The Socio-technical Dimensions of Shared Mobility Innovations:

The Case of Digital Ridesharing Platforms in Southeast Asia

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A thesis submitted for the degree of

Doctor of Philosophy

Michaelmas 2024

Abstract

Digital ridesharing platform (“ridesharing”) innovations constitute a new socio-technical system in urban mobility, whereby people and institutions interact with technology in ways that reshape how people travel and relate to one another. Through three interdisciplinary, multi-method studies, I explore how the rapid adoption of ridesharing in Southeast Asia engendered social norms, moral codes of conduct, and trust when innovations introduced by startups like Grab and Uber induced strangers to interact in the confined space of a shared ride. The first study analyses the case of how ridesharing scaled rapidly from 2012 to 2022 in Southeast Asia using the Multi-Level Perspective (MLP) framework and found that entrant competition between ridesharing startups, fueled by venture capital, accelerated a transition towards ridesharing in under a decade. This finding contributes to the socio-technical transitions literature in transport geography. The second study examines social norms and moral codes in ridesharing in Singapore and Manila through 65 qualitative interviews of drivers and passengers. Interactions between drivers and passengers were shaped by pre-existing prejudices and privacy concerns, reflecting broader societal dynamics, contributing an understanding of urban encounters between strangers in shared rides to urban studies and transport geography. The third study surveyed 553 passengers to understand the role of user trust in the usage and satisfaction of pooled ridesharing services. It extends the Technology Acceptance Model from information systems research by showing that different types of trust—interpersonal and institutional—significantly influence the decision to use ridesharing. Ultimately, this thesis shows how the socio-technical dimensions of ridesharing innovations shape and are shaped by how ridesharing users and companies should behave and relate to and trust one another.

Acknowledgements

This thesis is dedicated to my beloved parents and my husband, Shen, whose unwavering love, support, and belief in me have been my greatest sources of strength throughout this journey. To my mother and late father, thank you for instilling in me the values of seeking truth beyond what is in front of us, persevering through challenges, and living a life of purpose and gratitude. To Shen, your encouragement, care, and fortitude during the most challenging moments made this achievement possible—thank you and I look forward to our new adventures with Sebastian, who inspires me to complete this thesis.

I would like to express my deepest gratitude to my supervisor, Professor Tim Schwanen. His generous commitment of time, invaluable guidance, and constant support have been instrumental in shaping this work. His profound insights and encouragement, combined with his dedication to teaching me what it means to be a thoughtful and rigorous researcher, have left an indelible mark on both my academic journey and personal growth. I am truly honoured to have had him as a mentor and role model.

I am also immensely grateful to my colleagues and friends that I have crossed paths with, including Kirsty Ray, Wenbo Guo, Dr. Kezhen Hu, Dr. Peilin Li, Yifan Han, Dr. Ben Ma, Dr. Neil Lopez, Dr. Raymund Abad, Dr. Krister Roquel, Dr. Ersilia Verlinghieri, Helen Morrisey, Dr. Debbie Hopkins, Prof. Christian Brand, Dr. Jennie Middleton, Dr. Brendan Doody, and Dr. Denver Nixon. I also thank Selena Galeos, Mag Chalil, Dr. Jarek Kriukow, and Ardiansyah Muhammad for their excellent research assistance and advisory; and my dear friend, Pauline Kang Fiennes, for making Oxford such a delight. Their collaboration, feedback, and camaraderie have enriched my academic experience and made this journey all the more rewarding.

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Submission Plan for Publications

The paper presented in Chapter Four has been submitted for publication and the papers in Chapters Five and Six will be submitted for publication in the following peer-reviewed journals:

Chapter Four:

Teng, N. and Schwanen, T. Competition and the rapid scaling of niche innovations: The case of Southeast Asia's ridesharing industry (2012-2022).

