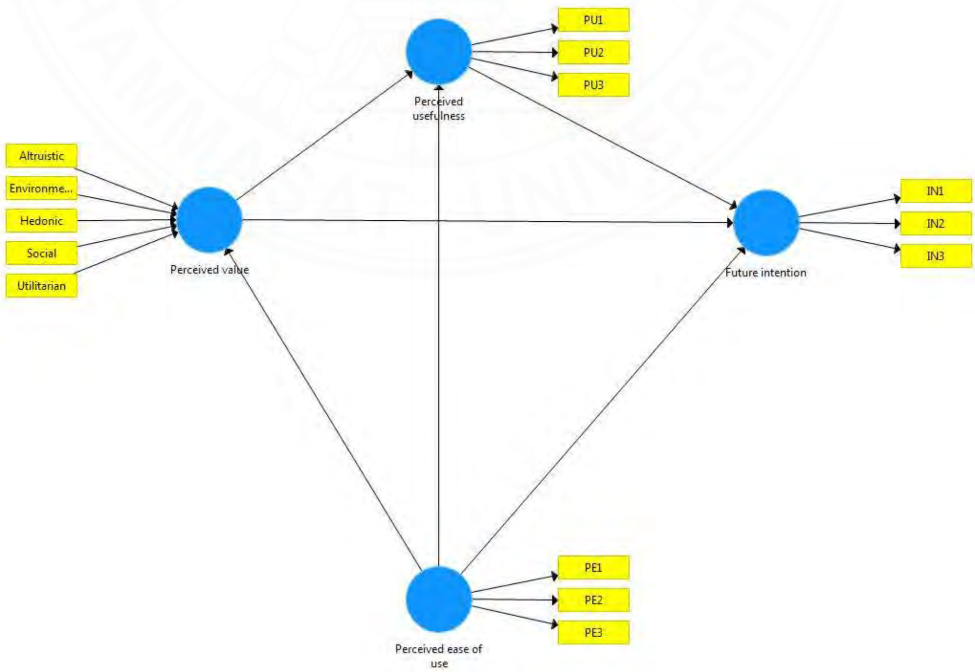


Figure 7.2: Disjoint two-stage approach

Recently, Hair, Risher et al. (2019) suggest researchers who using PLS-SEM should follow their guideline and criteria to increase rigor of research. Below, a systematic evaluation of criteria was performed by following a two-step process: evaluation of the measurement model and the structural model.

7.5.3 The evaluation of measurement model for the lower-order constructs

In Step-1-Specification, PLS-Algorithm was performed using path weighting scheme, 300 iterations, and stop criterion: 10^{-7} (Hair et al., 2017). The LOCs assessments were performed at this stage. All LOCs i.e. PU, PEOU, FI, and the five value dimensions were assessed with the criteria illustrated in Table 7.5.

Table 7.5: Evaluation criteria for lower-order constructs specified reflectively

Issue	Analysis	Criteria and interpretation
Convergent validity	Loadings	Indicator loading ≥ 0.708 indicates that the construct explains more half of the indicator's variance (Hair, Risher et al., 2019) High outer-loadings means the construct has common indicators; outer-loadings between 0.40 and 0.70 indicate that the indicator should be removed or retained if it contributes to content validity; outer-loadings below 0.40 indicate that it should be removed from the construct (Hair et al., 2017)
		Indicator reliability (the square of a standardised indicator's outer-loading) should be greater than 0.50 (Hair et al., 2017)
	Average variance extracted (AVE)	AVE value ≥ 0.50 indicate that, on average, the construct explains more than 50% of the variance of its indicators (Hair, Risher et al., 2019)

Table 7.5: Evaluation criteria for lower-order constructs specified reflectively (continue)

Issue	Analysis	Criteria and interpretation
Internal consistency	Construct reliability	The true reliability lies around Cronbach’s alpha (the lower bound) and Composite reliability (the upper bound) (Hair, Risher et al., 2019) ρA is a good measure of construct reliability (Dijkstra & Henseler, 2015; Hair, Risher et al., 2019) Values between 0.60 and 0.70 indicate acceptable reliability; values between 0.70 and 0.90 indicate satisfactory to good reliability; values of equal to or greater than 0.95 indicate that the items are redundant and reducing construct validity (Hair, Risher et al., 2019)
Discriminant validity	Heterotrait-Monotrait Ratio (HTMT)	HTMT values ≤ 0.85 indicate the constructs are conceptually distinct (Henseler et al., 2015; Hair, Risher et al., 2019)

Convergent validity was assessed by observing indicator outer-loadings, indicator reliability, and average variance extracted (AVE) values (Hair, Risher et al., 2019). For construct reliability, Hair, Risher et al. (2019) suggest that the true reliability value lies between Cronbach’s alpha (the lower bound) and the composite reliability (the upper bound). Convergent validity was assessed by observing Cronbach’s alpha, composite reliability, and ρA for assessing construct reliability (Dijkstra & Henseler, 2015; Hair, Risher et al., 2019). Furthermore, one should employ a bootstrapping to test the construct reliability whether it is significantly higher (lower) than the minimum (maximum) threshold (Hair, Risher et al., 2019). Bootstrapping was performed using 10,000 subsamples with bias-corrected and accelerated (BCA) and two-tails at significant level of 0.05 (Streukens & Leroi-Werelds, 2016; Aguirre-Urreta & Rönkkö, 2018). The BCA can adjust the confidence intervals for skewness (Efron, 1987).

Discriminant validity was assessed by using heterotrait-monotrait ratio (HTMT) (Henseler, Ringle & Sarstedt, 2015). For the case of EM-TSA, one does not need to assess any statistics arise from the relationships between the HOC and its LOCs (Sarstedt et al., 2019). Bootstrapping (the same setting) was performed in order to test whether the HTMT value is significantly lower than the threshold (Franke & Sarstedt, 2019). All results are shows in the next chapter.

7.5.4 The evaluation of measurement model for the higher-order construct

The scores of value dimensions derived from Step-1-Specification served as new data for the model. An assessment of formative HOC (i.e. PV) was performed following the three-step procedure as outlined in Hair, Risher et al. (2019) and Sarstedt et al. (2019). All criteria are presented in Table 7.6.

Table 7.6: Evaluation criteria for higher-order constructs specified formatively

Issue	Analysis	Criteria and interpretation
Convergent validity	Redundancy analysis using a global single-item recommended (Cheah et al., 2017)	The path coefficient of 0.70 or higher indicates the formative construct can explain at least half of the criterion construct's variance (Hair et al., 2017)
Collinearity	Observing VIF outer values (Hair, Risher et al., 2019)	VIF values should be lower than 5, or conservative number, 3 (Hair, Risher et al., 2019)
Bootstrapping	Assess the significance and relevance of the relationships between the LOCs and their HOC	Larger significant indictor weights are more relevant (contribute more) (Hair, Risher et al., 2019) For a non-significant indictor weight, if its indictor loadings >0.50 (and significant), it is considered relevant (Hair, Risher et al., 2019)

First, a redundancy analysis is suggested for assessing convergent validity (Hair, Risher et al., 2019). The idea is to assure that the scores of a formative construct correlate with the score of alternative construct that measures the same phenomena (Cheah, Sarstedt, Ringle, Ramayah & Ting, 2018; Hair et al., 2017). Cheah et al. (2018) further suggest the use of a global single-item as such alternative construct to perform a redundancy analysis. This is because respondents automatically consider different aspects of the construct and ignore aspects that are not relevant to them (Cheah et al., 2018). To verify the formative construct, the path coefficient between a formative construct and an alternative construct should be greater than 0.70 (Hair et al., 2017).

As noted earlier that, initially, the author intended to analyse the obtained data using CB-SEM but not PLS-SEM. As a result, a global single-item was not included in the questionnaire. Observing other items in the questionnaire did not found any item that could be used as a global single-item. Many previous studies that the author explored did not perform a redundancy analysis e.g. Carlson et al. (2015), Gallarza et al. (2017), Hamari et al. (2016) and Y. Wang et al. (2019). This may be because assessing formative constructs in PLS-SEM using redundancy analysis is new. Previous PLS-SEM method papers also did not mention such analysis (Becker, Klein and Wetzels, 2012; Hair, Sarstedt, Ringle & Mena, 2012). Recently, Benitez, Henseler, Castillo and Schuberth (2020) argue that they would accept the analysis "[as] soon as there is sufficient evidence (e.g., by means of Monte Carlo simulations) for the efficacy of the new suggestion (p. 13). Henseler, Ringle and Sinkovics (2009) suggest reseachers to assess nomological validity: the significant relationship between the formative construct (i.e. PV) and other constructs (i.e. PU, PEOU and FI) in the path model.

Nevertheless, a global single-item was obtained from post-hoc interviews. The author and three research assistants called to each respondent using the phone number they provided in the questionnaire. A possible bias could be that the respondent might not feel as similar to when they answered the questionnaire for the first time. Thus, the research team started by briefly recapping about their answers and then asked them with a global single-item. The global single-item was borrowed from Cheah et al. (2018): "Overall, carpooling as a driver offers you a good value"

Seven points Likert scales was used. If there was bias, it would affect only the path coefficient between the global single-item construct and the PV i.e. under (over) determine the convergent validity of all sub-constructs of perceived value. Such bias will not affect other parts because the global single-item was used only for a redundancy analysis.

The author carried out a separate redundancy analyses for each construct i.e. PV and the global single-item (Figure 7.3). PLS-Algorithm was performed using the same setting. The path coefficient between PV and e global single-item construct is reported in the next chapter.

Figure 7.3: Redundancy analyses

Collinearity issues among the LOCs of HOC were assessed. A VIF outer value of less than 5 or, for a conservative one, less than 3 can indicate that there is no collinearity issue (Hair, Risher et al., 2019). PLS-Algorithm was performed using the same setting with the Step-2-Specification. VIF outer values are presented in the next chapter. Finally, bootstrapping (the same setting) was performed to assess the significance and relevance of the relationships between the LOCs and their HOC (Hair, Risher et al., 2019). These results also provide the nomological validity as suggested by Henseler et al. (2009), and are presented in the next chapter.

7.5.5 The evaluation of structural model

There are five steps to assess structural model. Table 7.7 presents all criteria. First, collinearity issue was assessed with thresholds of 5 and 3 (Hair, Risher et al., 2019). Second, PLS-Algorithm performed with the Step-2-Specification provided the coefficient determinant value (R^2) which determined the model's explanatory power (Hair, Risher et al., 2019). Assessing the blindfolding-based measure Q^2 (out-of-sample prediction and in-sample explanatory) was performed by running PLS-Blindfolding (Hair, Risher et al., 2019). Forth, the model's out-of-sample predictive power or $Q^2_{predict}$ was examined by running PLS-Predict (Hair, Risher et al., 2019; Shmueli et al., 2019). Further, comparison of prediction errors was made by observing between the PLS model against the linear model. Finally, bootstrapping (the same setting) was performed to assess the path coefficients' significance and the mediation i.e. indirect effect and total effects. All results are shows in the next chapter.

Table 7.7: Evaluation structural model (adapted from Hair, Risher et al., 2019; Shmueli et al., 2019)

Issue	Analysis	Criteria and interpretation
Collinearity	Observing VIF inner values	VIF values should be lower than 5, or conservative number, less than 3
In-sample predictive power	R^2 for assessing the model's explanatory power by performing PLS-Algorithm	0.75 (substantial), 0.50 (moderate) and 0.25 (weak)
Out-of-sample prediction & in-sample explanatory	Q^2 for assessing the combine aspects of out-of-sample prediction & in-sample explanatory by performing PLS-Blindfolding	Q^2 values less than 0 represents a lack of predictive relevance; Q^2 values of greater than 0 means the model has predictive relevance Q^2 values: 0 (small), 0.25 (medium) and 0.50 (large)

Table 7.7: Evaluation structural model (adapted from Hair, Risher et al., 2019; Shmueli et al., 2019) (continue)

Issue	Analysis	Criteria and interpretation
The model's out-of-sample predictive power	$Q^2_{predict}$ for assessing the model's out-of-sample predictive power by performing PLS-Predict	A negative $Q^2_{predict}$ value indicates that the model lacks predictive power
	Compare prediction errors (using RMSE/MAE) between the PLS model (PM) against the linear model (LM)	If the prediction error distribution is skewed, the MAE is more appropriate PM>LM for all (high predictive power), the majority (medium predictive power), the minority (low predictive power), or none of the indicators (lack of predictive power)

Hair, Risher et al. (2019) and Sarstedt et al. (2012) suggest researchers to perform structural robustness checks in order to increase rigor of study. Next section, structural robustness checks undertaken in the dissertation are presented.

7.6 Structural robustness checks in PLS-SEM

Structural model robustness checks for PLS-SEM was performed in regard to three analyses: nonlinear effects, endogeneity and unobserved heterogeneity (Hair, Ringle, Sarstedt & Gudergan, 2018; Hair, Risher et al., 2019; Sarstedt et al., 2020).

Nonlinear effect can be tested by investigating whether the relationships in the path model are linear by nature i.e. whether the specification of a nonlinear effect yields a significant result or not (Sarstedt et al., 2020). Hair et al. (2018) suggest adding a quadratic effect into the dependence construct (i.e. FI) in order to assess a nonlinear effect between the dependence construct and other constructs (i.e. PU, PEOU and PV). The quadratic effect was set with the TSA, standardised generation, and default weighing mode (Hair et al., 2018). Bootstrapping (the same setting) was performed three times with each relationship: PU-FI, PEOU-FI and PV-FI. Interpretation was made based on Hair et al.'s (2018) criterion: a non-significant interaction term of the quadratic term offers evidence of the linear effect's robustness.

Endogeneity is occurred when a predictor construct is correlated with the error term of the dependent construct to which it is related (Sarstedt et al., 2020). It is occurred when the independent variables are then not only explained by the dependent variable, but also the error in the model (Hult et al., 2018). There are two steps. Firstly, the requirements check for confirming non-normally distribution (Sarstedt & Mooi 2014) was carried out by using R software version 4.0.4. Kolmogorov–Smirnov test with Lilliefors correction were used to indicate any non-normally distribution (Sarstedt & Mooi 2014). The R-codes for performing Kolmogorov–Smirnov test with Lilliefors correction can be downloaded via this link: www.pls-sem.net/pls-sem-academy/gaussian-copula-files/. Interpretation was made based on Sarstedt and Mooi (2014): a p-value below 0.05 indicates the variable does not follow a normal distribution. By using R software, Gaussian copula (C) approach was carried out by modelling the correlation between all endogenous variables (i.e. PU, PEOU and PV) and the error term by means of a copula (Hult et al., 2018). The R-codes for performing Gaussian copula (C) approach can be downloaded via this link: www.pls-sem.net/pls-sem-academy/gaussian-copula-files/. Interpretation was made by observing if the values C of all endogenous variables are insignificant, it means no critical endogeneity issue (Hult et al., 2018).

Unobserved heterogeneity occurs when there are groups in the data set. To perform this is first to check the minimum sample size requirements. This may be done by two methods: the minimum R-squared method (Hair et al., 2017) and using G*Power. In the first method, a minimum R^2 of 0.10 based on Hair et al. (2017) equals to 122 observations. This means that the data can be split into 2 segments (254 divided by 122 ≈ 2.08). However, Kock and Hadaya (2016) argue that this method is inaccurate. Calculating sample size by using G*Power (with the minimum f^2 in DIS-TSA (0.112), 5 maximum arrows, t-test, linear multiple regression, two-tails, 5% significant level, and 80% R^2) indicated 73 observations. This means that the data for DIS-TSA model can be split into 3 segments (≈ 3.479). The next step was then to run a PLS-FIMIX and assessed the criteria follow the guideline provided by Sarstedt et al.

(2017). PLS-FIMIX was performed (5,000 iterations, stop criterion: 10^{-5}, 10 repetitions). The results of structural model robustness checks are provided in the next chapter.

7.7 Summary of the chapter

This chapter described the research methodology of the explanatory empirical research. Data inquiry method used was survey with self-administrated questionnaire. The questionnaire was developed by using well-developed indicators borrowed from the literature. A pilot study via interviews were carried out and helped improve the items in the questionnaire. A survey was performed and provided data for further analyses which include EFA, PLS-SEM and structural model robustness checks. The next chapter presents the findings of the explanatory study.

CHAPTER 8
FINDINGS OF THE EXPLANATORY EMPIRICAL RESEARCH

Chapter Seven explained the research methodology of the explanatory research. The purpose of this chapter is to provide the results of the explanatory empirical research. It starts with the results of exploratory factor analysis (EFA) and is followed by the results of measurement model and structural model. Finally, the findings of structural model robustness checks are provided.

8.1 The results of exploratory factor analysis

As described in the previous chapter, the aim of performing EFA is to check whether items represent collectively in expressing a proposed construct (Hair, Black et al., 2019). The EFA used with two groups of items: (1) the elements regard PU and PEOU (6 items) and (2) the elements of value dimensions (16 items). The EFA processes undertaken were followed the guideline provided by Hair, Black et al. (2019). Hereunder, the result of EFA regards the elements regard PU and PEOU is reported.

First, an EFA was carried out for the elements regard PU and PEOU (6 items). The MSA and Bartlett's test of sphericity were used to indicate significant correlations among the variables (Hair, Black et al., 2019). The assumption test of EFA showed that Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was more than 0.50 (0.800) meanwhile Bartlett's test of sphericity indicated significant value (Chi-square = 754.587; DF = 15; Sig. = 0.000). This indicates that there were sufficient correlations among the manifest variables (Hair, Black et al., 2019). A correlation matrix is provided in Table 8.1.

Table 8.1: Correlation matrix for perceived usefulness and perceived ease of use

	PU1	PU2	PU3	PE1	PE2	PE3
PU1	1.000					
PU2	.497	1.000				
PU3	.745	.567	1.000			
PE1	.345	.435	.477	1.000		
PE2	.312	.440	.531	.687	1.000	
PE3	.328	.436	.485	.571	.679	1.000

'PU' denotes perceived usefulness; 'PE' denotes perceived ease of use.

With varimax rotation, two components were identified by the eigenvalues of 1. A total variance explained of 75.831%, in which each component contributed more than 5% (Table 8.2). A scree plot also suggested choosing the number of components less than three (Figure 8.1).

Table 8.2: Total variance explained for perceived usefulness and perceived ease of use

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		Extraction Sums of Squared Loadings		Rotation Sums of Squared Loadings	
	Total	% of Variance	Sum %	Total	% of Variance	Sum %	Total	% of Variance	Sum %
1	3.522	58.704	58.704	3.522	58.704	58.704	2.383	39.717	39.717
2	1.028	17.127	75.831	1.028	17.127	75.831	2.167	36.114	75.831
3	.520	8.671	84.502						
4	.429	7.155	91.656						
5	.296	4.928	96.585						
6	.205	3.415	100.000						

Extraction method: principal component analysis

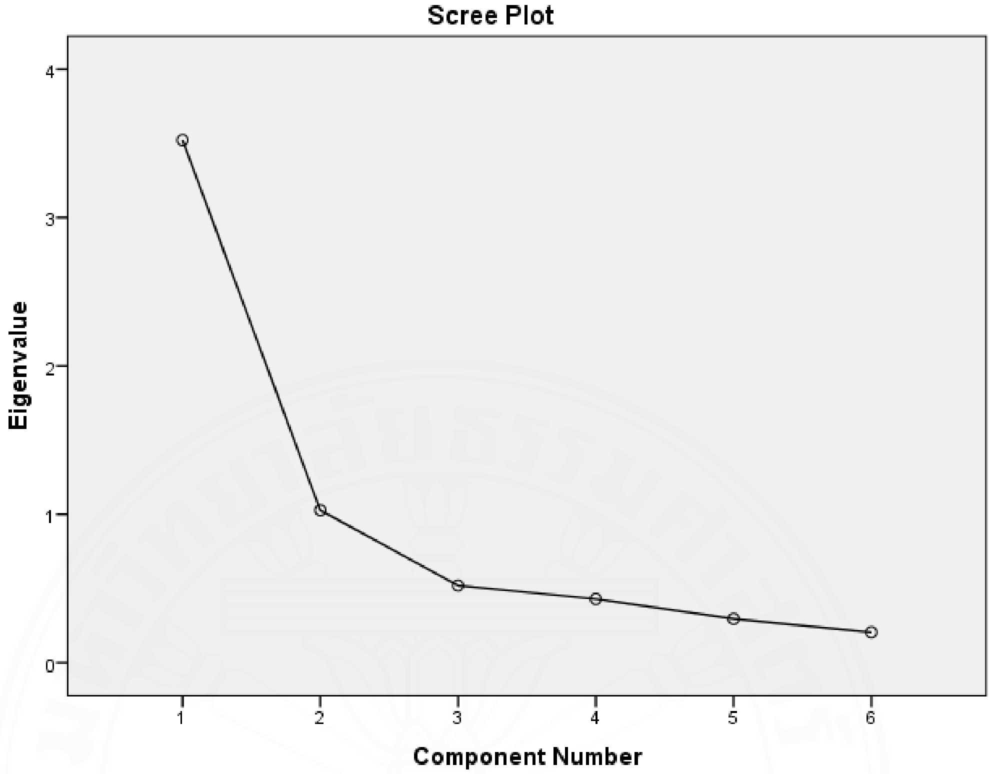


Figure 8.1: Scree plot for perceived usefulness and perceived ease of use

The assessment of factor loadings without varimax rotation identified one single component where one item (PU1use) was cross loaded between two components (the cut point for cross loading was 0.4). With varimax rotation, two components were indicated: perceived usefulness and perceived ease of use, as consistent to TAM (Table 8.3). Each component had a score of factor loadings greater than 0.40, which are considered significant. Finally, all manifest variables had communalities greater than 0.50. This indicates that further analysis can be performed.

Table 8.3: Component matrices and communalities for perceived usefulness and perceived ease of use

Component Matrix[a]			Rotated Component Matrix[b]			Communalities
Factor	Component		Factor	Component		
	1	2		1	2	
PU3	**.830**	.375	PE2	**.878**	.230	.824
PE2	**.803**	-.423	PE3	**.818**	.242	.727
PE1	**.769**	-.368	PE1	**.816**	.248	.728
PE3	**.766**	-.374	PU1	.097	**.919**	.854
PU2	**.728**	.241	PU3	.359	**.837**	.829
PU1	**.693**	**.612**	PU2	.374	**.669**	.588

'PU' denotes perceived usefulness; 'PE' denotes perceived ease of use.

[a] Extraction method: principal component analysis

[b] Rotation method: varimax with Kaiser normalisation, rotation converged in 3 iterations

Another EFA was performed for the elements of value dimensions (16 items). The MSA and Bartlett's test of sphericity were again employed to indicate significant correlations among the variables. The assumption test of EFA showed that KMO was more than 0.50 (0.886) meanwhile Bartlett's test of sphericity indicated significant value (Chi-square = 2492.998; DF = 120; Sig. = 0.000). This indicates that there were sufficient correlations among the manifest variables. A correlation matrix is provided in Table 8.4.

Table 8.4: Correlation matrix for the elements of value dimensions

	U1	U2	U3	H1	H2	H3	S1	S2	S3	E1	E2	E3	A1	A2	A3	A4
U1	1.000															
U2	.417	1.000														
U3	.420	.697	1.000													
H1	.351	.387	.423	1.000												
H2	.333	.468	.498	.678	1.000											
H3	.317	.496	.496	.643	.675	1.000										
S1	.130	.343	.363	.386	.441	.450	1.000									
S2	.173	.421	.352	.408	.508	.453	.721	1.000								
S3	.127	.395	.349	.322	.416	.409	.737	.742	1.000							
E1	.246	.380	.308	.421	.396	.397	.294	.396	.287	1.000						
E2	.446	.321	.292	.409	.345	.368	.126	.262	.173	.577	1.000					
E3	.344	.373	.336	.434	.428	.360	.282	.352	.266	.779	.640	1.000				
A1	.373	.439	.422	.420	.510	.520	.370	.398	.289	.369	.389	.340	1.000			
A2	.328	.473	.427	.450	.509	.571	.383	.435	.333	.441	.439	.372	.764	1.000		
A3	.295	.334	.416	.374	.467	.515	.433	.473	.417	.313	.251	.247	.451	.452	1.000	
A4	.365	.471	.425	.428	.500	.533	.406	.504	.394	.355	.349	.331	.583	.581	.703	1.000

‘A’ denotes altruistic value; ‘S’ denotes social value; ‘E’ denotes environmental value; ‘H’ denotes hedonic value; ‘U’ denotes utilitarian value.

