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ASIAN TRANSPORTATION RESEARCH SOCIETY

Understanding the dynamic of carsharing industry in Bangkok, an application of participatory group modelling

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CHAPTER I INTRODUCTION

Urban carsharing is a mobility concept that often posited as a solution to enhance the urban transport system. It is based on a simple concept; in which individuals can gain the benefits of access to a car without the responsibility and costs related to its ownership. By distancing vehicle usage from ownership, this access-based mobility has been linked with merits associated with sustainable transport, such as the reduction and delay of vehicle purchasing, decreasing vehicle miles travel, promoting public transport usage, and reducing energy consumption (Chen et al., 2016; Giesel & Nobis, 2016a; Lane, 2005; Martin et al., 2010).

The origin of the carsharing concept can be traced back to its first implementation in the 1940s in a city in Switzerland's. The service enabled the Swiss city's dwellers to reduce their car dependence without sacrificing the benefits of having access to cars. Since that initial point, carsharing has been replicated around the world in different forms and variations (See section 2). The integrations of new technology in mobile internet, Smartphone and real-time locational tracking to the service in the recent years have transformed and enabled the service to be provided at a higher level of sophistication. Carsharing users in many cities around the world can conveniently reserve, locate, unlock, and pay for their trips conveniently from their smart devices. The success of car sharing is reflected in the rapid increase and expansive scale of their operations. Today, there are more than 236 carsharing operators (CSO), providing services in 3,128 cities in 59 countries with more than 4.8 million members, sharing more than 104,000 vehicles worldwide (CSA, 2019; Lane, Zeng, Dhingra, & Carrigan, 2015).

As the number of CS services and their wide implementations are increasing, in several countries carsharing is still a fringe service that serves a limited proportion of the urban population, particularly in a highly motorized and developing countries, such as Thailand.

In Thailand, carsharing is still in its infancy; the first carsharing service has only been in operation from 2016. Since then, the number of available services has increased incrementally. The coverage of the service is also largely limited to Bangkok with some coverages in major regional cities, such as Chiang Mai or Phuket. These regional services are primarily targeting tourists and recreation users. In Bangkok city alone, it is estimated that there are 300 sharing vehicles available, which is relatively minute in comparison to the number of private vehicles in the city (approximately, over 10 million cars and motorcycles).

The development of carsharing services in Thailand has been dominantly driven by the private sector. Individual companies and entrepreneurs fueled by their vision and passion in car sharing are the concept's advocacy. In contrast, the recognition of carsharing by the public sector as an effective Transport Demand Management (TDM) for Bangkok city is relatively slower. Although it has been instated as a TDM measure in the recent city's transport masterplan in 2015 (OTP, 2015), the recognition has yet translated into tangible actions. The public sector has a potential to do much more to support carsharing. The limited public efforts may stem from their unfamiliarity with the service, unavailable knowledge, or the lack of appropriate means, such as regulation or funding. It is also uncertain if the state sees carsharing as a means to positively contribute to the sustainability of the

city's transport system. In any case, the inertial of the public sector in its support can prove to be detrimental to the success of a carsharing program, which typically highly dependence on local government and city authority supports (Lane et al., 2015).

In parallel to the wider implementations of carsharing services around the world, the number of carsharing researches are also increasing (e.g., (Becker et al., 2017)Becker, Ciari, & Axhausen, 2017; Costain, Ardron, & Habib, 2012; Morency, Trépanier, Agard, Martin, & Quashie, 2007; Shaheen, Schwartz, & Wiprywski, 2004; Stocker, Lazarus, Becker, & Shaheen, 2016; Wang, Cheu, & Lee, 2010). However, there are several apparent gaps in these studies. Firstly, these researches are often focused on parts of the carsharing system, such as users' behavior, users' adoptions, or fleet optimization. While these approaches may be useful in providing insights into individual elements that combine to form a carsharing system, their reductionist approaches often ignored the interconnectedness and feedback effects between the entities within the carsharing system and the urban transport system that it is part of.

Secondly, the modelling process in some of these studies involved only a limited group of experts, which, at best, provide insights into limited aspects within the system but not account for the system perspective. Moreover, the resulting models or analyses are often too complex or difficult to understand for the stakeholders or decision-makers concerned. The lack of transparency of the so-called Blackbox can lead to a low acceptance or rejection of the outcomes by the stakeholders. Finally, most of these studies are based on cases from developed countries, which have different challenges and dynamics in urban mobility than those in developing nations, such as Thailand (Gakenheimer, 1999).

Research aims and objectives

In our research project, we address the societal and scientific niches identified above by examining the dynamics of the carsharing system in Bangkok city from a system perspective. The research is driven by the following problem statements:

- a) What are the dynamic interactions between different entities and stakeholders within the carsharing system in Bangkok city?
- b) In what way can we mobilize the support for and the adoption of carsharing services in the city?

The project's aim is to gain a holistic understanding of the carsharing system to identify key policies and measures that would mobilize supports for and the adoption of carsharing services. Additionally, we look to identify means that would ensure carsharing positive societal contributions, in environmental and social aspects.

To this end, we employed the **Group Model Building (GMB) technique**, a participatory approach to engage stakeholders in constructing a mental map of a complex system. The application of GMB helped identify relevant entities within Bangkok's carsharing system (such as available carsharing fleet and dedicated carsharing parking space) and how these entities behave and interact

qualitatively by involving key stakeholders (such as carsharing service provider, policymakers, and representative of users) in the process. Additionally, we also explored how GMB, which typically implemented in a workshop format, can be carried out remotely in the context of COVID-19 outbreak.

The objectives of this project are as follows:

- 1) To review the literature related to the carsharing service operation, with a focus on those in the developing countries
- 2) To undertake a Group Model Building workshop with stakeholders related to carsharing operation in Bangkok city
- 3) To identify key policies and measures to mobilize supports for and the adoption of carsharing services in Bangkok city

This research project is expected to produce a causal loop diagram (CLD), a qualitative model that visually maps the interconnectedness between entities within the carsharing system and beyond, through involvements of stakeholders in the system. The participatory approach in the process to create CLD helped the stakeholders to construct a shared understanding of the 'bigger picture' in the city's carsharing system. The process also helped to identify leverage policies and measure necessary to support carsharing and to ensure its operation contributes to the sustainability of the urban transport system. The qualitative model can be used as a basis for the development of a quantitative model, such as a System Dynamics (SD) model, to support a detailed policy analysis at a later stage.

This report is structured in the following manner: In this chapter (Chapter 1) we introduce the research project, its aims, problem statements and the objectives. In the next chapter (Chapter 2), the literature review on previous studies related to carsharing service operation is presented. The review focuses particularly on how carsharing services are implemented in the context of developing countries, detailing the typology of the services, their impacts and roles of stakeholders within the system. The review also includes how the Group Model Building (GMB) technique has been applied to gain insights into the operation of a complex system. In Chapter 3, we present the methodology, plan and timeline of this research project.

CHAPTER 2 LITERATURE REVIEW

This section presents a literature review on three main topics: 1) the definition and typology of carsharing services, 2) how existing carsharing services are operating in Thailand and other selected countries, 3) the measures and policies that have been implemented to support carsharing services, and 4) the participatory group model building (GMB) approach and how it has been applied to better understand complex systems.

2.1 Carsharing Development and ITS Operation

2.1.1 Typology

In North America has four forms of carsharing (Martin & Shaheen, 2016):

- **Round trip:** members begin and end their trips at the same location and typically pay for use by the hour, mile, or both.
- **One-way:** members can pay for their usages by the minute, they can begin and end a trip at different locations-either throughout a free-floating zone or station- based model with designated parking locations.
- **Peer-to-peer:** shared use of privately-owned vehicle operated by a third-party organization.
- **Fractional:** users can co-own a vehicle and share its costs and use

ACEA (Association des Constructeurs Européens d'Automobiles) has summary the forms of car-sharing as follows: (Le Vine et al., 2014)

- **Round trip:** the customers return the car to the same place that it was accessed and pay for the entire time between when they gain access to the car and when they return it at the end of their reservation.
- **Peer-to-peer:** carsharing fleets is owned by private individuals not owned by a central operator. People choosing to make their private car available for use by others receive payments when it is rented out
- **Point-to-point free-floating:** one-way journeys within a specified geographic zone, in contrast to round-trip carsharing.
- **Point-to-point station-based:** user picks up a car from one parking station and returns it to another

2.1.2 Impacts of Carsharing

The impact of carsharing is summarized in Table 2-1 below.

Table 2-1 Impacts of carsharing

Type of impact	Description	Source
Impact on vehicle holdings	Station-based and free-floating carsharing leads to a reduction of private cars and carsharing tends to reduce car use, ranging from DriveNow 7%; Flinkster 15% (Using the example of DriveNow and Flinkster in Berlin and Munich).	(Giesel & Nobis, 2016b)
Impact on parking providers	Reduction in cars parked on public street space and reduced demand for parking spaces, reduction of more than 5,000 privately owned cars from 14,000 car-sharing users in Bremen	(Schreier et al., 2018)
Impact on transport mode	Promotion of public transportation use and active modes Users use sustainable transport mode (walking, cycling, public transport) significantly more than non-carsharing users Car sharing making increased walking and biking (short commute distances)	(Sioui et al., 2012) (Schreier et al., 2018) (Martin & Shaheen, 2011)
Impact on travel behaviors	Reductions in vehicle miles travelled (VMT) range from 1% to 5%	(Stocker et al., 2016)
Impact on environment	Reduction in greenhouse gas (GHG) emissions, ranging from a 0.1% to a 2.6%	(Stocker et al., 2016)

2.1.3 Existing Carsharing Services in Thailand and Selected Countries

Previous studies that look at operation and business model their findings and gaps

In Thailand, there are a few carsharing operators including Haupcar, Ha:mo, and Drivemate. Haupcar stated its operations using a Business to Consumer (B2C) model. Meaning that, the operator has its own fleet to serve customers. However, the company later pivoted the business model to Business to Business to Consumer (B2B2C) by forming a partnership with auto dealers, car rental, and leasing companies. That is, the auto dealers, car rental, and leasing companies provide vehicles to be listed on Haupcar online platform. Meanwhile, Haupcar focuses on building platform and acquire customers. Currently, the platform has more than 300 vehicles serving more than 16,000 users along the mass transit lines, universities, office buildings, and shopping malls within Greater Bangkok vicinity. Figure 2-1 illustrates the carsharing station at Future Park Rangsit operated by Haupcar. Figure 2-2 illustrates station locations in Greater Bangkok.



Figure 2-1 Example of the one-way carsharing station at Future Park Rangsit operated by Haupcar

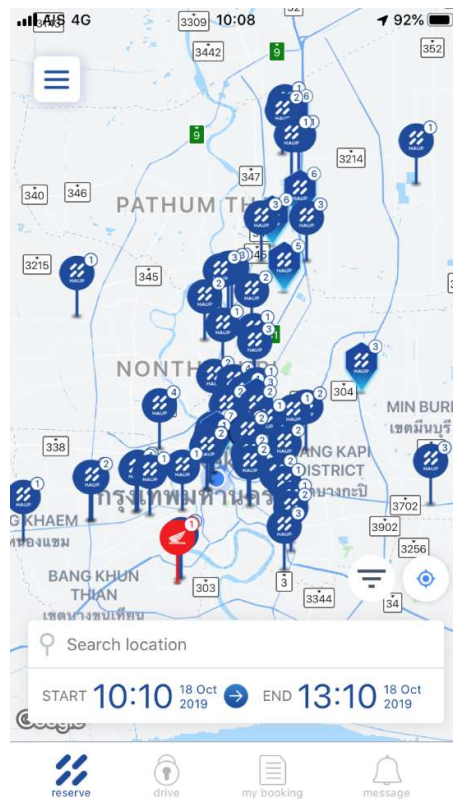


Figure 2-2 User Interface of Haupcar application showing station locations in Greater Bangkok

Figure 2-3 depicts growth of the carsharing usage for Haupcar from 2016-2019. Its high growth in hour usage is due to the increase in number of vehicles in the fleet. Majority of its fleet provides round-trip service while approximately 5 percent of its fleet operates in a station-based one-way mode. Most of vehicles in Haupcar platform are ecocars and midsize sedan such as Toyota Vios, Mazda 2, Honda Jazz, Nissan Almera, Toyota Altis, and Mazda 3. Approximately two thirds of the carsharing reservations is hourly type (30 min to 8 hours) while the other one third of the reservations is daily type (more than 8 hours to one week). Figure 2-4 represents the ratio between hourly and daily reservations. Additionally, Haupcar started to accept personal cars to be listed on its carsharing platform early 2020 to expand its carsharing network further.

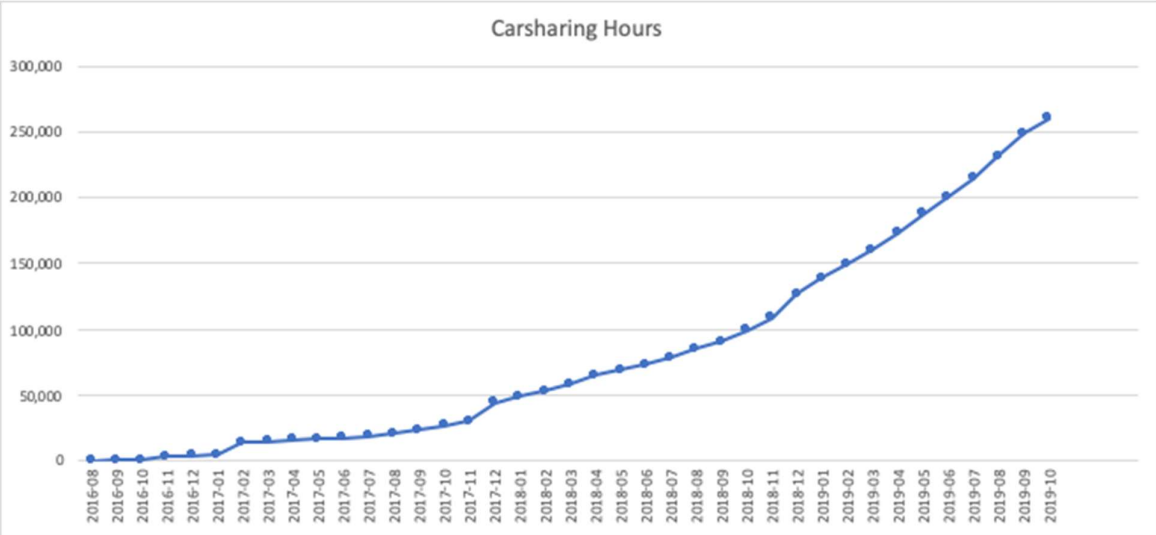


Figure 2-3 Haupcar’s Carsharing growth based on number of reserved hours from 2016-2019

By Reservations

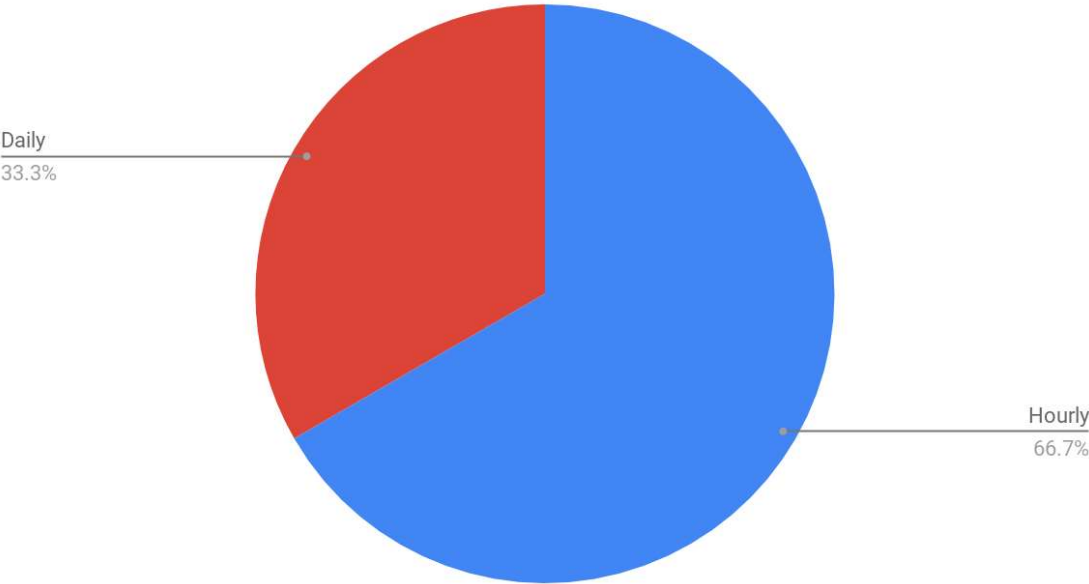


Figure 2-4 Ratio of Hourly and Daily usage based on number of reservations

Next, Toyota cooperation introduced Ha:mo in 2012 in Tokyo, Toyota City, and Okinawa, Japan (Antoniou et al., 2019). The company also expanded its service to Bangkok, Thailand in 2017. There are four models for the electric carsharing vehicle in this program namely P-COM (one passenger), T_COM (two passengers), COMS, and i-ROAD (see Figure 2-5) and the model used in Thailand is COMS where the vehicle can fit only one passenger at a time. The service currently has 30 vehicles operating strictly only inside Chulalongkorn University campus. While it is possible that public users (not affiliated with Chulalongkorn University) can apply for a member, all Ha:mo members are not allowed to drive Ha:mo vehicles outside the campus vicinity. There are total of 12 one-way stations and the members are required to choose the drop-off stations during the reservation process (see Figure 2-6). The vehicles can only be rented by hours and daily rental is not possible.



Figure 2-5 The Ha:mo Electric Carsharing Vehicle (Antoniou et al., 2019)



Figure 2-6 Ha:mo vehicles parked at one of the charging stations

Founded in 2017, Drivemate is the only peer-to-peer carsharing operator that has coverage in other provinces outside Bangkok. Its website claimed that there are more than 3,000 personal and rental cars listed on its platform. The vehicles can rent only in a daily, weekly, or monthly format. Hourly reservation is not available on this platform.

SOCAR is one of the largest carsharing operators in the world with 5.8 million users in South Korea and 20,000 users in Malaysia with more than 11,000 carsharing vehicles. Founded in Jeju island in 2015, the B2C company quickly grew due to high population density in Seoul and other big cities. Only persons with Korean driver's license are eligible for the service in Korea. Figure 2-7 depicts a carsharing vehicle provided by SOCAR.

Zoomcar is the key player in carsharing industry in India with more than 6,500 vehicles serving more than 3 million users in 42 cities. Only roundtrip service is available.