Under First-Round Revision at *Technological Forecasting and Social Change*

Chapter Five:

Teng N. Stranger encounters in ridesharing: Urban microcosms of social norms and informal codes about moral conduct

To be submitted to *Urban Studies*

Chapter Six:

Teng N. In strangers we trust? Analyzing the role of trust in the adoption of on-demand ridesharing

To be submitted to *Transportation Research Part A: Policy and Practice*

1. Chapter One - Introduction

1.1 Background and rationale of study

Smartphone application (app) platform innovations have given rise to the digital hailing of on-demand, shared rides between strangers in Southeast Asia since 2012. Digital ridesharing platform services enable passengers to request a ride from the nearest available driver through the use of real-time, data-driven algorithms on smartphone apps (Jin *et al.*, 2018; Shaheen & Cohen, 2019; Sundararajan, 2016). Digital ridesharing platform services, used interchangeably with “ridesourcing,” “ridesplitting,” and “ride-hailing,” is the act of sharing a ride between a driver and one or more passengers through a digital ridesharing app (Siddiqi & Buliung, 2013). I will refer to digital ridesharing platform services as simply “ridesharing” in this thesis. Ridesharing firms offer diversified services that include the matching of on-demand taxi, private car and carpooling rides in private vehicles (cars, taxis, three-wheelers, and motorcycles) between a driver and passenger(s). As such, on-demand, digital ridesharing platforms have given rise to algorithmically matched rides between groups of strangers—both drivers and passengers who share a social experience in a confined vehicle space.

Ridesharing has gained popularity globally among passengers in dense, urban areas due to its ease of use (Rayle *et al.*, 2016), cost savings compared to private transport options (Santos & Xavier, 2015), and user flexibility to travel from point A to point B efficiently compared to other private and public transport alternatives (Acheampong *et al.*, 2020; Stiglic *et al.*, 2016). For some passengers, ridesharing platform apps offer a potentially safer experience due to technological features that enable GPS tracking and the sharing of ride details through social media for friends or family in case of an emergency (Acheampong, 2021). Existing taxi or professional drivers benefit from using ridesharing apps to efficiently find customers closest to them, while private vehicle owners have an opportunity to earn an income as gig workers by using their vehicle to drive customers. Despite these benefits of ridesharing that have led to its mass adoption, there are some drawbacks regarding safety and driver welfare that have been raised for both ridesharing companies and government regulators to address. Ridesharing safety concerns exist, particularly among female passengers, as there have been cases where female passengers have been harassed by ridesharing drivers (Icasiano and Taeihagh, 2021). Ridesharing platform companies have also been scrutinized in some jurisdictions globally for unfair practices of not recognizing drivers as employees who may be entitled to employee welfare benefits or minimum wages (Icasiano and Taeihagh, 2021).

Because of the rapid adoption of ridesharing among users, digital ridesharing platform companies have received unprecedented funding and valuations as private startup companies (Brail, 2022), and a few have become publicly listed companies since 2019. While online ridesharing services first emerged in the United States (US) in 2004 (Chan & Shaheen, 2012), the popularity of on-demand ridesharing in Southeast Asia has grown exponentially from 2012 onwards and can be characterized by the public market capitalizations of leading global companies headquartered in the US (Uber and Lyft) and Asia (Didi, Grab, GoTo (GoJek), and Ola). Uber was founded in 2009, went public through an initial public offering in 2019, and currently has a market capitalization of USD 163.7 billion; while Lyft was founded in 2012, also went public in 2019, but has a smaller market capitalization of USD 5.1 billion.[1] The Chinese-

[1] As of 10 October 2024

headquartered ridesharing platform company, Didi, was founded in 2012, merged with its major competitor Kuadi in 2015, went public in 2021, and has a market capitalization of USD24 billion.[2] Grab, the focal ridesharing firm studied in this thesis, was founded in Malaysia in 2012 and currently operates in eight countries across Southeast Asia (Malaysia, Philippines, Thailand, Vietnam, Singapore, Indonesia, Cambodia, and Myanmar). Nonetheless, given Uber's wider global reach and top position in the ridesharing industry, Grab made international headlines when it acquired Uber's entire Southeast Asian division in March 2018 and became the dominant digital ridesharing firm in Southeast Asia (Waters & Lucas, 2018). Grab went public in December 2021 and has a market capitalization of USD14.4 billion.[3] GoJek, the other focal ridesharing platform company in Southeast Asia headquartered in Indonesia and launched in 2015 as a digital platform application company, merged with Tokopedia, an e-commerce company also from Indonesia, to form GoTo in 2021. GoTo went public in 2022 and has a market capitalization of USD4.1 billion.[4] Ola, based in India, is the most recent major ridesharing platform company to go public in 2024 and has a market capitalization of USD4.7 billion.[5] The rise of the ridesharing industry has made it a ubiquitous service for users in urban areas globally. The past decade has shown that innovative digital ridesharing firms like Grab and Uber have been favoured by the international investment community and the public, whereby they have respectively raised USD11.5 billion and USD24 billion in private funding before their initial public offerings.