The number of components indicated by eigenvalues of 1 yielded three components with a total variance explained of 64.685%, in which the each component contributed more than 5% (Table 8.5). As expect, because the number of manifest variables were 16 which is less than 20, this method yielded too few components (Hair, Black et al., 2019).

Table 8.5: Total variance explained for the elements of value dimensions (eigenvalues of 1)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Sum %	Total	% of Variance	Sum %	Total	% of Variance	Sum %
1	7.334	45.834	45.834	7.334	45.834	45.834	4.717	29.480	29.480
2	1.741	10.882	56.716	1.741	10.882	56.716	2.971	18.572	48.051
3	1.275	7.969	64.685	1.275	7.969	64.685	2.661	16.634	64.685
4	.963	6.020	70.705						
5	.860	5.378	76.083						
6	.714	4.463	80.546						
7	.624	3.901	84.447						
8	.399	2.491	86.938						
9	.364	2.274	89.212						
10	.333	2.082	91.295						
11	.312	1.947	93.242						
12	.257	1.605	94.847						
13	.231	1.444	96.291						
14	.215	1.344	97.635						
15	.204	1.278	98.913						
16	.174	1.087	100.000						

Extraction method: principal component analysis

Table 8.6: Component matrices and communalities for the elements of value dimensions (eigenvalues of 1)

Component Matrix[a]				Rotated Component Matrix[b]				Communalities
Factor	Component			Factor	Component			
	1	2	3		1	2	3	
H3	**.772**	-.041	-.159	A1	**.735**	.158	.192	.602
H2	**.768**	-.034	-.077	A4	**.714**	.318	.112	.624
A2	**.746**	.086	-.202	A2	**.702**	.208	.262	.605
A4	**.742**	-.093	-.253	U3	**.690**	.180	.140	.528
A1	**.715**	.082	-.289	H3	**.680**	.336	.218	.623
S2	**.707**	-.454	.304	U2	**.648**	.212	.216	.511
H1	**.703**	.103	-.005	H2	**.625**	.365	.271	.597
U2	**.687**	.048	-.193	A3	**.619**	.394	.020	.539
U3	**.669**	.027	-.282	U1	**.609**	-.171	.296	**.487**
A3	**.667**	-.220	-.215	H1	**.543**	.263	.376	.505
S1	**.638**	-.558	.266	S3	.201	**.861**	.103	.792
E1	**.636**	.379	.493	S1	.250	**.849**	.084	.790
E3	**.625**	**.460**	.496	S2	.288	**.820**	.206	.798
S3	**.616**	-.560	.315	E3	.196	.178	**.882**	.848
E2	**.576**	**.565**	.242	E1	.198	.242	**.832**	.791
U1	**.506**	**.384**	-.289	E2	.335	-.038	**.772**	.710

‘A’ denotes altruistic value; ‘S’ denotes social value; ‘E’ denotes environmental value; ‘H’ denotes hedonic value; ‘U’ denotes utilitarian value.

[a] Extraction method: principal component analysis

[b] Rotation method: varimax with Kaiser normalisation, rotation converged in 5 iterations

The assessment of factor loadings without varimax rotation identified one single component where three items were cross loaded. With varimax rotation, three components were indicated (Table 8.6): social value dimension (3 items) and environmental value dimension (3 items). Utilitarian, hedonic and altruistic value dimensions were identified as one single component. Each component had a score of factor loadings greater than 0.40, which are considered significant. However, one item (U1cost) had communalities less than 0.50. The author analysed the three-component solution with partial least squares structural equation modelling (PLS-SEM), the results derived quite similar to the solution identified by the following method.

Hair, Black et al. (2019) suggest one must consider other criteria rather only using eigenvalues. Scree plot was used and suggested the author to choose any component that less than eight (Figure 8.2). The predetermined theoretical foundation i.e. hypotheses suggests that there would be five components. Another EFA was performed for the elements of value dimensions but the extracted components number was fixed to five. A total variance explained of 76.083% was reported, in which the each component contributed more than 5% (Table 8.7). Such total variance explained was improved from the three-component solution.

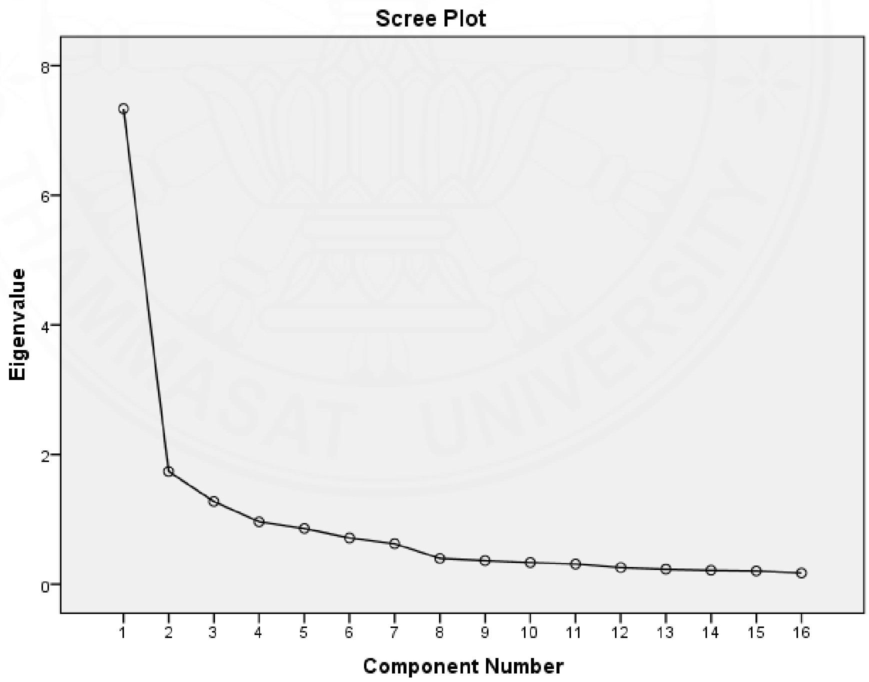


Figure 8.2: Scree plot for perceived value

Table 8.7: Total variance explained for the elements of value dimensions (5 factors)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Sum %	Total	% of Variance	Sum %	Total	% of Variance	Sum %
1	7.334	45.834	45.834	7.334	45.834	45.834	2.800	17.501	17.501
2	1.741	10.882	56.716	1.741	10.882	56.716	2.713	16.958	34.459
3	1.275	7.969	64.685	1.275	7.969	64.685	2.469	15.430	49.889
4	.963	6.020	70.705	.963	6.020	70.705	2.153	13.456	63.345
5	.860	5.378	76.083	.860	5.378	76.083	2.038	12.738	76.083
6	.714	4.463	80.546						
7	.624	3.901	84.447						
8	.399	2.491	86.938						
9	.364	2.274	89.212						
10	.333	2.082	91.295						
11	.312	1.947	93.242						
12	.257	1.605	94.847						
13	.231	1.444	96.291						
14	.215	1.344	97.635						
15	.204	1.278	98.913						
16	.174	1.087	100.000						

Extraction method: principal component analysis

Without varimax rotation, one single component was identified where five items were cross loaded. After varimax rotation, five components were identified (Table 8.8): utilitarian value dimension (3 items), hedonic value dimension (3 items), social value dimension (3 items), environmental value dimension (3 items), and altruistic value dimension (4 items). Each component had a score of factor loadings greater than 0.40, which are considered significant. Finally, all manifest variables had communalities greater than 0.50. Overall, it can be concluded that the manifest variables for (1) the elements regard PU and PEOU (6 items) and (2) the elements of value dimensions (16 items) collectively represented their constructs.

Table 8.8: Component matrices and communalities for the elements of value dimensions (5 factors)

Component Matrix[a]						Rotated Component Matrix[b]						Communalities
Factor	Component					Factor	Component					
	1	2	3	4	5		1	2	3	4	5	
H3	**.772**	-.041	-.159	-.032	-.369	A1	**.760**	.097	.210	.234	.205	.727
H2	**.768**	-.034	-.077	.037	-.434	A4	**.757**	.276	.137	.160	.232	.748
A2	**.746**	.086	-.202	-.326	.092	A2	**.723**	.143	.276	.261	.180	.720
A4	**.742**	-.093	-.253	-.283	.210	A3	**.678**	.345	.040	.176	.152	.634
A1	**.715**	.082	-.289	-.333	.118	S3	.144	**.874**	.093	.121	.149	.829
S2	**.707**	-.454	.304	.002	.105	S1	.208	**.831**	.067	.218	.085	.794
H1	**.703**	.103	-.005	.039	-.558	S2	.277	**.806**	.201	.181	.099	.809
U2	**.687**	.048	-.193	**.477**	.186	E3	.074	.177	**.865**	.188	.174	.851
U3	**.669**	.027	-.282	**.502**	.082	E1	.166	.226	**.829**	.173	.081	.802
A3	**.667**	-.220	-.215	-.271	.148	E2	.261	-.045	**.773**	.135	.208	.730
S1	**.638**	-.558	.266	.053	.035	H1	.182	.151	.274	**.812**	.167	.818
E1	**.636**	.379	**.493**	-.082	.064	H2	.291	.267	.184	**.737**	.230	.787
E3	**.625**	**.460**	**.496**	.036	.047	H3	.396	.238	.144	**.687**	.232	.760
S3	**.616**	-.560	.315	.142	.131	U3	.183	.236	.079	.280	**.782**	.786
E2	**.576**	**.565**	.242	-.086	.112	U2	.197	.282	.171	.184	**.770**	.774
U1	**.506**	.384	-.289	.266	.215	U1	.280	-.117	.277	.085	**.654**	.604

‘A’ denotes altruistic value; ‘S’ denotes social value; ‘E’ denotes environmental value; ‘H’ denotes hedonic value; ‘U’ denotes utilitarian value.

[a] Extraction method: principal component analysis

[b] Rotation method: varimax with Kaiser normalisation, rotation converged in 6 iterations

The next step was to investigate the relationships between constructs whether they would behave similar to the proposed hypotheses. Jamie et al. (2021)

suggest that one may need to confirm the Type-II models by employing confirmatory factor analysis.

8.2 Validating the Type-II model with confirmatory factor analysis

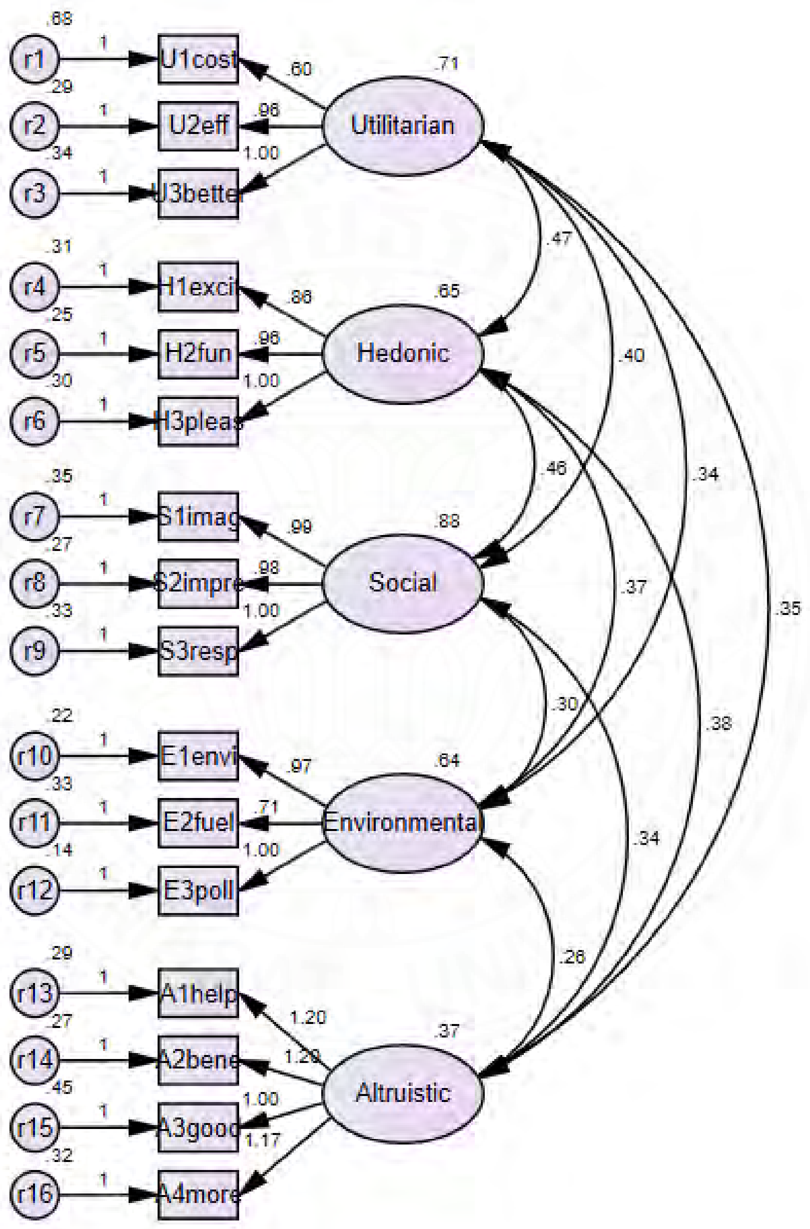
The confirmatory factor analysis with maximum likelihood estimation to evaluate the properties of variables was undertaken, as suggested by Jamie et al. (2021). Table 8.9 reports the model fit measures of the 5-constructs model (five value dimensions) versus the unidimension model (all manifest variables within one construct). The aim of this testing is not to a model fit but to "determine that one model is better than another" (Hair, Black et al., 2019, p. 642). Criteria for assessing goodness-of-fit suggested by Hair, Black et al. (2019) were used as a guideline for comparing between the two models. In Table 8.9, it is observed that the 5-constructs model overall showed improved criteria when compared with the unidimension model. For example, the 5-constructs model has smaller Chi-square than the unidimension model, which indicates that two models are different (Hair, Black et al., 2019). Two criteria are observed to be higher than the given thresholds: CFI and RMSEA. The CFI of the 5-constructs model (0.928) are within a range between 0.90 and 0.95 which indicates acceptable fit (Bentler, 1990; Hu & Bentler, 1999). The RMSEA of the 5-constructs model (0.086) is still within the range of some other methodologists who suggest that a RMSEA between 0.08 and 0.10 indicates an acceptable value (Bollen & Long, 1993; Browne & Cudeck, 1992; Marsh, Hau & Wen, 2004).

Table 8.9: Model fit measures (AMOS)

	CMIN (χ^2)	DF	CMIN/DF	CFI	SRMR	RMSEA
Criteria	Significant p-Value	n/a	3:1	>0.94	<0.08	<0.07
PV: 5-constructs model	268.463	94	2.856	0.928	0.048	0.086
PV: 1-construct model	924.115	104	8.886	0.663	0.097	0.177

Significant p = 0.000; 'PV' denotes perceived value.

Figure 8.3 provides the correlations between all lower-order constructs (LOC). It is observed that the operative model of the dissertation is a Type-II model, as all correlations were less than 0.70 (Jamie et al., 2021).



'A' denotes altruistic value; 'S' denotes social value; 'E' denotes environmental value; 'H' denotes hedonic value; 'U' denotes utilitarian value.

Figure 8.3: Confirmatory factor analysis

Analysing obtained data with PLS-SEM has to be done systematically using a set of criteria. Recently, Hair, Risher et al. (2019) suggest researchers to follow their guideline and criteria for the use in evaluating the measurement model and the structural model.

8.3 The evaluation of measurement model for the lower-order constructs

As explain in the previous chapter (Section 7.5.2), the first step of disjoint two-stage approach (DIS-TSA) was considered only the LOCs i.e. modelling without the HOC and then specified the path model by directly linking the LOCs to other constructs that the HOC was related (Sarstedt et al., 2016). The first issue for the LOCs assessment is convergent validity (Hair, Risher et al., 2019). As observed in Table 8.10, all indicator outer-loadings values were greater than 0.708. All indicator values were between 0.70 and 0.90, which indicate satisfactory to good. No value was greater than 0.95. Furthermore, the indicator reliability were also greater than 0.50. This suggests that each construct explains more than half of its indicator's variance. In Table 8.11, all indicators showed AVE values of greater than 0.50, which indicates that, on average, the construct explains more than half of the variance of its indicators. These results indicate a convergent validity.

Table 8.10: Indicator outer-loadings values and indicator reliability values

	Altruistic		Environmental		Hedonic		FI		PEOU		PU		Social		Utilitarian	
	LO	IR	LO	IR	LO	IR	LO	IR	LO	IR	LO	IR	LO	IR	LO	IR
A1	.864	.746														
A2	.864	.747														
A3	.749	.561														
A4	.843	.711														
E1			.888	.788												
E2			.838	.702												
E3			.919	.844												
H1					.867	.752										
H2					.879	.772										
H3					.896	.803										
IN1							.919	.844								
IN2							.911	.831								
IN3							.906	.820								
PE1									.848	.719						
PE2									.911	.831						
PE3									.861	.741						
PU1											.866	.750				
PU2											.796	.634				
PU3											.909	.827				
S2													.914	.835		
S3													.907	.822		
S3													.898	.807		
U1															.720	.518
U2															.869	.754
U3															.873	.762

‘FI’ denotes future intention; ‘PEOU’ denotes perceived ease of use; ‘PU’ denotes perceived usefulness; ‘LO’ denotes indicator outer-loadings; ‘IR’ denotes indicator reliability; ‘PU’ denotes perceived usefulness; ‘PE’ denotes perceived ease of use; ‘INT’ denotes future intention; ‘A’ denotes altruistic value; ‘S’ denotes social value; ‘E’ denotes environmental value; ‘H’ denotes hedonic value; ‘U’ denotes utilitarian value.

Table 8.11: Average Variance Extracted

	Average Variance Extracted
Altruistic	0.691
Environmental	0.778
Future intention	0.831
Hedonic	0.776
Perceived ease of use	0.764
Perceived usefulness	0.737
Social	0.821
Utilitarian	0.678

Construct reliability were in between the thresholds of 0.70 and 0.95. The results of bootstrapping also indicated the values within the thresholds (Table 8.12). These results indicate that reliability is established.

Table 8.12: Reliability

	Cronbach's Alpha	rho_A	Composite Reliability
Altruistic value	0.851 (0.816, 0.882)	0.864 (0.830, 0.889)	0.899 (0.876, 0.919)
Environmental value	0.856 (0.808, 0.893)	0.859 (0.809, 0.892)	0.913 (0.887, 0.934)
Future intention	0.899 (0.873, 0.919)	0.899 (0.873, 0.919)	0.937 (0.922, 0.949)
Hedonic value	0.856 (0.817, 0.887)	0.871 (0.830, 0.903)	0.912 (0.890, 0.930)
Perceived ease of use	0.845 (0.795, 0.881)	0.854 (0.799, 0.890)	0.906 (0.880, 0.927)
Perceived usefulness	0.820 (0.774, 0.857)	0.829 (0.781, 0.865)	0.893 (0.869, 0.913)
Social value	0.892 (0.865, 0.913)	0.904 (0.869, 0.936)	0.932 (0.917, 0.945)
Utilitarian value	0.758 (0.705, 0.802)	0.769 (0.708, 0.812)	0.863 (0.838, 0.885)

The number in parenthesis is the result of bootstrapping, 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05.

Regards discriminant validity, Table 8.13 presents the results of heterotrait-monotrait ratio (HTMT). All indicators showed HTMT values below 0.85. This indicates that the constructs are conceptually distinct. Bootstrapping also showed that all HTMT values below the upper bound 0.85. Discriminant validity is established. The next step is to assess formative measurement model.

Table 8.13: Heterotrait-monotrait ratio

	A	E	FI	H	PEOU	PU	S	U
A								
E	0.558 (0.688)							
FI	0.658 (0.757)	0.654 (0.741)						
H	0.772 (0.846)	0.594 (0.696)	0.686 (0.767)					
PEOU	0.440 (0.572)	0.326 (0.468)	0.505 (0.628)	0.452 (0.570)				
PU	0.625 (0.734)	0.531 (0.645)	0.755 (0.833)	0.626 (0.725)	0.675 (0.785)			
S	0.613 (0.712)	0.388 (0.487)	0.487 (0.594)	0.603 (0.718)	0.317 (0.451)	0.443 (0.570)		
U	0.724 (0.825)	0.580 (0.721)	0.679 (0.774)	0.718 (0.805)	0.393 (0.528)	0.650 (0.752)	0.482 (0.606)	

‘A’ denotes Altruistic value; ‘E’ denotes Environmental value; ‘FI’ denotes Future intention; ‘H’ denotes Hedonic value; ‘PEOU’ denotes Perceived ease of use; ‘PU’ denotes Perceived usefulness; ‘S’ denotes Social value; ‘U’ denotes Utilitarian value. The numbers in parenthesis are the results of bootstrapping, 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05.

8.4 The evaluation of measurement model for the higher-order construct

The redundant analysis derived a path coefficient value of 0.774, which means the formative construct PV can explain at least half of the variance of global-single item (Figure 8.4). The model exhibit convergent validity. Next, collinearity is not an issue, as VIF values were below the conservative threshold of 3 (altruistic = 2.180, environmental = 1.467, hedonic = 2.228, social = 1.515 and utilitarian = 1.754).

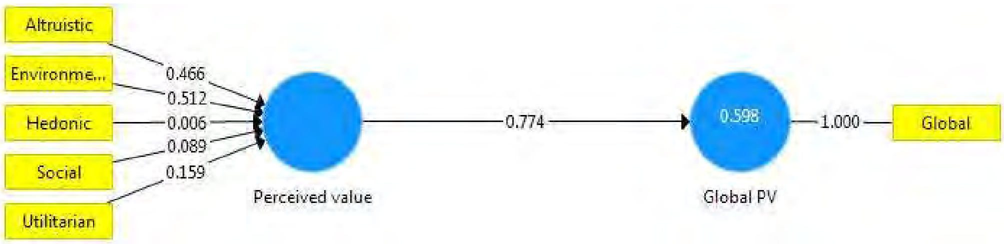


Figure 8.4: Redundant analysis

Table 8.14 presents the indicator weights and indicator loadings values. Four value dimensions were significant and relevance. The most relevant construct was hedonic value (β_{H7b} = 0.325, *p* = 0.001) and was followed by environmental value (β_{H7d} = 0.293, *p* = 0.000), altruistic value (β_{H7e} = 0.273, *p* = 0.005) and utilitarian value (β_{H7a} = 0.267, *p* = 0.003), respectively. Social value was not significant (β_{H7c} = 0.098, *p* = 0.197). However, the indicator loadings of social value dimension was significant at the level of 5% and larger than 0.5 (β = 0.622, *p* = 0.000). Social value dimension was, thus, retained in the HOC measurement model. In conclusion, all results offered support for the validity of the formative HOC. Next, we will do structural model assessment.

Table 8.14: Indicator weights and indicator loadings

	Outer weights	t-Value	p-Value	Sig (p<0.05)	Outer loadings	t-Value	p-Value	Sig (p<0.05)
Utilitarian → Perceived value	0.267	3.006	0.003	H7a: Yes	0.792	16.112	0.000	Yes
Hedonic → Perceived value	0.325	3.248	0.001	H7b: Yes	0.862	24.673	0.000	Yes
Social → Perceived value	0.098	1.291	0.197	H7c: No	0.622	10.004	0.000	Yes
Environmental → Perceived value	0.293	3.921	0.000	H7d: Yes	0.746	14.176	0.000	Yes
Altruistic → Perceived value	0.273	2.825	0.005	H7e: Yes	0.838	17.786	0.000	Yes

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

8.5 The evaluation of structural model

There were five steps to assess structural model: collinearity, R^2 (in-sample predictive power), Q^2 (out-of-sample prediction and in-sample explanatory), $Q^2_{predict}$ (the model's out-of-sample predictive power), and the path coefficients' significance and the mediation.