Summary of Carsharing Operators in Thailand and Other Countries (see Table 2-2)



Figure 2-7 SOCAR vehicle parked in the parking lot in Jeju Island, South Korea

Table 2-2 Summary of Carsharing Operators in Thailand and Other Countries

Operator	Number of members	Service Coverage	Service Vehicle	Service Type	Service Rate
Hauptcar Since April 27, 2016	16,000+	140+ stations within Greater Bangkok	More than 300 vehicles	Round-trip and with partial one-way stations	79-339 THB/hour 719-2,659 THB/day
Ha:mo Since Dec 1, 2017	Not published	12 stations limited usage only within Chulalongkorn Campus	30	One-way	30 THB/first 20 min + 2 THB/min
Drivemate since 2017	More than 50,000 members with 1,000 reservations per month	35 provinces throughout Thailand	3,000+	Peer-to-peer	690-150,000 THB/day
Korea: SOCAR since 2015	Around 5.8 million members, only with Korean driver's license	3,200 rental zones	11,000 vehicles	Round trip, one-way	8,080-66,000 KRW/hr 48,400-330,000 KRW/day
Malaysia: SOCAR since 2018	20,000 users registered with 1,000 bookings	1,000+ zones in Kuala Lumpur, Selangor, Penang,	2,000+ cars	Round trip, pick-up/drop off	RM 8- 42/hour

Operator	Number of members	Service Coverage	Service Vehicle	Service Type	Service Rate
		Johor Bahru, and Ipoh			
India: Zoomcar Since 2013	3,000,000+ members with 10,000,000+ booking	42 cities	6500+ cars	Round-trip	70-240 INR/hour

2.2 Business Models

To analyze the dynamics of carsharing industry, it is important to understand different types of carsharing business models (see Table 2-3). Categorized by fleet owner and end user, there are four existing business models in operating carsharing including business-to-consumer (B2C) model, business-to-business (B2B) model, business-to-business-to-consumer (B2B2C) model, and lastly peer-to-peer (P2P) model.

2.2.1 Business-to-Consumer (B2C) Model

Most of the carsharing operators falls into this category (Zipcar, car2go, Socar, etc.) where a carsharing operator directly provides rental service to end consumers. Under this model, a carsharing operator purchases its own fleet, markets the services to its customers, and performs routine vehicle maintenance such as carwash, vehicle relocation, and oil change.

2.2.2 Business-to-Business (B2B) Model

The second model, B2B, is similar to the B2C model, except that an B2B operator provides carsharing service to businesses/corporates (as opposed to end consumers).

2.2.3 Peer-to-Peer (P2P) Model

With the rise of the sharing economy in the recent years, several operators (Turo, Getaround, Drivemate) are using this model to provide service to the carsharing users. Vehicles on the platform are owned by individuals who would like to have income from renting out their vehicles. This model has an advantage over the previous two models, i.e., B2C and B2B models, in that, the carsharing platform does not need to purchase its own vehicles, and hence, reduce the capital cost.

2.2.4 Business-to-Business-to-Consumer (B2B2C) Model

B2B2C model is an innovative approach that combines the advantage of B2C and P2P Model. That is, Multiple fleet owners (which are car rental companies) lists their vehicles on the carsharing platform where end consumers can rent vehicles through. The carsharing platform will get a small fee based on the rental transactions.

Table 2-3 – Summary of carsharing business models

Model	Fleet Owner	Operations	Marketing/ Platform	Renter	Example
B2C		Corporate		End Consumer	taxi
B2B		Corporate		Corporate	Denso (Automobile parts manufacturing company)
P2P		Individuals	Tech Company	End Consumer	Uber, Grab
B2B2C		Corporate	Tech Company	End Consumer	Hauptcar

2.3 Policies and Measures that Influence Carsharing Operations

Public policies and interventions can be highly crucial in providing a supportive environment for carsharing implementation and its continuing operation (Shaheen & Cohen, 2013). Particularly, in developing countries where nearly all carsharing services are setup through self-funding or by local capital investment (Lane et al., 2015). Incentives options to promote car sharing can largely be divided into monetary and nonmonetary measures, both of which can either have direct or indirect influences – see Table 2-4.

Table 2-4 Incentives options and policy to promote carsharing service

Incentive options	Details (case example)
Monetary measures	<p>Project-based financial support, such as Government-funded pilot projects which often operate within a limited period to test concepts</p> <p>Direct financial aid, e.g. low-interest loan or grant</p> <p>Indirect financial aid, e.g. tax incentive, subsidy, or utilization of the service by local government</p>
Nonmonetary measures	<p>Integrated transport planning; generate synergy with existing modes of transport encourage cooperation and functional, technical connections (Mexico City, Mexico – WRI, 2015)</p> <p>Integration with high-level plans and policies; e.g. include car sharing as part of urban development strategy</p> <p>Parking policies; provision of space for carsharing services for free or at a reduced rate to lower operating cost, reserved spaces for carsharing vehicles in dense and easy-access locations to enhance visibility and convenience of users (Hangzhou, China – WRI, 2015).</p> <p>Disincentive for private vehicles; restricting and regulating access of private vehicle to encourage a shift away from private vehicles (i.e. 'push' measure);</p> <p>Incentives for carsharing vehicles; introduce privilege for carsharing users to enhance its attractiveness, e.g. provide access to car restricted zone (low-emission zones) or free parking in the city center, adjusting parking regulation to exempt cs vehicle</p> <p>Political and public awareness-raising and lobbying support; provide high-level policy recommendations or endorsement to encourage car sharing support, endorse collaboration with other partners or support with lobbying work</p> <p>Establish standard and certification; establish standard to regulate carsharing services, provide environmental standards to endorse service operation (Bremen, Germany – GIZ, 2014)</p>

Source: (BCS, 2015; GIZ, 2014; Lane et al., 2015) GIZ, 2014; CSR, 2015; WRI, 2015

Despite their importance role, public authorities are often lack experience in carsharing policy and insights into how the concept operates (Lane et al., 2015; Münzel et al., 2018). Moreover, carsharing is still an emerging and novel concept for many authorities. For these reasons, supporting legislations can be delayed, or in certain cases, even resulted in regulations that have detrimental

effects to carsharing services. For examples, Germany drafted a law that introduce privilege for car sharers as recent as 2017, while in the USA a bill was passed in June 2019 that can hampered peer-to-peer car sharing (Delhaes, 2016; Elliott, 2019).

In developing countries, the public sector's support can be highly diverse (Lane et al., 2015). The provisions can range from highly supportive (in the case of Hangzhou, which free on-street parking spaces were provided) to limited (in the case of Bangalore, where a minimal fleet size need to be reached prior to any agreed support).

2.4 Participatory Group Model Building Approach

Group Model Building (GMB) is a process to develop a system dynamics model through involvements of stakeholders (Vennix, 1996). The technique seeks to construct a transparent model, leveraging on the diagramming convention of Causal Loop Diagramming (CLD) and, in some circumstances, Stock-Flow Diagrams (SFD). GMB can take shape in different variations depending on factors, such as expected results (i.e., qualitative or quantitative model) or required format (i.e., structured or unstructured) (Hovmand, 2014; Vennix, 1996). The process takes participants on a journey that enhances their understanding of the problem, broadens their perspectives, transforms insights, and enhances consensus and commitment around the outcomes (Rouwette et al., 2002; Scott et al., 2016).

GMB is different from an orthodox modelling approach in its transparency and involvement of stakeholders in both making and using the model. It takes a systemic approach to problems covering both technological and social factors (de Gooyert et al., 2017). The process takes stakeholders on a journey to share and gain new insights from different perspectives, resulting in more comprehensive knowledge and higher acceptance and support behind the outcomes. Previously, GMB has been applied to complex and contested issues, such as the Food, Water, Energy Nexus and the construction of resource and environmental models (Purwanto et al., 2019; Voinov et al., 2016). This research project is the first that explores how the GMB technique can support the carsharing operation of a city in a developing nation.

Typically, GMB is carried out by facilitator(s) who may assume different roles at different points of the workshop (i.e. facilitator, modeler, reflector, wall-builder.). Several researchers have sought to improve the technique through strengthening the objectiveness by formulating scripts (Andersen et al., 1997; Andersen & Richardson, 1997), enhancing scripts to ensure effective sessions (Ackermann et al., 2010), and using interactive dialogue games (Hoppenbrouwers & Rouwette, 2012). GMB has been applied to various case studies, including complex and contested issues, such as the Food, Water, Energy Nexus and the construction of resource and environmental models (Purwanto et al., 2019; Voinov et al., 2016). Its application in smart community planning has also been explored (Yoshida et al., 2020).

2.5 Potential Carsharing Stakeholders

One of the crucial tasks in this study is to invite all key stakeholders into the participatory process so that all the elements in the carsharing industry can be captured and discussed. Based on the research team discussion, we identified the total of six key stakeholder groups including policy makers and public sectors, carsharing users, smart mobility community, academic, service providers, and private organizations. After we reached to our potential contacts, 17 carsharing entities agreed to participate in our study. (see Table 2-5)

Table 2-5 Potential Carsharing Stakeholders

Stakeholder group	Organization	Participants
1. Policymakers & Public Sectors	Transportation Planning and Policy Agency	Office of Transport and Traffic Policy and Planning (OTP)
	Insurance Regulator	Office of Insurance Commission
	Local Authority	Traffic and Transportation Department, Bangkok Metropolitan Administration
	Land Transport Regulator	Department of Land Transport
	Digital Economy Promotion Agency	Digital Economy Promotion Agency
2. Representatives of users	Carsharing Customer A	Haupcar's customer
	Carsharing Customer B	Haupcar's customer
3. Smart Mobility Community	Smart City Company	Khon Kaen Think Tank
	Smart mobility consortium	ITS Thailand
4. Research	Mobility researcher A	Ubonratchathani University
5. Service Providers	Operator A	Haupcar
	Operator B	ASAP Go
	Operator C	Drivemate
	Operator D	Toyota Ha:mo
6. Private Organizations	Property Development	Sansiri Development PLC
	Insurance Provider	Thaivivat Insurance
	Automaker	BMW (Thailand) Company Limited
Total Number of Stakeholders		17

CHAPTER 3 RESEARCH PLAN AND METHODOLOGY

This research project consists of three parts (see Figure 3-1) and the timeframe (see Table 3-1).

Part 1: Semi-structured interview with key stakeholders

In the first step, the research team reviewed review relevant literature (Task 1: literature review). We reviewed then identified key stakeholders within the carsharing system of Bangkok and set up interviews with them (Task 2: Expert interview). The interview was guided by a set of questionnaires that help to identify their role and operations within the carsharing system (Task 3: pre-workshop survey). We also carried out a pre-experiment survey to assess the effect of GMB session on these stakeholders. We transcribed the information and used it to pre-map the CLD. We reported our initial finding at the 13th ATRANS annual conference on December 4, 2020.

Based on the ATRANS Key Success Indices (KSIs), the list of stakeholders considered in this study are as follows:

- Policy makers: Office of Transport and Traffic Policy and Planning (OTP), Office of Insurance Commission (OIC), Bangkok Metropolitan Administration (BMA)
- Transport users: existing carsharing users
- Society/Community: ITS Thailand, Smart City
- Scholar/Researchers: ATRANS, Universities
- Private Organizations: carmakers, auto dealers, car rental companies, car leasing companies carsharing providers, insurance companies, and property development companies

Part 2: GMB preparation

The research team reviewed review existing GMB session scripts to formulate custom scripts for our GMB session (Task 4: GMB script formulation). The objective of this session is to formulate measures and policy to promote carsharing within Bangkok city. The script was tested internally and involved key stakeholders (Task 5: Script testing), such as service provider or planning officers of Bangkok city, to take part in this stage to build trust and ensure a co-designing process. We also prepared additional information (e.g., fleet utilization, etc.) that may be useful to GMB session.

Part 3: GMB sessions

We set up two GMB sessions with the key stakeholders (Task 6: Running GMB Session). The tentative program for the two days is shown on Table 3-2. We monitored and processed the outputs in between each session. The sessions involve a combination of nominal group technique, Causal loops creation, and feedback identification. These sessions were conducted in Thai. Outputs of this session will be published in the form of a policy brief and conference proceedings. We also will share early outcomes from the project at international conferences.

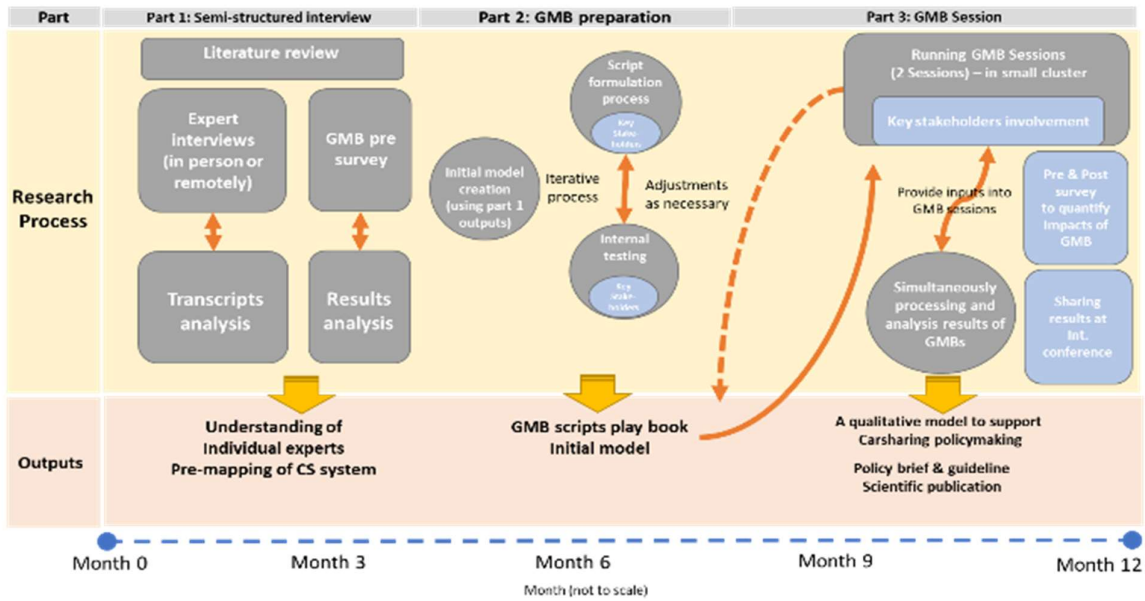


Figure 3-1 Overall concept and activities of the research project

Table 3-1 Schedule/timeframe of the project

Task	2020								2021			
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1. Semi-structured interview												
1.1 Literature Review												
1.2 Stakeholder identification and contact												
1.3 Questionnaire design												
1.4 Interview												
2. Script formulation & GMB preparation												
2.1 Review script from previous studies												
2.2 Create script												
2.3 Preparing additional data												
3. GMB sessions												
3.1 Running 2 sessions												
4 Reporting												
4.1 Interim reporting												
4.2 Final report writing												
3.6 Final report presentation												
3.7 Final report submission												

Table 3-2 Tentative GMB program

Public agenda	Team activity
Day 1	
Introduction and overview	Provide an introduction and the overview of the workshops; divided into groups
Shared expectations	Review individual expectation, establish shared expectation and concern
CLD concept introduction	Introduce Causal Loop Diagram technique, and provide an example of a simple model with trial exercise
Variable elicitation	Review variable and stock, provide additional elicitations, cluster, select and prioritize list; envision success
Structure elicitation	Identify the relationship between variables and stocks, clarify stakeholders shared understanding;
Reference mode elicitation	Stakeholders are paired to draw behavior of the system over time, present to the group and select agreed behavior
Conclude	The facilitator provides reflection and story of the agreed model
Day 2	
Review model structure	Overview of the model structure, review and revise as required
Simulation demonstration	The model developed in day one is translated into calculation model; demonstrate its functionalities with several test run; discuss with stakeholders on their confidence of the model
Elicitation of policy option	Identify feasible and available policies to support the decarbonization of the transport system
Exploration of policy options	Test selected policies with the model
Debriefing session	Discuss insights and review expectations vs reality, identify the next steps of the project

The methodological approach of this study involved four steps, including 1) knowledge elicitation 2) conceptualization of system and interconnectedness among variables, 3) analysis impacts of possible interventions and 4) evaluation of the process. These steps are typically carried out in a face-to-face workshop setting but to move the GMB process online, we made the following adjustments. The knowledge elicitation was carried out through semi-structured interviews with stakeholders (Galletta & Cross, 2013), Steps 2 and 3 took place during a two-session online workshop, and the final step took place through an online follow-up survey.

3.1 Interview Sessions

The semi-structured interviews aim to elicit the personal knowledge, experience, and expertise of each interviewee related to the carsharing system to prepare for the workshop. We sent the respondents the questionnaire in advance, which asked them to describe 1) their roles and within the

Bangkok transport and carsharing systems, 2) their vision of a successful carsharing system and the current status of the city, 3) factors that may hinder or accelerate the process toward the vision, and 4) the policies or measures that should be considered. All interviews, except three, were conducted and recorded via online teleconference service. The interviews lasted 30 minutes on average and the organizations that have more than one participant. The interview started in May 2020 and ended in July 2020.