[2] As of 10 October 2024
[3] Ibid
[4] Ibid
[5] Ibid

My thesis is motivated by my previous work experience as an early senior employee at Grab, the focal digital ridesharing company studied in this thesis, from June 2013 to June 2017, where I helped to launch new markets and services regionally, and subsequently led regulatory affairs as the founding Regional Business Development Lead, Country Heads of Thailand and Vietnam, and subsequently the Vice President of Public Affairs. My experience as an early employee tasked with helping the company expand regionally starting in June 2013 also enabled me to understand and observe how digital ridesharing platform applications, which were introduced by Grab in June 2012 grew from a niche innovation into a widely adopted innovation. I witnessed how ridesharing scaled fast despite multiple challenges of regulatory ambiguity and scrutiny, a lack of smartphone ownership and access to mobile internet among drivers, slow mobile internet infrastructure in most of the region, and opposition from the incumbent taxi industry. I also experienced the intense competitive landscape in which Grab was embedded along with other competing digital ridesharing platform startup companies like EasyTaxi, Uber, and GoJek in the region—and how these startup companies inadvertently helped the new practice of ridesharing to scale, even though some companies did not survive in the region. These experiences of seeing first-hand how digital ridesharing platform innovations were quickly and widely adopted across Southeast Asia, despite initial challenges, motivate the first and second studies of my thesis, detailed in Section 1.2 and in Chapters Four and Five, respectively.

As digital ridesharing services have become more commonplace, there is growing literature on the antecedents to the rapid scaling of niche innovations that can help to explain the rapid adoption of digital ridesharing platform innovations. The Multi-Level Perspective (MLP), detailed in Section 2.2.2, offers a framework to understand the factors and processes responsible for the rapid scaling radical innovations, whereby an emerging innovation can grow, gain momentum, and eventually reconfigure or replace an incumbent technology system—completing a socio-technical transition—when the right windows of opportunity emerge and pressures are exerted between the niche (radical innovations), regime (incumbent, dominant socio-technical system), and landscape levels (the broader environment and context that can create pressures or opportunities for which the socio-technical transitions occur) (Geels 2002, 2005; Geels *et al.*, 2017; Geels, 2018). Several research studies have documented how ridesharing innovations have disrupted incumbent taxi and public transport sectors globally (Clewlow & Mishra, 2017; Contreras & Paz, 2018; Dreyer *et al.*, 2017; Jin *et al.*, 2018; Kim *et al.*, 2018; Laurell & Sandstrom, 2016; Mair & Reischauer, 2017; Nie, 2017; Watanabe *et al.*, 2017), but how ridesharing startups have competed with incumbent taxi firms and other rival entrants and their subsequent effect on driving the rapid scaling of the overall ridesharing industry remain understudied.

The rapid growth and transformative potential of disruptive innovations, such as digital ridesharing platforms, have increasingly drawn scholarly attention. These innovations can prompt significant socio-technical shifts, challenging and often displacing traditional systems like the established taxi industry. Within these transitions, various stakeholders play an influential role by driving changes that enable radical innovations to stabilize and gain momentum. Recent research has reconceptualized the MLP as a framework in which actors have agency in influencing the speed and direction of socio-technical transitions by shaping the properties of the three levels of niches, regimes, and landscapes (Kanger, 2021). Kanger (2021) identifies three factors that can impact the rapid scaling of radical innovations: (1) landscape pressure intensity: the extent to which the landscape can exert pressure on the incumbent regime and enable the development of radical innovations, (2) regime resilience: the extent to which the incumbent regime can withstand external pressures and co-opt radical innovations without changing its architecture, and (3) niche maturity: the extent to which the radical innovation has stabilized along various dimensions. The author posits that the right configuration of a high degree of these three factors can lead to different transition pathways that enable the rapid scaling of niche innovations. Geels and Turnheim (2022) examine how innovations such as renewable energy technologies and electric vehicles interact with established systems and policy frameworks to support a shift toward low-carbon solutions, identifying critical factors for scaling, including technological advancement, policy backing, and market dynamics. Similarly, Andersen and Geels (2023) explore how interactions across interconnected systems, like energy, transportation, and housing, impact the pace of transitions toward net-zero emissions. Their findings emphasize the need for coordinated, cross-sectoral efforts to scale niche innovations and achieve broader sustainability goals. However, less focus has been placed on how competitive pressures from new entrants—often supported by substantial venture capital investments—can accelerate the scaling and socio-technical transition of digital ridesharing platforms within a brief period.