8.5.1 Explanatory and prediction powers

Collinearity is not an issue, as the VIF inner values were below the conservative threshold of 3 (ranging from 1.000 to 1.996). The R^2 values indicated that future intention (FI) and PU were moderately explained by its independent constructs (R^2_{FI} = 0.583; R^2_{PU} = 0.499) where as PV is not well explained by PEOU (R^2_{PV} = 0.181). Table 8.15 shows the R^2 values.

Table 8.15: In-sample predictive power: coefficient of determination (R^2 values)

	R^2 Value	t-Value	p-Value	Explanatory power
Future intention (FI)	0.583	14.922	0.000	Moderate
Perceived usefulness (PU)	0.499	10.345	0.000	Moderate
Perceived value (PV)	0.181	4.094	0.000	Weak

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

The Q^2 (out-of-sample prediction and in-sample explanatory) values indicated that all endogenous constructs were larger than zero (Table 8.16). More precisely, FI and PU have the highest Q^2 values (Q^2_{FI} = 0.473, Q^2_{PU} = 0.355), which indicate medium predictive power. PV has the lowest Q^2 value (Q^2_{PV} = 0.107) which indicates small predictive power. All values suggest that the model has predictive relevance regarding the endogenous constructs.

Table 8.16: Out-of-sample prediction and in-sample explanatory: predictive relevance Q^2 value

	SSO	SSE	Q^2 (=1-SSE/SSO)	Predictive power
Future intention (FI)	762.000	401.626	0.473	Medium
Perceived usefulness (PU)	762.000	491.456	0.355	Medium
Perceived value (PV)	1270.000	1133.795	0.107	Small

The model's out-of-sample predictive power reported with $Q^2_{predict}$ showed that the $Q^2_{predict}$ for all endogenous variables were greater than zero (Table 8.17). This indicates that the model exhibits predictive power. Furthermore, it was observed that the prediction error distributions for all were skewed; therefore, the MAE was used to determine the predictive power. It was found that the model exhibited medium predictive power, as the majority of indicators in PLS-SEM showed lower prediction error than linear model i.e. the MSE values of linear model minus the MSE values of PLS model yielded positive values in general.

Table 8.17: The model's out-of-sample predictive power

	The prediction error distribution	PLS model	LM-PLS
		Q^2_predict	MAE
INT1	-0.177	0.121	0.005
INT2	-0.171	0.167	0.002
INT3	-0.342	0.180	0.002
PU1	-0.012	0.240	0.002
PU2	-0.312	0.315	-0.007
PU3	-0.363	0.120	-0.006
Altruistic	-0.278	0.092	0.003
Environmental	-0.368	0.146	0.002
Hedonic	-0.358	0.072	0.005
Social	-0.879	0.071	0.005
Utilitarian	-0.315	0.139	-0.009

'LM-PLS' denotes the MSE values of linear model minus the MSE values of PLS model; 'INT' denotes future intention; 'PU' denotes perceived usefulness.

8.5.2 Path coefficients

The path coefficient analysis was conducted to test the proposed hypotheses. The results of path coefficients are showed in Table 8.18, Table 8.19 and Figure 8.5. Most of the proposed hypotheses are supported. More precisely, PU is positively associated with FI (β_{H1} = 0.306, *t*-value = 4.807, $p < 0.05$), which supports H1. The result indicates that the drivers who perceived that the app is useful were more likely to use the app for carpooling in the future. The result is consistent with previous studies (Barnes & Mattsson, 2017; Li & Wen, 2019; Mola et al., 2020; Wang et al., 2018; Wu et al., 2019). Next, it is observed that PEOU is positively associated with PU (β_{H2} = 0.368, *t*-value = 5.087, $p < 0.05$) and with PV (β_{H5} = 0.426, *t*-value = 8.387, $p < 0.05$), which means that H2 and H5 are supported. The results indicate that the drivers who perceived the app is easy to use were more likely to perceive that the app is useful as well as were more likely to carpool via the app in the future. These results are also consistent with the literature (Cheng & Huang, 2013; Kim & Kim, 2020; Mola et al. 2020; Wang et al., 2018; Wu et al., 2019). However, the effect of PEOU on FI was not significant (β_{H3a} = 0.056, *t*-value = 0.910, $p < 0.05$), which implies that H3a is not supported. Such insufficient effect is found to be similar to Cheng and Huang (2013) and Wang et al. (2018). Finally, the findings suggest that PV is positively associated with PU (β_{H4} = 0.467, *t*-value = 7.747, $p < 0.05$) and with FI (β_{H6a} = 0.502, *t*-value = 8.638, $p < 0.05$), which indicate that H4 and H6a are supported and consistent with previous studies (Barnes & Mattsson, 2017; Li & Wen, 2019). In other words, the drivers who perceived the value of carpooling were more likely to perceive that the app is useful as well as were more likely to carpool via the app in the future.

Table 8.18: Statistical significance and relevance of path coefficients

Direct effect	Path coefficients	t-Value	p-Value	95% CI	Sig. (p<0.05)
Perceived usefulness → Future intention	0.306	4.807	0.000	(0.184, 0.432)	H1: Yes
Perceived ease of use → Perceived usefulness	0.368	5.087	0.000	(0.224, 0.505)	H2: Yes
Perceived ease of use → Perceived value	0.426	8.387	0.000	(0.309, 0.512)	H5: Yes
Perceived ease of use → Future intention	0.056	0.910	0.363	(0.060, 0.180)	H3a: No
Perceived value → Perceived usefulness	0.467	7.747	0.000	(0.339, 0.577)	H4: Yes
Perceived value → Future intention	0.502	8.638	0.000	(0.379, 0.606)	H6a: Yes

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

The estimates for the value dimensions can be conclude from Table 8.19. It is observed that perceived value which is constituted by, at least, four value dimensions (utilitarian, hedonic, environment and altruism) had a positive effect on the driver' future intention to carpool via the app (β_{H6a} = 0.502, t-value = 8.638, $p <$ 0.05). Furthermore, the findings shown in the table not only confirm the multidimensional nature of the perceived value within the context of carpooling via the app but also validate the nomological validity of formative construct, as suggested by Henseler et al. (2009). The driver's perception of utilitarian, hedonic, environment and altruism value were significant components of perceived value. This means that H7a, H7b, H7d and H7e are supported. The results of the relationships between most of value dimensions (utilitarian, hedonic, environment and altruism) are consistent with previous studies (Arteaga-Sánchez et al., 2018; Arbour-Nicitopoulos et al., 2012; Barnes & Mattsson, 2017; Previte et al., 2019; Y. Wang et al., 2019). However, the result shows that social value was insignificant component of perceived value, which implies that H7c is not supported. Hamari et al. (2016) also indicate an insignificant effect of reputation (i.e. perceptions towards improving social image, gaining recognition and earning respect) on future intention to engage in collaborative consumption practices.

Table 8.19: Estimations for the value dimensions

	Estimate	t-Value	p-Value	Sig (p<0.05)
Perceived value → Future intention	0.502	8.638	0.000	H6a: Yes
Utilitarian → Perceived value	0.267	3.006	0.003	H7a: Yes
Hedonic → Perceived value	0.325	3.248	0.001	H7b: Yes
Social → Perceived value	0.098	1.291	0.197	H7c: No
Environmental → Perceived value	0.293	3.921	0.000	H7d: Yes
Altruistic → Perceived value	0.273	2.825	0.005	H7e: Yes

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

8.5.3 Mediation

The results report the mediation effect of PU in two ways: from PEOU to FI and from PV to FI (Table 8.20, 8.21), which confirm H3b and H6b and consistent with previous studies (Barnes & Mattsson, 2017; Li & Wen, 2019; Mola et al., 2020). More specifically, perceived usefulness represents indirect-only mediation (full mediation) of the relationship between perceived ease of use and the driver's future intention to carpool via the app. This is observed from the significance of the indirect effect from PEOU to FI (β_{H3b} = 0.112, *t*-value = 3.459, p < 0.05) and the insignificance of the direct effect from PU to FI (β_{H3a} = 0.056, *t*-value = 0.910, p < 0.05). In other words, perceived usefulness acts as a mechanism that underlies the relationship between perceived ease of use and the driver's future intention to carpool. The drivers who perceived the app is easy to use were more likely to perceive that the app is useful and consequently were more likely to carpool via the app in the future.

Table 8.20: The mediating role of perceived usefulness

	Indirect effect	95% CI	t-Value	p-Value	Sig. (p<0.05)
Perceived ease of use → Perceived usefulness → Future intention	0.112	(0.060, 0.192)	3.459	0.001	H3b: Yes
Perceived value → Perceived usefulness → Future intention	0.143	(0.079, 0.221)	3.931	0.000	H6b: Yes

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

Second, perceived usefulness is observed to be complementary mediation (partial mediation) of the relationship between perceived value and the driver's future intention to carpool via the app. This is observed from the significance of the indirect effect (β_{H6b} = 0.143, *t*-value = 3.931, p < 0.05) and the direct effect (β_{H6a} = 0.502, *t*-value = 8.638, p < 0.05) from PU to FI. This means that perceived usefulness also acts as a mechanism that directs the relationships between perceived value and future intention to carpool. The drivers who perceived the value of carpooling were more likely to perceive that the app is useful and consequently were more likely to carpool via the app in the future.

Table 8.21: Types of mediating role of perceived usefulness

	Direct effect	95% CI	t-Value	p-Value	Sig. (p<0.05)	Indirect effect	95% CI	t-Value	p-Value	Sig. (p<0.05)
PEOU → FI	0.056	(-0.060, 0.180)	0.910	0.363	H3a: No	0.112	(0.060, 0.192)	3.459	0.001	H3b: Yes
PV → FI	0.502	(0.379, 0.606)	8.638	0.000	H6a: Yes	0.143	(0.079, 0.221)	3.931	0.000	H6b: Yes

‘PEOU’ denotes perceived ease of use; ‘PV’ denotes perceived value; ‘FI’ denotes future intention.

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

The path model presented in Figure 8.5 illustrates the path coefficients described above and also presents the importance of elements of value dimensions, in which hedonic value was perceived as the most important for the drivers to carpool and followed by environmental, altruistic, and utilitarian value, respectively. Coefficient of determination values are also reported in the blue circles.

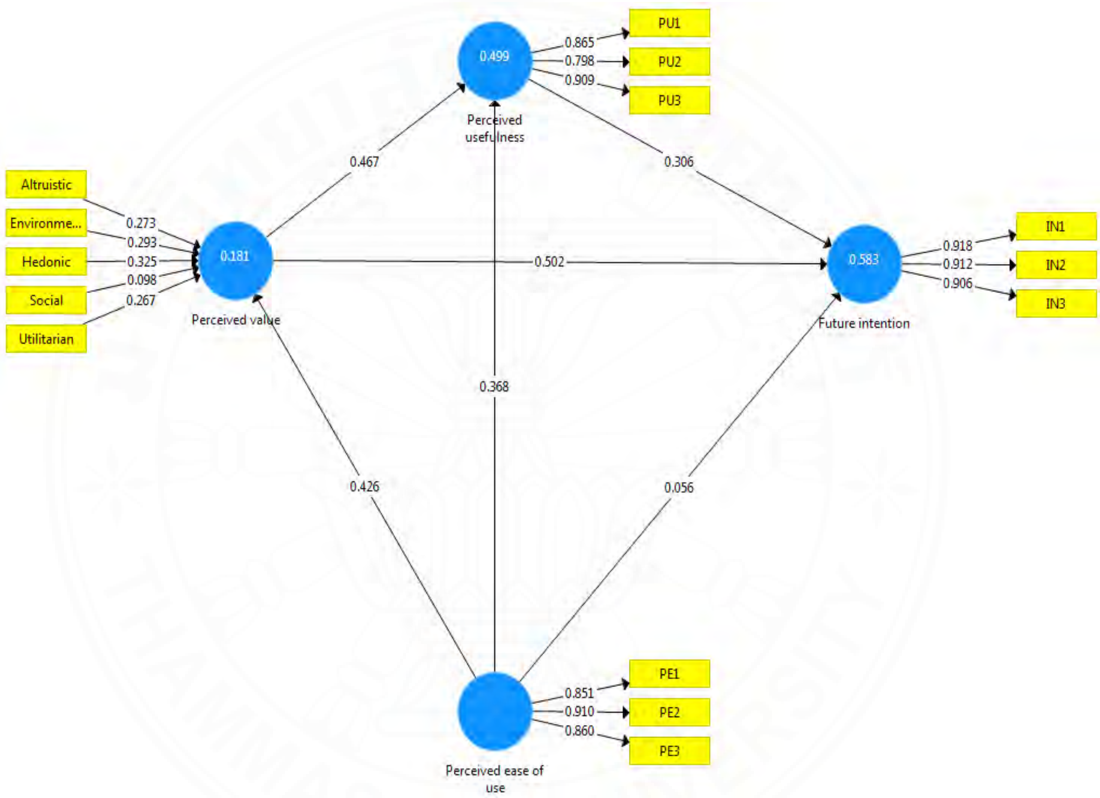


Figure 8.5: The path coefficients.

Table 8.22 summarises the results of hypothesis testing. It is observed that most hypotheses were supported as similar to the literature. Only two hypotheses, i.e. H3a (the direct effect of PEOU on FI) and H7c (Social value as a formative first-order dimension of PV), were not supported. These not-supported findings also found in Cheng and Huang (2013) and Wang et al. (2018), for H3a, and Hamari et al. (2016) for H7c.

Table 8.22: A summary of hypothesis testing

Hypothesis	Result	Similar studies
H1: Perceived usefulness is positively associated with the driver's future intention to carpool via the app.	Supported	Barnes & Mattsson (2017), Li & Wen (2019); Mola et al. (2020), Wang et al. (2018), Wu et al. (2019)
H2: Perceived ease of use is positively associated with perceived usefulness.	Supported	Cheng & Huang (2013), Mola et al. (2020), Wang et al. (2018), Wu et al. (2019)
H3a: Perceived ease of use is positively associated with the driver's future intention to carpool via the app.	Not supported	Cheng & Huang (2013), Wang et al. (2018)
H3b: Perceived usefulness is a mediator between perceived ease of use and the driver's future intention to carpool via the app.	Supported	Mola et al. (2020)
H4: Perceived value is positively associated with perceived usefulness.	Supported	Barnes & Mattsson (2017), Li & Wen (2019)
H5: Perceived ease of use is positively associated with perceived value.	Supported	Kim & Kim (2020)
H6a: Perceived value is positively associated with the driver's future intention to carpool via the app.	Supported	Y. Wang et al. (2019)
H6b: Perceived usefulness is a mediator between perceived value and the driver's future intention to carpool via the app.	Supported	Barnes & Mattsson (2017), Li & Wen (2019)
H7a: Utilitarian value is a formative first-order dimension of PV.	Supported	Y. Wang et al. (2019)
H7b: Hedonic value is a formative first-order dimension of PV.	Supported	Y. Wang et al. (2019)

Table 8.22: A summary of hypothesis testing (continue)

Hypothesis	Result	Similar studies
H7c: Social value is a formative first-order dimension of PV.	Not supported	Hamari et al. (2016)
H7d: Environmental value is a formative first-order dimension of PV.	Supported	Arbour-Nicitopoulos et al. (2012); Arteaga-Sánchez et al. (2018)
H7e: Altruistic value is a formative first-order dimension of PV.	Supported	Barbosa & Fonseca (2019), Previte et al. (2019)

Hair, Risher et al. (2019) and Sarstedt et al. (2012) suggest researchers to perform structural robustness checks in regard to three analyses: nonlinear effects, endogeneity and unobserved heterogeneity. Such analyses can increase the rigor of study.

8.6 Structural robustness checks

Nonlinear effect yielded the results as showed in Table 8.23. Future Intention did not have a significant quadratic effect on perceived ease of use, perceived usefulness and perceived value. Overall, it suggests that nonlinear effect is not an issue.

Table 8.23: Non-linear effects

	Path coefficients	95% CI	t-Value	p-Value	Sig. (*p*<0.05)
Quadratic Effect (PEOU) → Future intention	0.008	(-0.054, 0.084)	0.219	0.827	No
Quadratic Effect (PU) → Future intention	-0.002	(-0.059, 0.056)	0.063	0.950	No
Quadratic Effect (PV) → Future intention	-0.002	(-0.065, 0.059)	0.061	0.951	No

Bootstrapping with 10,000 subsamples with bias-corrected and accelerated and two-tails at significant level of 0.05

Table 8.24 shows the results of Gaussian copula (C) approach. The correlations between all endogenous constructs (i.e. PU, PEOU and PV) and the error term by means of a copula were not significant. This means that endogeneity is not an issue.

Table 8.24: Endogeneity

	Original model		Gaussian copula					
			Model 1		Model 2		Model 3	
			PEOU		PU		PV	
	Value	*p*-values	Value	*p*-values	Value	*p*-values	Value	*p*-values
PEOU	.057	.261	.032	.719	.058	.352	.063	.322
PU	.312	.000	.307	.000	.328	.001	.296	.000
PV	.484	.000	.484	.000	.484	.000	.842	.030
C_{PEOU}	n/a	n/a	.021	.615	n/a	n/a	n/a	n/a
C_{PU}	n/a	n/a	n/a	n/a	-.011	.751	n/a	n/a
C_{PV}	n/a	n/a	n/a	n/a	n/a	n/a	-.349	.365
	Gaussian copula							
	Model 4		Model 5		Model 6		Model 7	
	PEOU, PU		PEOU, PV		PU, PV		PEOU, PU, PV	
	Value	*p*-values	Value	*p*-values	Value	*p*-values	Value	*p*-values
PEOU	.014	.877	.034	.702	.063	.321	.022	.818
PU	.348	.001	.291	.000	.301	.003	.320	.002
PV	.482	.000	.845	.032	.841	.039	.838	.042
C_{PEOU}	.036	.438	.023	.576	n/a	n/a	.035	.462
C_{PU}	-.031	.465	n/a	n/a	-.004	.920	-.023	.606
C_{PV}	n/a	n/a	-.352	.367	-.348	.389	-.345	.398

p-values significant level of 0.05.

Regards unobserved heterogeneity, the minimum sample size calculated by G*Power indicated that the data for DIS-TSA model can be split into 3 segments. PLS-FIMIX operations of one-segment to three-segment solutions yielded the values shown in Table 8.25. The minimum values were chosen for each criterion (bolded numbers). The 2-segment solution was identified together by AIC4 and BIC, which provided an initial support for selecting this solution (Sarstedt et al., 2017). Further, the entropy statistic (the maximum) indicated the 2-segment solution. However, G*Power indicated the minimum sample size of 73 observations. Splitting 73 observations based on the ratio given from the results of PLS-FIMIX (0.809 and 0.191) derived approximately 205 (205.486) and 49 (48.514) observations per each segment. Comparing with the minimum sample size of 73 observations, the sample size for the second segment (49 observations) was not large enough, compared, to produce accurate estimates in each group. Sarstedt et al. (2017) suggest that one can use aggregate level data and assume no unobserved heterogeneity issue.

Table 8.25: Unobserved heterogeneity

	Solution		
Criterion	1-segment	2-segment	3-segment
AIC (Akaike's Information Criterion)	1732.076	1567.313	**1554.186**
AIC3 (Modified AIC with Factor 3)	1741.076	1586.313	**1583.186**
AIC4 (Modified AIC with Factor 4)	1750.076	**1605.313**	1612.186
BIC (Bayesian Information Criteria)	1763.912	**1634.522**	1656.768
CAIC (Consistent AIC)	1772.912	**1653.522**	1685.768
MDL5 (Minimum Description Length with Factor 5)	**1963.256**	2055.36	2299.099
EN (Entropy Statistic)	n/a	**0.917**	0.815
Ratio of sample size for 2-segment	0.809	0.191	n/a
Observations for 2-segemtn	205.486	48.514	n/a
Ratio of sample size for 3-segment	0.697	0.202	0.101
Observations for 3-segemtn	177.038	51.308	25.654

8.7 Summary of the chapter

This chapter provided the results of the explanatory empirical research. The results of exploratory factor analysis as well as the results of measurement model for LOCs and the HOC were reported. The findings regard structural model and the path coefficients were also provided. Finally, the findings of structural model robustness checks were presented.

In sum, the findings supported almost of the proposed hypotheses, except H7c i.e. social value dimension. Yet, the dimension still remains in the model because it contributed to the model in terms of outer loadings. Regards H1 to H6, the findings indicated that PV, PEOU and PU are antecedent to the driver's future intention to carpool via the app (FI). PV is formative construct constituted by five value dimensions: utilitarian, hedonic, social, environmental and altruistic. The most influential factor is hedonic whereas the least one is social. It was also found that PV and PEOU together influenced PU, which consequently affected FI. Thus, PU played the important role in representing complementary and indirect-only mediation of the relationships between its related constructs.

The next chapter discusses interpretations of all findings derived from the exploratory and the explanatory empirical studies.

CHAPTER 9
INTERPRETATION OF ALL FINDINGS

The previous chapter provided the findings of the explanatory research. The purpose of this chapter is to provide interpretations of the findings that derived from the previous chapter and compare them with the literature. Further, the findings of the explanatory research will be compared with those of the exploratory research. This chapter starts with interpretations regards the results of explanatory empirical research and is followed by interpretations of the results derived from both empirical studies.

9.1 Interpretations

There are five main interpretations can be made from the findings: (1) the role of the app as a facilitator (2) the ease of use of the platform (3) the importance of value dimensions, (4) cost-savings for drivers and riders and (5) . Discussions in each section are based on the results of the exploratory and explanatory empirical studies.

9.1.1 The role of the platform

The dissertation shows that the platform played an important role in facilitating drivers to perceive the benefit of carpooling. Such facilitating role was observed in terms of the driver's perception towards the usefulness of the platform. The results of the explanatory research show that the relationship between perceived value (PV) and the driver's future intention to carpool via the app (FI) was mediated by perceived usefulness (PU). The more the drivers perceived the value of carpooling via the app, the more they perceived the app is usefulness and the more they tend to carpool via the app in the future. This effect was first to discover by Barnes and Mattsson (2017) who found that PU mediated the relationship between perceived value, from the perspective of triple-bottom line, and the user's intention to used carsharing services. Li and Wen (2019) also found the mediation role of PU between the bicycle-sharing user's intention and their perceptions towards economic and convenience value of bicycle-sharing.

However, in this dissertation, the finding also confirms the significant direct influence of perceived value (PV) on the driver's future intention to carpool via the app (FI). This means that, in fact, PU represents complementary mediation i.e. partial mediation, rather indirect-only mediation. Interestingly, it is observed that the direct effect of PV on FI (β_{H6a} = 0.502) is stronger than the indirect effect of PV on PU to FI (β_{H6b} = 0.143). Furthermore, the direct impact of PV on FI was the strongest one among the other path coefficient values. From a layman's perspective, this suggests that, for this particular group of drivers, their perceptions towards the benefits of carpooling was key motivations for carpooling via the app. It can be implied that, although the platform could carry forwards the perception of value dimension for the driver to carpool, it did not contribute much, which means that the drivers were not concerned much about the usefulness of the platform.