3.1.1 List of Questions

1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.
2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.
3. What makes a successful car-sharing business?
4. What are the indicators of the success of a car-sharing business in Bangkok?
5. How would you rate the current performance of car-sharing services in Bangkok out of 10?
6. What factors contribute to the success of the car-sharing industry?
7. What factors hinder the success of the car-sharing industry?
8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?
9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The interview was divided into two approaches depending on the participants' preference. The first approach is an online interview. We utilized Zoom for a 30 to 45-minute video call with participants who were familiar with the tools. The participants who preferred this approach included Office of Insurance Commission, ASAP Go, BMW (Thailand) Company Limited, Digital Economy Promotion Agency (DEPA), Drivemate, Haupcar Company Limited, Haupcar Customers, ITS Thailand and Chulalongkorn University, Khon Kaen Think Tank, Sansiri Development PLC, Thaivivat Insurance, Toyota Ha:mo and Ubon Ratchathani University (see Figure 3-2 to Figure 3-14). Other participants preferred a face-to-face interview, including Office of Transport and Traffic Policy and Planning and Traffic and Transportation Department, Bangkok Metropolitan Administration (see Figure 3-15 to Figure 3-16)

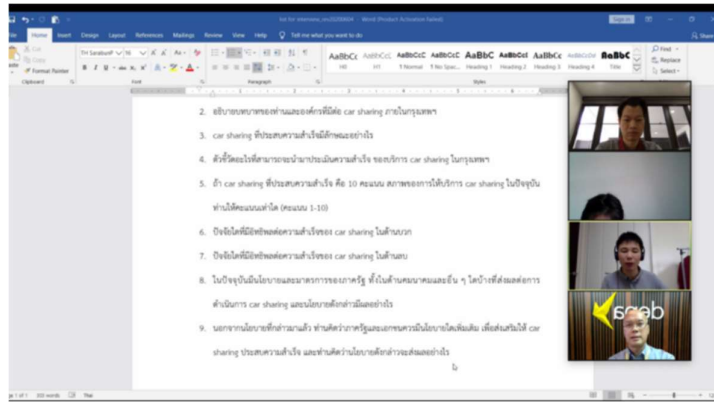


Figure 3-2 Interview with Digital Economy Promotion Agency (DEPA) on May 20, 2020

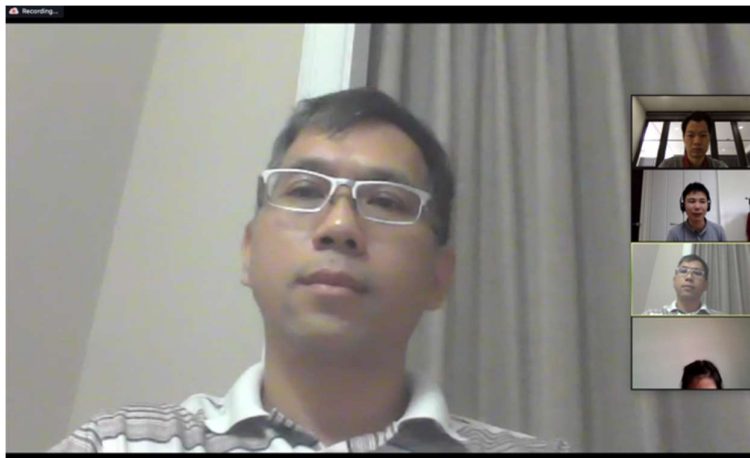


Figure 3-3 Interview with ITS Thailand President and Chulalongkorn University Faculty Member on May 20, 2020



Figure 3-4 Interview with Khon Kaen Think Tank on June 16, 2020



Figure 3-5 Interview with Toyota Ha:mo on June 16, 2020



Figure 3-6 Interview with Drivemate on June 17, 2020



Figure 3-7 Interview with Haupcar Company Limited on June 18, 2020



Figure 3-8 Interview with Ubonratchathani University Faculty Member on June 19, 2020



Figure 3-9 Interview with Thaivivat Insurance on June 23, 2020



Figure 3-10 Interview with Sansiri Development PLC on June 24, 2020



Figure 3-11 Interview with Haupcar Customer #1 on June 26, 2020



Figure 3-12 Interview with Haupcar Customer #2 on June 28, 2020



Figure 3-13 Interview with ASAP Go on July 1, 2020



Figure 3-14 Interview with Office of Insurance Commission on July 17, 2020



Figure 3-15 Interview with Traffic and Transportation Department, Bangkok Metropolitan Administration on July 15, 2020



Figure 3-16 Interview with Office of Transport and Traffic Policy and Planning on July 24, 2020

3.2 Mock Workshops 1 and 2

There are two mock workshops to test the scripts and the online settings with a group of volunteers by Mock Workshop #1 (May 21, 2020) and Mock Workshop #2 (June 25, 2020). The participants were from Haupcar as well as graduate students from Kasetsart University who have background in transportation or carsharing in particular (see Figure 3-17 to Figure 3-18).

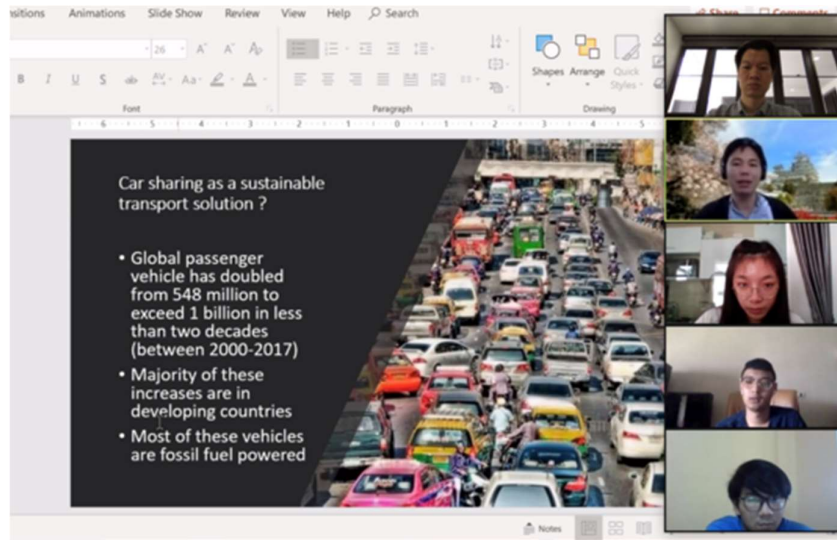


Figure 3-17 Mock workshop day 1

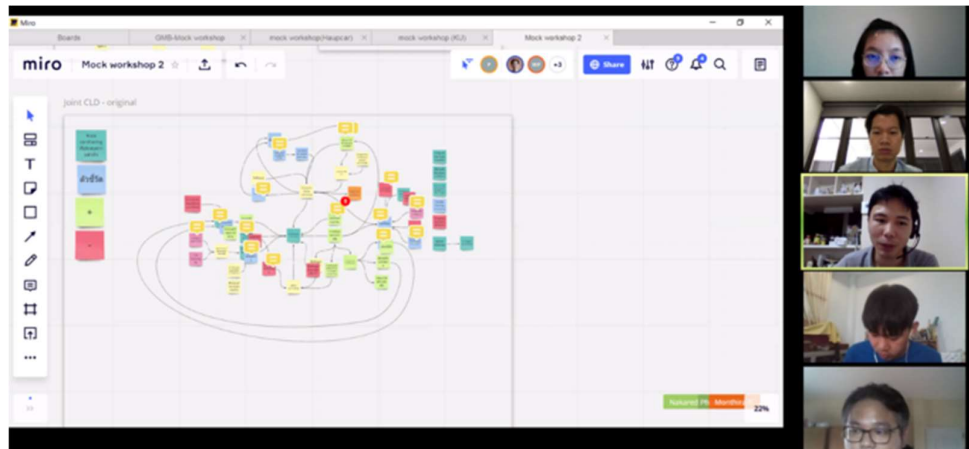


Figure 3-18 Mock workshop day 2

3.3 Pre-Workshop 1

The research team transcribed and translated the interviews into English (for the report and publication purpose) and construct a CLD for each of them to illustrate the points discussed. The interviewees were sent their transcripts and personal CLDs to confirm their accuracies. The transcripts were then open coded (Strauss & Corbin, 1990).

Before the workshops, the research team prepared and made available an online collaboration space for the participants, it included the workshop program, presentations, personal CLDs, outputs from the interviews, links to relevant information, and shared working space (see Figure 3-19). Miro was preferred for its online simultaneous collaborative capacity. The participants were also expected to carry out simple tasks (fill in the self-introduction form and shared their expectations) to familiarize themselves with Miro. A communication channel was also provided to the participants to raise any question with the team using Line service’s (line.me) “OpenChat” feature which protected their

personal information. A separate communication channel was also created for the research team members. A preliminary conceptual model (see Figure 3-20), constructed from the results of the analysis of the interviews, was presented as a possible starting point. The variables extracted from the interview transcripts were ranked and presented to the workshop participants to select. A selection of this list is presented in Table 3-3. Participants can also suggest additional variables during the workshop. Note that the interview transcripts can be found in Appendix A.

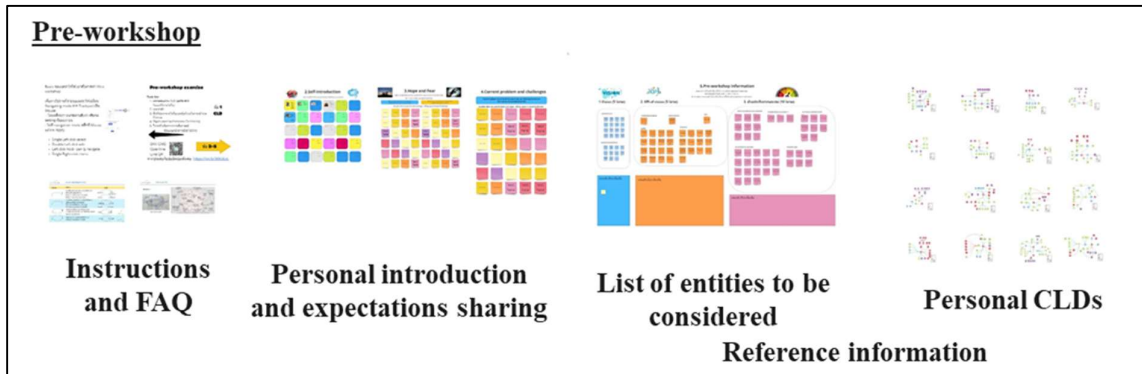


Figure 3-19 Online GMB collaboration space

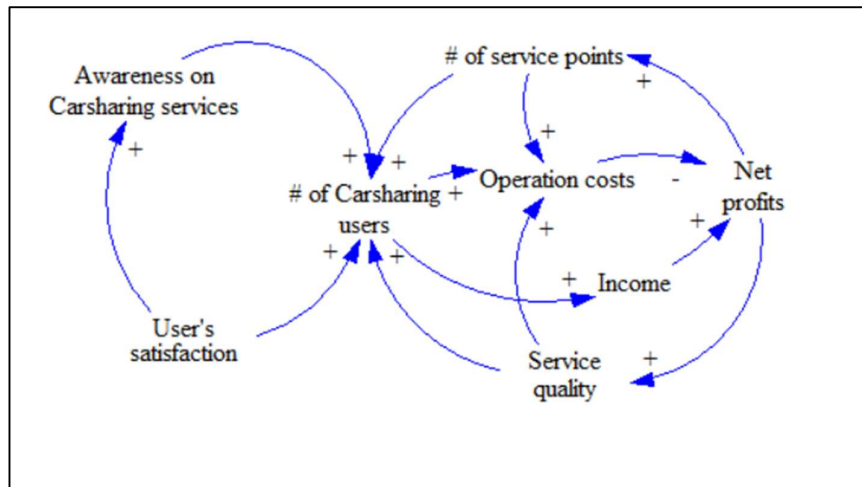


Figure 3-20 Initial CLD provided to the participant as a starting point

Table 3-3 Most frequent mentioned variables in each category extracted from the interview transcripts

Category	Variables	Counts
Vision	Services are convenient and easy to use	10
	Sufficient stations and coverage area	7
	High variety of vehicle types and models	6
Key Performance Index	People's awareness of carsharing service	15
	Number of users, number of reservations/days, Utilization rate	8
	Reduction of transport system externalities (pollution, accidents, and energy consumption)	5
	Number of private cars in the system	4
Factors that can accelerate or prevent visions to be reached	Stakeholder collaboration	6
	People's awareness of carsharing service	6
	Confidence in carsharing service (reliability)	6
	Competitions/alternative modes of transport	5
	Convenient and attractive services	4
	Value for money and customer satisfaction	4
	Quality of public transportation systems	4
	Government support and endorsement	4
Government policy	Road pricing, e.g., toll fees	4
	Tax incentive	4
	Vehicle ownership control policies	1

Note: all variables from the interview in appendix B (see Table 6-1)

3.4 Workshop 1

The schedule of workshop sessions 1 is shown in Table 3-4. On the first day, after a brief welcome and an explanation on the goal of the exercise, the research team (one main facilitator and four group facilitators) and participants introduced themselves. The team explained the workshop process and the iconography of CLD (Richardson, 2013) and split the participants into four groups. Each group had 4-5 members from different sectors and a group facilitator to support them in examining the CLDs of their group members and to combine them into one CLD. For each modification to the diagram, a consensus must be reached by the group on the proposed adjustment. This activity yielded four CLDs. The process was then repeated to combine the four CLDs into two and the first

day session was concluded. The research team prepared and made available an online collaboration space for the participants (see Figure 3-21).

Table 3-4 Schedule of the remote GMB workshop day 1

Day 1: Activity / duration - (total duration 3 hrs)	Duration
Welcome, setting the scene, outline activities and expected outcomes for the day	10 min
Background on carsharing, explaining the process and results from the interview, clarification on CLD, and GMB process	20 min
CLD formulation round 1 (4 groups, each with 4-5 participants and a facilitator)	50 min
Break	10 min
CLD formulation round 2 (2 groups, each with 8-10 participants and two facilitators)	60 min
Break	10 min
Group discussion and concluding remarks	20 min

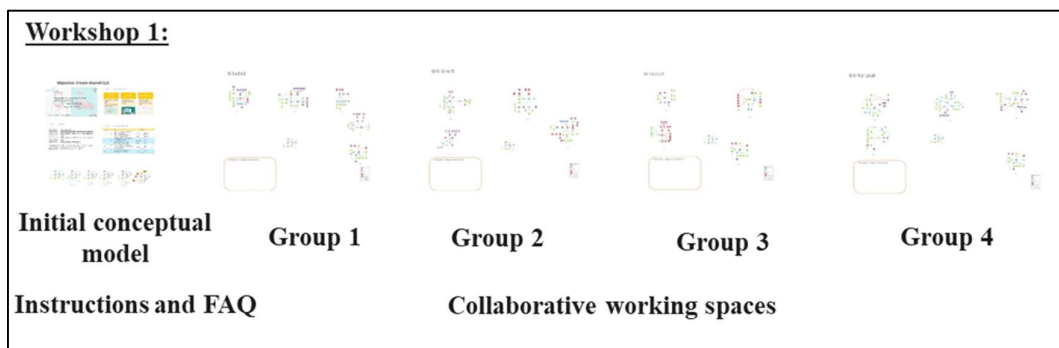


Figure 3-21 Online GMB collaboration space

3.5 Pre-Workshop 2

Before the second workshop, the research team had several meetings to combine and finalize the two CLDs resulting from the first workshop. The resulting CLD can be illustrated in Figure 3-22 and then the research team presented the resulting CLD to the group in detail at the beginning of the second day of the workshop. The participants could critique and modify the diagram until a consensus was reached. At the end of the second day's session, the participants deliberated the impacts of possible interventions using the CLD and expressed their opinions on the overall process. The research team also followed up with an online evaluation survey in the next day.

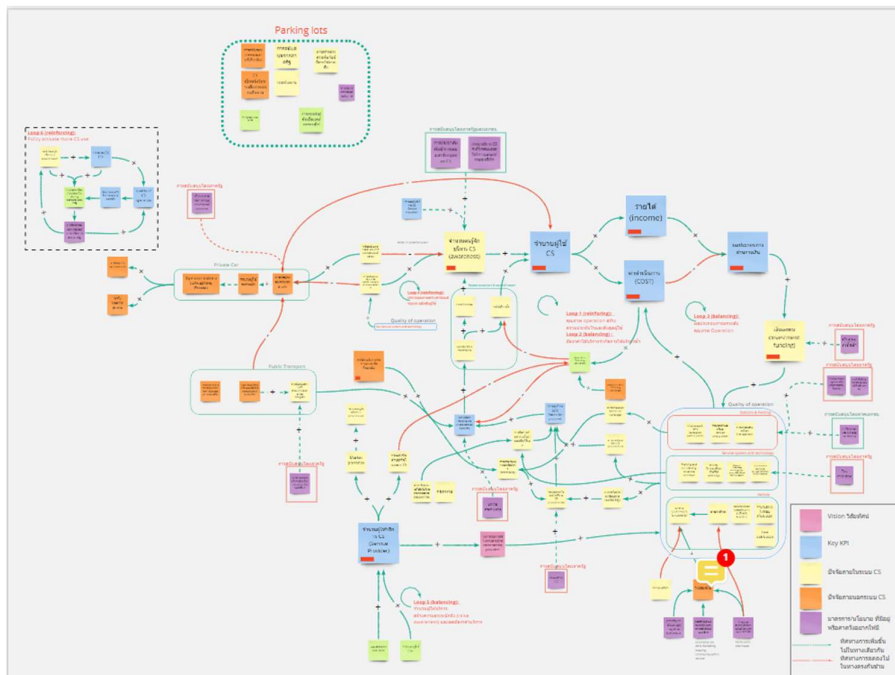


Figure 3-22 Combined CLD

3.6 Workshop 2

The schedule of workshop sessions 2 is shown in Table 3-5. The research team presented a combined CLD to the group in detail at the beginning of the second day of the workshop. The participants could critique and modify the diagram until a consensus was reached. At the end of the second day’s session, the participants deliberated the impacts of possible interventions using the CLD and expressed their opinions on the overall process. The research team also followed up with an online evaluation survey the next day. The research team prepared and made an online collaboration space for the participants (see Figure 3-23).

Table 3-5 Schedule of the two-day remote GMB workshop

Day 2: Activity / duration (total duration 2 hrs 30 min)	Duration
Welcome, setting the scene, outline activities and expected outcomes for the day	10 min
Presenting results from the previous session; explaining the combined CLD	40 min
Discussion and alteration on the combined CLD	50 min
Break	15 min
Discussion on policy evaluation	20 min
Evaluation and concluding remarks	15 min

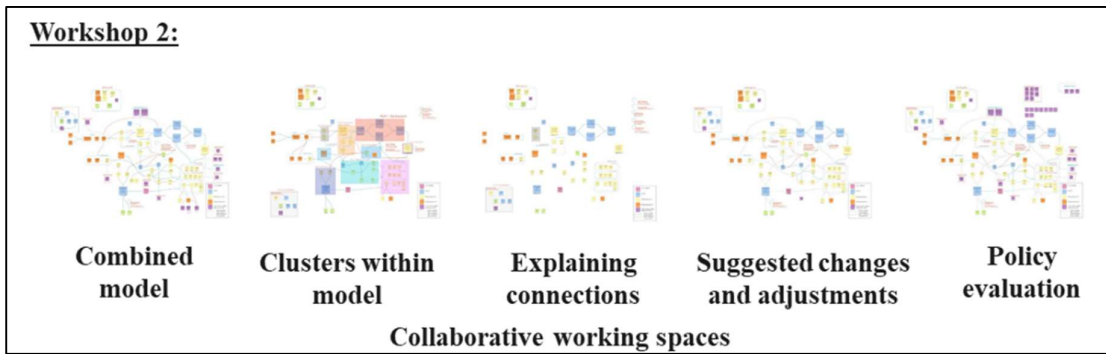


Figure 3-23 Online GMB collaboration space

3.7 Post Workshop Survey

We sent out questionnaire survey at email between August 26 and September 2, 2020 to all participants for their feedbacks. The questionnaire list is shown in Table 3-6

Table 3-6 Questionnaire survey

No.	Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Part A: The modeling process						
1	My insight into the problem has increased due to the workshop					
2	The modelling process has given me new understandings of the connection and feedback between the elements within the system					
3	I think that, because of the workshops, we have reached a shared vision of the problem					
4	The causal diagrams that were developed were the result of the integration of diverse opinions and ideas of the participants					
5	The use of causal diagrams has clarified the communication between participants in the workshop					
6	All in all, I think these workshops were successful					
Part B: Satisfaction with the outcomes						
7	I support the overall conclusions/findings that were drawn during the modeling process					
8	I will share and explain the conclusions/findings of these workshops in front of other members of my organization					
9	I will try to convince others in my organization of the importance of these conclusions.					
Part C: Policy analysis						

No.	Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
10	The current situation of the carsharing system was well mapped.					
11	In the workshop process, all relevant information was discussed and included.					
12	In the modelling process, not all useful policies and measures were discussed.					
13	In the modelling process, the pros and cons of possible policies and measures were attended to					
Part D: Suggestions for future sessions*						
14	What were the three best features of the sessions?					
15	What were the three most disappointing features or problems of the sessions?					
16	What specific suggestions would you make if meetings like these were to be organized or held again?					