Although ridesharing firms like Grab have advertised how ridesharing can foster positive social relations among strangers in society, recent literature has revealed adverse effects of shared rides among strangers. An audit study from almost a decade ago (Ge *et al.*, 2016) found evidence of racial and gender discrimination in ridesharing platforms in US cities. This follows the findings of similar audit studies conducted in the home sharing platform industry in which an online marketplace matches people who are willing to share their homes with guests who are strangers (Cui *et al.*, 2019; Edelman *et al.*, 2017).

Research on ridesharing has also begun to explore the nuanced social interactions between drivers and passengers who are strangers, grouped together by an algorithm in shared carpooling rides (Pratt *et al.*, 2019). These studies focus on trust and the often uneasy dynamics within the confined space of pooled, on-demand rides arranged via digital apps (Pratt *et al.*, 2019; Morris *et al.*, 2020; Hansen and Sener, 2023; Sarriera *et al.*, 2017). For example, Pratt *et al.* (2019) found that users of UberPool and Lyft Shared frequently voiced frustrations over unpredictable travel times and uncomfortable forced interactions. Similarly, Morris *et al.* (2020) found that pooled ridesharing drivers across the US reported many social interactions between passengers who are strangers to be unpleasant or awkward, with silent tension as passengers refuse to engage with one another or even conflicts and arguments. Sarriera *et al.* (2017) found that potential negative encounters discouraged pooled ridesharing usage more than potential positive social experiences attracted users. Overall, recent studies indicate that social interactions among strangers in shared rides tend to be largely negative.

My former work experience at Grab also enabled me to witness how drivers and passengers were initially hesitant to use digital ridesharing platform services from 2013 to 2017. My job had involved training ridesharing drivers on how to use the digital platform application and develop trust in the company—trust that the technology would work reliably, trust that the company would pay them the fares that they earned, and trust that passengers were verified and registered so that they would not have to bear the risk of picking up passengers who would threaten their safety or would not pay them for the ride. At the same time, my colleagues in the marketing and technology departments at Grab had spent significant effort in ensuring that passengers could trust taking rides through a digital platform application because riding in private ridesharing vehicles with private drivers and other strangers was a foreign concept to Southeast Asia. The

Grab team emphasized that: the drivers would be trained and verified for identification purposes, the rides would be tracked, and the ride details could be shared in real-time with friends and family, and the company can vet drivers to ensure that errant drivers could not be on the platform. When Grab introduced carpooling services like GrabShare[6] and GrabHitch,[7] a lot of marketing was done to ensure that passengers could trust sharing a ride with complete strangers who are also traveling in the same direction to save costs and increase the efficiency of rides in cities. The company perceived trust as a key factor in whether drivers and passengers would use a new digital ridesharing platform to travel with strangers in intimate vehicle spaces across Southeast Asian cities since 2012, which motivates the third study of my thesis detailed in Section 1.2 and in Chapter Six.

As such, I aim to explore how different types of trust plays a role in the choice for passengers to use digital ridesharing services. Most research to date on the role of trust in digital ridesharing platform services centres on institutional trust in the platform or interpersonal trust between passengers and drivers yet does not address the role of dispositional trust in strangers or society in general. Dispositional trust in strangers in general is relevant in the case of ridesharing because passengers are sharing the confined space of a car ride with drivers and possibly other passengers who are strangers. Studies indicate that female users tend to be more sensitive to perceived safety risks, which shapes their trust in ridesharing (Shao *et al.*, 2022; Ma *et al.*, 2019).

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[6] GrabShare is an on-demand, commercial carpooling service like UberPool and Lyft Shared (formerly Lyft Line), whereby passengers agree to be matched to ride with other passengers who are traveling in similar routes and are driven by a commercially licensed ridesharing driver.

[7] GrabHitch is a social carpooling service that differs from GrabShare in that the rides are driven by a private driver who are not commercially licensed, and rides must be booked at least two hours in advance. GrabHitch drivers do not earn an official fare from the ride like in GrabShare but receive enough compensation to subsidize their petrol costs. GrabHitch matches private drivers with passengers who are traveling to the same destination, typically to a workplace or university.