Nevertheless, interpretations can be made further. In information technology literature, Liang and Lai (2002) found that the customer's decision on whether to shop via an online bookstore in the first place was determined based on a set of hygiene factors e.g. security and consistent styles. Wu, Chuang and Chen (2008) indicated that if users of a website were not satisfied with hygiene factors in the first place, they would not try the website. Van der Heijden, Verhagen and Creemers (2003) surmised that perceived usefulness may be hygiene factors for attracting offline users to switch to online users. The terms 'hygiene factor' has been mentioned in Herzberg's (1959) Two Factor Theory. Herzberg theorises that motivational factors e.g. achievement and recognition can increase job satisfaction while hygiene factors e.g. salary and social relationships in work places can decrease job satisfaction. Using this reasoning, it is possible that when a carpool has been formed, the driver's perception towards the app's usefulness was their hygiene factors. The results of exploratory research in this dissertation may support this claim. The findings revealed that drivers perceived the platform was useful to them in terms of providing passenger information and communication channels as well as enhancing their decision making and reducing a feeling shame. If the platform cannot satisfy the drivers in terms of such abovementioned usefulness, the drivers may be dissatisfied and not use the app in the future. In the other way around, the value dimensions may be motivational factors that can satisfy the drivers. Once the carpool has been formed, the drivers are satisfied without noticing the usefulness of the app. This reasoning may explain why the indirect effect of PV on FI through PU is observed to be lower than the direct effect of PV on FI.

This study also confirms the indirect influence of PEOU to FI via PU, as similar to Mola et al. (2020). PU plays a role as indirect-only mediation of the relationship between PEOU and FI. This implies that the more the drivers perceived the app is ease of use, the more they perceived the app is useful and the more they intent to carpool via the app in the future. In other words, the drivers will not choose to carpool via the app because the app is easy to used (Y. Wang et al., 2018).

9.1.2 The ease of use of the app

The finding confirms the direct influence of PEOU on PV, as similar to Kim and Kim (2020) who investigated the user's intention to use bike-sharing services. In the context of carpooling, the study discovers an important role of PEOU in directly influencing PV, which suggests the more the drivers perceived the app is easy to use, the more they perceived the benefits of carpooling via the app. Interestingly, the finding of the dissertation reports that the effect of PEOU on PV was ranked as the third strongest among the other path coefficient values (β_{H5} = 0.426) and even stronger than the effect of PEOU on PU (β_{H2} = 0.368).

In information technology literature, Liang and Lai (2002) found that the ease of use in terms of search engine and easy to sign up was motivational factors for the customers to choose an online bookstore. As a result, the customers switched to the store that can provide them a better search engine system. Wu et al. (2008) also found that motivational factors could help satisfy and retain customers. In this dissertation, the information technology literature suggests that, for this particular group of drivers, the ease of use of the app is critical for the platform. The drivers may switch to another platform that provides a better carpool matching system.

9.1.3 Value dimensions

Regards to the five value dimensions, it was found that hedonic value dimension shows the significant highest regression weight (β_{H7b} = 0.325) relative to the other value dimensions. This finding is consistent to Y. Wang et al. (2019) who indicated that hedonic value dimension was the second important aspect that DiDi Hitch's passengers were concerned. Emotional feeling generated from carpooling also increase the satisfaction of BlaBlaCar's users (Arteaga-Sánchez et al., 2018).

Whereas Y. Wang et al. (2019) indicated that utilitarian value dimension was the most important component for DiDi Hitch's passengers, this dissertation found that utilitarian value dimension was significant but had the lowest regression weight (β_{H7a} 0.267). This confirms that the drivers in our case did not aim at profit-making and they thought that utilitarian benefit was no longer the primary factor for them. Instead, the intrinsic ones i.e. hedonic (β_{H7b} = 0.325), environmental (β_{H7d} = 0.293) and altruistic (β_{H7e} = 0.273) were important to them. This result remains in line with the literature. Guyader (2018) found a number of BlaBlaCar's drivers were concerned less on monetary. Shaheen et al. (2017) found that passengers rather drivers were concerned more one cost-savings.

Next, the finding reveals that social value has the lowest insignificant regression weight (β_{H7c} = 0.098, p = 0.197). The dissertation's finding replicates Hamari et al. (2016) but seems to be conflict with Y. Wang et al. (2019), who posit that carpooling via the app should improve the driver's social status and allow them to gain social recognitions. The author of this dissertation carried out a post-hoc interview with three drivers who responded to the survey and rated a low score on the social dimension. They reported that they had told their peers e.g. family, friends and mate about their carpooling via this app but received negative feedbacks. Their peers warned them about security and crimes as well as tried to stop them sharing carpool seats via the app. This made the respondents felt that they should not tell anyone about their carpooling. Thus, from their perspective, carpooling cannot offer them social prestige.

9.1.4 Cost-savings for drivers and riders

In Chapter Five, the result of content analysis provided the frequencies of keywords the drivers mentioned in their trip notes. It can be observed that the overall motivations-related keyword ‘Carpool motivation’ appeared about 741 times. It is observed that the keyword ‘Find friends/companions’ (565 times appeared) and the keyword ‘Save costs’ (400 times appeared) were the two most frequently appeared and are very greater than the other keywords appeared. This could be interpreted that the drivers in the app, in general, perceived hedonic and utilitarian value more than the other dimensions. However, the findings of the explanatory study indicate that the drivers rarely perceived the utilitarian value from carpooling via the app. Are these results contradicted?

A possible reason could be because a drawback of reading only words and sentences. The author and the other coder could not differentiate the many meanings of a particular keyword. It could be possible that they keyword ‘Save cost’ have two meanings. Some drivers may not intent to save the costs for themselves but for the riders. This is evidence in the findings from the qualitative methods that facilitated the author to explore more about the words the informant just told. It was found that some informants perceived sharing carpool seats via the app is the way to help the riders save their travel costs whereas some other informants desired to have a rider helping pay some toll fees and fuel costs. It can be concluded that the term ‘Save costs’ in the result of content analysis can have two meanings: save costs for oneself and save costs for others. Therefore, the findings of both studies may not be contradicted.

9.1.5 The environmental benefit of carpooling

Another inconsistent finding between the result of content analysis and the result of structural model is the environmental value. In the result of content analysis, ‘Saving the environment’ was mentioned a few times, but the finding of structural model shows that the environmental value was ranked as the second. These dissimilar findings may be explained with two reasons. First, in the result of content, the drivers rarely mentioned ‘Saving the environment’ could be because the environmental-related issue was not their main reason for carpooling, as compared with the other issues e.g. finding carpool partners and socialisation (hedonic value) as well as cost savings (utilitarian value). This is why the drivers might recall only the most important issues they wanted from carpooling. Gheorghiu and Delhomme (2018) also indicated that, at the beginning of a trip, drivers' aims were to save costs but their concerns on the environment were appeared after a number of trips increased.

It is also possible that the survey on the attitude towards the environmental benefit of carpooling may be susceptible to social desirability bias i.e. people tend to answer carpooling is environmentally (Malodia et al., 2016). In fact, the drivers may not be concerned on the environment but the Thai government's propaganda had influenced their attitudes towards carpooling and the environmental issue. In Thailand, carpooling has been campaigned as an environmental means of transport (Rudjanakanoknad, 2011). This could be a reason why the respondents' scores were high on the environment value but, when mentioning such issue in the driver's trip notes, the environment-related issues did not appear.

9.2 Summary of the chapter

This chapter provided discussions regard the findings of the explanatory study. The dissertation discusses the important role of PU in representing complementary and indirect-only mediation of the relationships between its related constructs. Four value dimensions had found to be important to the drivers to carpool via the platform. Interpretations of the findings from the exploratory and explanatory studies were provided and liked back to the literature. The next chapter provides conclusions of the dissertation in terms of theoretical contributions, managerial implications and policy interventions.

CHAPTER 10
CONCLUSIONS OF THE DISSERTATION

Chapter Nine provided discussions regard the findings of explanatory empirical research. The purpose of this chapter is to conclude the dissertation in terms of how it contributes to the literature, management implications and policy interventions as well as to note the limitations of the research. This chapter starts with the discussions on how all studies undertaken in the dissertation have answered the research questions. The theoretical contributions of the dissertation are sated next. Managerial implications that may be useful not only for LILNA but also other carpooling platform are also discussed based on the findings of exploratory and exploratory empirical research. Some policy implications are also proposed. Finally, the dissertation's limitations are noted which may be useful for further works in the context of carpooling.

10.1 Answering the research questions

This dissertation aimed to explore drivers' perceptions and motivations towards carpooling through a platform and then investigate how motivational factors affect their future intention to carpool via the platform. The first research question was asking: *what make carpool drivers using the platform share their seats and drive for strangers and what factors found in the literature and elements of the Technology Acceptance Model explain such behaviour?* The first objective is to understand motivational factors for the drivers to carpool via a platform. The dissertation started by reviewing the carpooling literature and found that few studies investigated carpooling behaviour via platforms. Besides, the identified psychological factors were not derived from the perspective of drivers. The author, therefore, developed a priori conceptual model based on Technology Acceptance Model (TAM) and a set of identified psychological factors. Field studies were undertaken by means of exploratory research.

The exploratory study found that TAM helped understand drivers' perceptions towards using the app. The drivers perceived the app was useful and easy to be used. The usefulness of the app was perceived by the drivers in terms of providing passengers' information, facilitating communication, improving decision making, and reducing a feeling of shame. The ease of use of the app was perceived as the app was easy to use in its chat box and data-filling system. Regards the drivers' perceptions toward the benefits of carpooling, the study found a number of perceptions: road safety, helping driving, not feeling lonely, friends for future benefits, friends for socialising, nostalgic thoughts, opening to new experiences, helping others, empathy, feeling good after helping, belonging, self-image, saving the environment, and merit. Based on consumer perceived value (CPV) theory, these perceptions were conceptualised into six value dimensions: utilitarian, hedonic, social, environmental, altruistic, and merit. The priori conceptual model was reconceptualised to be a conceptual model.

The second research question was asking: *how important are these factors for the driver's future carpooling decisions via the platform?* Thus, the aim was to know the impact of identified motivational factors on the drivers' future carpooling decisions via the platform. If we know which factors impact the drivers we will know how to satisfy them and make them continue use the app for carpooling. The proposed conceptual model needed to be tested and analysed using a statistical method. An operative model developed was proposed based on the proposed conceptual and the literature. An explanatory empirical research was carried out using a survey and a structural equation modelling.

The findings provided empirical data that can be used to test the proposed hypotheses. Whereas the carpooling literature suggested only three value dimensions i.e. utilitarian, hedonic, and social, the dissertation was found that perceived value (PV), as a higher-order construct, comprised of five value dimensions including utilitarian, hedonic, social, environmental, and altruistic. For a particular group of drivers, hedonic value had the strongest impact on their future carpooling decisions via the platform (FI), and was followed by environmental, altruistic and utilitarian. The findings further indicated that PV had the strongest impact on the driver's decision, than perceived usefulness (PU). Whereas the collaborative consumption literature suggested that PU played an indirect-only mediation role between PV and FI, this dissertation found that PU was, in fact, the complementary mediation of the relationship between PV and FI. It also indicated that PU was an indirect-only mediation of the relationship between perceived ease of use (PEOU) and FI. Last, the dissertation found that PEOU had an impact on PV, which is found to be new in the carpooling literature.

10.2 Theoretical contribution

First, it was indicated that the carpooling literature lacks of the driver's perspective regards why they carpool via the platforms, despite they are the providers of platform. Logically, drivers are the first sharers and should be the focus, as they are at the supply side which is critical to the market system (Farajallah et al., 2019). Collaborative consumption platforms should know what their providers need (Benoit et al., 2017). Recent study indicates that a carpooling platform was in crisis of building critical mass and had to switch to other business models because there were more passengers needing a ride than drivers providing empty car seats, i.e. the demand was greater than the supply (Guyader & Piscicelli, 2019).

This dissertation was first to observe the driver's perceptions towards carpooling via a platform, from a perspective of TAM and CPV theory. The contribution is answering the research gap identified by Aspara et al. (2020), who noted that researchers should investigate the motivations of a supplier of a platform, especially in terms of CPV theory.

Second, in the carpooling literature, Olsson et al. (2019) suggested that an individual's intention to carpool via online platforms is not only determined by their perceptions on how carpooling benefits them but also by the characteristics of platform. In collaborative consumption literature, empirical evidence have been provided in other contexts such as carsharing and bicycle-sharing services (Barnes & Mattsson, 2017; Li & Wen, 2019), but not in the carpooling context. Furthermore, the CPV literature suggested that further research should investigate the role of platform in terms of the relative impact of each value dimension on intention to use a technology (Leroi-Werelds, 2019; Zeithaml et al., 2020).

In this dissertation, the findings not only provide empirical evidence regards the driver's perceived value (PV) but also the relationships between PV and the elements in TAM i.e. PU, PEOU, and FI. The findings showed the relative importance of PV, as a higher-order construct, in relation with the elements in TAM, in the context of carpooling. Furthermore, previous studies in the carpooling literature have never tested TAM and CPV in for-profit organisation settings. This study validated them in a not-for-profit organisation setting.

Third, Neoh et al. (2017) noted that the carpooling literature needs to investigate carpooling behaviour based on theories that are developed from an underpinned psychological theory. The dissertation has proposed a conceptual model based on two theories: TAM and CPV. Such two theories have been tested in for-profit settings. In this study, the theories were validated with the data obtained from the drivers of a non-profit platform. The dissertation is the first to discover that PV in relation with the elements in TAM can explain and predict the drivers' carpooling decisions. The proposed conceptual model should be a foundation for future research on carpooling via platform.

Forth, previous studies in the collaborative consumption literature found that PU played an indirect-only mediation role between PV and FI. This dissertation further found that, in fact, PU was a complementary mediator of the relationship between PV and FI. Yet, for a particular group of drivers, PV had a stronger impact on FI than PU. Furthermore, the findings provided evidence proving the indirect-only mediator of the relationship between PEOU and FI; meanwhile, PEOU influenced PV. Such relationships were only found in the context of bicycle sharing.

Finally, from the perspective of perceived value, the carpooling literature indicated only three value dimensions from the perspective of passengers: hedonic, environmental, altruistic, utilitarian, hedonic and social value dimensions (Arteaga-Sánchez et al., 2018; Y. Wang et al., 2018). Although Arteaga-Sánchez et al. (2018) indicated the relationships between the users' environmental awareness and their intention to use a carpooling service; they did not specify the role of carpoolers and did not investigate the environmental aspect from the CPV's perspective. Researchers can contribute to the literature by adding into the complexity of value dimensions, how to measure value and how to operationalise such value dimensions (Sánchez-

Fernández & Iniesta-Bonillo, 2007; Zeithaml et al., 2020). Zeithaml et al. (2020) further encourage researchers to incorporate environmental value into the core value dimensions and investigate its impact.

In this dissertation, the findings increased us an understanding of the providers of sharing economy in the context of carpooling platform. The findings discovered the drivers' perceptions of value of carpooling: utilitarian, hedonic, social, environmental and altruistic. These value dimensions had conceptualised and proved to be the components of the higher-order construct of PV. The environmental and altruistic value dimensions are new to the carpooling literature. The dissertation has further added two items in altruistic value dimension and proved that carpool drivers perceived that they could help riders by sharing seats via the platform as well as perceived that carpooling is a vehicle for doing good and gaining merits. It can be concluded that the dissertation not only added the complexity of value dimensions but also provided the methods how to measure and operationalise such value dimensions in the context of carpooling.

10.3 Managerial implications

COVID-19 has an impact on the transport sectors of the sharing economy. Platforms, such as France's BlaBlaCar and DiDi, experienced the greatest fall and had lost providers and customers during the early COVID-19 outbreak (Hossain, 2021). However, travelling by private cars including carpooling is considered safer than other transport means because a car's windows can be opened to increase air circulation and carpool participants can deny to ride with or drive for other who are unmasked (Bushwick et al., 2020). Hereunder, the research suggest what the platform should do during COVID-19 and after activities return to normal.

10.3.1 The usefulness and the ease of use of the platform

Slater (1997) has observed that "the creation of customer value must be the reason for the firm's existence and certainly for its success" (166). A platform should be interested in the value of its online platform (Zeithaml et al., 2020; Leroi-Werelds, 2019). This study indicated that PU and PEOU are the platform's core competency. LILUNA can claim its usefulness in terms of carrying forward the value dimension to carpool drivers, servicing drivers with the easy-to-be-used system, providing the sanitary guidelines during COVID-19 and suggesting users that carpooling is a safer transport means for people who want to avoid crowded transport means such as trains and buses. Hereunder are details of each managerial recommendation regards the usefulness and the ease of use of the app.

First, the dissertation indicated that PU and PEOU can be used to reflect an ability of the platform in facilitating and carrying forward the value dimensions to its carpool drivers. Thus, the platform should emphasis drivers with the four types of value (hedonic, environmental, altruistic and utilitarian) and emphasis how the platform can facilitate the drivers to perceive such values. This will not only drive the drivers to continue carpooling via the platform but also increase their good perceptions towards the platform.

Second, it was found that PEOU is still critical to the driver's decision to carpool via LILUNA because it directly impacts PV and PU, in which the latter consequently influences FI. The use of platform should be easy to the drivers. If the drivers perceived that the platform is hard to use, they would think the platform is not useful and may stop using it for carpooling. Furthermore, if the drivers perceive that the platform is hard to use, they may switch to other platforms i.e. competitors that can service the drivers with a better carpooling system or relatively better performance. This is evident in Liang and Lai's (2002) and Wu et al.'s (2008) works which found that customers will switch to the online platform that offer them a better service.

Third, during COVID-19 pandemic, the platform should provide sanitary guidelines for the drivers and riders. LILUNA should follow the measures issued by the Center for COVID-19 Situation Administration (CCSA). The platform should encourage its users to follow the CCSA's sanitation guidelines. Grab Thailand have followed the CCSA's sanitation guidelines and issued five rules including: (1) drivers and passengers must wear a mask at all times (2) drivers must complete an online health and hygiene declaration everyday (3) if a driver or passenger is unwell or not wearing a mask, either party can cancel the ride and the penalty will be waived (4) drivers are distributed a hygiene kit, advised to disinfect their hands and vehicles frequently throughout the day and (5) go cashless to reduce contact with coins and bills (Grab, 2021). BlaBlaCar in Europe also encourages its users to follow the CDC's sanitation guidelines including: (1) taking only one passenger (2) wearing a mask (3) respecting social distancing guidelines (4) do not shake hands with anyone (5) washing hands before and after the journey (6) keeping car clean and disinfecting car before and after driving and (7) do not accept a passenger or postpone the trip if you are not feeling well (BlaBlaCar, 2021).

The platform not only provides sanitation guidelines but also actively implement some actions. For example, DiDi installed protective plastic sheets in a car to separate a driver from passengers while Uber launched features in its app to check whether the users are wearing masks and whether passengers sit on the backseat (Hossain, 2021). LILUNA may provide the drivers with protective plastic sheets for the use in their car or provide an app's feature that helps check whether the sanitation guidelines have been followed.

Forth, LILUNA may suggest its users that carpooling is a safer transport means compared to other crowded transport means such as trains and buses. With respecting to the sanitary guidelines, BlaBlaCar claims that its carpooling services are safer than other means of transport because they are "a means of transportation that minimises the number of contacts between individuals compared to other means of transportation" (BlaBlaCar, 2020a). If LILUNA suggests its users to follow the sanitary guidelines and can provide them a carpooling trip that can minimises the number of contacts between individuals by allowing only one driver and one rider, it may be able to maintain the number of users during COVID-19.

10.3.2 Satisfying the drivers by meeting what they valuing

A platform should also be interested in the value that users want (Benoit et al., 2017; Leroi-Werelds, 2019; Zeithaml et al., 2020). Business literature suggests that PV is critical in strategic management (Mizik & Jacobson, 2003; Spiteri & Dion, 2004). For LILUNA, hedonic, environmental, altruistic and utilitarian value dimensions are important to the drivers. These value dimensions are conceptualised as a higher-order abstraction. This means that for a driver to carpool via the platform, not all value must met their desires but only one value perception is enough to drive them carpool. The platform can promote one of the four in order to minimise its marketing costs.

Hedonic value is the important one and should be selected first but it seems to be depended on the riders. The platform should encourage riders to have conversations with a driver, as acquiring friends, socialising and not feeling loneliness are the needs of such drivers. Utilitarian value dimension is another one that relies on the riders. It can be promoted by encouraging the riders to reciprocate the driver by helping them pay some trip costs, buying them some snacks or beverages or meals, and helping watch the roads and cars.

Altruistic and environmental value dimensions, in contrast, may not rely much on the riders' behaviour. Once the carpool is matched, a driver should perceive such value dimensions. Promoted value perceptions may be about encouraging drivers to do good and become an altruistic person helping neighbours save cost and travel faster. The platform may coordinate with the community and launch environmental campaigns using keywords such as helping reduce traffic-related air pollution.

Regards social value dimension, the drivers did not perceive the image gained or respectfulness from their peers. This may be because the platform is not well known among non-users who may think of risks rather benefits. The results of interviews provide insights that the drivers trust the platform but their peers did not. The platform should promote its brand and increase its security level in order to increase the users' and non-users' confidence and assurance in the platform.

10.3.3 Reaching critical mass

A common problem for any platform including LILUNA is a chicken-and-egg problem (Caillaud and Jullien, 2003). In other words, drivers would not join a platform if the platform has few riders and vice versa. Although LILUNA has a large number of users around 100,000 users in 2019, not all users use the app. It was found that there were approximately 18 posts per day. LILUNA may reach critical mass but it must be assumed that activities return to normal during the post-COVID-19.

First, LILUNA should provide more services to community setting i.e. private carpooling platform. These platforms are reserved for the users of each platform. Currently, LILUNA has a carpooling service in private platforms e.g. universities, condominiums and private and governmental offices. Community setting not only can reduce the barrier regards lack of trust among users but also can provide users the benefits of socialisation and community engagement. To promote the engagement of the users of private platforms, hedonic value should be the main driver. Such private platforms of LILUNA further allow each platform's users to use the public platform i.e. the main landing page of LILUNA where anyone who registered can offer seats and ask for a ride. Thus, increasing the number of private platforms should increase the total users of the system and a chance that the users in the private platforms join the public platform. LILUNA should encourage the drivers in private platforms to share seats in the public platform.

Second, LILUNA can boost the number of users but should respect to the sanitation guideline and start boosting after most people in Thailand receive the COVID-19 vaccines. The drivers should be focused at first and then the riders. How to encourage them to share seats by utilising keywords related to value dimensions were suggested earlier.

Third is diversifying the platform's business models to increase the total number of community members. A platform can increase its users by providing other similar services within its main platform. For example, GoMore first launched carpooling service and then expanded its business models to car rental and B2C car leasing services, which have increased the number of community members (Guyader & Piscicelli, 2019). For a case of not-for-profit setting, BlaBlaHelp allows the members to support each other with grocery shopping during COVID-19 (BlaBlaCar, 2020b). LILUNA can play a role in matching the members, who are ready to help, and the other members who are in need. Some LILUNA's members living nearby the vulnerable members may help by going out to buy basic necessities or help doing something for those vulnerable members. LILINA may launch a feature that cultivates such altruistic sense in a community. Furthermore, the 'Police Share' campaign is an example in which LILUNA acts as a forum for police officers who want to help transporting a student to school. Another example could be school-run.

With the government's support, LILUNA may provide a private platform for school which allows the school's teachers to share seats to students who will travel in the same way.

One important implication of this study is that a tool in a form of questionnaire was provided for LILUNA when it makes B2B contacts. An organisation may question whether its employees need a carpooling service. The questionnaire provided in this research may be modified to be used to investigate the employees' perceptions and willingness to use a carpooling service.

10.3.4 Monetisation after COVID-19

It is noted that managers of the forums type face a problem of monetisation (Perren & Kozinets, 2018). LILUNA is facing such challenge and wants to know whether it should charge service fees to users or not and, if it has to be, who should be charged. The results of the exploratory research pointed out some implications regard how to maintain LILUNA's business model. The platform in this case is at a critical decision-making point in its business model and growth and thus has three options.