3.8 Workshop with the Office of Transport and Traffic Policy and Planning

We are planning to have a seminar with the Office of Transport and Traffic Policy and Planning in January 2021 to present our research findings and discuss the future collaboration between OTP and ATRANS. Note that the workshop schedule is postponed indefinitely until the COVID-19 pandemic in Thailand is under control. The workshop program is show in Table 3-7.

Table 3-7 Workshop program

Time	Program
13:00-13:10	Introduction / setting the scene
13:10-13:40	Presentation on Mobility as a Service and Shared mobility and outcome of research
13:40-13:50	Break
13:50-15:20	Mini workshop on participatory approach to transport planning using Group model building Break
15:20-15:40	Briefing on outcome of research
14:40-15:25	Debrief and conclusion
15:40-15:50	Closing remarks

CHAPTER 4 RESULTS

4.1 Results from Interviews

The final respondent list comprised of 23 stakeholders from the public sectors and governmental agencies (11 persons), service providers (4 persons), private sector (3 persons), smart mobility community (2 persons), academia (1 person), and users (2 persons). See Table 4-1 for the details.

Table 4-1 Stakeholders involved and their participants in the interview

Stakeholder group	Organization	# of participants	Interview
1. Policymakers & Public Sectors	Transportation Planning and Policy Agency	4	√
	Insurance Regulator	1	√
	Local Authority	1	√
	Land Transport Regulator	4	√
	Digital Economy Promotion Agency	1	√
2. Representatives of users	Customer A	1	√
	Customer B	1	√
3. Smart Mobility Community	Smart City Company	1	√
	Smart mobility consortium	1	√
4. Research	Mobility researcher A	1	√
5. Service Providers	Operator A	1	√
	Operator B	1	√
	Operator C	1	√
	Operator D	1	√
6. Private Organizations	Property Development	1	√
	Insurance Provider	1	√
	Automaker	1	√
Total participant		23	23

4.2 Results from Workshop 1

There is a total of 23 persons participated in the first workshop (see Figure 4-1), which was held on August 5, 2020. The participants in the first workshop comprised of 19 stakeholders from the public sector and governmental agencies (see Table 4-2).

Table 4-2 Stakeholders involved and their participants in the Workshop 1

Stakeholder group	Organization	# of participants	Workshop 1
1. Policymakers & Public Sectors	Transportation Planning and Policy Agency	4	√
	Insurance Regulator	1	-
	Local Authority	1	√
	Land Transport Regulator	4	NA
	Digital Economy Promotion Agency	1	√
2. Representatives of users	Customer A	1	√
	Customer B	1	-
3. Smart Mobility Community	Smart City Company	1	√
	Smart mobility consortium	1	√

4. Research	Mobility researcher A	1	√
5. Service Providers	Operator A	1	-
	Operator B	1	√
	Operator C	1	-
	Operator D	1	√
6. Private Organizations	Property Development	1	√
	Insurance Provider	1	√
	Automaker	1	√
Total participant		23	15

* The participants from a land transport regulator refused to attend both workshops.

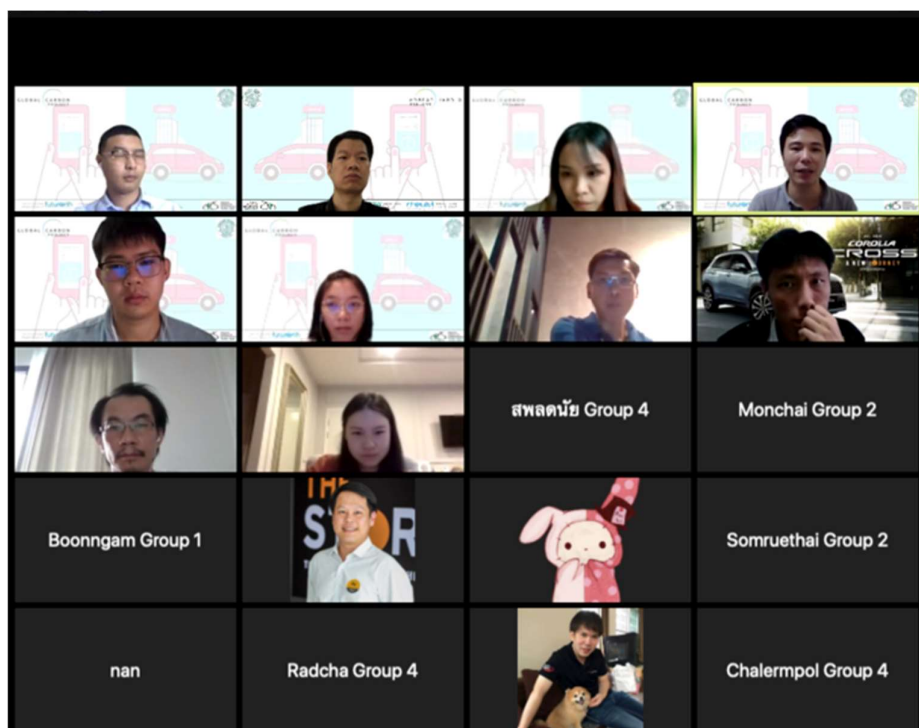


Figure 4-1 Participants of Workshop 1

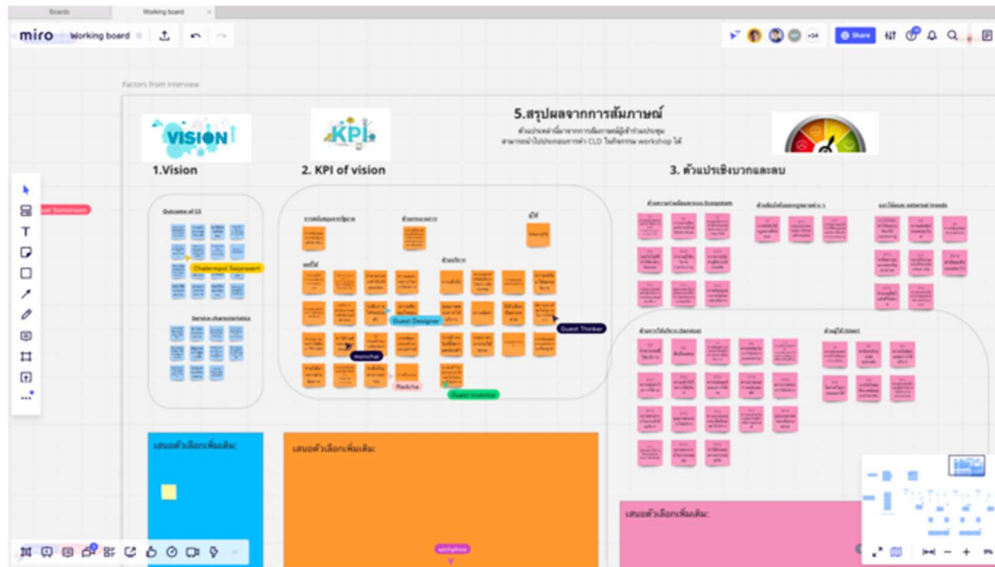


Figure 4-2 Working board in Miro

At the first round of the activity during the workshop, Participants were asked to expand the initial CLD (see Figure 4-2). Therefore, four diagrams from the 4 groups (see Figure 4-3 to Figure 4-6). Next, in the second round, we merged group 1 with group 4 as well as group 2 with group 3. In each group, the participants were asked to combine their first-round CLDs into a single diagram. As a result, the 4 diagrams were reduced into 2 diagrams (see Figure 4-7 to Figure 4-8). To improve readability in this report, the research team re-produced all CLDs using Vensim software (see Figure 4-9 to Figure 4-14).