Shao *et al.* (2022) found that trust in Didi, a popular platform in China, directly influences perceived benefits, risks, and likelihood of recommending the service, with female users placing particular importance on fair interactions. Similarly, Ma *et al.* (2019) showed that factors such as gender, age, and income affect trust and risk perception, noting that female users are less likely to trust drivers in situations perceived as physically risky. In a US-based study, Su *et al.* (2024) found that trust in both drivers and co-passengers is critical for users considering pooled ridesharing services like UberPool or Lyft Shared. Thus, digital ridesharing innovations present research gaps in understanding what drove its rapid diffusion, and the underlying trust involved among its users inside a shared ride, with the digital ridesharing company, and in greater society.

1.2 Major objectives and research questions

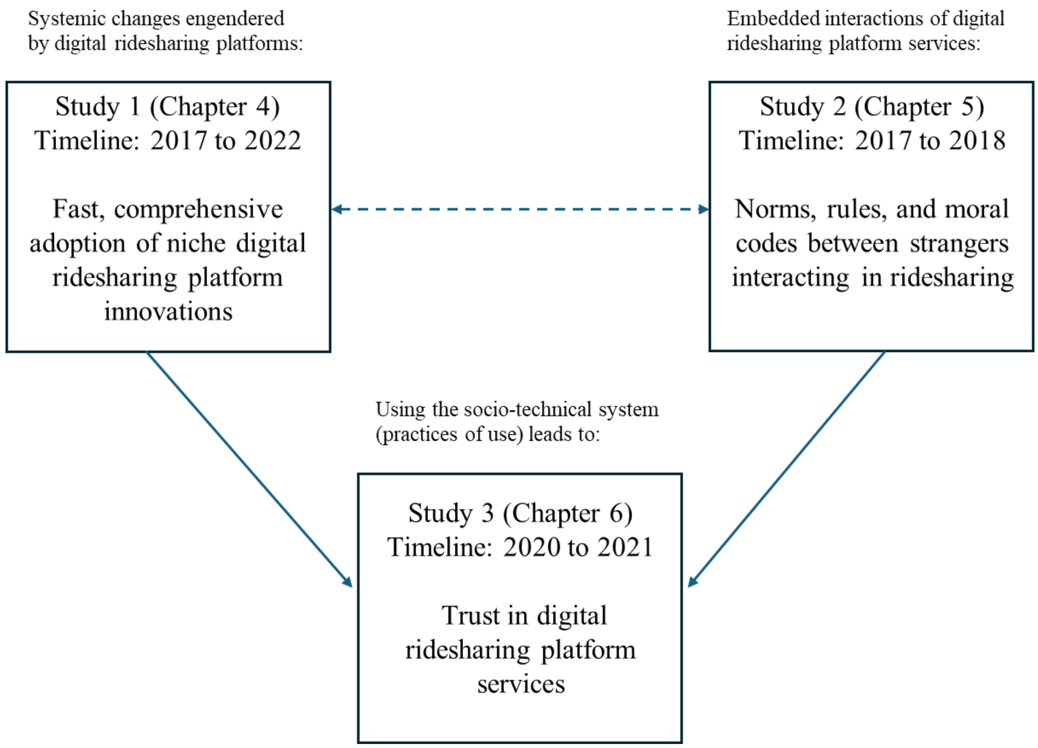

Figure 1.1 A conceptual map of the three studies of this thesis

My thesis focuses on studying digital ridesharing platform innovations as a new socio-technical system in urban mobility, whereby people and institutions interact with the technology in ways that reshape how people travel, relate to one another, and trust ridesharing platform companies, in urban areas. In a socio-technical system, the technological aspects of the system and the social systems involved with the technology in society are interdependent; each shape and is shaped by the other in a continuous, dynamic relationship. For example, digital ridesharing platform innovations as a socio-technical system combine cutting-edge technologies—such as algorithms, real-time GPS tracking, data analytics, and smartphone applications—with social systems that include drivers, passengers, ridesharing platform companies, regulatory bodies, and urban mobility infrastructures. In this thesis, I aim to understand how the entry and rapid adoption of shared mobility innovations like ridesharing has engendered socio-technical changes in how strangers interact with and trust one another in shared rides across Southeast Asia at the macro and micro levels of analysis.