First, LILUNA may move towards monetisation business model by generating revenue from both drivers and passengers. Evidence show that such strategy could dissatisfy altruistic-oriented carpoolers (Täuscher & Kietzmann, 2017), but this may not be problematic for this platform as there is 5% of 'Free' drivers at present. A question, which we will continue discuss shortly, is what should be the fee rate.

Second, if the platform still provides free access, its operating costs might be subsidised by other businesses in a form of corporate social responsibility projects, donations and government subsidies. The platform may adopt the prior strategy of Couchsurfing where there was no compensation involved because it was a pure sharing site (Belk, 2014). The company enjoyed money gained from a 'freemium' business model e.g. subscription fee. However, COVID-19 forces Couchsurfing to charge fees to all members (Couchsurfing, 2020). BlaBlaCar also found that advertisement displaying and 'freemium' memberships generated too low revenue which was not sustainable in the long-term (Lakhani, Sundararajan, Billaud & Caltagirone, 2017).

Third, this study suggests that the platform should charge service fees to only 'Fee' drivers and passengers. While the passengers should be charged with a booking fee, the 'Fee' drivers should be charged in terms of percentage. This strategy is quite similar to France's BlaBlaCar in which it charges riders a booking fee but does not charge a fee to all driver's seat price. In the exploratory empirical research, a question regards the driver's perception towards a fee was also asked, as per the request of the founder of the app. Most of the informants agreed that the app should charges a fee at around 10 to 15 percent of the price charged per seat. This range was much closed to the fixed rate guessed by the app's founder, i.e. around 10%. The drivers agreed that the app should earn some cash to maintain the business and improve the services.

LILUNA announced in its website that the platform did not want to charge anyone. However, the owner and the co-founder have always looked forwards to earn some cash at least to maintain the service. At first, LILUNA wanted to provide service for free and tried to maintain it business using revenues generated from partners' corporate social responsibility projects. Once the users increase the cost increases and they have realised that the platform needs some revenues. Thus, the third strategy should be the best choice for the platform. This should not only cultivate the altruistic sense of the community but also generate some revenues to maintain the business.

Charging LILUNA's users a fee is their future plan after COVID-19, the co-founder recently said with the author. However, it needs to be noted that LILUNA should be aware of the consequence of switching from not-for-profit to for-profit organisation. BlaBlaCar was at war when it switched to for-profit (Guyader, 2018). This may be because BlaBlaCar forces the drivers to choose any price within the app's proposed range (Farajallah et al., 2019). However, such effect may be less severe for LILUNA if the app allows altruistic drivers i.e. 'Free' drivers share seats without any charge and does not control the driver's price setting. The latter strategy should also be applicable because the LILUNA's owner also plans not to force the drivers to choose a price.

A following question is that what would happen to the findings of this study if the platform charges a service fee. If LILUNA turns to charge a fee in terms of percentage, the perception of the driver who shares for free should remain the same because a percentage multiplies zero is zero. However, the perception of the driver who charges a fee may be changed only the altruistic and utilitarian value dimensions. They may value utilitarian more than altruistic i.e. they may be more profit-motivated. This is support by the finding of Guyader (2018), who pointed out two opposite concepts: altruism (free) and utilitarianism (cost). Guyader (2018) found that some drivers who were concerned more on profit-making tried to generate income by maximising the reserved seats whereas some drivers remained to be altruistic drivers tried to offer seats for free.

At the end of the day, the dissertation recommends LILUNA to charge a price because revenues should help the owner alleviate current costs as well as should be used to invest in the app's improvement. The app should charge the riders, who are users of carpooling services, and charge the drivers who charge a fee. The app has righteousness to do this because it provides the services that help the 'Fee' drivers and the riders save their costs. These users should allow the app to save it s operational and fixed costs as well as allow it to collect some incentives to be used to increase the efficacy of the app. When the app announces that it would charge a fee to drivers and riders, it should declare rationale why it has to charge a fee and also highlights that these revenues are, in the end, increase the efficacy of the app and benefits the users.

After LILUNA charges users a fee, some 'Free' drivers may see opportunity to earn cash and switch to be a 'Fee' driver. But this should benefit the app as it can earn more revenues. The challenge is the riders. If the platform does not have many users, charging a fee might work well, as passengers have limit choices. Yet, a challenge may arise if there are many users in the platform. Passengers may prefer to carpool with 'Free' drivers, as they will pay only the fee charged as a rider. Once few riders increasingly choose 'Free' drivers, the 'Fee' drivers, who generate revenues for the app, may be dissatisfied and stop sharing seats.

10.4 Public policy interventions

It is noted that intervention programs would be effective if they originate from a solid understanding of the underpinning psychological theories (Nielsen et al., 2015; Neoh et al., 2017). “The effectiveness of behavioural interventions generally increases when they are aimed at important [antecedence] of the relevant behaviour” (Steg & Vlek, 2009, p. 311). There are some public policy interventions hereunder.

10.4.1 Better than driving alone

This dissertation suggests, based on findings, that to increase carpool seats is to encourage a single driver to be a carpool driver. Policy-makers should inform single drivers the benefits of carpooling and encourage them to switch to be carpool drivers. Meanwhile, a matching platform is also critical as it facilitates the matching between carpool participants. The ease of use of the platform is the key, as it can increase the drivers’ perception of the usefulness of the platform and the perceived benefits of carpooling.

Hedonic value dimension is for drivers who desire to socialise with others in the community. This approach should be implemented easier in a community-based setting. Policy-makers should develop a carpool program in a community and should match carpool participants who have similar goals or interests. For example, their kids are studying in the same school. A driver and riders are working in the same projects.

Environmental value dimension is for drivers who desire to act environmentally-friendly. Such drivers may already reduce their plastic uses or eat plant-based foods but may not be able to reduce car use. Policy-makers may increase the awareness of single drivers by showing that providing carpool seats may be an additional way for single drivers to reduce their impacts on the environment.

Altruistic value is for drivers who want to act prosocially. Policy-makers should inform single drivers that providing carpool seats to others is an alternative way for single drivers to do prosocial behaviour. Although this study did not test the effect of empathy on the intention to carpool as a driver, the results of interviews suggest that empathy may play the role in motivating them to share seats and help strangers. A keyword used to promote a sense of empathy among single drivers may be, for example, sharing seats to those riders who are struggling from bad traffic.

Finally, utilitarian value dimension is for drivers who focus on saving cost and/or increasing their driving performance by having riders sitting with and may help the driver watch the roads and cars. Policy-makers should inform riders that these drivers need riders to help watch roads and cars.

10.4.2 Switching the driving role

Another issue is related to the environmental situation. Carpooling is considered as environmental only if drivers stop driving and become passengers or use public transport. Drivers should be the main focus of carpooling campaigns and should be informed about negative impacts of car use. The dissertation suggests a way to reduce carbon-dioxide emission and air pollution i.e. creating a program that pairs drivers together.

We know that hedonic, environmental, altruistic and utilitarian value dimensions are co-created by drivers and riders. The platform needs to inform the drivers that, if they would like to perceive such value dimensions, they do not need to play the driver role but can be a rider. In fact, a driver may know the best what the other drivers want. For example, the driver who switches a role to be a rider should know how to help one another driver drive safely.

Another example, in an organisational setting, is that the platform may create a program that pairs drivers together e.g. two drivers switch their roles weekly. While two drivers are paired together and help each other driving a car weekly, other riders can contribute by, for example, paying trip costs and socialising with others in a car. The final outcome of this campaign should reduce the number of car on the roads, the carbon-dioxide emission and air pollution by half.

10.5 Policy implications

In the literature, there are two beliefs of the impact of carpooling on the environment: carpooling is contributing to the environment (Minett & Pearce, 2011) and carpooling is not a sustainable means of transport (Yin et al., 2018). This is because carpooling is “invisible mode” and its impact on the environment is not clear (Shaheen & Cohen, 2019, p. 7). The impact of carpooling on the environment is not the aim of this dissertation.

Logically, we can say that carpooling is a sustainable transport means only if drivers stop driving and become passengers. For the Thai government, carpooling with LILUNA can be stated as a sustainable means of transport if it follows this logic. First, the government should be the leader to encourage people to carpool. A government-led carpooling campaign, incorporating with LILUNA, should be implemented in government offices. The government can implement the two suggested campaigns: (1) switching single drivers in a government office to be carpool drivers and (2) paring two drivers together and switching their driving roles.

Compared to developed countries, the reasons why Thai people lack of environmental concern are education and government-led environmental campaigns (Laiphrakpam, Aroonsrimorakot & Shanker, 2019; Vassanadumrongdee & Kittipongvises, 2018). While Italy has put climate change and sustainability at the core of its school curriculum, the Thai government has only in its conception stage (Greennews, 2020). Some practices for reducing climate change are impractical. A recent curriculum of the office of the Non-Formal and Informal Education encourage people to travel by bicycle instead of car. Yet, Thailand seems to have insufficient infrastructures for bicycling. The dependence on car use is inevitable in the developing with problems such as inadequate road infrastructure, weak traffic management, and lack of structural supports for sustainable transport means (Gwilliam, 2003; Dulal, 2017). Carpooling should be included as an alternative and practical way of approaching climate change problem. LILUNA can make carpooling convenient at any location. The government needs to include carpooling in its educational-related syllabus and to initiate carpooling programs in schools and universities.

Last but not least, it is found that, in a long-distance trip, carpooling is not a sustainable means of transport because passengers preferred carpooling than the other sustainable transport means e.g. trains (Yin et al., 2018). Promoting the benefits of carpooling, therefore, should be carried out in according with the improvement in public transport system and transport infrastructure (Yin et al., 2018) as well as the integration of carpooling and public transport (Olsson et al., 2019). Thus, the Thai government should link LILUNA with public transport systems e.g. train stations and motorcycle taxis. This cannot be done solely by LILUNA but needs helps from the government.

10.6 Limitations

The dissertation has several limitations. First, it is an exploratory research only. Although the proposed conceptual model has been tested, there still needs to carry out a confirmative research i.e. validating this proposed model. Yet, formative construct is in debate among methodologists (Posey, Roberts, Lowry & Bennett, 2015) and the model fit indicators for PLS-SEM is on researching (Hair, Risher, et al. 2019). This may take time and should be of interest for further research.

Second, the codes related to PU and PEOU found from the exploratory study (passengers-related information, communication, better decision making, and reducing a feeling shame) were disregarded in this dissertation for the parsimony of the conceptual model. The dissertation instead employed a well-ground theory and indicators to investigate the phenomenon.

Third, the socio-demographics of carpoolers, trip characteristics, and situational factors had not been tested in this study. A limitation is that there were small samples collected due to COVID-19. For a multiple group analysis using PLS-SEM, Hair et al. (2017) suggest a minimum sample size of 122 observations per group. The sample acquired and usable was 254 responses, which was not sufficient to split into many groups for a multiple group testing. Those who shared for free were only 80 responses: 55 drivers shared for free and 25 drivers set a price but did not charge the riders at the end of the trip. A test between the ‘Free’ and ‘Fee’ could not be conducted.

Last, some scholars argue that perceived value should encompass both the perceived benefits and sacrifices/costs and these should be conceptualised as two distinct higher order dimensions (Sánchez et al., 2018; Zeithaml et al., 2020). This dissertation focuses only the benefits of carpooling. It assumes that only perceived value can have an impact on the driver’s intention and is, in fact, empirically correct. It is observed in Appendix E that the mean scores of the three items measuring future intention are more than half, which indicate that, on average, the drivers were willing to carpooling via LILUNA in the future.

10.7 Future research

There are several suggestions for future research. First, we need more samples to investigate the differences between groups. It could be expected that if splitting respondents into two groups: ‘Free’ and ‘Fee’, the respondents who shared for a fee, compare with those who shared for free, might perceive the importance of utilitarian value rather than hedonic and altruistic value. This is supported by Guyader (2018) who found that the drivers who charge a fee seemed to be less concerned on hedonic and altruistic value. Findings may be used for customising interventions that suit for a particular group of respondents. In terms of service, two groups of respondents may perceive carpooling differently. For example, a driver who charges a fee may perceive themselves as a service provider whereas those who provide seats for free may perceive carpooling as a charitable activity.

Second, perceived value may be affected by the characteristics of carpoolers e.g. demographics, personalities, and personal characteristics should be investigated in further works. For example, evidence shows that personality traits (openness, conscientiousness, and extraversion) can predict emissions-reducing behaviours including carpooling. A recent research also found the direct impact of personality traits (the Big Five Inventory) on perceived value for the users’ intention to use a social network site (Gvili, Kol & Levy, 2020). Thus, it is possible that personality traits can impact on not only the perception towards to use of the app but also the perceived benefits of carpooling. Regards demographics, future research may investigate whether there is a difference of perception between people in different generation. Evidence suggests that Generation Z (1990s-2000s) valued social and altruistic rewards (Farrell & Phunsoonthorn, 2020) while Generation X (1978-1981) valued hardworking but not social relationship (Komin, 1991).

Third, it could be possible that the drivers would incline to share seats if they know the purpose of riders e.g. an elder person going to a temple or a student going to a school. An experimental design may be best used to investigate this effect. Future research may be interested in explaining an underlying mechanism of such phenomena. Knowing the purpose of riders may activate the driver's sense of empathic feeling because empathy is a determinant of altruistic behaviour (Penner et al., 2005). This means that the driver who has empathy towards the riders may charge them less or ever give them free seats.

Forth, further studies should investigate the moderating role of geographical factors on value dimensions. For example, it could be possible that the same driver may perceive the utilitarian value differently when they share seats for a short distance compared with a longer distance, as noted by *Informant-3*: "for a longer trip, I may charge some fee just to cover some of my trip costs".

Fifth, cross-cultural studies may be of interest, as the existing literature does not provide enough cases for comparing the perceptions towards carpooling between countries (Shoshany Tavory et al., 2019). It was found that the findings of the dissertation are similar to the literature. Arbour-Nicitopoulos et al. (2012) found that the drivers in two regions in Canada had an attitude towards carpooling as an environmental-friendly transport means. Tahmasseby et al. (2016) found that environmental and sustainability incentives rather than saving costs were an important factor for drivers to participate in a platform. Future studies to look at this issue.

Sixth, this dissertation investigated the drivers who were the users of the app. Future research should employ the proposed conceptual model to investigate the drivers who are not the uses of the app. Increasing the number of drivers is the interest of any carpooling platform. We need to know whether they will perceive similar value dimensions. A challenge is that we may not be able to test PU and PEOU easily because they are non-users. Another point is that the platform being studied is an online community which may cultivate a sense of community. Users may be stranger to each other compared to a closer community e.g. schools and companies. Would the model applicable with other types of carpooling e.g. carpooling within an organisation?

Seventh, some PU's and PEOU's characteristics found in this study might be of interests e.g. passengers information, communication, better decision making, reducing a feeling shame. Other interesting factor might be the platform's performances such as matching ability, users' information, communication channels for users, customer service. The user's characteristics that are related to PU and PEOU such as innovativeness and the categories of adopters might be a set of antecedences that should be investigated.

Eighth, the proposed conceptual model can be used to investigate the current drivers but it is not completed, as it represents only the driver's perception regards the benefit of carpooling but not the cost of being a carpool driver. Perceived costs or risks of being carpooling drivers should be included into the proposed conceptual model. The drivers used LILUNA for carpooling because they perceived the benefits of carpooling and the benefits of using the app. From the perspective of trade-off evaluation of perceived value, it can be said that the drivers might perceived some costs but such costs were not their major concerns because at the end of the day they used the app for carpooling. In other words, the benefits side of the value equation were outweighed the costs side. Using the similar logic, some drivers who have stopped using the app for carpooling should perceive the costs/risks more than the benefits. In other words, their perceived costs are outweighed their perceived benefits. Although these ex-drivers were not the unit of analysis of this dissertation, future research should investigate them why they stopped using the app. The current proposed model could not be well used unless it has been improved by including the costs side of the value equation.

Ninth, understanding consumer behaviour from the CPV's perspective can also extend our knowledge regards the antecedence of customer's satisfaction (Danaher & Mattsson, 1994). Future research should include customer's satisfaction into the proposed conceptual model and investigate both the driver's and passenger's perspectives. It is possible that satisfaction should help separate the effect of the value of carpooling and the effect of the value generated by the platform. Satisfaction can be an antecedent of continuance intention to use the platform for carpooling (Arteaga-

Sánchez et al., 2018). We may be able to split the effect of the platform and the effect of PV: (1) satisfaction towards the platform (e.g. service offered by the platform, usefulness, ease of use) and (2) satisfaction towards carpooling (carpooling activities, carpool partners). In other words, satisfaction may be a mediator of the relationship between PU-PEOU and FI and a mediator of the relationship between PV and FI.

Tenth, as noted in Chapter 9, the drivers may perceive PU as their hygiene factor and perceive PV and PEOU as their motivational factors. Future research should investigate these relationships by modifying the methods provided in Van der Heijden et al. (2003) and Wu et al. (2008) to investigate the carpooling motivations.

Finally, carpooling during COVID-19 is observed to be lower than usual. In 2020, completed carpooling in BlaBlaCar was at 70% during COVID-19 compared with the early year (BlaBlaCar, 2020a). It was observed that LILUNA had about two posts per day and most posts were expensive compared to the pre-COVID-19 days. A critical challenge for academia and practitioners is that COVID-19 may have an impact on individuals' motivations to carpool. During COVID-19, considering the benefits of carpooling such as socialising and a sense of community, when social distancing is required, carpooling may not be appropriate or recommended. If this crisis remains and if drivers still sharing seats during this pandemic, it will be interesting to investigate how drivers balance such contradictory benefits: how they perceive socialisation and a sense of community while maintaining social distancing.

World-wide experts observed that 64.8% of travellers shifted to private cars during COVID-19 while some experts expected that the car dependence would become more obvious in the post-COVID-19 era (Zhang, Hayashi & Frank, 2021). A question is that would carpooling become the main transport means. It will be interesting to ask whether drivers still want to share seats, or they may be fear of carpooling and prefer to drive alone. Besides, people can have experienced such serious pandemic and may become sensitive to public health threats in the future (Zhang et al., 2021). It would also be interesting to investigate how the driver's carpooling motivations and behaviour are affected by social distancing restrictions during the COVID-19 crisis and social distancing norms in the future.

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APPENDICES

APPENDIX A
DEFINITIONS OF CARPOOLING

Definitions of carpooling in the literature

Author(s)	Definition
Train (1980)*	"Carpooling is defined as commuting by auto with more than one person in the car (the respondent can be either the driver or a passenger)." (p. 360)
Teal (1987)	"[A] carpooler is considered to be anyone who shares transportation to work in a private vehicle with another worker." (p. 206)
Brownstone & Golob (1992)*	"[Carpooling] is defined [...] as two or more occupants per vehicle." (p. 6)
Ferguson (1995)*	"Carpooling is defined as any home-based work trip in which the commuter is accompanied by at least one other person in a private motor vehicle." (p. 142)
Kelly (2007)*	"Casual carpooling refers to the sharing of a ride with a driver and one or more passengers, where the ridesharing between the individuals is not established in advance but coordinated on the spot." (p. 119)
Ivan (2010)*	"[Carpooling] refers to the shared use of a car by the driver and one or more passengers, usually for commuting." (p. 218)
Rahman & Al-Ahmadi (2010)*	"[A] type of ridesharing arrangement whereby drivers wishing to form carpools pick up passengers waiting at roadsides or any specific locations suitable for them" (p. 179)
Buliung et al. (2012)	"[The] sharing of a private vehicle between two or more persons for travel to a pre-arranged destination like work." (p. 878)
Malodia & Singla (2016)	"[Carpooling] can be defined as ridesharing between two or more persons sharing a trip to a common workplace or in close proximity." (p. 539)

* Articles found in an extensive literature review via Google Scholar.

Definitions of carpooling in the literature (continue)

Author(s)	Definition
Tahmasseby et al. (2016)	“Carpoolers are usually colleagues or friends that have recurring commute trips, for example, home to work or home to school.” (p. 241)
Bruck et al. (2017)*	“[A] ridesharing practice that can be defined as the act of a group of individuals that ride a single car by splitting travel costs.” (p. 40)
Javid et al. (2017)*	“[Carpooling] refers to a shared transport service that either runs on mutual coordination of the users or is provided by some organizations from certain residential places to certain work/education places.” (p. 269)
Neoh et al. (2017)	“[An] agreement where two or more persons, not living in the same household, travel together in the same private vehicle to reduce the number of [single-occupancy vehicles] needed per journey.” (p. 426)
Shin (2017)*	“[Automobile] trips with non-household members.” (p. 16)
Amirkiaee & Evangelopoulos (2018)	“[One] or more passengers enter a vehicle in a manner that is not fully commercial or fully formal, regardless of whether they are family members, friends, peers, or strangers, they enter into the ridesharing mode. A formal agreement, for example for splitting travel costs, may or may not exist between ridesharing participants, and this mode of commuting may be used on a regular or occasional basis.” (p. 10-11)
Bachmann et al. (2018)	“[The] sharing of a ride so that two or more persons travel together in a vehicle.” (p. 260)
Gheorghiu & Delhomme (2018)	“Carpooling is usually understood as an informal agreement between two or more individuals to share a privately owned vehicle for a trip and to contribute to its expenses.”(p. 460)

* Articles found in an extensive literature review via Google Scholar.

Definitions of carpooling in the literature (continue)

Author(s)	Definition
Guyader (2018)	Ridesharing or carpooling is defined as "adding additional passengers to a pre-existing trip. Such an arrangement provides additional transportation options for passengers while allowing drivers to fill otherwise empty seats in their vehicles." (p. 700)
Neoh et al. (2018)	"[Two] or more people travelling together in a private vehicle (with one of the participants driving the vehicle) from the same origin to the same destination." (p. 129)
Park et al. (2018)	"The casual grouping of [travellers] into common commute trips by a single vehicle." (p. 2)
Guyader & Piscicelli (2019)*	"Ridesharing (or carpooling) is defined as a joint trip where drivers offer empty seats in their [vehicle] to other passengers without a profit motive. [...] Passengers contribute to travel expenses but do not remunerate the driver. [...] The coordination between drivers and passengers is facilitated by ridesharing platforms in exchange for a service fee and/or a commission or for free when operated by grassroots or non-profit organizations." (p. 1061)
Olsson et al. (2019)	"Carpooling refers to the situation where two or more individuals travel in the same car to reduce the number of single-occupancy vehicles on the road." (p. 1)
Standing et al. (2019)	"[A] sharing approach that is typically a not for hire arrangement but rather an agreement between people to share a journey. This could involve regular trips or a longer one-off trip. Some sharing of the expenses could take place but it is not typically a commercial arrangement." (p. 3)

* Articles found in an extensive literature review via Google Scholar.

APPENDIX B
CONSENT FORMS

The acceptance letter signed by LILUNA's founder

ใบตอบรับคำขอ

วันที่ 10 เดือน 12 พ.ศ. 2562

เรียน ผู้อำนวยการโครงการปริญญาดุษฎีบัณฑิต สาขาวิชาบริหารธุรกิจ หลักสูตรนานาชาติ (Ph.D.)

ข้าพเจ้า นาย ได้รับทราบเรื่องคำขอความอนุเคราะห์ให้นักศึกษา นายพุฒิพงศ์ จุลกสิกร ได้เข้าเก็บข้อมูลผู้ขับขี่รถยนต์ของลิลูน่า ข้าพเจ้ามีความเห็นว่า

☒ อนุญาตให้นักศึกษาใช้แพลตฟอร์มลิลูน่า (Liluna) เพื่อเข้าเก็บข้อมูลผู้ขับขี่รถยนต์ของลิลูน่า

☐ ไม่อนุญาตให้นักศึกษาใช้แพลตฟอร์มลิลูน่า (Liluna) เพื่อเข้าเก็บข้อมูลผู้ขับขี่รถยนต์ของลิลูน่า

เนื่องจาก ....

ขอแสดงความนับถือ

ลงชื่อ ....