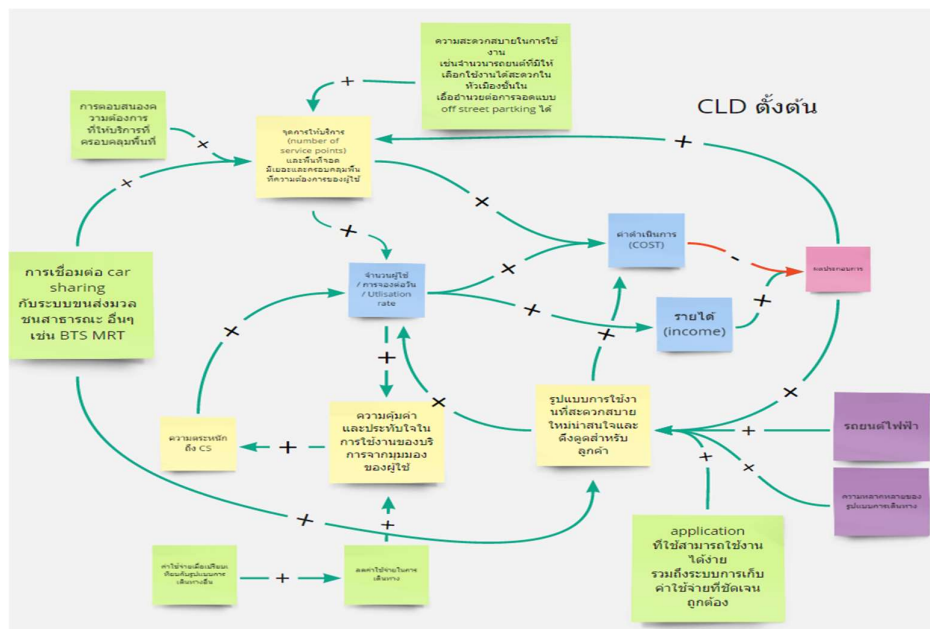


Figure 4-3 Group 1's CLD resulting from the first round of activity

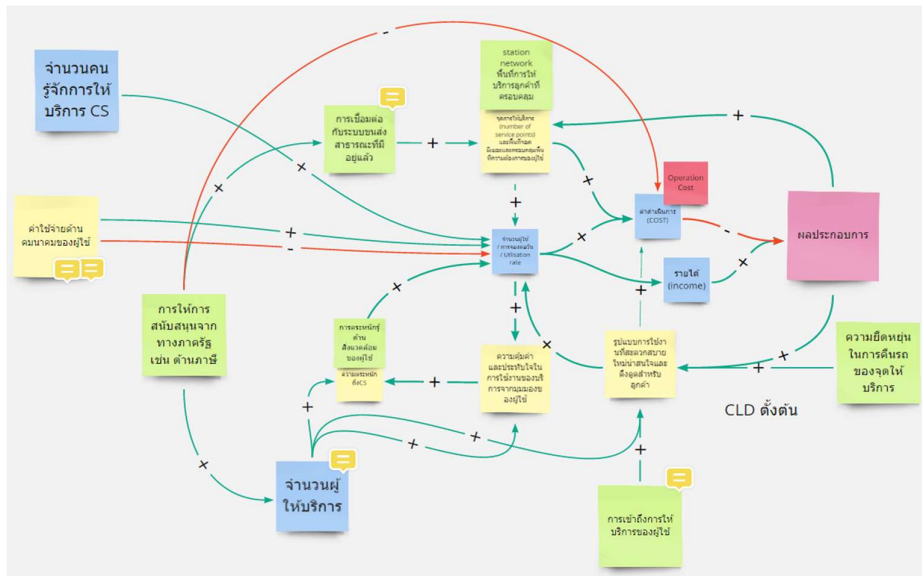


Figure 4-4 Group 2's CLD resulting from the first round of activity

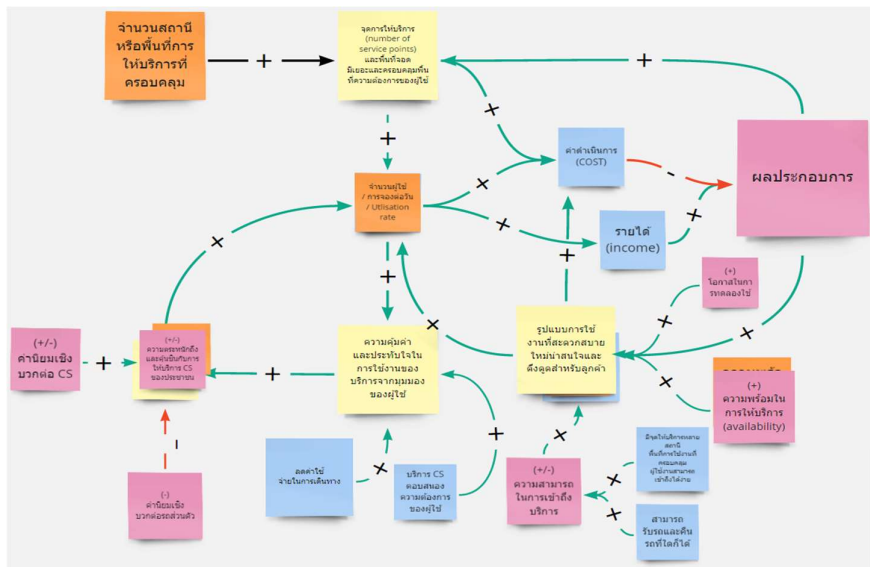


Figure 4-5 Group 3's CLD resulting from the first round of activity

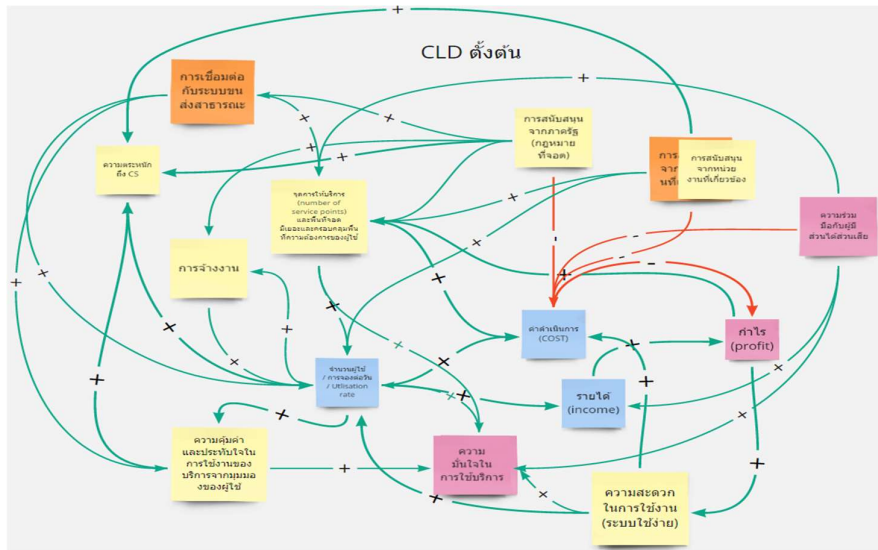


Figure 4-6 Group 4's CLD resulting from the first round of activity

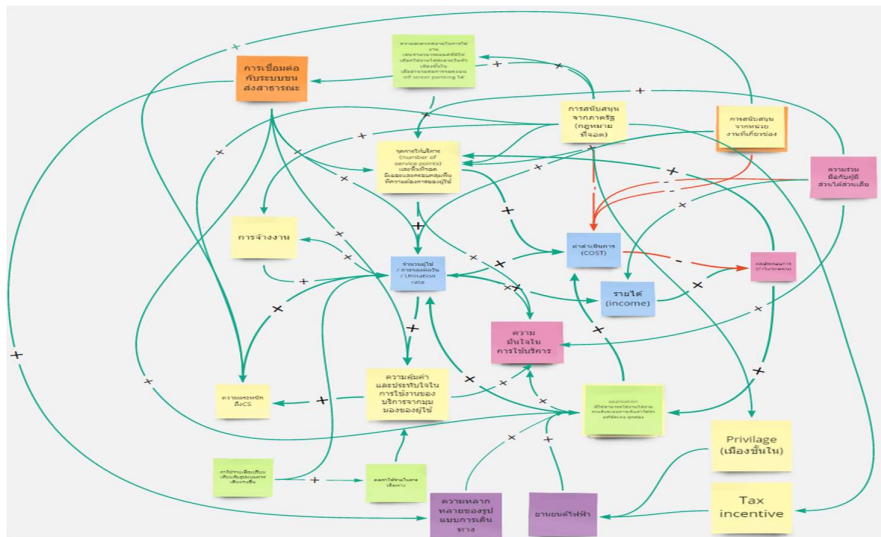


Figure 4-7 Group 1 and 4's CLD resulting from the second round of activity

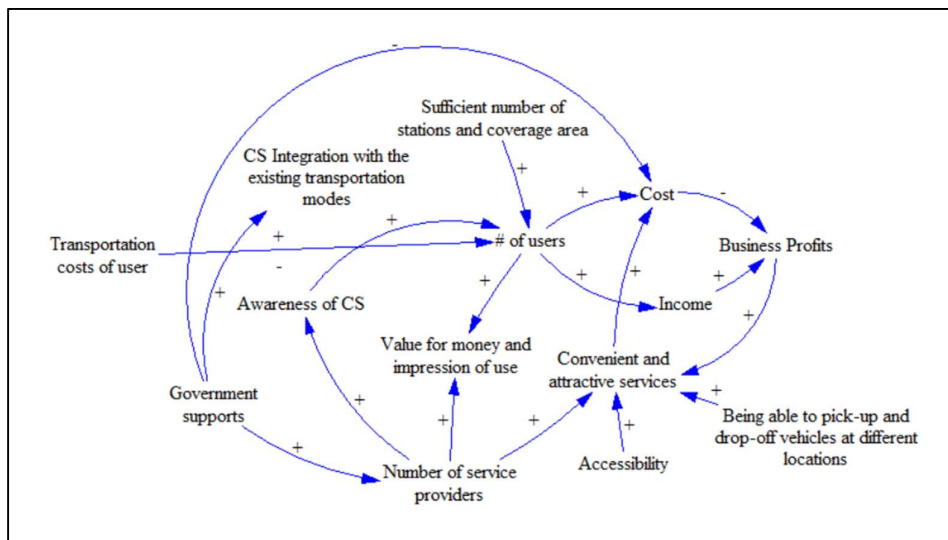


Figure 4-10 Group 2's CLD reproduced using Vensim

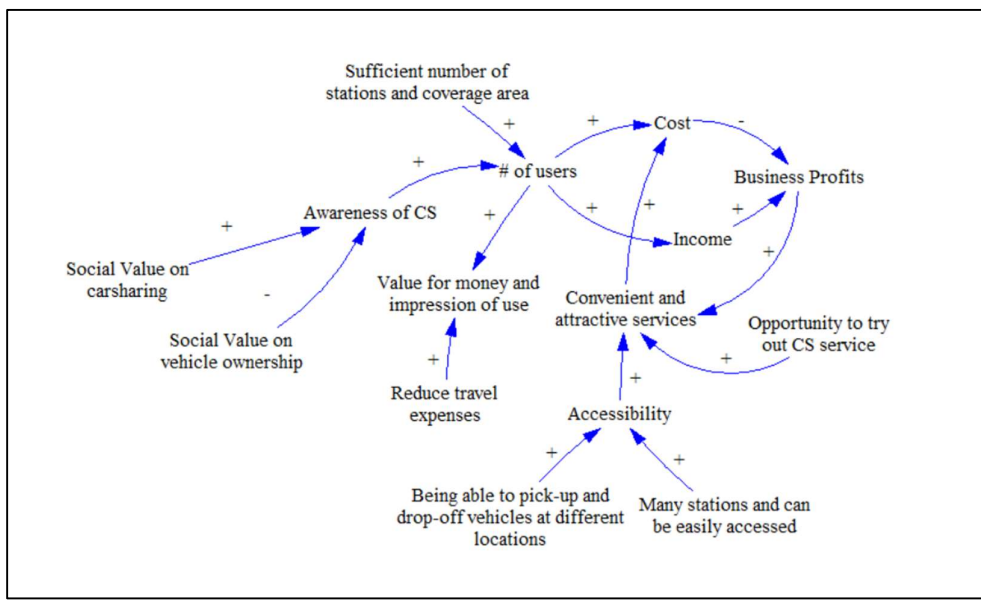


Figure 4-11 Group 3's CLD reproduced using Vensim

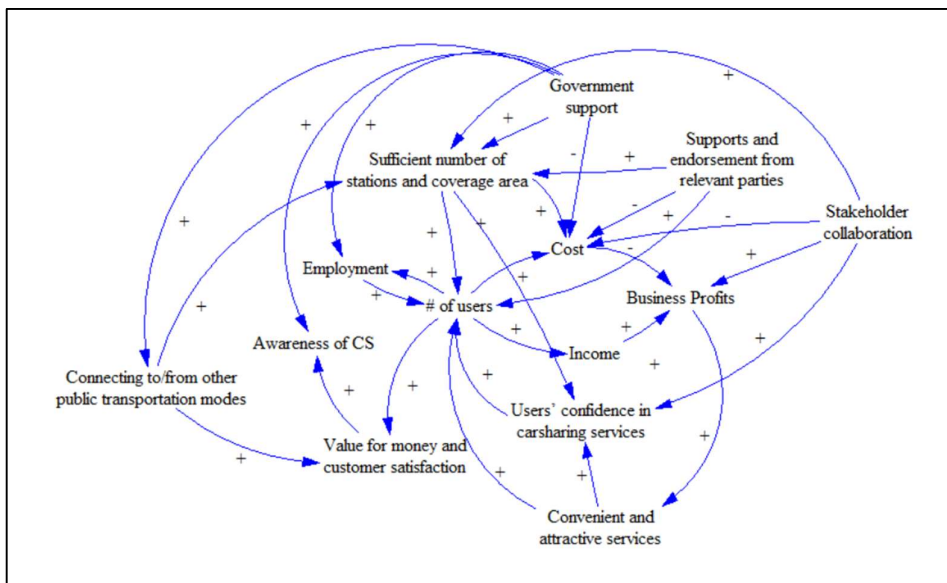


Figure 4-12 Group 4's CLD reproduced using Vensim

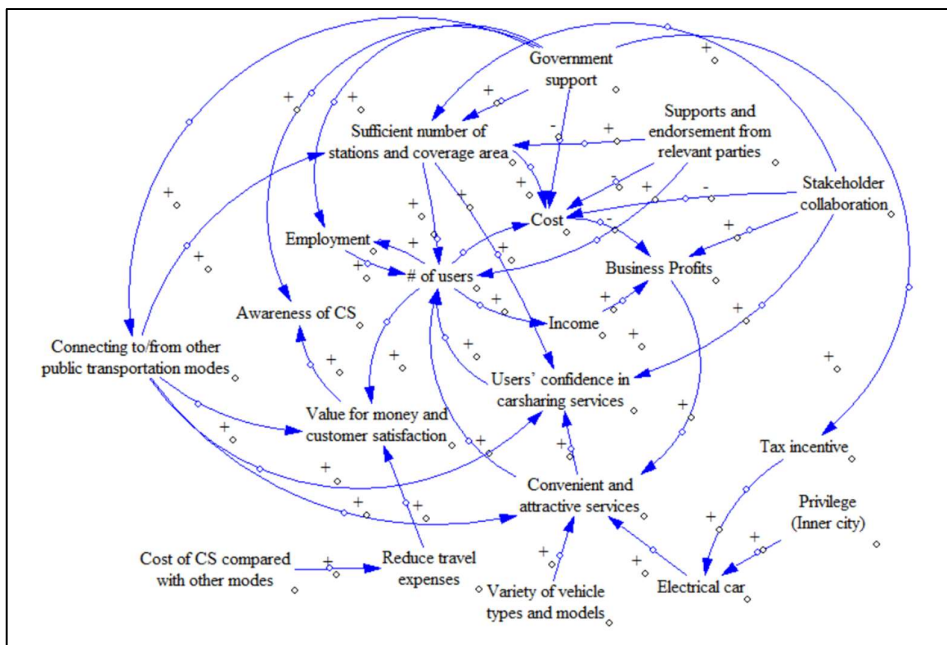


Figure 4-13 Group 1 and 4's CLD reproduced using Vensim

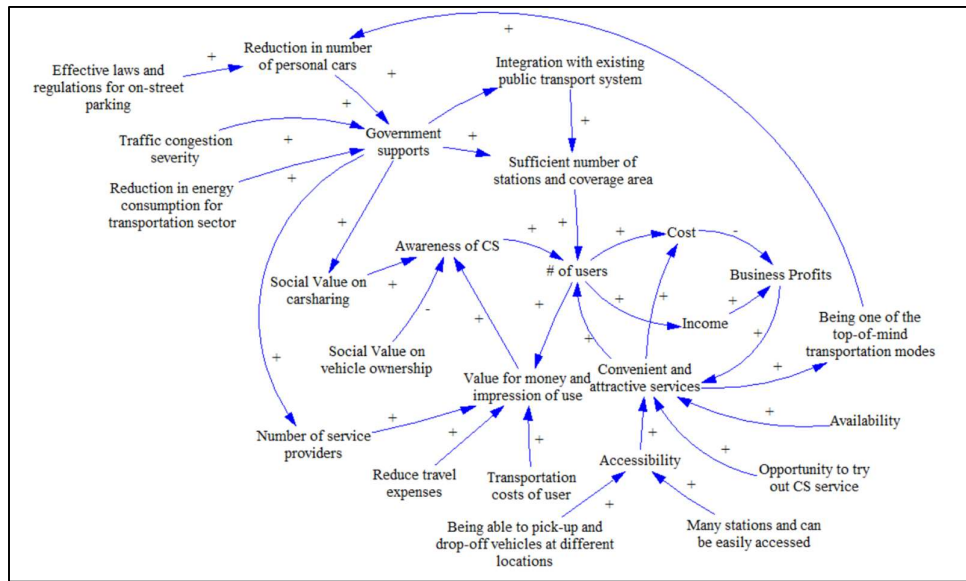


Figure 4-14 Group 2 and 3’s CLD reproduced using Vensim

4.3 Results from Workshop 2

In the second workshop, there are 14 stakeholders from the private sector and government agencies (See Table 4-3). During the second workshop, we went through each part of the CLD and explain the feedback loops to the participants. The participants provided their opinions and we adjusted the combined CLD if all parties agreed with the modification. (see Figure 4-15 to Figure 4-16)

Table 4-3 Stakeholders involved and their participants in the Workshop 2

Stakeholder group	Organization	# of participants	Workshop 2
1. Policymakers & Public Sectors	Transportation Planning and Policy Agency	4	√
	Insurance Regulator	1	√
	Local Authority	1	√
	Land Transport Regulator	4	n/a*
	Digital Economy Promotion Agency	1	√
2. Representatives of users	Customer A	1	√
	Customer B	1	-
3. Smart Mobility Community	Smart City Company	1	√
	Smart mobility consortium	1	√
4. Research	Mobility researcher A	1	√
5. Service Providers	Operator A	1	√
	Operator B	1	√
	Operator C	1	-
	Operator D	1	√
6. Private Organizations	Property Development	1	√
	Insurance Provider	1	√
	Automaker	1	√
Total participant		23	17

* The participants from a land transport regulator refused to attend both workshops.

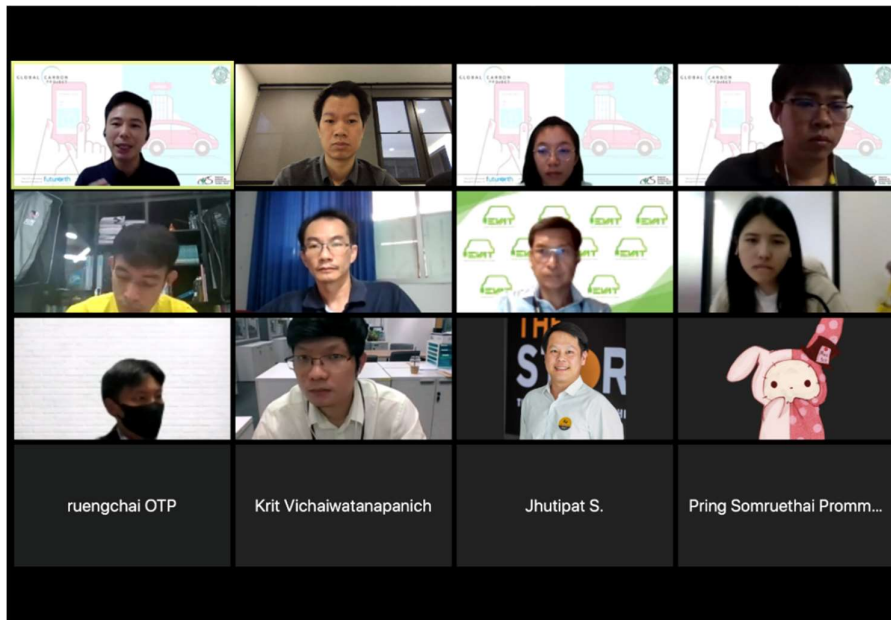


Figure 4-15 Participants of Workshop 2

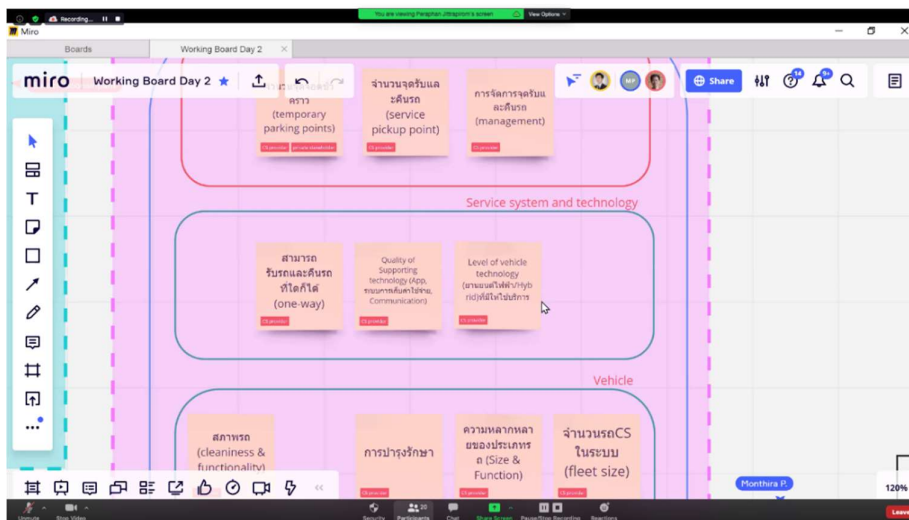


Figure 4-16 Working board in Miro

The results from the second Workshop, we summarized 2 diagrams from Workshop 1 into a single diagram (see Figure 4-17)

The system structure of the model is shown in Figure 4-17. The model does not take a perspective of a carsharing provider but of the whole system. Starting at the upper right of the diagram, the entities here describe the dynamics among the *number of carsharing users*, carsharing service *Income*, operational *Cost*, the providers' *Net Profit*, their *Investment funding*, and *Quality of carsharing operation*. Here, a balancing loop¹ (B1: Investment funding drives service quality) can be identified.

¹ In System Dynamics, there are two types of feedback loop; a reinforcing or positive feedback loop and a balancing or negative feedback loop (Sterman, 2000)

Quality of carsharing operation can be defined by manifolds of attributes, namely Quality of vehicle, Quality of service stations and parking, and Quality service system and technology, each of which have further dependent entities of their own (see Figure 4-18 for the sub-model).

The *Quality of Carsharing operation* in turn affected the services' *Levels of attractiveness, availability, and coverage* by the services. The *Levels of availability* and *Coverage* further drive the *Convenience* and *Accessibility to Carsharing services*, which combined with the *Level of attractiveness* to dictate how well Carsharing service characteristics align with users' demand (*Fitness for purpose*), the *Value for money of carsharing service in relation to other modes of transport* available, and *Customer satisfaction*. The satisfaction of Carsharing customers affects *the Number of repeat users* and how the *Public awareness* of the service is being spread through *Word-of-mouth* and influence the *Number of Carsharing users*. Here, a reinforcing loop (*R1: Service quality attracts user*) can be identified.

An increase in operation *Cost* – due to increases in the *number of users* and *Quality of Carsharing operation* – can also increase the *Price of Carsharing service*. This rate is currently controlled by the market mechanism (*Limit to Carsharing price*) but can also be controlled by government regulation in the future. This service price adversely affects the *Value for money* of Carsharing and consequentially *the Repeated users*. Here, we can identify the second balancing loop (*B2: Service price controls Number of users*).

An increase in the *Number of carsharing users* will decrease the *Number of personal cars*. A lowered *Perceived values and usefulness of private cars* as a status symbol and additional measures by the government to control car ownership can also erode the *Number of personal vehicles*, which further affect *the Number of trips made by personal cars* and externalities related to private vehicle (*Energy consumption, Air pollution, Road accident, as well as Road and parking congestions*). The *Quality of public transport (PT) service* also has a role here; a higher quality of public transport service will decrease car ownership and car use. On the other hand, with the government policy to enhance the integration and *Connectivity between carsharing and PT*, the *Quality of public transport service* will increase the *Connectivity between public transport (PT) and carsharing services*, which in turn, improves the level of *Accessibility to carsharing service*.

Finally, in the lower section of the diagram, the *Number of Carsharing providers* will increase if the *Attractiveness of the Carsharing market* is increased, i.e., by a higher *Number of users and Net profit*. An increase in *Number of Carsharing providers* will affect the system in two folds. Firstly, it will increase the level of *Competition among Carsharing operators* in the market, thus decrease the *Price of carsharing service*. Secondly, it will allow the formation of *Cooperation among service providers* that may lead to a higher *Quality of Carsharing operation* (e.g. shared facility and knowledge exchange). Three feedback loops can be identified, illustrating the dynamics driven by internal attributes within the system. Several possible interventions were also identified and integrated into the CLD. These policies and measures are depicted in grey boxes and the arrows indicate where these interventions influence the system. These measures can be from both the public and private sectors.

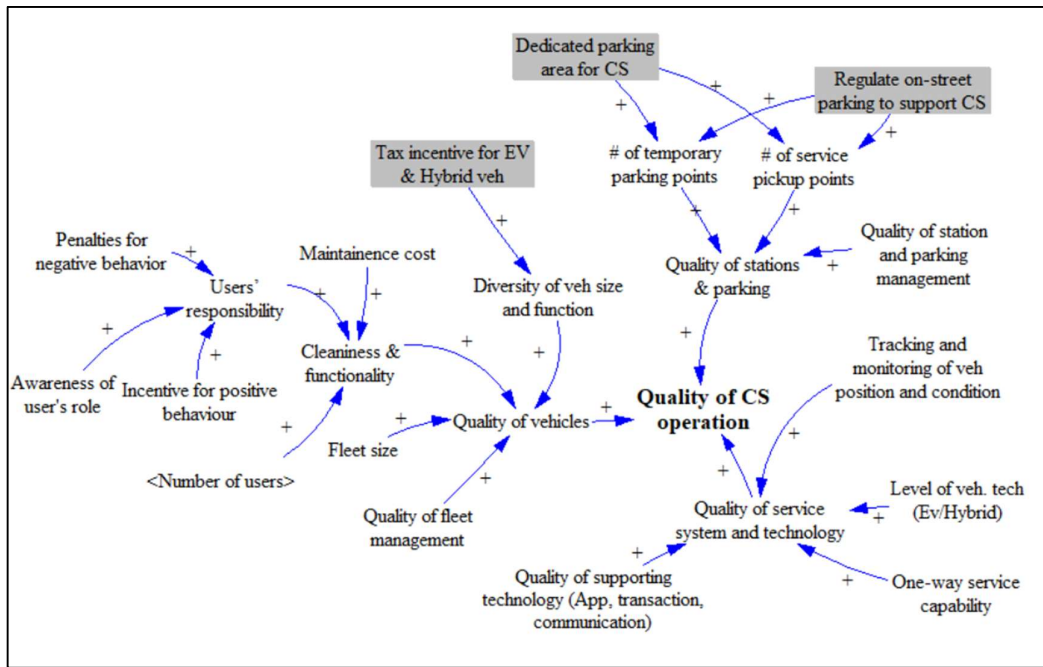


Figure 4-18 Quality of carsharing operation sub-model

4.4 Post Workshop Survey

After each workshop, the participants were called in the next days to ask for feedback. Some of the participants reported exhaustion and suggested a shorter meeting, resulted in a reduced duration of 30 min on the second day. The evaluation survey shows the respondents have a positive impression of the workshops (Figure 4-19). The participants who responded to the survey (11 persons out of 16) appreciated how the workshops enhance their insights into the problem, give them a new understanding of the interconnectedness within the system, and bringing different perspectives together to reach shared understandings using the CLD (Q1-6). They also felt that the workshops were successful and were satisfied with the outcomes and gained conviction to stand by them (Q7-9). However, they felt more improvements can be made to ensure the existing situation and relevant information of the carsharing system is better reflected in the CLD (Q10-11). Moreover, more efforts should be made in the aspects concerning policy analysis (Q12-13). The relatively lower scores on these questions may be a direct reflection of the limited amount of time allocated to address related to how the obtained system structure reflects the current situations and how the CLD could support the evaluation of policies and measures.