(นาย)

Translation of the acceptance letter

Acceptance letter

Date

Dear the director of the Ph.D. program of Thammasat Business School

I Mr……… has been requested to allow the Ph.D. student, Mr. Puthipong Julagasigorn, to collect the app data involves the drivers of LILUNA. I would like to express that I:

☑ allow the student to use the platform (LILUNA) to collect the data involves the drivers

☐ do not allow the student to use the platform (LILUNA) to collect the data involves the drivers because ……………………………………………….

Regards

Sign ….. [signature]…..

Mr. …………..

Consent form for interview

แบบฟอร์มยินยอมให้เข้าสัมภาษณ์

(แบบฟอร์มนี้ทำไว้ให้เพื่อนักวิจัยได้อ่านให้แก่ผู้เข้าร่วมวิจัยรับทราบก่อนเริ่มต้นการสัมภาษณ์ โดยแบบฟอร์มชุดหนึ่งจะเก็บไว้ที่ผู้เข้าร่วมวิจัย และอีกชุดหนึ่งไว้ที่นักวิจัย)

ข้าพเจ้าชื่อ นายพุทธิพงศ์ จุลกสิกร เป็นนักวิจัยศึกษาในระดับปริญญาเอกของมหาวิทยาลัยธรรมศาสตร์ และกำลังทำวิจัยที่มีหัวข้อเรื่องชื่อไทยว่า ”การเข้าใจปัจจัยผลักดันให้คนขับรถยนต์แบบคนเดียวกลายมาเป็นคนขับรถยนต์แบบทางเดียวกันไปด้วยกัน” โครงการศึกษานี้ได้รับการอนุมัติและตรวจสอบจากอาจารย์ผู้ควบคุมงานวิจัย และผู้ทรงคุณวุฒิ เป็นที่เรียบร้อยแล้ว หากท่านต้องการข้อมูลเพิ่มเรื่องใด โปรดติดต่อข้าพเจ้าได้ที่เบอร์โทรศัพท์ ....

ขอขอบพระคุณที่ท่านได้ให้ความร่วมมืองานวิจัยนี้ ก่อนที่จะเริ่มต้นการสัมภาษณ์ ข้าพเจ้าขอแจ้งให้ท่านทราบถึงสิทธิของท่านผู้เข้าร่วมวิจัยดังนี้

การมาเข้าร่วมวิจัยของท่านเป็นไปโดยความสมัครใจ

1) ท่านมีสิทธิที่จะปฏิเสธการตอบคำถามได้ทุกเวลา
2) ท่านมีสิทธิที่จะถอนตัวออกจากการการสัมภาษณ์ได้ทุกเวลา
3) บทสัมภาษณ์ เทปบันทึกเสียง (หากท่านอนุญาต) จะเก็บไว้เป็นความลับอย่างที่สุด แต่จะเปิดเผยต่อกลุ่มสมาชิกผู้ทำวิจัยเท่านั้น

บางส่วนของสัมภาษณ์อาจถูกตัดตอนเพื่อนำมาเขียนลงในรายงานการวิจัย <u>โดยจะไม่มีการอ้างอิงถึงตัวท่าน หรืออ้างถึงเอกลักษณ์ใดๆ ที่เกี่ยวกับตัวท่านทั้งสิ้น</u>

Transaction of the consent form for interview

Consent form for interview

(To be read by the researcher before the beginning of the interview. One copy of should be left with the respondent, and one copy should be left with the researcher)

My name is Puthipong Julagasigorn. I am a PhD candidate at Thammasat University who is conducting a research project entitled "Understanding motivations behind carpool drivers" This project has been already approved by (the chief of research project) and research committees. If you have any questions, please contact at this phone number ………………

Thank you for your willingness to participate in this research project. Your participation is very much appreciated. Just before we start the interview, I would like to reassure you that as a participant in this project you have several very definite rights.

1) Your participation in this interview is entirely voluntary.
2) You are free to refuse to answer any question at any time.
3) You are free to withdraw from the interview at any time.
4) This interview will be kept strictly confidential and will be available only to members of the research team.

Excerpts of this interview may be made part of the final research report, but under no circumstances will your name or identifying characteristics be included in this report.

APPENDIX C
QUESTIONS USED IN INTERVIEWS

Questions used in the interviews

Type	Question
Exploratory	What do you think about LILUNA? What make you use LILUNA? Which things of LILUNA that you like? What do you think about carpooling via LILUNA? What do you thing about carpooling with ones you do not meet before? How would you think about previous riders? How could you explain the relationships between you and other drivers/riders?
Narrative	Could you describe what happen in your carpooling? Could you describe what happen when riders reached at their destinations?
Following	Could you give me an example of [feelings, benefits, or experiences]? As you stated [word], could you explain me more? What makes you think/do like that?

APPENDIX D
QUESTIONNAIRES

Questionnaire in Thai language

ส่วนที่ 1: คำแนะนำ
• การสำรวจออนไลน์นี้เป็นส่วนหนึ่งของโครงการวิจัยในความร่วมมือระหว่าง LILUNA และคณะพาณิชย์และการบัญชี มหาวิทยาลัยธรรมศาสตร์ โดยมีวัตถุประสงค์เพื่อศึกษาความคิดเห็นของคนขับรถยนต์ใน LILUNA คำตอบของคุณจะมีประโยชน์ต่อโครงการงานวิจัยของเรา รวมไปถึงจะนำไปใช้เพื่อปรับปรุงการให้บริการของ LILUNA • คุณจะใช้เวลาทำแบบสำรวจนี้ประมาณ 5-10 นาที คำตอบของคุณจะถูกเก็บไว้เป็นความลับและจะนำไปใช้รายงานผลโดยไม่มีการระบุถึงตัวบุคคล คุณสามารถถอนตัวจากการทำแบบสอบถามได้ทุกเวลา อย่างไรก็ตามหากคุณกด “ส่งแบบสอบถาม” จะไม่สามารถยกเลิกการส่งคำตอบได้ • การตอบกลับที่ครบถ้วนสมบูรณ์จะได้รับ 1 รางวัล (บัตร Starbuck มูลค่า 100 บาท หรือ Gift voucher Tops Supermarket มูลค่า 100 บาท หรือยาดมเอี๊ยะแซ จำนวน 3 กระปุก มูลค่า 105 บาท) โดยในตอนท้ายของแบบสำรวจนี้ คุณสามารถเลือกของรางวัล และให้ข้อมูลการติดต่อของคุณเพื่อให้นักวิจัยติดต่อกลับและส่งมอบรางวัลให้
โปรดยืนยันว่าคุณได้อ่านคำแนะนำและยินดีที่จะเข้าร่วมในแบบสำรวจนี้ ☐ ฉันได้<u>อ่านคำแนะนำ</u>และ<u>ยินดีที่จะเข้าร่วม</u>ในการตอบแบบสำรวจนี้
แบบสำรวจนี้มุ่งเน้นไปที่ผู้ขับรถยนต์ที่ได้เคยเสนอที่นั่งใน LILUNA อย่างน้อยหนึ่งครั้ง โดยอาจจะมีหรือไม่มีผู้ร่วมเดินทางก็ได้ ☐ ฉันเป็น<u>คนขับรถยนต์</u>ที่เคย<u>เสนอที่นั่งใน LILUNA อย่างน้อยหนึ่งครั้ง</u>

ส่วนที่ 2: โปรดอ่านคำจำกัดความของ คาร์พูล (Carpool) และใช้คำจำกัดความนี้เพื่อตอบคำถามต่อจากนี้ไป
สำหรับวัตถุประสงค์ของการสำรวจนี้ เราได้กำหนดคำว่า "คาร์พูล" (Carpool) หมายถึงวิธีการเดินทางที่คุณได้<u>เสนอที่นั่งในรถของคุณให้กับผู้ร่วมเดินทางผ่านทางแอป LILUNA</u> และ<u>ตั้งใจที่จะเดินทางร่วมไปกับผู้ร่วมเดินทางเหล่านั้น</u>จากที่หนึ่งไปยังอีกที่หนึ่ง โดย<u>คุณอาจจะขอให้ผู้ร่วมเดินทางช่วยออกค่าใช้จ่ายบางส่วนหรือไม่ก็ได้</u>

ส่วนที่ 3: คุณคิดอย่างไรเกี่ยวกับ LILUNA? โปรดอ่านข้อความต่อไปนี้ แล้วเลือกคำตอบที่ตรงกับความคิดของคุณให้มากที่สุด
• LILUNA มีประโยชน์กับฉัน • LILUNA มีข้อดีมากกว่าข้อเสีย • โดยรวมแล้ว การใช้งาน LILUNA เป็นประโยชน์ต่อฉัน
• ระบบการใช้งาน LILUNA ชัดเจนและเข้าใจง่าย • การใช้งาน LILUNA เป็นเรื่องง่ายสำหรับฉัน • ฉันไม่มีปัญหาในการใช้งาน LILUNA

ส่วนที่ 4: อะไรที่มีอิทธิพลให้คุณอยากคาร์พูลด้วย LILUNA

โปรดอ่านข้อความต่อไปนี้ แล้วเลือกคำตอบที่ตรงกับความคิดของคุณให้มากที่สุด

- เปิดโอกาสให้ฉันลดค่าใช้จ่ายในการเดินทาง
- เพิ่มประสิทธิภาพการเดินทางของฉัน เช่น ผู้ร่วมเดินทางช่วยดูรถ ดูเส้นทาง
- ทำให้ประสิทธิภาพการเดินทาง/การขับรถของฉันดีขึ้นกว่าการขับรถคนเดียว

- คาร์พูลด้วย LILUNA เป็นสิ่งที่น่าตื่นเต้น
- คาร์พูลด้วย LILUNA เป็นเรื่องสนุกสนาน
- คาร์พูลด้วย LILUNA ให้ประสบการณ์ที่น่ารื่นรมย์

- ภาพลักษณ์ของฉันในสังคมดูดีขึ้นเมื่อคาร์พูลด้วย LILUNA
- คาร์พูลด้วย LILUNA ทำให้ฉันสร้างความประทับใจให้คนในกลุ่มสังคมของฉันได้
- ฉันได้รับการยอมรับนับถือจากคนในสังคม เมื่อคาร์พูลด้วย LILUNA

- คาร์พูลด้วย LILUNA เป็นการเดินทางที่เป็นมิตรต่อสิ่งแวดล้อม
- คาร์พูลด้วย LILUNA เป็นการเดินทางที่ช่วยประหยัดทรัพยากรน้ำมัน
- ฉันมีส่วนช่วยลดมลพิษทางสิ่งแวดล้อมเมื่อคาร์พูลด้วย LILUNA

- ฉันกำลังช่วยเหลือผู้ร่วมเดินทางใน LILUNA
- ฉันกำลังทำประโยชน์ให้ผู้ร่วมเดินทางใน LILUNA
- การแบ่งปันที่นั่งให้ผู้ร่วมเดินทาง เป็นการทำดีที่จะส่งผลดีกับฉันในอนาคต
- ยิ่งฉันแบ่งปันที่นั่งให้ผู้ร่วมเดินมาก ฉันก็ยิ่งได้สิ่งดีๆ ต่อตัวฉันมากขึ้น

ส่วนที่ 5: ความตั้งใจจะคาร์พูลด้วย LILUNA เมื่อกิจกรรมต่างๆ กลับสู่สภาวะปกติหลัง COVID-19 โปรดอ่านข้อความต่อไปนี้ แล้วเลือกคำตอบที่ตรงกับความรู้สึกของคุณให้มากที่สุด
• พิจารณาทุกๆ ประเด็นแล้ว ฉันตั้งใจจะคาร์พูลด้วย LILUNA ในอนาคต • ฉันเห็นตัวเองมีส่วนร่วมคาร์พูลกับ LILUNA บ่อยขึ้นในอนาคต • ฉันตั้งใจจะคาร์พูลด้วย LILUNA เพิ่มขึ้น เท่าที่จะเป็นไปได้

ส่วนที่ 6: ลักษณะของการเดินทาง
จุดประสงค์ของการเดินทางครั้งนั้นคืออะไร? (ตอบได้หลายข้อ) • การเดินทางไปทำงาน   • ทำธุรกิจส่วนตัว   • ไปงานสังคม • ไปงานสันทนาการ/ท่องเที่ยว   • ไปบ้านเกิดของฉัน/ไปหาครอบครัว   • อื่น ๆ ....
การเดินทางครั้งนั้น เป็นระยะทางประมาณกี่กิโลเมตร? .... กม.
ค่าใช้จ่ายในการใช้รถยนต์ของคุณเพื่อการเดินทางครั้งนั้น มีต้นทุนประมาณเท่าไหร่? .... บาท
ในการเดินทางครั้งนั้น คุณตั้งราคาค่าโดยสารใน LILUNA หรือไม่? • ฉันตั้งราคาค่าโดยสาร   • ฉันตั้งราคาค่าโดยสาร แต่ไม่ได้คิดเงินผู้ร่วมเดินทาง • ฉันไม่ได้ตั้งราคา (ข้ามไป ส่วนที่ 7)
ราคา<u>รวมทุกๆ ที่นั่ง</u>เป็นเท่าไหร่? (เช่น หากคุณเสนอ 2 ที่นั่ง ที่นั่งละ 100 บาท ดังนั้น ราคารวมเท่ากับ 200 บาท) .... บาท

ส่วนที่ 7: ข้อมูลประชากร
เพศ • ชาย • หญิง • ไม่ต้องการตอบ
อายุ • 18-24 • 25-34 • 35-44 • 45-54 • 55-64 • 64 ขึ้นไป • ไม่ต้องการตอบ
การศึกษาระดับสูงสุด •ไม่มีปริญญา • มัธยมศึกษา • ประกาศนียบัตร • ปริญญาตรี • สูงกว่าปริญญาตรี • ไม่ต้องการตอบ
คุณมีรายได้ต่อเดือนประมาณเท่าไหร่? • น้อยกว่า 15,000 บาทต่อเดือน • 15,000–25,000 บาทต่อเดือน • 25,001--35,000 บาทต่อเดือน • 35,001--50,000 บาทต่อเดือน • มากกว่า 50,001 บาทต่อเดือน • ไม่ต้องการตอบ

ส่วนที่ 8: ข้อมูลติดต่อ
ขอขอบคุณที่สละเวลาทำแบบสอบถามครั้งนี้ การมีส่วนร่วมของคุณมีคุณค่าต่อโครงการวิจัยของเรา และจะเป็นประโยชน์ต่อการพัฒนาปรับปรุงคุณภาพการบริการของ LILUNA
คุณจะได้รับรางวัลอย่างใดอย่างหนึ่ง เมื่อการสำรวจสิ้นสุดลง โปรดเลือกรางวัลที่คุณสนใจ (1) บัตรแทนเงินสด Starbuck มูลค่า 100 บาท (2) Gift voucher Top Supermarket มูลค่า 100 บาท (2) ฉันไม่ต้องการรางวัล
นักวิจัยจะติดต่อคุณผ่านทางโทรศัพท์ ซึ่งจะถูกเก็บไว้เป็นความลับอย่างที่สุด และจะลบเมื่อสิ้นสุดการส่งมอบของรางวัล • ชื่อเรียก/นามสมมติ • เบอร์โทรศัพท์: ....
หากมีข้อสงสัยสามารถสอบถามเพิ่มเติมได้ที่คุณพุทธิพงศ์ จุลกสิกร มหาวิทยาลัยธรรมศาสตร์ ติดต่อ: puthipong-jul58@tbs.tu.ac.th; 097-219-3957

Questionnaire in English language

Section 1: Instruction
• This survey is a part of the project in collaboration between LILUNA and Thammasat Business School, Thammasat University. It is aimed at studying the perceptions of LILUNA's carpool drivers. Your response not only is valuable to our research project but also will be used to improve the service in LILUNA. • Time required for completing this survey is around 5-10 minutes. Your answers will be kept confidential. The results will be reported without identifying your identity. You can withdraw from the survey at any time. However, if you press "Submitting the questionnaire", you will not be able to cancel your answer. • All completed responses can get a reward (100-THB Starbuck e-coupon card or 100-THB Tops Supermarket e-coupon card or 3-bowl of EarSair inhaler valuing 105-THB). At the end of this survey, you can choose a reward and can provide your contact details in order to allow a researcher to contact you back and deliver you a reward.
Please confirm that you have read the instruction and are willing to participate in this survey. ☐ I have <u>read the instruction</u> and I am <u>willing to participate</u> in this survey.
This survey focuses on the drivers who have, at least once, offered seats via LILUNA, no matter you got a rider or not. ☐ I am a <u>driver</u> who have <u>offered seats at least one time</u> via LILUNA.

Section 2: Please read the definition of carpooling and use it to answer the following questions.
For the purpose of this survey, we define carpooling as a means of transport where <u>you share seats in your own car to riders via LILUNA and intend to travel with them</u> from one location to another. You <u>may or may not ask the riders to share you some expense</u>.

Section 3: What do you think about LILUNA?

Please read the statements shown below and choose the answer that best explains your thinking.

• LILUNA is of benefit to me.

• The advantages of LILUNA outweigh the disadvantages.

• Overall, using LILUNA is advantageous to me.

• Using LILUNA is clear and understandable.

• Using LILUNA is easy to me.

• I have no problems using LILUNA.

Section 4: What influence you to carpool via LILUNA?

Please read the statements shown below and choose the answer that best explains your thinking.

• I have a chance to reduce the cost of my trip.

• It improves my trip performance such as riders help watch the cars/roads.

• The performance of my trip/driving is better than driving alone.

• Carpooling via LILUNA is exciting.

• Carpooling via LILUNA is fun.

• Carpooling via LILUNA is pleasant.

• Carpooling via LILUNA improves my image within communities.

• By carpooling via LILUNA, I make a good impression on people in communities.

• By carpooling via LILUNA, I earn respect from people in communities.

• Carpooling via LILUNA is an environmentally friendly means of transport.

• Carpooling via LILUNA is an efficient way of using fuel energy.

• By carpooling via LILUNA, I contribute to the reduction of environmental pollution.

• I’m helping riders in LILUNA.

• I’m benefiting riders in LILUNA.

• Sharing seats with riders is a good thing to do which yields good benefits to me in the future.

• The more often I share seats with riders the more I feel I would receive good things.

Section 5: Your future intention to carpool via LILUNA assumes activities return to normal after the COVID-19 pandemic. Please read the statements shown below and choose the answer that best explains your thinking.
• All things considered; I expect to carpool via LILUNA in the future. • In the future, I see myself carpooling via LILUNA more frequently. • I intend to increase carpooling via LILUNA if possible.

Section 6: trip characteristics
What was your purpose for that trip? (can choose more than one) • Work commuting • Personal business • Social • Recreational/travel • My hometown • Other ………….
In that trip, how far did you go? …………. km.
In that trip, how much it cost you to drive in your car? …………. THB
Did you set a price the last time you shared seats? • I set a price • I set a price but did not charge the riders • I did not set a price (skip to Section 7)
How much, in sum of all your offered seats? (for example, if you offered 2 seats at 100 THB each, the sum would be 200 THB) ….. THB

Section 7: demographics		
What is your gender?		
• Male	• Female	• Prefer not to answer
What is your age in years?		
• 18-24	• 25-34	• 35-44
• 45-54	• 55-64	• 64 and over
• Prefer not to answer		
What is your highest level of educational achievement?		
• No degree	• High school	• Diploma
• Bachelor	• Postgraduate	• Prefer not to answer
How much you earn monthly?		
• THB < 15,000	• THB 15,000–25,000	• THB 25,001–35,000
• THB 35,001–50,000	• THB > 50,001	• Prefer not to answer

Section 8: Your contact
Thank you for taking the time to complete this survey. Your contribution is valuable to our research project and to the improvement of LILUNA’s service.
You will receive a reward once this survey is ended. Please choose a reward that is of your interest. (1) 100-THB Starbuck e-coupon card (2) 100-THB Top Supermarket gift voucher (2) I don’t want a reward
Please provide your contact in order to allow a researcher to contact you back. Your contact provided here will be kept confidential and will be deleted after you received your reward. Your pseudo name: ……….. Telephone number: …………………………
If you have any questions, please contact Mr.Puthipong Julagasigorn, Thammasat University. Contact: puthipong-jul58@tbs.tu.ac.th; 097-219-3957

APPENDIX E
DESCRIPTIVES STATISTIC

Demographics

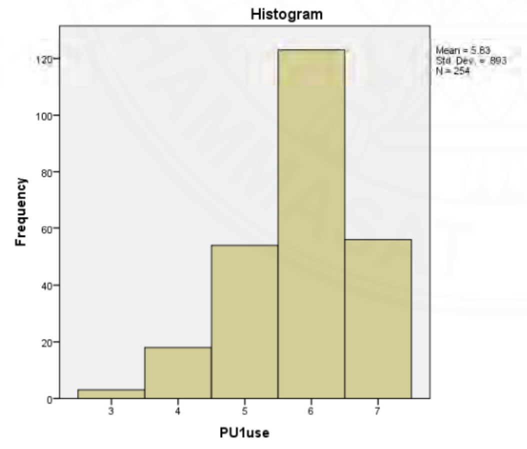
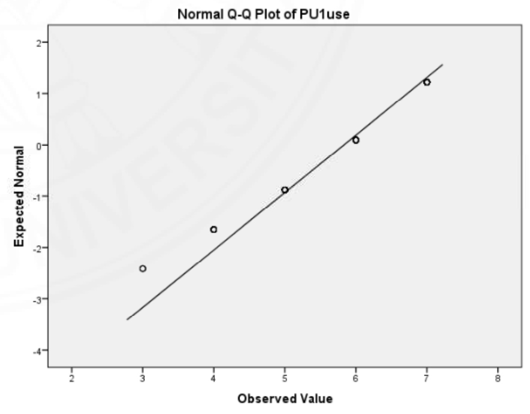
	Answer	Frequency	Percent
Gender	Male	192	75.6
	Female	60	23.6
	Prefer not to answer	2	0.8
Age	18-24	17	6.7
	25-34	139	54.7
	35-44	84	33.1
	45-54	11	4.3
	55-64	2	0.8
	Prefer not to answer	1	0.4
Education	No degree	2	0.8
	Primary	11	4.3
	Certificate	15	5.9
	Bachelor	173	68.1
	Higher-education	47	18.5
	Prefer not to answer	6	2.4
Salary	15,000 Baht	16	6.3
	15,000-25,000 Baht	82	32.3
	15,000-25,000 Baht	83	32.7
	25,000-35,000 Baht	36	14.2
	35,000-50,000 Baht	28	11.0
	50,000 Baht up	9	3.5

Perceived usefulness: descriptive statistics

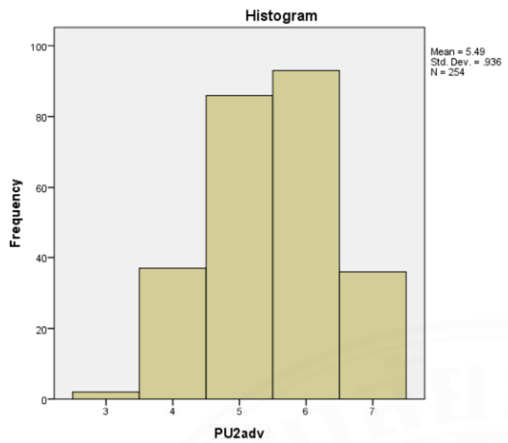
			Statistic	Std. Error
PU1use	Mean		5.83	.056
	95% Confidence Interval for Mean	Lower Bound	5.72	
		Upper Bound	5.94	
	5% Trimmed Mean		5.88	
	Median		6.00	
	Variance		.797	
	Std. Deviation		.893	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.668	.153
	Kurtosis		.309	.304
PU2adv	Mean		5.49	.059
	95% Confidence Interval for Mean	Lower Bound	5.37	
		Upper Bound	5.60	
	5% Trimmed Mean		5.50	
	Median		6.00	
	Variance		.875	
	Std. Deviation		.936	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.126	.153
	Kurtosis		-.619	.304

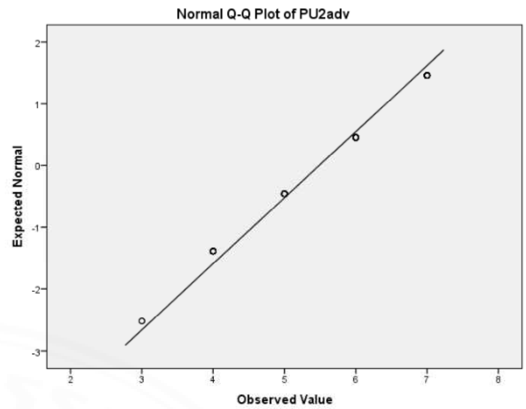
			Statistic	Std. Error
PU3over	Mean		5.61	.062
	95% Confidence Interval for Mean	Lower Bound	5.49	
		Upper Bound	5.74	
	5% Trimmed Mean		5.65	
	Median		6.00	
	Variance		.965	
	Std. Deviation		.982	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.398	.153
	Kurtosis		-.342	.304

Perceived usefulness: histogram and Q-Q plot

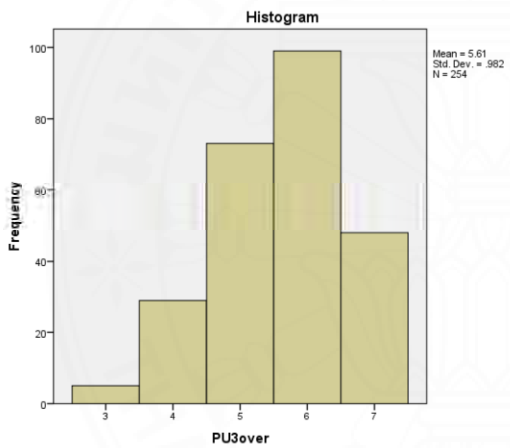
PU1: LILUNA is of benefit to me.	
	