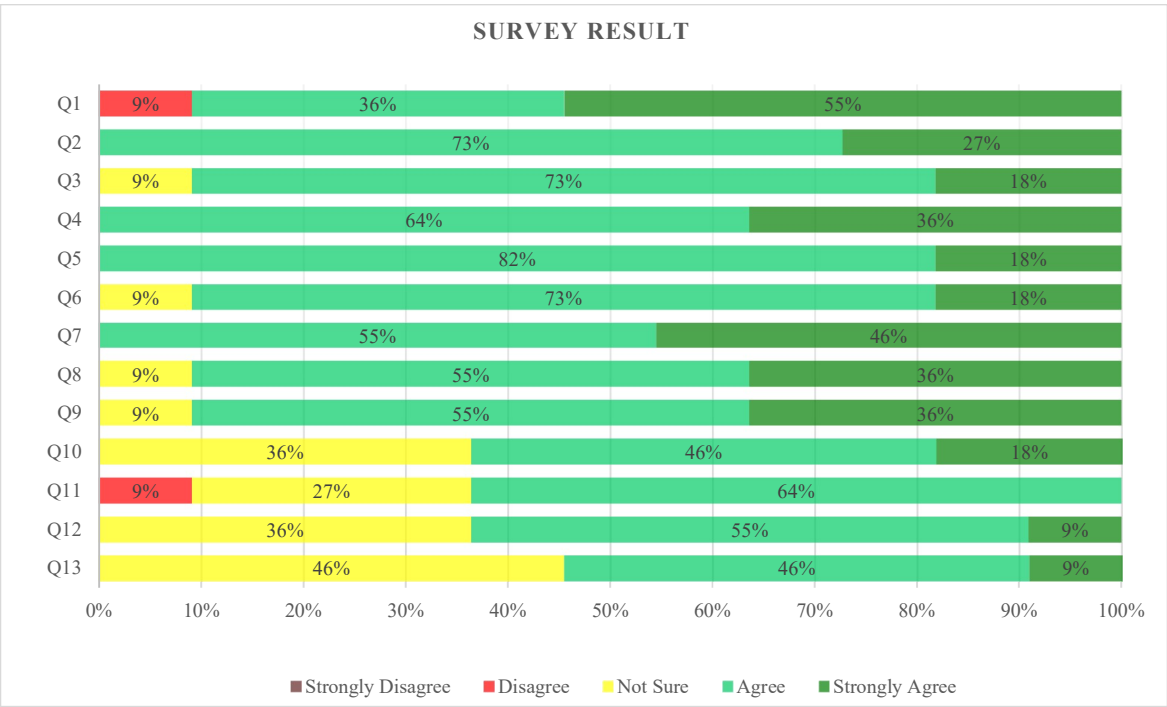


Figure 4-19 Online evaluation survey result

CHAPTER 5 DISCUSSION AND CONCLUSION

In this study, GMB remote settings were used in research to help reduce the risk of exposure to the coronavirus. The work process includes interviews and online workshops. The researcher used an online interview method. Researchers used an online interview method and found a few problems with online interviews that can leave participants feeling tense and shy. Facilitators need to encourage participants to join the discussion. It was also found that Suitable duration for online workshop is 2 hours. Longer duration will lead to less engagement from the participants and certain stakeholders felt reluctant to engage in the process.

In addition, this study contributes to the wide implementation of carsharing in Bangkok city, Thailand by constructed a shared understanding of the subject using a remote participatory Group Model Building process. The process also demonstrated how GMB can bring together relevant stakeholders and provided a systematic approach to facilitate exchanges of knowledge and experience among them. The process helped to enhance their insights into the novel mobility concept and improve their understanding of the complex interactions involved. The resulting system structure, which consists of three feedback loops, can provide a basis for formal model and policy analysis regarding the mobility concept. The remote setting of GMB also helped to minimize the risks in risks of exposure to coronavirus for the participants and the research team.

Lessons learned from this study can be useful for researchers and practitioners seeking to implement novel mobility concepts, such as Mobility-as-a-Service, to promote sustainability in developing countries. Future studies can examine how the mechanism of consensus reaching in remote workshops is different from the in-person setting, also different measures to enhance engagement and focus of remote workshop participants can be explored. For example, participants may meet in small clusters, which are connected via an online interactive platform. Moreover, future works can explore how knowledge and information generate during the participatory process in GMB can also be utilized to formulate an implementation plan for the subject, using planning frameworks, such as Dynamic Adaptive Policymaking (See Jittrapirom et al., 2018).

CHAPTER 6 Appendices

Appendix A
Interview Transcripts

Digital Economy Promotion Agency's interview on May 20, 2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

DEPA is a governmental organization that promotes the digital industry, covering 5 areas; software, hardware, service, game/multimedia and telecom. Dr. Passakon Prathombutr (Senior Executive Vice President of DEPA) takes responsibility for the supervision of mega projects, such as Thailand Silicon Valley in Sriracha. Other roles include the promotion of digital platforms in SMEs and the idea of 'Smart City'. The latter covers 7 fields, such as Smart Mobility. The major role of DEPA is to support the Smart City initiative, motivate executives and carry out the plan in order to create Smart City areas in compliance with governmental procedures. This will lead to many franchises regarding services and benefits.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

The responsibility falls into 2 parts. The first one is the roles as a regulator in charge of assessing, examining and introducing Smart City areas. The second part is the roles as a promotor encouraging activities related to the Smart City project, such as organizing supportive activities, raising public awareness and knowledge of the issue. Also, there are both area-related schemes (the promotion of Smart City areas, such as Chulalongkorn University) and others, such as subsidization and training sessions.

3. What makes a successful car-sharing business?

The success actually depends on types of business models, which vary from area to area. It is also mainly dependent on users in particular areas. In perspective, details can be provided in the following points:

- For Smart Mobility, the success can be measured by the creation of movements, which can provide convenience to both people and facilities, as well as reducing time spent on accessing the process.
- For cities, the measures of the success include GDP growth, increase in employment rates, reduction of transportation costs and drop in pollution, energy consumption and road accidents. Numerous indicators are thus taken into account.
- In terms of the service, the success is the clear understanding and application of technology that can help clients to have easy and safe access to the service. Personal data must be protected and not used unlawfully. There is also education of such technology that leads to the success.
- Another measure is integrity, which covers payment process, fare of the service and fair treatment of other existing businesses (as exemplified in the case of the rivalry between taxis and UBER). Anyway, the indicators of the success are not definite, conditioned by different sections of society. For example, development is not an attractive thing for some locals, while business owners tend to promote it.

4. What are the indicators of the success of a car-sharing business in Bangkok?

Accessibility is key to the success. That is to say clients can access the service in easy and comfortable ways. It can also be measured by worthiness, safety and cleanliness. Other indicators are transparent process of payment, which should be streamlined, ability to reduce traffic congestion, which includes EV Carsharing to tackle pollution, reduction of the average cost of living and enhancement of the connectivity between the service and the existing transportation system.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

4 points, because it is not widely known at present.

6. What factors contribute to the success of the car-sharing industry?

Social values, public confidence and awareness of the car-sharing service, all of which have to be bolstered by both government sectors and private sectors. There has to be promotion in order to make carsharing widely known. The government is to provide other infrastructures, including parking lots and special lanes for the service (hence a privilege of the service). Other ways of building values of the service are insurance and Covid-19 measures as the current situation of the pandemic is preventing people from using mass transit.

Good accessibility, convenient forms of the service and price worthiness lead to the success of the car-sharing industry. Besides, the connectivity of payments between organizations for the service (such as delivery or travel) and more different choices of vehicles are also the contributing factors.

7. What factors hinder the success of the car-sharing industry?

Business rivals and other alternatives. Clients can get better options if the government encourages other alternatives to the business, such as the promotion of cycling and GRAB or the enhancement of infrastructures of Bangkok's 10 rail lines covering essential areas. These can all induce more clients to use mass transit. On the contrary, the Covid-19 crisis might draw clients back to private transport. It is also down to people's mindset that the average car-sharing service is uncomfortable and expensive as they have to drive themselves (compared with other modes of transport).

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

1) The promotion through BOI in the A3 category within the period of 5 years and under 100% of the investment. Anyway, it also depends on the profits of the business. 2) The integrated ticketing policies, which help combine mass transit and car-sharing services. 3) The tax deduction. Anyway, the advantages of the car-sharing industry for the government sectors are not clear socially and environmentally. They could otherwise build the values of the tourism industry through the creation of new markets, attracting both Thai and foreign tourists. The car-sharing industry can offer an alternative to other modes of transport. Car-sharing services can also be connected to the state welfare card (used by civil servants).

2) The integrated ticketing system connected to the public transportation system. The integrated system can also be good to financial benefits of civil servants.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The government is expected to promote tourism in the country by encouraging the use of car-sharing services to travel in other provinces. The government sectors should invest in big data, such as traffic data, to connect car-sharing data to electronic payment and Easy Pass. The benefits of these data can enhance the efficiency of the system design and the operation. The government sectors can also partially support data accessibility and application of car-sharing users' data for further researches and connectivity to other data in order to generate benefits for companies and other commercial sectors. Monetization can improve by the application of these data, which is a way of generating revenue and building forms of business transaction.

Others

DEPA is responsible as both a promoter and a regulator for specifying Smart City areas. This could possibly lead to conflicts of interest. However, DEPA has included other organizations as committees who share the responsibility of considering and examining the issue.

The data derived from business platforms should go to the government sectors in order that they can manage and catalog the data for the sake of many different sectors. Although no laws have been made for this yet, the government can play their part in enhancing the industry via such managements.

ITS Thailand and Chulalongkorn University's interview on May 20,2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

ITS-Thailand is an organization of people working on transportation and traffic. Its principal aim is to promote the technology industry. In this particular area, technology is intended to be a huge advantage for Thailand with the help of sound advices. It is specifically aimed at Thai companies and expected to provide guidance on plans and policies to government sectors. For example, the organization is responsible for giving suggestions, drafting Bangkok's master plans for the OTP, supporting UNESCAP by introducing related Thai cases and providing opinions regarding policies for the country and regions.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

In terms of carsharing, there is promotion of technological issues to improve the service, such as the support for hardware & software developers and the use of devices in Thailand, the promotion of the ecosystem of the industry, as well as taking the role as a promoter of several technologies.

3. What makes a successful car-sharing business?

At present, car-sharing services are still confined to specific areas. Initially, the overall success of the car-sharing system in Bangkok looks similar to the early-stage system in Europe where carsharing is an alternative that offers more conveniences and privacy than any other mode of transport. This results in a number of choices for clients to choose for their travel purposes.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The indicators include the fact that this mode of transport can be a convenient choice for people, easy access to the service, convenience and service quality as part of the travel, functionality of the service as an alternative, equal access to the service and opportunity to use the service. Anyway, car-sharing services are now only available for clients able to drive cars.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

1-2 points, because there are some restrictions. For example, the car-sharing industry is still not well known in a wider society. So, it is not the primary choice for travelers.

6. What factors contribute to the success of the car-sharing industry?

There are a number of factors, including its importance as a mode of transport, opportunity and impression for people who use the service, functionality for certain purposes leading to customer loyalty, public awareness of the service, familiarity with the car-sharing service, a variety of services for many purposes and involvement of other systems, such as special promotions for the use of the service, together with the public transportation system (on the assumption that the car-sharing service alone does not meet the requirements of all people). An integrated system between the service and other modes of transport or businesses is also

beneficial to the values of the car-sharing service. Moreover, the attractiveness of the service can be seen as an upside increasing its values. The ways many companies use the service can bring benefits to users in a variety of ways. Also, the connectivity between the service and the public transportation system and the precise locations of service points and parking spaces are the contributing factors of the success.

7. What factors hinder the success of the car-sharing industry?

The car-sharing industry may not answer the needs of all travelers as they are still not familiar with the system or do not know it at all. The exceptional quality of the mass transit system might also account for its unpopularity. Other negative factors include limited number of car license holders, responsibility of users and business rivals who can offer better and cheaper services, such as motorbike rental service.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

No.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

There should be exclusive car-sharing parking lots, fare exemption for parking, strong cooperation with private sectors to make carsharing a welfare scheme and connectivity between the service and the public transportation system. To bring carsharing into the system can increase the utility of the city's transportation networks. Besides, a complete understanding of the car-sharing service in Bangkok is necessary as the system of the business is still unclear, unlike other services for travel purposes, which are clear, useful and easy to understand.

Others

If the government sectors see the potential of the car-sharing industry as a method to improve public accessibility, they should play their roles in putting forward the related policies, which have not yet taken shape in terms of its comprehensive practicality. At present, more and more companies start using the car-sharing and car-leasing services. More trials have been done with the pay-per-use system. However, only short-term car-rental service is suitable for the areas where there are still no other options of transport.

Khon Kaen Think Tank Smart City's interview on June 16,2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

The development of the city of Khon Kaen is hugely thanks to an integration of numerous organizations who collaborate with each other, motivate different sectors and disseminate and clarify the information of Smart City and Smart Mobility initiatives in order to provide a common understanding. For my personal responsibility, I am a co-founder of Khon Khaen City Development and Secretary General of the Khon Kaen Chamber of Commerce, responsible for implementing the 20-year Smart City plan (short-term, medium-term and long-term). Carsharing is also part of the entire plan we are considering as it is expected to be carried out in the middle phase. That is after the completion of all infrastructures in the first phase, including roads, fiber-optic rail system and city planning. We think that car-sharing users must have a great deal of knowledge and awareness of the system.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

We are working in close cooperation with other organizations in Khon Khaen, such as BANPU NEXT and Toyota. Khon Kaen is expected to be an exemplary city, like Toyota's Ha:mo scheme. There are also online applications, a creation of the ecosystem of the city and an evaluation of the possibility of many technologies, such as promotion of EV public transport for the utmost utility of EV cars and car-sharing services.

3. What makes a successful car-sharing business?

A successful car-sharing business has to include motorbike ride-sharing services as part of the business. This is due to the fact that there are numerous clients in the city. As car-sharing services are still used by particular groups, they might not be a good option for people who come from other provinces. The business should initially offer its services at airports, but it is likely that there could be conflicts with other car-rental services.

This type of car-sharing business might work for short trips and can be compatible with monthly payment and the flexibility of the payment schedule. Motorbikes can travel into many snaking paths and are a comfortable service to use (the service is not necessarily a hi-tech one). The service should also cover all essential areas, including shopping malls and airports.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The number of clients (which can lead to the learning of the service, helping develop the system), convenience of clients, ready availability of the system, support from associated organizations and worthiness of the service. It should be an on-demand service for all clients.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

5 points, because the industry is still not supported by an effective ecosystem and lacks government support.

6. What factors contribute to the success of the car-sharing industry?

The contributing factors include awareness of the functionality of the service on a daily basis, cooperation between locals and associated private sectors, supportive government policies, promotion of an understanding of the system, adverse situations that prompt the learning of new knowledge, ecosystem of the city favorable to the service, which includes parking lots and service points, and amendments to related rules and regulations.

7. What factors hinder the success of the car-sharing industry?

The negative factors include lack of support from government sectors and other related organizations, no supportive law related to the car-sharing industry, lack of cooperation from locals and other existing businesses, necessity to learn new systems, behavioral change for a new service and traffic congestion.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

There are policies on cooperation between different organizations, parking lots and parking spots.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

There should be changes in perspectives through the cooperation in order to achieve the plan. A good management of expenses should be taken into account so as to cut the running costs of the investment. Goals should be clearly outlined according to each sector's plan, such as reduction of pollution and road accidents, dissemination of information and PR about the success of the business and how effective the operations are.

Also, the promotion of EV cars is key to spreading the costs of the investment, such as installments of EV car purchase over a long period of time, cars' taxes for carsharing regulated by the master plan. There should also be connections between the business and EV cars and collection of Smart Parking big data.

Toyota Ha:mo's interview on June 16,2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

Toyota Motor Thailand Co., Ltd. is a huge automobile manufacturer and distributor in Thailand. The company's policy for the future is that it aims to shift its position of a manufacturer to the position of a service provider. The company also regards that traffic congestion is a pressing problem in Thailand, while Japan has a system of EV sharing Ha:mo. Toyota also sees that the surroundings of Chulalongkorn University are a suitable place due to its favorable location where there is a massive transit interchange between BTS and MRT. So, this location can be where the platform from Japan can be applied.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

In terms of carsharing, there is promotion of technological issues to improve the service, such as the support for hardware & software developers and the use of devices in Thailand, the promotion of the ecosystem of the industry, as well as taking the role as a promoter of several technologies.

3. What makes a successful car-sharing business?

First and foremost, a successful car-sharing business is expected to operate as a sustainable business and answer the consistent needs of users. For consumers, it is important for them to have a good conscience about their responsibility for society, such as give-and-take attitude.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The indicators are profitability of the business, clients' discipline to return cars and percentage of property damage. For example, according to Ha:mo's survey, users of the service were well-disciplined as they took good care of their cars and left no garbage after the service.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

5 points. The overall operation is not as good as it should be because most car-sharing services offer only round-trip services. There should be collaboration between service providers and the government to implement plans on parking lots. It could help reduce the costs of the service and improve the service as a whole.

6. What factors contribute to the success of the car-sharing industry?

The collaboration of car service providers and providers of parking lots, together with the development of online platforms, like applications. Good collaboration can lead to a drop in the costs of the service. Also, the government support for the companies who help solve social issues, such as tax deduction for service providers and rent reduction, could be a positive factor as well.

7. What factors hinder the success of the car-sharing industry?

Consumer behavior. This means users who are not responsible enough for their use of the service, e.g., causing property damage with no report to the operator. Apart from that,

enormous costs of parking lots and uncooperative landowners are also the deterrents to the expansion of parking spaces and, ultimately, the success of the business.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

No.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The government support for mass transit induces first-and-last-mile travel. It subsequently leads to high demand of the car-sharing service as it becomes a choice for last-mile travel.

Moreover, an integration of services from many different service providers is also key to satisfying the needs of more clients (such as subscription mobility service).

Drivemate's interview on June 17, 2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

Drivemate is a peer-to-peer car-sharing business. We offer a service in which car owners can lease their cars to anyone who don't have a car, either daily, monthly or yearly. Both lessors and lessees will agree on terms and conditions and can make appointments to get the car via Drivemate's application. The company regards that this business is financially good to car owners who rarely use their cars and can help reduce traffic congestion.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

The service is pretty similar to Airbnb. The company created certain platforms to make it convenient for both lessors and lessees to access the service. A dashboard is also provided for car owners to deal with the process. There are also marketing campaigns, GPS service, car monitoring for safety, measures against fraud, insurance and service of getting suitable cars for customers. In other words, the company is an intermediary between lessors and lessees.

- 3. What makes a successful car-sharing business?**

A successful car-sharing business must have many service points for people in Bangkok to use as another choice. As a result, the number of private cars will decrease and commuting in the city becomes more convenient. A drop in car use can also lead to a rise in car-rental businesses.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

The numbers of users and cars in the system.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

2-3 points, because it is still an early-stage business.

- 6. What factors contribute to the success of the car-sharing industry?**

Funding for start-ups, popularity of the business, people's understanding and awareness of the business, changes in social values about car ownership as people are likely to use other modes of transport, such as mass transit and car-sharing services.

- 7. What factors hinder the success of the car-sharing industry?**

The attitude that having a private car is a mark of success in life, socio-economic conditions that affect car sales and lack of funding for start-ups.

- 8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?**

-

- 9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?**

Carsharing can be promulgated by the government to make the industry better known. There should also be supportive measures on parking lots, such as parking provision, and policies against car ownership. For private sectors, tourism can be promoted and there should be cooperation between commercial sectors (connections between different business models).

Ubon Ratchathani University's interview on June 19, 2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

Ubon Ratchathani University has worked in cooperation with government sectors, such as the Office of Transport and Traffic Policy and Planning (OTP), to carry out joint projects, including improvements of bus and taxi networks and a planning scheme for the sky train.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

For carsharing, no studies have been conducted, because the government sectors have not had any plans on it.

- 3. What makes a successful car-sharing business?**

A successful car-sharing business is to offer a system in which clients can access the service easily and spend little time on the booking process. Parking spots should cover all essential areas and not be located in distant areas. Cars can be obtained and returned anywhere. For now, clients have to return cars where they got them. This is suitable for long journeys rather than short trips in the city center.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

The number of service points or areas where the services are available for clients.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

2 points

- 6. What factors contribute to the success of the car-sharing industry?**

Efficient public transport has a positive effect on the car-sharing industry, because people are not likely to use their own cars, but choose public transport instead. Carsharing is another choice they can choose. Besides, good policies on parking spots, the system that allow clients to return cars anywhere, and car ownership restrictions are all the contributing factors of the success.

- 7. What factors hinder the success of the car-sharing industry?**

The popularity of having a private car. This involves good prices and many special promotions that encourage people to buy cars (The government support on tax deduction, car ownership, parking and petrol). Also, the inefficiency of mass transit is another important factor.

Other negative factors include business rivals, such as taxis, ride-hailing services and car-rental services regarding price and convenience. Taxis, in particular, are the most important one as a taxi service is generally cheaper (price control) and it is also easy to access the taxi service, compared with the car-sharing service. This results in people turning away from carsharing and taxis becoming the most popular choice, second only to private cars. For long journeys, CS will be compared with low-priced car-rental services, which offer easy-to-use services, like quick booking without applying for membership. In addition, the car-leasing

business is also another rival that can answer the needs of clients, with its ready availability and good prices.

Clients' ability to pay for the service is also an obstacle when it comes to membership application. This is because uncertainty of clients' frequency of their use of the services.

The car return procedure is a problem as well in case clients have to return cars only at certain points, making the service less convenient.

The intricate process of payment can be difficult for clients as prices are charged in different ways, unlike the car-rental business, which offer certain flat rates. This can discourage people from using the service.

The lack of an understanding of the system can also put off people as well.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

The government policies are unlikely to bolster other alternative ways of transport. This is due to the fact that private cars are still a better and cheaper choice.

Other policies include an improvement of public transportation, which can discourage people from buying a private car. They can also be the target group of the car-sharing business.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The car-sharing business must prove that it can be advantageous to society. Its values can draw attention from the government. It is unclear whether this business is supported by the government in other countries. The government support of alternative methods of transport is generally improbable.

Thaivivat Insurance's interview on June 23,2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

Thaivivat is an insurance company that ensures travel risk mitigation for customers. As traveling from one place to another in Bangkok can be risky for commuters, the company offers personalized products and services that meet the requirements of customers.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

In terms of carsharing, there are still no practical plans, but the company has talked to Haup Car and pledged to launch new insurance products and services for P2P rental cars. The company is also planning to build models that help to cut the customers' expenses. They can all be ways of getting more clients of the car-sharing service.

- 3. What makes a successful car-sharing business?**

The business must answer the needs of users, with no obstacles during the entire service, whether booking, car use, payment, quality of the car, safety, credibility, area for the service or type of vehicle.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

From a business perspective, the indicators are number of bookings per day and income. From a public transport perspective, carsharing must be widely known in society, measured by feedbacks from clients who are satisfied with the service and would recommend it to others.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

3 points, because the car-sharing industry is still recognized and used by some particular groups.

- 6. What factors contribute to the success of the car-sharing industry?**

The factors are awareness of carsharing as a popular business, understanding of users who can adapt to this new business and exceptional platforms and services the business can offer. From an insurance perspective, carsharing can lead to the personalization of insurance on-demand services. This means customers can pay for personalized services suitable to their needs.

- 7. What factors hinder the success of the car-sharing industry?**

Laws and regulations. If this new business is still illegal, it is impossible to assure clients of its safety. It is equally difficult to gain trust from clients, especially during the Covid-19 situation.

- 8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?**

The government campaigns for the reduction of travel expenses.

- 9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?**

The private sectors should provide a variety of car-sharing services. Models of the business have to be diverse to meet all requirements of clients. New markets should also be created to meet the demand.

Sansiri Development PLC's interview on June 24,2020

1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.

Sansiri offers a service called Smart Move to the residents. The project focuses on green energy and is concerned with the residents' awareness of the sharing economy. The project is intended to reduce pollution and use of resources. The Smart Move project is then applied to all Sansiri properties along the BTS Line where the use of public transportation is in high demand. Moreover, there are many other sustainable schemes, such as waste management, green energy and BCBG's solar roof system.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

Sansiri sees that the residents who live in properties along the BTS Line have a tendency to use public transport as a principal mode of travel. Car use is also necessary, and that is why the Smart Move project is initiated. The project starts with an investment of EV cars to facilitate the residents' use. The project is then extended to allow all people of Sansiri to access the service. There are also 5 IONIQ cars and 7 BMW i3 cars for the service. At present, the cooperation between Sansiri and car-sharing service providers is getting underway. There have been several problems and challenges for the operation, such as car crash, property damage and high running costs. In addition, the number of users is still limited. Some users, for example, only use the service only when their own private cars break down or when they want to use the service for shopping trips.

3. What makes a successful car-sharing business?

It can roughly be assumed, according to the public opinion, that a successful car-sharing business can reduce pollution, traffic congestion and improve the environment. There should be awareness of a positive influence of the industry on the environment and an understanding of the sharing economy. For example, the belief that owning a car is a sign of social status has to be dispelled. In addition, clients who use a good car-sharing service can be assured of safety. Therefore, the car-sharing industry in Thailand can be part of a self-sustained economy.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The success can be measured by the potential of the business to reduce traffic congestion and pollution, especially in city centers (central business districts - CBDs). A rising number of clients, a decrease in car ownership and ability of service providers to make carsharing a self-sustained business are all the factors of the success.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

3 points.

6. What factors contribute to the success of the car-sharing industry?

1. Social values about environmental sustainability 2. The new generation's better understanding of fixed costs, socio-economic status and economical lifestyle. The young

generation can also be the primary target group of the car-sharing business. 3. Safety. It is an important thing to convince clients that the car-sharing service is a good alternative amid the Covid-19 pandemic as people turn away from public transport to carsharing. 4. The ability to solve traffic problems. 5. Being a self-sustained business. More groups of people tend to use the business because it promotes environmental sustainability. Patterns of the business have to be appealing to clients too.

7. What factors hinder the success of the car-sharing industry?

There are many negative factors, such as policies that encourage people to buy cars easily or high taxes of EV cars. In addition, the expenses incurred from running a car-sharing business is huge (operation, maintenance and insurance). These all make it difficult for carsharing to be a self-sustained business. Other factors include the intricacy of online applications and cars' functions, the belief that cars are a sign of social status and Thai people's habit of using cars. Although car-sharing businesses are open for more people, the maintenance costs are still higher. Users are also confined to small groups. Also, the instability of applications and the operation of the business and unfamiliarity with modern cars (such as EV cars) are hindrances to the success.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

Policies that induce car purchase and the law regarding high taxes of EV cars.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

Sansiri begins the Smart Move initiative to support the idea of sharing economy, as well as bringing the car-sharing service into every project of the company. At first, the company tried to invest in cars used in the system singlehandedly, but now we are considering a cooperation with other commercial sectors who are running this business. The company also realizes that the demand for the service is not as high as expected. Now, the operation is still mainly concerned with the supply-side strategy, dealing with car-sharing services and installation of EV chargers.

Hauptcar Company Limited's interview on June 26, 2020

1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.

Hauptcar is a car-sharing service provider in the city center. The business is aimed at facilitating people's travel without using private cars. For car owners, we have a policy on sharing cars on our platforms. The ultimate goal is to reduce the number of private vehicles in Bangkok and optimize the use of cars. Hauptcar acts as an intermediary between other transportation systems, such as a link between mass transit and boat service. We also help commuters to access the service more easily.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

Hauptcar is a car-sharing service provider in the city center. We proceed to maximize the use of existing resources (private cars and organizations' cars) for the utmost utility.

3. What makes a successful car-sharing business?

A successful car-sharing business boasts 5-10 hours of utilization per day to run the business. It must be capable of enhancing connectivity and expanding networks that cover more areas. A successful business is also expected to be sustainable and provide more options of its services for different uses, such as motorbikes, scooters and electric cars.

4. What are the indicators of the success of a car-sharing business in Bangkok?

1. Utilization of the service or hours of the service per day. There should be more organizations or companies who rent cars of the car-sharing business to support the business. 2. The declining number of private cars after using the car-sharing service, according to a longitudinal survey. 3. Sufficient service points that should cover all essential areas in Bangkok.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

4 points.

6. What factors contribute to the success of the car-sharing industry?

1. The sufficient fleet of electric cars to help tackle environmental problems. 2. NBIoT technology, which can reduce communication costs (SIM card). 3. More business operators and providers, leading to a bigger market of the industry and its popularity. 4. The exceptional standards of the business, by which experienced car-rental service providers move to run the car-sharing business. 5. The use of the car-sharing services by giant companies, such as SCB and SCG, instead of long-term rental services. It can help to enhance the utilization in the daytime, while general clients can use the service in the nighttime. 6. Policies that can reduce the running costs, like operation costs.

7. What factors hinder the success of the car-sharing industry?

The negative factors include lack of supportive policies, such as no parking lots for the service, no promotion or reduction of parking fees to cut the operation costs, no link between carsharing

and mass transit card. 2. No consortium to bring commercial sectors together for a better cooperation and efficiency of the system.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

At present, no policies have been implemented to support the car-sharing industry.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

1. Policies on parking lots, which can be divided into 2 zones; private parking and public parking. The rules and policies on payment and privilege of shared mobility businesses. For private parking, the amount of spaces should be reduced to the minimum requirement. 2. Special lanes for carsharing, as could be seen in other countries where there are carpool lanes. 3. No congestion fee for carsharing. 4. Support for sales promotion and marketing through government channels. 5. An increase in registration fees on new cars. 6. Restriction of the number of cars per household to discourage car ownership and support shared mobility. 7. Promotion of EV, such as reduction of electricity expenses for EV chargers.

Hauptcar Customer #1's interview on June 26, 2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

User.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

I am a client of car-sharing services and interested in using an electric car. I found it comfortable, but there should be some improvements to make the system a one-way service.

- 3. What makes a successful car-sharing business?**

A successful car-sharing business has to be flexible in its procedures of getting and returning cars. This means clients can get or return cars anywhere. Car owners can join the business for car leasing. Service points or stations must be flexible and sufficient for clients. Big stations should be created for the P2P car parking system.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

The number of clients per month, its popularity and the number of cars in the system.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

5 points, because the number of clients is still low and the business is still not well known.

- 6. What factors contribute to the success of the car-sharing industry?**

More business competitors in the market, public awareness of carsharing, promotion of the business, government support and supportive laws.

- 7. What factors hinder the success of the car-sharing industry?**

The business is still not widely recognized by people. There are also concerns about safety and cleanliness, especially during the Covid-19 pandemic. Besides, there are property damage, lack of law implementation and insufficient number of cars, all of which are the obstacles to the success.

- 8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?**

No related laws have been implemented yet.

- 9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?**

The private sectors should work together on service points in order to provide a variety of facilities for clients. It can also be easier for clients to get and return cars.

Hauptcar Customer #2's interview on June 28, 2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

User of the BTS and electric scooter.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

I am a client of the car-sharing business and used Hauptcar when it was first launched. The reason behind this is I do not own a car and often find it difficult to use mass transit. With this service, I can control my budgets and would like to recommend it to others. Anyway, people's unfamiliarity with this new business can put them off using the service. In addition, as I was a client of Ha:mo, the service could still not answer the needs of clients as I could not share it with others.

- 3. What makes a successful car-sharing business?**

The number of clients is a determinant of its success. It can also be measured by falling demand for private car use, a wide range of services and cars, one-way service system and convenience of getting and returning cars anywhere.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

The number of clients, the decrease in pollution and green-house gases, the falling demand for private car use and car sales.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

4 points

- 6. What factors contribute to the success of the car-sharing industry?**

The business's popularity, people's falling demand for private car use, convenience of the service, such as locations of service points, good quality of the service and reasonable prices.

- 7. What factors hinder the success of the car-sharing industry?**

High prices can lead to its unpopularity as people think it's not worth using, unlike having a private car. Concerns about cleanliness, confidence of the service quality and customer service are also the obstacles to the success.

- 8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?**

-

- 9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?**

The government can introduce laws and regulations that help to cut excise taxes on car sales for organizations, as well as reducing taxes imposed on any other related issues. Public awareness should be raised through PR sectors in order to encourage people to use the car-sharing business. There should also be promotion of competitions between businesses in the

market and a ban on monopoly. Private sectors can support the car-sharing industry by including the car-sharing services in their organizations. For example, employees can be encouraged to use a corporate car-sharing service, instead of buying a private car.

BMW (Thailand) Company Limited's interview on July 1, 2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

I am in charge of BMW's corporate communication in Thailand. The company is an automobile manufacturer (BMW car, motorcycle, Mini). We incorporate the concept of sustainable development, energy conservation and environmental conservation into our core values. There have been studies and experiments on the reduction of pollution, including the car-sharing initiative called DriveNow. It is a car-rental service for short trips. BMW sees that mobility services will become a new business in the future.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

In Thailand, the company has worked in cooperation with King Mongkut's University of Technology Thonburi on a pilot project called Electric Vehicle Charging and Sharing (Charge & Share), which offers a car-rental service. The company also collaborates with Haupcar on supporting related researches, experiments of the system and the ACES scheme.

3. What makes a successful car-sharing business?

A successful car-sharing business has to be connected to mass transit. There should be a park-and-ride system in which users can leave their cars at certain points and use mass transit and car-sharing services in the city center. The system is useful for users who want to travel to the city center a car-sharing services are a good choice when they carry a lot of belongings. This system helps to reduce private car use. Applications and a wide range of cars should also be available for clients. Besides, safety and cleanliness are the elements of a successful business to assure clients of their convenience, not least during the Covid-19 pandemic. An understanding of this business should also be promoted in society as it is relatively new for many people.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The rising number of clients, positive responses from clients, decline in car ownership and reduction of pollution and environmental degradation.

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

2-3 points, because people are still not attuned to the car-sharing industry.

6. What factors contribute to the success of the car-sharing industry?

Densely-populated areas where the services are available, public transportation networks that should cover all essential areas, a park-and-ride system, public awareness of the business, government support for environmental conservation and enough service points and parking lots.

7. What factors hinder the success of the car-sharing industry?

Restrictions of service points, lack of government campaigns for environmental sustainability, inefficiency of public transportation, complications of law enforcement, such as restrictions on public parking spaces.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

-

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The government should support special regulations on taxation, subsidization for start-ups and tax deduction to promote competitions in the market. Strict laws on car parking should be enforced. Explicit plans on the development of public transport and other connections have to be outlined in order to make the idea of carbon-free society achievable. The car-sharing industry can contribute to this success as EV carsharing can be part of the business to promote electric vehicles and other related issues, such as sales of electric vehicles and tax deduction.

ASAP Go's interview on July 1, 2020

- 1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

ASAP is a car-rental business that provides one-stop services. There are long-term car-rental services for organizations, daily rental services and services of drivers. The business also offers car-sharing services, which are specially for corporate clients (public & private). The fleet-sharing system is installed for carpools at each organization.

- 2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.**

A service provider, as mentioned above.

- 3. What makes a successful car-sharing business?**

A successful car-sharing business is to be an integral part of urban life in Bangkok. This means the business becomes another mode of transport people are aware of and can access easily.

- 4. What are the indicators of the success of a car-sharing business in Bangkok?**

Public awareness of the business and number of individuals and organizations, such as government sectors and other commercial sectors, who make contributions to the success.

- 5. How would you rate the current performance of car-sharing services in Bangkok out of 10?**

2-3 points, because it is still a new business for Thai people.

- 6. What factors contribute to the success of the car-sharing industry?**

Public understanding of the business and its system, interesting service models that attract more clients and urban geography favorable to the business, such as low traffic volumes and free parking. In addition, more businesses in the market can lead to growth of the industry and lead to new developments. Business partners from other commercial sectors, such as Central and CP, are also key to the success as they can collaborate with the car-sharing industry to enhance the success. Apart from that, the good quality of the services is the contributing factor too.

- 7. What factors hinder the success of the car-sharing industry?**

Lack of clients' understanding of the business, lack of knowledge related to technologies and restrictions on car parking. Also, lack of government support and bad urban geography (traffic congestion) are the obstacles to people's travel in the city center. An expansion of BTS networks, for example, can facilitate people's travel and provide more options of transport. It can subsequently lead to an expansion of car-sharing networks. Apart from that, high expenses of the services, compared with low-priced taxi services, can deter people from using carsharing, although taxis can only offer point-to-point services.