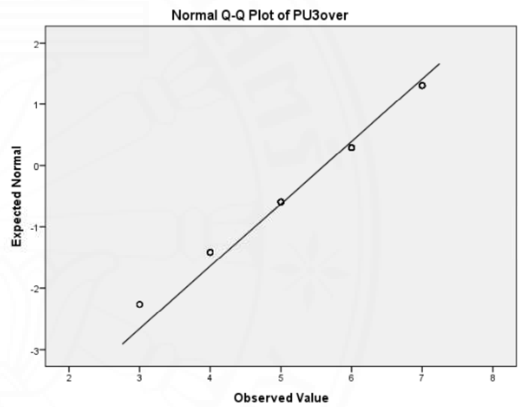
PU2: The advantages of LILUNA outweigh the disadvantages.





PU3: Overall, using LILUNA is advantageous to me.





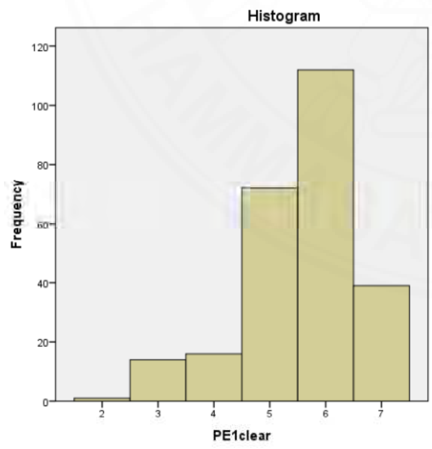
Perceived ease of use: descriptive statistics

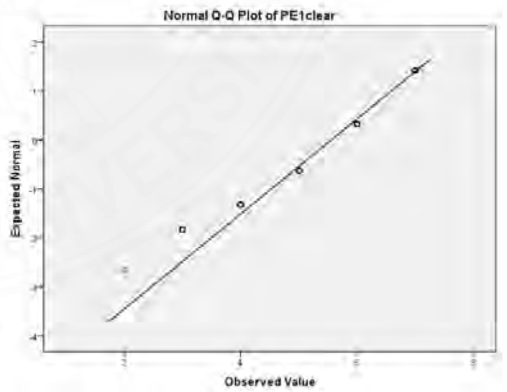
			Statistic	Std. Error
PE1clear	Mean		5.56	.065
	95% Confidence Interval for Mean	Lower Bound	5.44	
		Upper Bound	5.69	
	5% Trimmed Mean		5.63	
	Median		6.00	
	Variance		1.061	
	Std. Deviation		1.030	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.837	.153
	Kurtosis		.696	.304
PE2easy	Mean		5.65	.063
	95% Confidence Interval for Mean	Lower Bound	5.53	
		Upper Bound	5.78	
	5% Trimmed Mean		5.71	
	Median		6.00	
	Variance		1.018	
	Std. Deviation		1.009	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.729	.153
	Kurtosis		.506	.304

			Statistic	Std. Error
PE3prob	Mean		5.51	.070
	95% Confidence Interval for Mean	Lower Bound	5.37	
		Upper Bound	5.65	
	5% Trimmed Mean		5.58	
	Median		6.00	
	Variance		1.255	
	Std. Deviation		1.120	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.787	.153
	Kurtosis		.213	.304

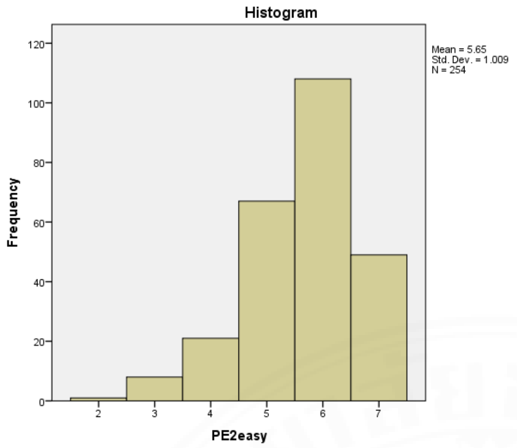
Perceived ease of use: histogram and Q-Q plot

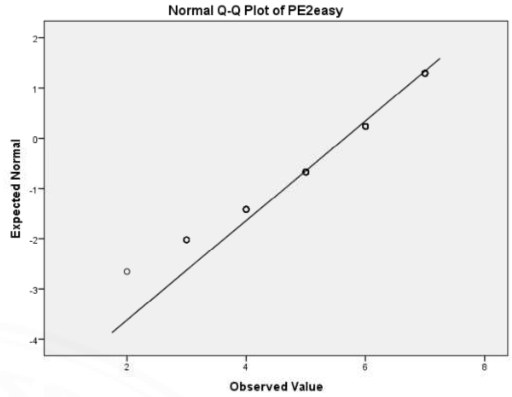
PE1: Using LILUNA is clear and understandable.



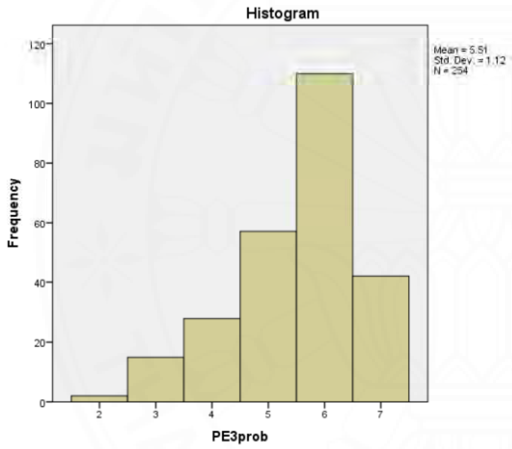


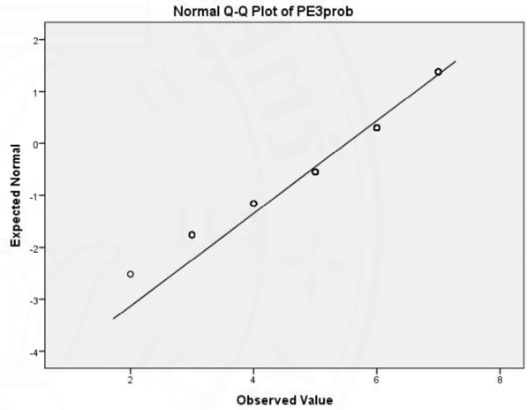
PE2: Using LILUNA is easy to me.





PE3: I have no problems using LILUNA.





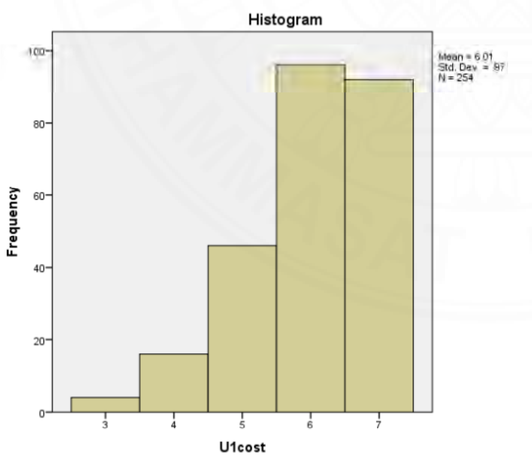
Utilitarian value: descriptive statistics

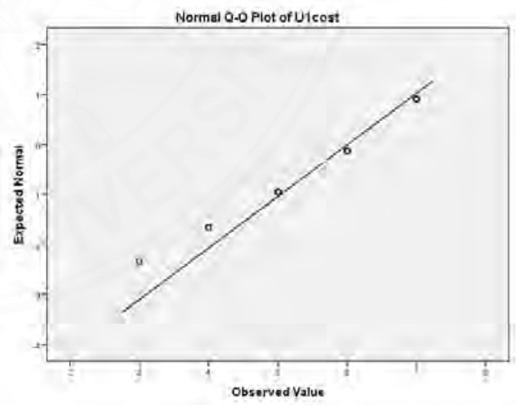
			Statistic	Std. Error
U1cost	Mean		6.01	.061
	95% Confidence Interval for Mean	Lower Bound	5.89	
		Upper Bound	6.13	
	5% Trimmed Mean		6.08	
	Median		6.00	
	Variance		.941	
	Std. Deviation		.970	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		2	
	Skewness		-.854	.153
	Kurtosis		.276	.304
U2eff	Mean		5.50	.061
	95% Confidence Interval for Mean	Lower Bound	5.38	
		Upper Bound	5.62	
	5% Trimmed Mean		5.52	
	Median		6.00	
	Variance		.955	
	Std. Deviation		.977	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.306	.153
	Kurtosis		-.344	.304

			Statistic	Std. Error
U3better	Mean		5.54	.064
	95% Confidence Interval for Mean	Lower Bound	5.41	
		Upper Bound	5.67	
	5% Trimmed Mean		5.55	
	Median		6.00	
	Variance		1.056	
	Std. Deviation		1.027	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.151	.153
	Kurtosis		-.938	.304

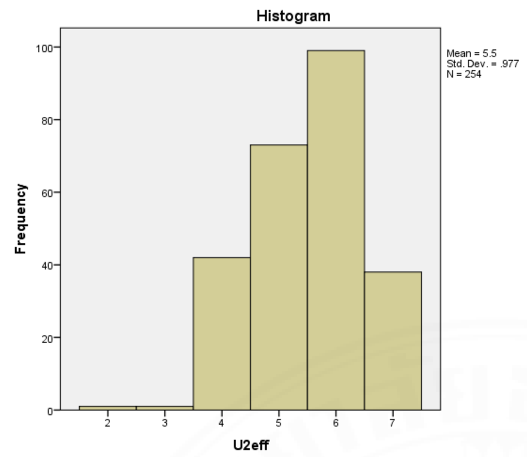
Utilitarian value: histogram and Q-Q plot

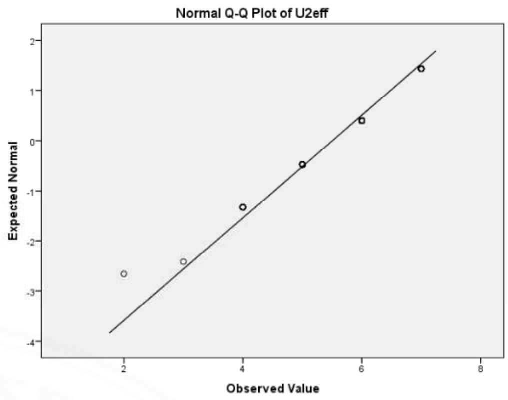
U1: I have a chance to reduce the cost of my trip.



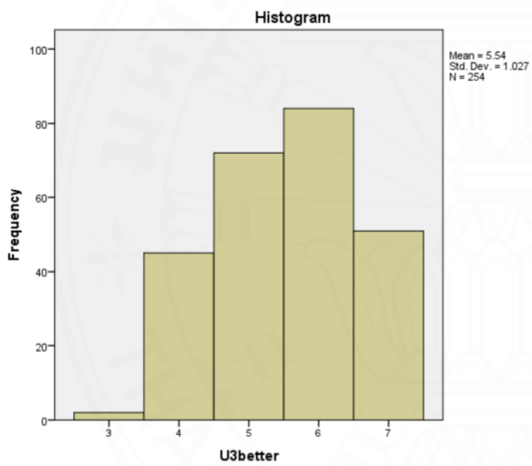


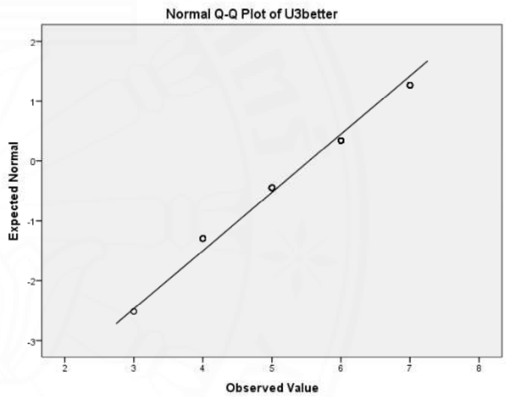
U2: It improves my trip performance such as riders help watch the cars/roads.





U3: The performance of my trip/driving is better than driving alone.





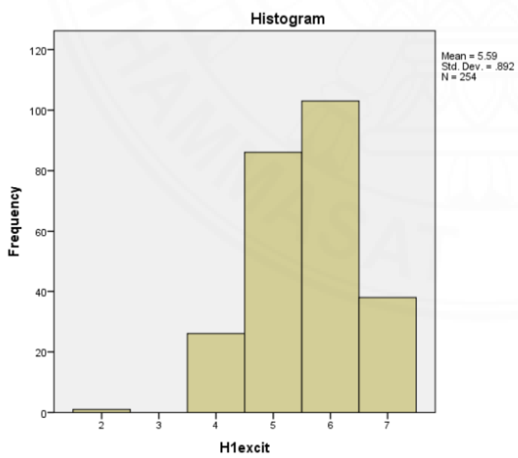
Hedonic value: descriptive statistics

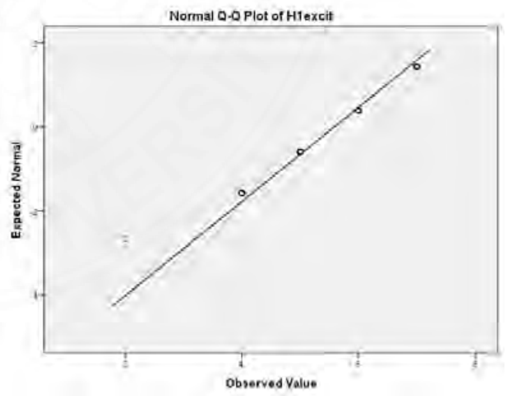
			Statistic	Std. Error
H1excit	Mean		5.59	.056
	95% Confidence Interval for Mean	Lower Bound	5.48	
		Upper Bound	5.70	
	5% Trimmed Mean		5.61	
	Median		6.00	
	Variance		.796	
	Std. Deviation		.892	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.309	.153
	Kurtosis		.131	.304
H2fun	Mean		5.46	.058
	95% Confidence Interval for Mean	Lower Bound	5.34	
		Upper Bound	5.57	
	5% Trimmed Mean		5.47	
	Median		6.00	
	Variance		.866	
	Std. Deviation		.930	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		1	
	Skewness		-.348	.153
	Kurtosis		.114	.304

			Statistic	Std. Error
H3pleas	Mean		5.30	.062
	95% Confidence Interval for Mean	Lower Bound	5.18	
		Upper Bound	5.42	
	5% Trimmed Mean		5.29	
	Median		5.00	
	Variance		.963	
	Std. Deviation		.981	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		.044	.153
	Kurtosis		-.898	.304

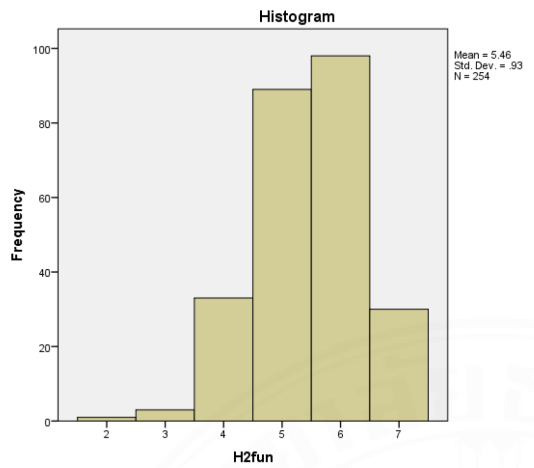
Hedonic value: histogram and Q-Q plot

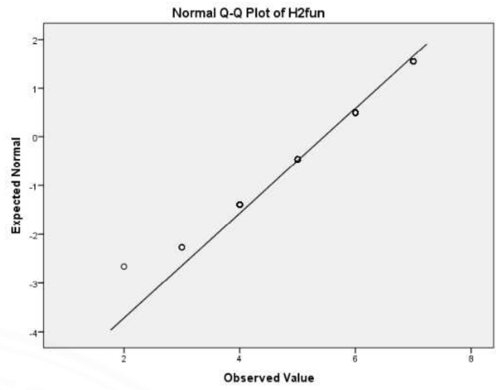
H1: Carpooling via LILUNA is exciting.



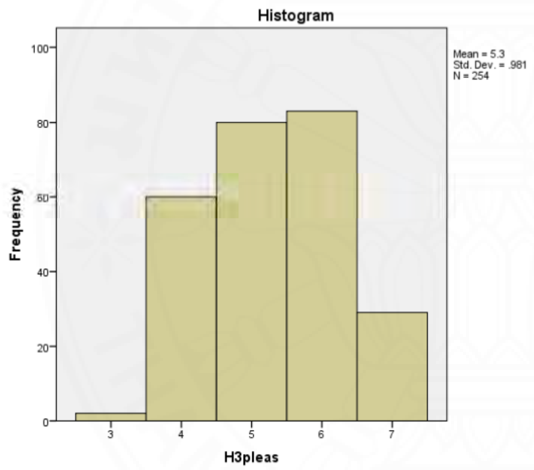


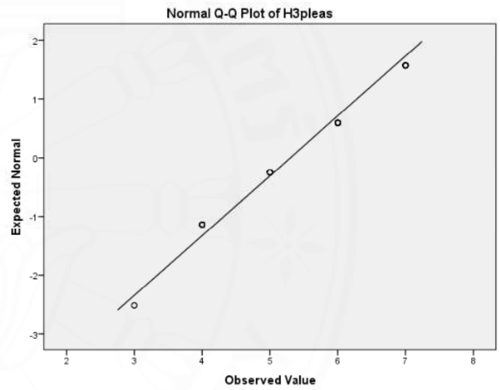
H2: Carpooling via LILUNA is fun.





H3: Carpooling via LILUNA is pleasant.





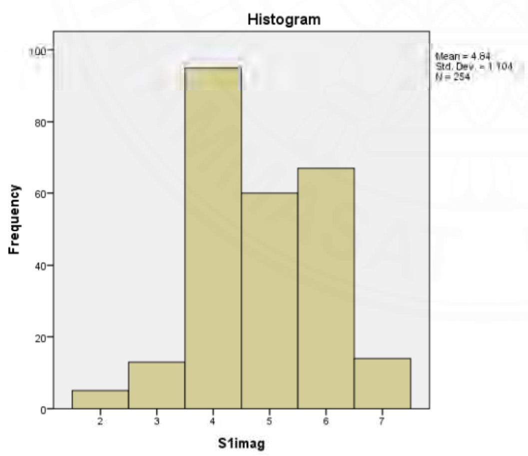
Social value: descriptive statistics

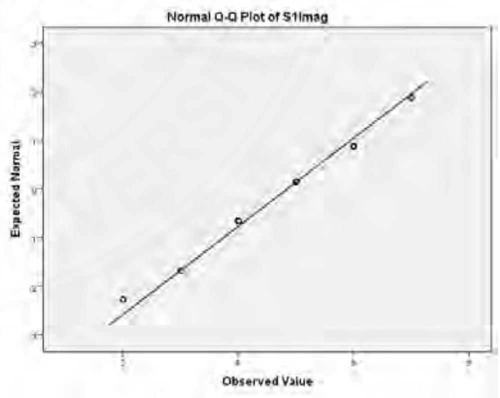
			Statistic	Std. Error
S1imag	Mean		4.84	.069
	95% Confidence Interval for Mean	Lower Bound	4.70	
		Upper Bound	4.98	
	5% Trimmed Mean		4.84	
	Median		5.00	
	Variance		1.219	
	Std. Deviation		1.104	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		2	
	Skewness		-.014	.153
	Kurtosis		-.454	.304
S2impre	Mean		5.12	.066
	95% Confidence Interval for Mean	Lower Bound	4.99	
		Upper Bound	5.25	
	5% Trimmed Mean		5.14	
	Median		5.00	
	Variance		1.116	
	Std. Deviation		1.057	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		2	
	Skewness		-.238	.153
	Kurtosis		-.439	.304

			Statistic	Std. Error
S3resp	Mean		4.85	.069
	95% Confidence Interval for Mean	Lower Bound	4.71	
		Upper Bound	4.98	
	5% Trimmed Mean		4.86	
	Median		5.00	
	Variance		1.213	
	Std. Deviation		1.102	
	Minimum		2	
	Maximum		7	
	Range		5	
	Interquartile Range		2	
	Skewness		-.139	.153
	Kurtosis		-.230	.304

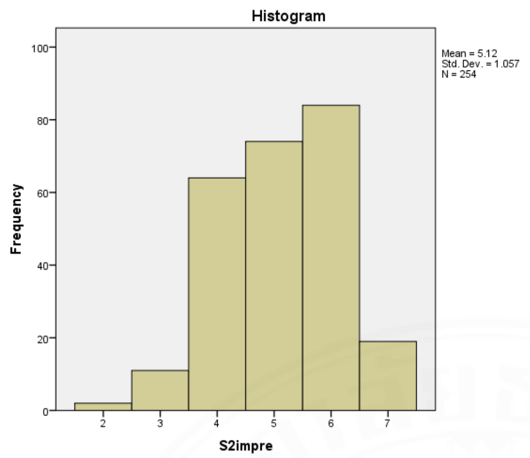
Social value: histogram and Q-Q plot

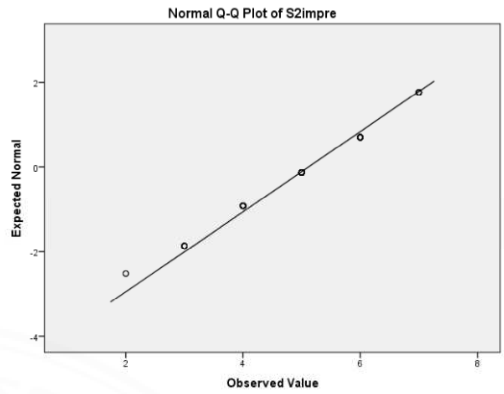
S1: Carpooling via LILUNA improves my image within communities.