- 8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?**

-

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The government sectors should promote areas where car-sharing services are available, such as areas around shopping malls in the city center. As a result, clients will be assured that they can access the service easily. Other special supports, like free parking, are favorable to the business too.

Office of Transport and Traffic Policy and Planning (OTP)'s interview on July 24, 2020**1. Please tell us about the roles you and your organization play in the area of public transportation system in Bangkok.**

The Office of Transport and Traffic Policy and Planning (OTP) is in charge of executing and scrutinizing plans and giving suggestions on transportation in terms of policy implementation. With regard to individuals' responsibilities, the personnel's principal task is concerned with proposing schemes and policies on the connectivity of transportation networks and public transportation, not least the connectivity between public transportation and other transport infrastructures, which is still below par. The OTP's objective is to help facilitate people's travel and provide them with the benefits from the costly investment in the rail system. Due to the poor connectivity, it is unlikely for the public transportation system to gain a decent market share from other transportation modes. It makes the networks unworthy of the investment.

2. Please explain the roles you and your organization play in the car-sharing industry in Bangkok.

The OTP regards that feeder services contribute a great deal to improving the connectivity between public transportation networks and carsharing is one of the alternatives. Anyway, the Ministry of Transport has not yet formulated any clear policies on it. There is promotion of the car-sharing industry through the broad concept of 'Green Transport', but no specific schemes have been created yet. The Green Transport Policy is aimed at the shared mobility and the support of the use of public transportation. Carsharing and carpooling are also part of the shared mobility. The OTP has been interested in the car-sharing industry and following several pilot projects, such as HAMO and Haupcar. In addition, carsharing is included in Bangkok's Transport Demand Management strategies.

3. What makes a successful car-sharing business?

A successful car-sharing business has to be equipped with an on-demand service. That is to say clients can go to the service point where they can access the service straight away. Everybody can also have easy access to the service as it should be everywhere, like taxis.

4. What are the indicators of the success of a car-sharing business in Bangkok?

The indicators are number of clients, service quality, ready availability (which can dynamically affect the number of clients) and waiting time. Anyway, it is not worth an investment at the initial stage. (The interviewee sees the profitability of the operation and the contributions the business would make to the overall economy as different things.)

5. How would you rate the current performance of car-sharing services in Bangkok out of 10?

5-6 points

6. What factors contribute to the success of the car-sharing industry?

Cooperation and government subsidization are essential to the success. There are also other factors, including quick and easy accessibility, ready availability and number of service points. Apart from that, clients' familiarity with smartphones related to carsharing, the awareness of

the system and other conveniences, such as registration process and easy use of car-sharing Apps, also play their parts in the success.

7. What factors hinder the success of the car-sharing industry?

One thing is cashless payment, which is a relatively new payment option unfamiliar to most Thai people. As people are mainly using cash, it could be particularly difficult for car-sharing businesses. Surcharges can also be added to clients' expenses. Moreover, there is still not widespread and sufficient support for it.

At present, as carsharing is still not widely known, the demand for the service is quite low. This makes it difficult to extend its networks in a wider society. The intricacy of service and application procedures can also have a negative impact on client demand. Clients' risks and expenses incurred have to be considered as they can lead to falling demand. Although the average fare of a car-sharing service is still less than that of a taxi, the latter may still be more appealing, given the comparison between the risks and expenses of both businesses.

8. Are there any government policies or plans on transportation and other related issues that affect the industry? How do the policies work?

No policies have been formulated to support the car-sharing industry thus far. The government sectors still have no potential to operate the system of this particular service.

9. Apart from those policies, what do you think both government sectors and private sectors should do to achieve the success of the car-sharing industry, and what are the results of policy implementation going to be like?

The government should give legal rights to private sectors in favor of the car-sharing industry. Legislative processes are key to facilitating the operation of the industry effectively. The success of the car-sharing industry can then be achieved by the support of the government, as well as their cooperation with private sectors. Despite no supportive laws being enforced, the government should initiate pilot projects in collaboration with private sectors to push forward car-sharing schemes. To run a car-sharing business in an open system is more challenging than in a closed system (The scale of each system must also be made clear whether it is on the scale of area, municipality, district, province or country).

Others

At present, policies on car rental registration are unclear in terms of implementation. Most clients are unwilling to go along with having their cars registered as the average price of a registered rental car is usually lower than the market price. Anyway, the OTP sees the car-sharing industry as part of public transportation, not a rival getting clients from other transportation modes.

Appendix B
Variables from the interview

Table 6-1 All variables from interview

Variables	Counts
Vision	61
• Outcome	26
– Being one of the top-of-mind transportation modes.	3
– Being one of the top-of-mind transportation modes.	3
– Sustainable business	3
– High utilization and business growth	3
• Service	35
– Services are convenient and easy to use	10
– Sufficient stations and coverage area	7
– High variety of vehicle types and models	6
– Being able to pick-up and drop-off vehicles at different locations.	3
KPI	59
• Government	1
– Supports and endorsement from relevant parties	1
• Outcome	37
– Number of users, number of reservations/days, utilization rate	8
– Reduction of externalities (pollution, number of accidents, energy consumption)	5
– Number of personal cars	4
– Convenience and ease of use	3
– People’s awareness of carsharing services	2
– Profitable business model	2
– Reducing vehicle ownership	2
• Service	19
– Accessibility	3
– Number of stations and coverage area	2
– Safety and cleanliness	2
Positive	
• Collaboration	15
– Stakeholder collaboration	6
– Competitions among CS operators	3
– Level of collaborations among transportation providers	2
• Geographical	2
– Level of traffic congestion	2
• Outcome	1
– Being one of the top-of-mind transportation modes.	1
• Promote	15
– People’s awareness of carsharing services	15
• Public transport	4
– Quality of road network and public transportation systems	4
• Service	35
– Sufficient number of stations and coverage area	4
– Convenient and attractive services	4
– Value for money	4

Variables	Counts
• Support	9
– Government support and endorsement	4
– Government campaign on environmental awareness	2
– Legalization of carsharing services	1
• Trend	8
– Positive values of private cars	3
– Positive values of CS	1
– Familiarity with smart phone	1
Negative	
• Service	39
– People’s awareness of carsharing services	6
– Users’ confidence in carsharing services	6
– Alternative modes	5
– Parking is hard to find in the city	3
• Government	9
– Legalization of carsharing services	3
– Policy of carsharing services	3
– Government campaign on environmental awareness	1
• Trend	5
– Negative mindset to carsharing	1
– Good economy improvement	1
– Limited use of power of purchase	1
• Public transport	4
– Quality of road network and public transportation systems	2
• User	4
– Users’ responsibility	1
– Number of driver’s license holders	1
– Ability to pay	1
• Collaboration	3
– Stakeholder collaboration	2
– Conflicts with the existing transportation mode	1
• Competition	3
– Convenience of private cars	2
– High service charge	1
• Eco	1
– Eco system	1
– Poor urban planning	1
• Market	1
– People’s awareness of carsharing services	1

Appendix C
Responses to IATSS Advisor's Comments

IATSS Advisor's Comments	Research Team's Responses
<p>Since it has not been that long since the last presentation, I presume that the project has not made much progress due to the significant impact of the pandemic.</p>	<p>Thank you for your review and comments. We have since completed the assignments set in our project. Due to Covid-19 regulation, we have been unable to hold the additional briefing request by OTP. Also, OTP has specifically requested an in-person meeting for this briefing. We will look to undertake this activity in the coming months.</p>
<p>This slide includes slides of the response to the comment sheets from the IATSS side at the interim presentation, and I think the responses described are appropriate. I don't think the project members have had time to address all of them yet, but there were probably other comments that were made, and I hope you will consider them.</p>	<p>Thank you for your positive comments, we have considered these comments to improve our project accordingly.</p>
<p>As a future collaboration, the 36th slide shows that the workshop in January has been postponed. I think there is a high possibility that the workshop will be conducted online at least during 2021.</p>	<p>It is correct that the January workshop has been postponed. We have discussed with OTP for an alternative fashion for such activity, e.g., an online workshop or a hybrid online/in-person formats. However, OTP preferred to have a physical workshop when it is safe to do so. We are still checking with OTP from time to time.</p>
<p>It is also mentioned that there are issues regarding the level of participation in discussions by participants. I think this is something that needs to be addressed. On the other hand, the online workshop is promising because it will hopefully allow people from far away to participate.</p>	<p>The online workshop has made it more convenient for people to attend by which the level of participant can be further enhance through workshop planning and activities. We have since considered to include a better ice-breaking activity in our next workshop to ensure higher level of participation. Also, we may consider undertake activities in small groups that are connected in the future.</p>
<p>The main target of the research will be the Bangkok market, but by comparing it with other regions, the challenges in Bangkok and the desirable form of the ideal car-sharing business may be revealed. I did</p>	<p>This comment is highly relevant as the effects of Covid-19 is likely to sustain in longer term. We will look to consider also the difference between stakeholders in Bangkok and regional cities in our future undertaking.</p>

<p>think that if the workshop is going to be held online, it might be good to include as many different perspectives as possible. This is just a comment and you do not have to follow it. I hope that the workshop will be conducted in a way that meets the objectives of the research group.</p>	
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References

- Ackermann, F., Andersen, D. F., Eden, C., & Richardson, G. P. (2010). Using a group decision support system to add value to group model building. *System Dynamics Review*, 26(4), 335–346. <https://doi.org/10.1002/sdr.444>
- Andersen, D. F., & Richardson, G. P. (1997). Scripts for group model building. *System Dynamics Review*, 13(2), 107–129. [https://doi.org/10.1002/\(sici\)1099-1727\(199722\)13:2<107::aid-sdr120>3.3.co;2-z](https://doi.org/10.1002/(sici)1099-1727(199722)13:2<107::aid-sdr120>3.3.co;2-z)
- Andersen, D. F., Richardson, G. P., & Vennix, J. A. M. (1997). Group model building: Adding more science to the craft. *System Dynamics Review*, 13(2), 187–201. [https://doi.org/10.1002/\(SICI\)1099-1727\(199722\)13:2<187::AID-SDR124>3.0.CO;2-O](https://doi.org/10.1002/(SICI)1099-1727(199722)13:2<187::AID-SDR124>3.0.CO;2-O)
- Antoniou, C., Efthymiou, D., & Chaniotakis, E. M. (2019). *Demand for Emerging Transportation Systems: Modeling Adoption, Satisfaction, and Mobility Patterns*. Elsevier.
- BCS. (2015). The State of European Car- Sharing. *Bundesverband Carsharing e. V., Final repo*, 84.
- Becker, H., Ciari, F., & Axhausen, K. W. (2017). Comparing car-sharing schemes in Switzerland: User groups and usage patterns. *Transportation Research Part A: Policy and Practice*, 97, 17–29. <https://doi.org/10.1016/j.tra.2017.01.004>
- Chen, D., Kockelman, K., & Hanna, J. (2016). Operations of a shared, autonomous, electric vehicle fleet: Implications of vehicle & charging infrastructure decisions. *Transportation Research Part A: Policy and Practice*, 94, 243–254. <https://doi.org/10.1016/j.tra.2016.08.020>
- de Gooyert, V., Rouwette, E., van Kranenburg, H., & Freeman, E. (2017). Reviewing the role of stakeholders in Operational Research: A stakeholder theory perspective. *European Journal of Operational Research*, 262(2), 402–410. <https://doi.org/10.1016/J.EJOR.2017.03.079>
- Delhaes, D. (2016). *New Law Set To Boost Carsharing*. Handelsblatt. <https://www.handelsblatt.com/today/companies/handelsblatt-exclusive-new-law-set-to-boost-carsharing/23540350.html?ticket=ST-326007-0je9uclj1nPlvtBFUgWo-ap6>
- Elliott, C. (2019). *Will This New Law Kill Car Sharing?* Forbes. <https://www.forbes.com/sites/christopherelliott/2019/06/19/will-a-new-law-kill-car-sharing-in-this-state/#6912dd6d30e4>
- Gakenheimer, R. (1999). Urban mobility in the developing world. *Transportation Research Part A: Policy and Practice*, 33(7–8), 671–689. [https://doi.org/10.1016/S0965-8564\(99\)00005-1](https://doi.org/10.1016/S0965-8564(99)00005-1)
- Galletta, A., & Cross, W. E. (2013). Mastering the semi-structured interview and beyond: From research design to analysis and publication. In *Mastering the Semi-Structured Interview and Beyond: From Research Design to Analysis and Publication*. <https://doi.org/10.5860/choice.51-2430>
- Giesel, F., & Nobis, C. (2016a). The Impact of Carsharing on Car Ownership in German Cities. *Transportation Research Procedia*, 19, 215–224. <https://doi.org/10.1016/j.trpro.2016.12.082>
- Giesel, F., & Nobis, C. (2016b). The Impact of Carsharing on Car Ownership in German Cities. *Transportation Research Procedia*, 19, 215–224. <https://doi.org/10.1016/j.trpro.2016.12.082>
- GIZ. (2014). *Carsharing Services in Emerging Economies- Sustainable Urban Transport Technical Document #12*.
- Hoppenbrouwers, S., & Rouwette, E. (2012). A dialogue game for analysing group model building: framing collaborative modelling and its facilitation. *International Journal of Organisational Design and Engineering*, 2(1), 19. <https://doi.org/10.1504/ijode.2012.045905>
- Hovmand, P. S. (2014). *Community Based System Dynamics: Lessons from The Field*.

- Jittrapirom, P., Marchau, V., van der Heijden, R., & Meurs, H. (2018). Dynamic adaptive policymaking for implementing Mobility-as-a Service (MaaS). *Research in Transportation Business and Management*, 27(July), 46–55. <https://doi.org/10.1016/j.rtbm.2018.07.001>
- Lane, C. (2005). PhillyCarShare. *Transportation Research Record: Journal of the Transportation Research Board*, 1927(1), 158–166. <https://doi.org/10.1177/0361198105192700118>
- Lane, C., Zeng, H., Dhingra, C., & Carrigan, A. (2015). Carsharing A Vehicle for Sustainable Mobility in Emerging Markets? In *WRI Ross Center for Sustainable Cities*.
- Le Vine, S., Zolfaghari, A., & Polak, J. (2014). *Carsharing: Evolution, Challenges and Opportunities*.
- Martin, E., & Shaheen, S. (2011). The Impact of Carsharing on Public Transit and Non-Motorized Travel: An Exploration of North American Carsharing Survey Data. *Energies*, 4(11), 2094–2114. <https://doi.org/10.3390/en4112094>
- Martin, E., & Shaheen, S. (2016). Impacts of car2go on Vehicle Ownership, Modal Shift, Vehicle Miles Traveled, and Greenhouse Gas Emissions: An Analysis of Five North American Cities. In *Working Paper from the University of California, Berkeley*. <http://www.tsrc.berkeley.edu>
- Martin, E., Shaheen, S. A., & Lidicker, J. (2010). Impact of Carsharing on Household Vehicle Holdings. *Transportation Research Record: Journal of the Transportation Research Board*, 2143(1), 150–158. <https://doi.org/10.3141/2143-19>
- Münzel, K., Boon, W., Frenken, K., & Vaskelainen, T. (2018). Carsharing business models in Germany: characteristics, success and future prospects. *Information Systems and E-Business Management*. <https://doi.org/10.1007/s10257-017-0355-x>
- OTP. (2015). *Travel demand management study for Bangkok city*.
- Purwanto, A., Sušnik, J., Suryadi, F. X., & de Fraiture, C. (2019). Using group model building to develop a causal loop mapping of the water-energy-food security nexus in Karawang Regency, Indonesia. *Journal of Cleaner Production*, 240. <https://doi.org/10.1016/j.jclepro.2019.118170>
- Richardson, G. P. (2013). Concept models in group model building. *System Dynamics Review*, 29(1), 42–55. <https://doi.org/10.1002/sdr.1487>
- Rouwette, E. A. J. A., Vennix, J. A. M., & Van Mullekom, T. (2002). Group model building effectiveness: A review of assessment studies. *System Dynamics Review*, 18(1), 5–45. <https://doi.org/10.1002/sdr.229>
- Schreier, H., Grimm, C., Kurz, U., Schwieger, B., Kessler, S., & Möser, G. (2018). Results of Impact Analysis of Car-Sharing Services and User Behaviour Delivers Interesting Results in Bremen – Share North. In *Interreg North Sea Region*. <https://share-north.eu/2018/05/results-of-impact-analysis-of-car-sharing-services-and-user-behaviour-delivers-interesting-results-in-bremen/>
- Scott, R. J., Cavana, R. Y., & Cameron, D. (2016). Recent evidence on the effectiveness of group model building. *European Journal of Operational Research*, 249(3), 908–918. <https://doi.org/10.1016/j.ejor.2015.06.078>
- Shaheen, S. A., & Cohen, A. P. (2013). Carsharing and Personal Vehicle Services: Worldwide Market Developments and Emerging Trends. *International Journal of Sustainable Transportation*, 7(1), 5–34. <https://doi.org/10.1080/15568318.2012.660103>
- Sioui, L., Morency, C., & Trépanier, M. (2012). How Carsharing Affects the Travel Behavior of Households: A Case Study of Montréal, Canada. *International Journal of Sustainable Transportation*, 7(1), 52–69. <https://doi.org/10.1080/15568318.2012.660109>
- Sterman, J. (2000). *Business dynamics: systems thinking and modeling for a complex world*. Irwin/McGraw-Hill.
- Stocker, A., Lazarus, J., Becker, S., & Shaheen, S. (2016). *Effects on Vehicle Use and Ownership, Travel*

Behavior, Quality of Life, and Environmental Impacts.

Strauss, A., & Corbin, J. M. (1990). Basics of qualitative research: Grounded theory procedures and techniques. In *Basics of qualitative research: Grounded theory procedures and techniques*. Sage Publications, Inc.

Vennix, J. A. M. (1996). *Group model building : facilitating team learning using system dynamics*. Wiley.

Voinov, A., Kolagani, N., McCall, M. K., Glynn, P. D., Kragt, M. E., Ostermann, F. O., Pierce, S. A., & Ramu, P. (2016). Modelling with stakeholders - Next generation. *Environmental Modelling and Software*, 77, 196–220. <https://doi.org/10.1016/j.envsoft.2015.11.016>

Yoshida, T., Yamagata, Y., Chang, S., de Gooyert, V., Seya, H., Murakami, D., Jittrapirom, P., & Voulgaris, G. (2020). Spatial modeling and design of smart communities. In *Urban Systems Design* (pp. 199–255). Elsevier. <https://doi.org/10.1016/b978-0-12-816055-8.00007-5>

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