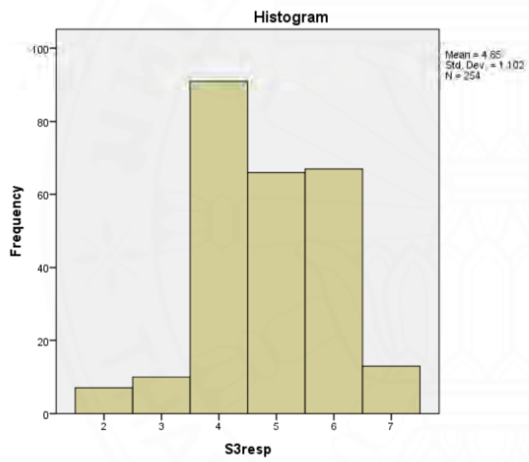


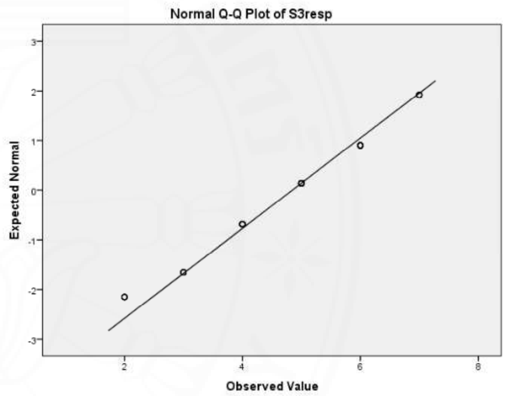
S2: By carpooling via LILUNA, I make a good impression on people in communities.





S3: By carpooling via LILUNA, I earn respect from people in communities.



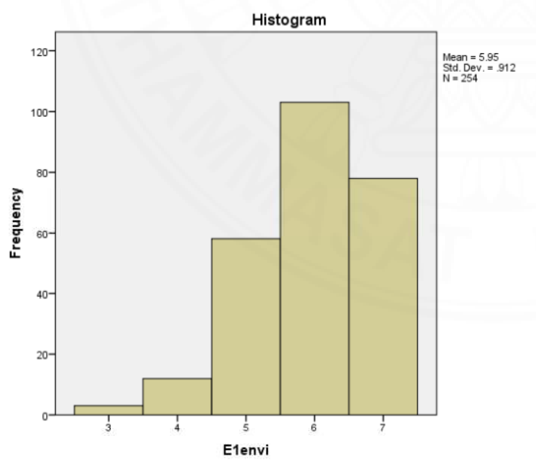
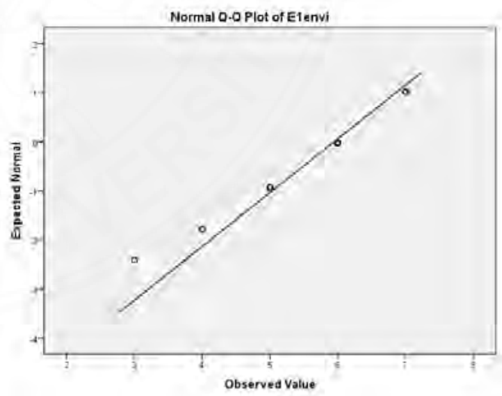


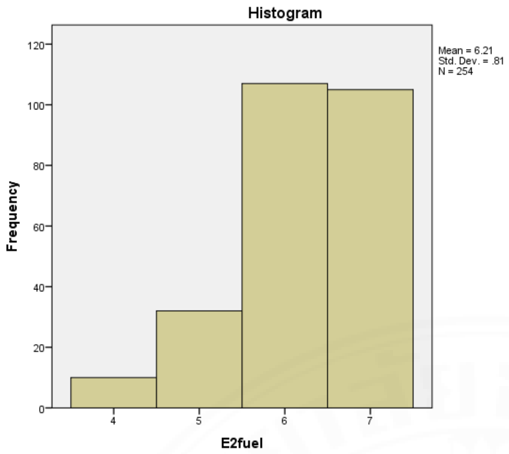
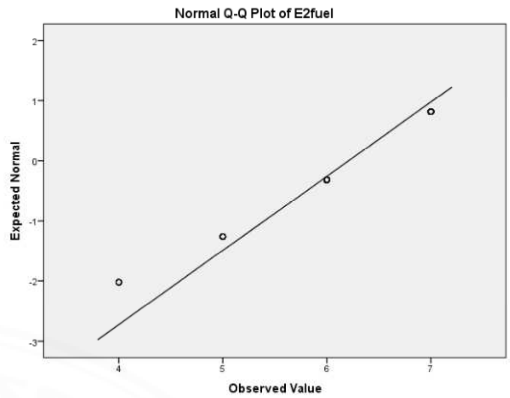
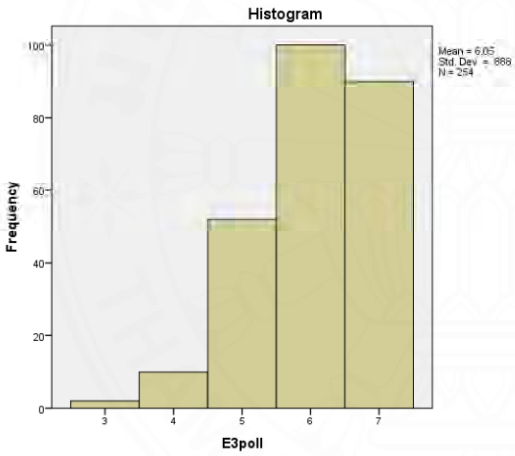
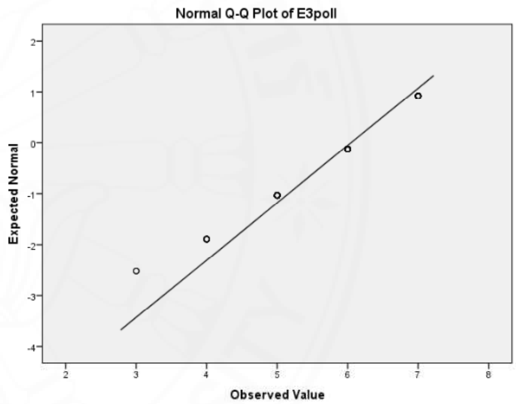
Environmental value: descriptive statistics

			Statistic	Std. Error
E1envi	Mean		5.95	.057
	95% Confidence Interval for Mean	Lower Bound	5.84	
		Upper Bound	6.06	
	5% Trimmed Mean		6.01	
	Median		6.00	
	Variance		.831	
	Std. Deviation		.912	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		2	
	Skewness		-.655	.153
	Kurtosis		.139	.304
E2fuel	Mean		6.21	.051
	95% Confidence Interval for Mean	Lower Bound	6.11	
		Upper Bound	6.31	
	5% Trimmed Mean		6.28	
	Median		6.00	
	Variance		.656	
	Std. Deviation		.810	
	Minimum		4	
	Maximum		7	
	Range		3	
	Interquartile Range		1	
	Skewness		-.849	.153
	Kurtosis		.235	.304

			Statistic	Std. Error
E3poll	Mean		6.05	.056
	95% Confidence Interval for Mean	Lower Bound	5.94	
		Upper Bound	6.16	
	5% Trimmed Mean		6.11	
	Median		6.00	
	Variance		.788	
	Std. Deviation		.888	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		2	
	Skewness		-.708	.153
	Kurtosis		.122	.304

Environmental value: histogram and Q-Q plot

E1: Carpooling via LILUNA is an environmentally friendly means of transport.	
	

E2: Carpooling via LILUNA is an efficient way of using fuel energy.	
	
E3: By carpooling via LILUNA, I contribute to the reduction of environmental pollution.	
	

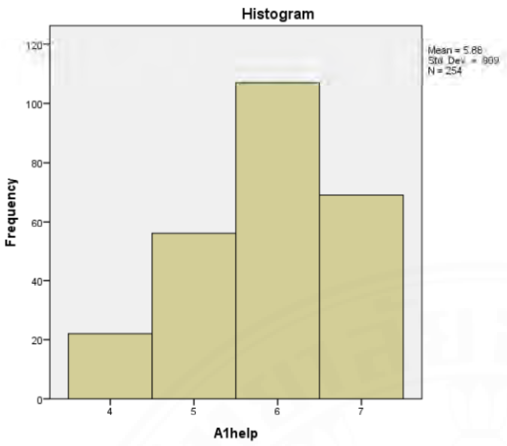
Altruistic value: descriptive statistics

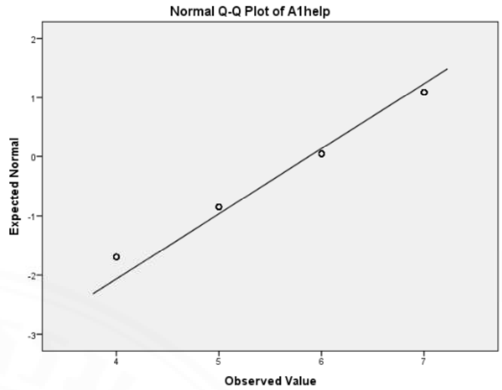
			Statistic	Std. Error
A1help	Mean		5.88	.057
	95% Confidence Interval for Mean	Lower Bound	5.77	
		Upper Bound	5.99	
	5% Trimmed Mean		5.92	
	Median		6.00	
	Variance		.827	
	Std. Deviation		.909	
	Minimum		4	
	Maximum		7	
	Range		3	
	Interquartile Range		2	
	Skewness		-.455	.153
	Kurtosis		-.572	.304
A2bene	Mean		5.81	.056
	95% Confidence Interval for Mean	Lower Bound	5.70	
		Upper Bound	5.92	
	5% Trimmed Mean		5.85	
	Median		6.00	
	Variance		.810	
	Std. Deviation		.900	
	Minimum		4	
	Maximum		7	
	Range		3	
	Interquartile Range		1	
	Skewness		-.438	.153
	Kurtosis		-.511	.304

			Statistic	Std. Error
A3good	Mean		5.65	.057
	95% Confidence Interval for Mean	Lower Bound	5.54	
		Upper Bound	5.76	
	5% Trimmed Mean		5.68	
	Median		6.00	
	Variance		.821	
	Std. Deviation		.906	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.373	.153
	Kurtosis		-.177	.304
A4more	Mean		5.60	.057
	95% Confidence Interval for Mean	Lower Bound	5.49	
		Upper Bound	5.71	
	5% Trimmed Mean		5.61	
	Median		6.00	
	Variance		.834	
	Std. Deviation		.913	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.185	.153

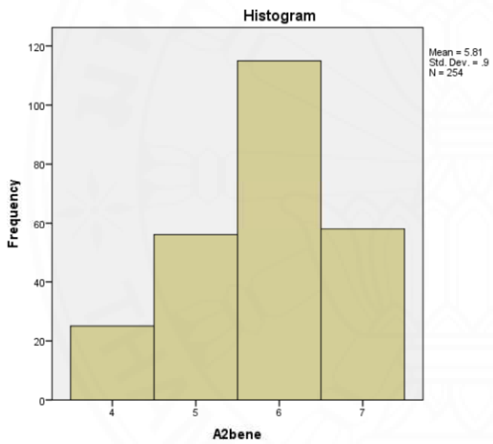
Altruistic value: histogram and Q-Q plot

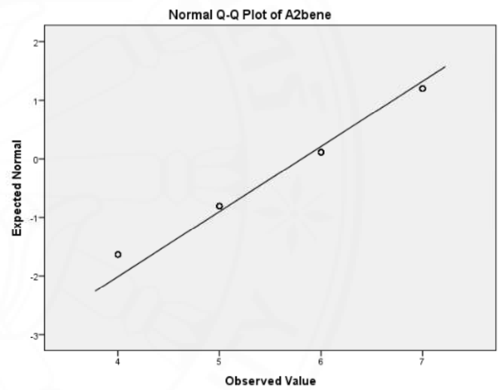
A1: I'm helping riders in LILUNA.



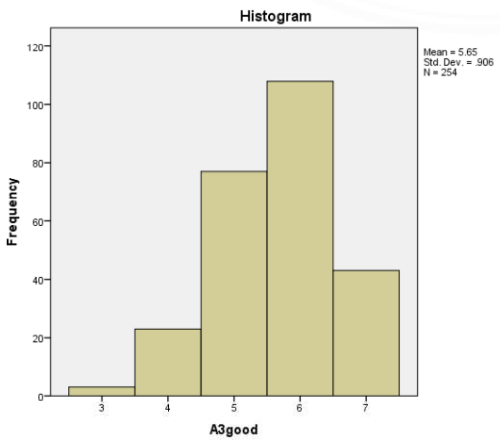


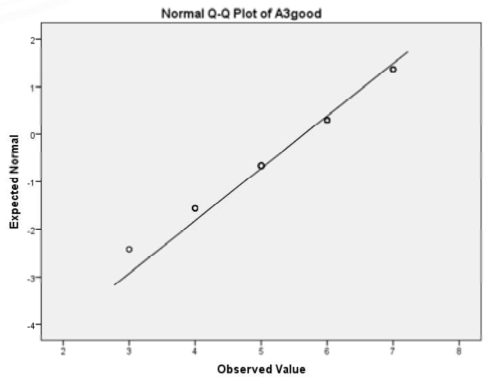
A2: I'm benefiting riders in LILUNA.



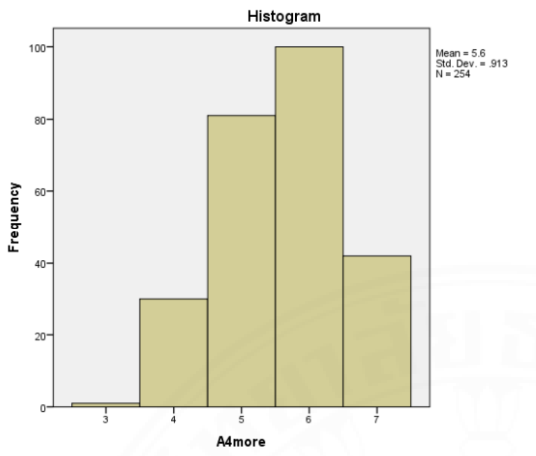


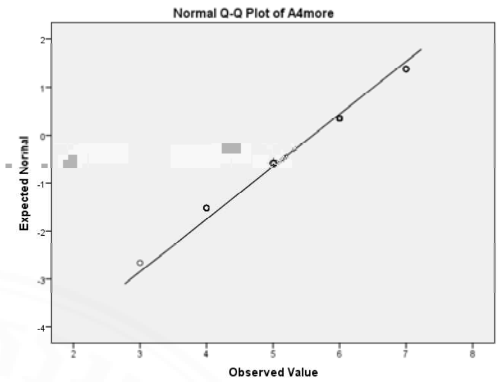
A3: Sharing seats with riders is a good thing to do which yields good benefits to me in the future.





A4: The more often I share seats with riders the more I feel I would receive good things.





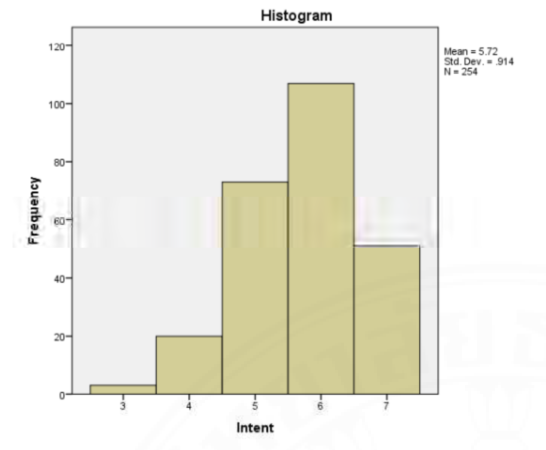
Future intention: descriptive statistics

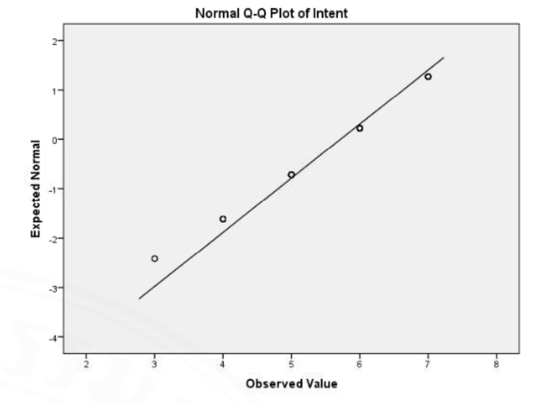
			Statistic	Std. Error
FI1: Intent	Mean		5.72	.057
	95% Confidence Interval for Mean	Lower Bound	5.61	
		Upper Bound	5.83	
	5% Trimmed Mean		5.76	
	Median		6.00	
	Variance		.835	
	Std. Deviation		.914	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.420	.153
	Kurtosis		-.150	.304

			Statistic	Std. Error
FI2: Partici	Mean		5.49	.061
	95% Confidence Interval for Mean	Lower Bound	5.37	
		Upper Bound	5.61	
	5% Trimmed Mean		5.50	
	Median		6.00	
	Variance		.931	
	Std. Deviation		.965	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.206	.153
	Kurtosis		-.627	.304
FI3: Increa	Mean		5.72	.059
	95% Confidence Interval for Mean	Lower Bound	5.60	
		Upper Bound	5.83	
	5% Trimmed Mean		5.75	
	Median		6.00	
	Variance		.892	
	Std. Deviation		.944	
	Minimum		3	
	Maximum		7	
	Range		4	
	Interquartile Range		1	
	Skewness		-.342	.153
	Kurtosis		-.503	.304

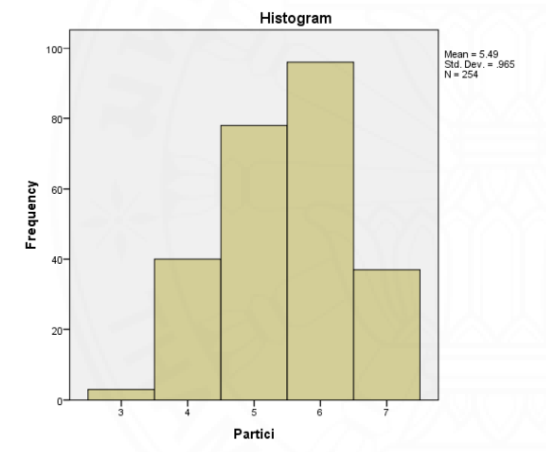
Future intention: histogram and Q-Q plot

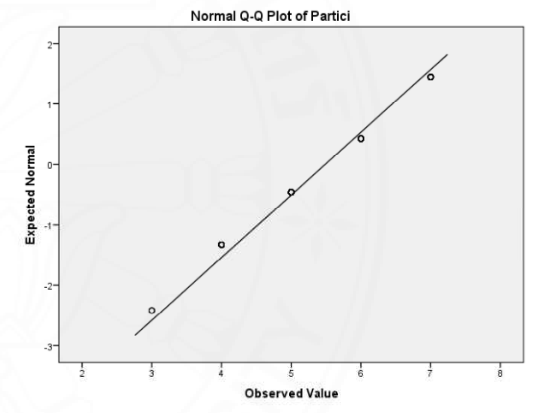
FI1: All things considered; I expect to carpool via LILUNA in the future.



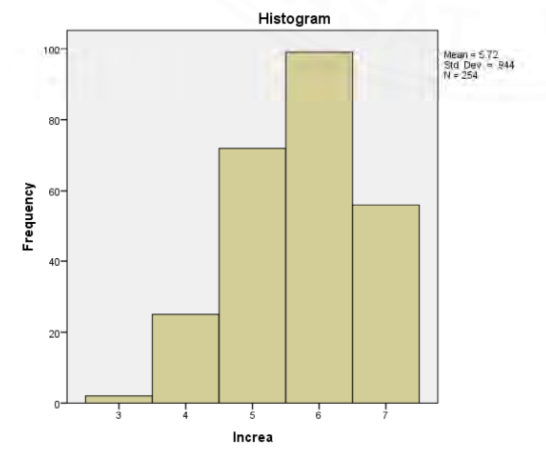


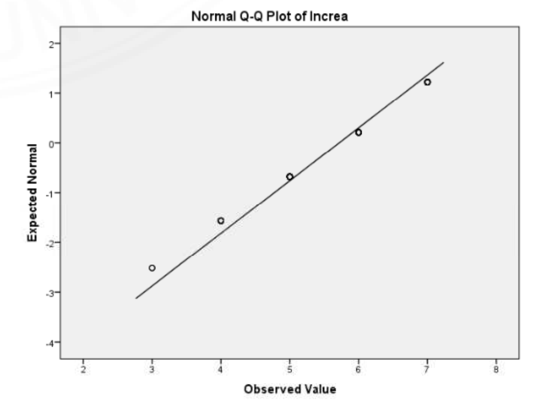
FI2: In the future, I see myself carpooling via LILUNA more frequently.





FI3: I intend to increase carpooling via LILUNA if possible.





APPENDIX F
SKEWNESS AND KURTOSIS

Test of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PU1use	.280	254	.000	.857	254	.000
PU2adv	.216	254	.000	.892	254	.000
PU3over	.231	254	.000	.890	254	.000
PE1clear	.259	254	.000	.865	254	.000
PE2easy	.252	254	.000	.877	254	.000
PE3prob	.267	254	.000	.876	254	.000
U1cost	.237	254	.000	.837	254	.000
U2eff	.234	254	.000	.889	254	.000
U3better	.205	254	.000	.889	254	.000
H1excit	.232	254	.000	.879	254	.000
H2fun	.224	254	.000	.892	254	.000
H3pleas	.202	254	.000	.888	254	.000
S1imag	.221	254	.000	.903	254	.000
S2impre	.204	254	.000	.909	254	.000
S3resp	.204	254	.000	.904	254	.000
E1envi	.235	254	.000	.854	254	.000
E2fuel	.249	254	.000	.800	254	.000
E3poll	.227	254	.000	.839	254	.000
A1help	.246	254	.000	.858	254	.000
A2bene	.264	254	.000	.860	254	.000
A3good	.245	254	.000	.882	254	.000
A4more	.229	254	.000	.885	254	.000

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Intent	.242	254	.000	.879	254	.000
Partici	.226	254	.000	.893	254	.000
Increa	.228	254	.000	.882	254	.000
Glob	.297	254	.000	.790	254	.000

BIOGRAPHY

Name	Puthipong Julagasigorn
Educational Attainment	2006: Bachelor of Science, Faculty of Science, Kasetsart University
	2009: Master of Business Administration, NIDA Business School, NIDA
	2016: Bachelor of Business Administration, School of Management Science, Sukhothai Thammathirat
Work Position	Research associate
Scholarship	2018-2019: Thammasat University Ph.D. scholarship
	2019-2021: Royal Golden Jubilee Ph.D. programme (RGJ) funded by the National Research Council of Thailand (NRCT)

Publications

Julagasigorn, P., Banomyong, R., Grant, D. B., & Varadejsatitwong, P. (2020), "Understanding Driver Motivations to Use a Carpooling Platform: Evidence from Thailand", in ICAMA-KAS 2020 International Conference, 31 October 2020, Online Conference via Zoom.

Julagasigorn, P., Banomyong, R., & Varadejsatitwong, P. (2019), "An Analysis of Logistics Cost Drivers in Thailand", in 11th ICLT Conference, 14-15 November 2019, Hanoi, Vietnam.

Julagasigorn, P. & Banomyong, R. (2019), "A Proposed Conceptual Framework for Investigating Factors Affecting Carpooling Decisions", in 12th Atrans Annual Conference (Symposium), 23 August 2019, Bangkok, Thailand

Julagasigorn, P., Banomyong, R., & Varadejsatitwong, P. (2019), "A Proposed Conceptual Framework for Investigating Factors Affecting Carpooling Decisions", in 10th Annual European Decision Sciences Conference, 2-5 June 2019, Nottingham, United Kingdom.

Julagasigorn, P., Banomyong, R., & Varadejsatitwong, P. (2018), "A Systematic Review on Psychological Factors Encouraging Carpooling", in 10th International Conference on Logistics & Transport, 15-16 November 2018, Okinawa, Japan.

Work Experiences	Present: Researcher Centre for Logistics Research, Thammasat Business School 2016-2017: Adjunct lecturer UTCC School of Business, University of the Thai Chamber of Commerce 2009-2010: Policy and plan analyst Salesian Foundation