Through an interdisciplinary approach with both qualitative and quantitative methods across three interrelated studies, I explore the socio-technical dimensions and implications of digital ridesharing platform services in select cities across Southeast Asia, whereby a digital platform innovation introduced by startup companies enables strangers to serendipitously interact in the confined space of a shared rides. As shown in Figure 1.1, my first study (Chapter Four) analyses the macro level, systemic changes caused by the rapid, comprehensive adoption of niche digital ridesharing platform innovations in Southeast Asia. My second study (Chapter Five) goes down to the micro level to explore the embedded social interactions of this new socio-technical system; particularly how it introduces social norms, rules, and moral codes of conduct between strangers interacting in a shared ride. The usage of ridesharing as a socio-technical system leads to my third study (Chapter Six), which also goes down to the micro level to examine the different types of trust that emerge between: ridesharing users (interpersonal trust), ridesharing users and the ridesharing platform companies (institutional trust), and between ridesharing users and greater society (dispositional trust).

This thesis takes an interdisciplinary approach, while aligning more closely with the multidisciplinary end of the spectrum as outlined by Barry *et al.* (2008), who describe interdisciplinarity as encompassing a range from multidisciplinarity to transdisciplinarity. While this thesis spans multiple disciplines, its analyses are more interdisciplinary because I synthesize perspectives and use theoretical frameworks from different fields to create more integrated insights that expand beyond the boundaries of individual disciplines. As such, I aim to make an interdisciplinary contribution to three distinct literatures on: (1) socio-technical transitions, (2) stranger encounters in shared rides and (3) trust in digital ridesharing platform services. Specifically, the first study of this thesis contributes to the fields of transport geography and innovation studies by applying the Multi-Level Perspective (MLP) framework, as detailed in Section 2.2.2, to understand the rapid scaling of ridesharing in Southeast Asia. The second study also engages the fields of urban studies and transport geography by exploring how shared rides foster social norms and moral codes of conduct between strangers in confined spaces, reflecting broader societal dynamics in Southeast Asia. Finally, the third study integrates the fields of information systems research, innovation studies, and transport geography by extending the Technology Acceptance Model (TAM), as explained in Section 2.4.2, to analyze the interplay of trust dimensions—interpersonal, institutional, and dispositional—shaping user decisions in digital ridesharing.

My first study (Chapter Four) focuses on the macro level of understanding the rapid, comprehensive systemic changes engendered by the entry and rise of digital ridesharing services in Southeast Asia. I aim to answer these two research questions: *1) what factors enable or constrain the scaling of niche innovations?* and *2) how does competition affect how radical niche innovations rapidly scale?* In doing so, I unpack how the digital platform business model for ridesharing changed the dynamics of competition via intense price wars between ridesharing rivals and a growth-at-all-costs mindset; and changed industry success metrics from profits to a new focus on user growth only. I analyze how a combination of these factors enabled a path for fast user adoption. I also examine how the external regulatory environment in Southeast Asia was not fully ready for such an innovative business model and technology; and how prior research highlights how these regulatory challenges or voids can inhibit niche innovation growth and survival. However, my first study shows how this was not the case in Southeast Asia, where digital ridesharing was rapidly adopted by different stakeholders, despite nascent regulations and initial challenges with the incumbent taxi industry.

The rapid adoption of digital ridesharing platforms in Southeast Asia has highlighted the spontaneous social encounters that occur between drivers and passengers, as well as between multiple passengers—who are typically strangers—in on-demand, shared rides. I aim to explore how these strangers interact during shared rides and to examine the role of trust in the adoption and use of digital ridesharing services. Thus, the second and third studies (Chapters Five and Six, respectively) of my thesis examine the micro-level socio-technical implications of the uncertainty and newness surrounding the use of digital ridesharing.

The second study offers a grounded theory study of the social norms and moral codes of conduct that emerge from, and are reworked through, the act of ridesharing between drivers and passengers in urban areas. I aim to answer the following research question: *what are the social norms and behaviors that arise from encounters between strangers in a shared car ride enabled by ridesharing booking applications?* Through an iterative analysis of over 65 semi-structured interviews with drivers and passengers of two major ridesharing platforms in Singapore and Manila in 2017, I contribute rich empirical insights that elucidate how both negative and positive stranger encounters between drivers and passengers unfold before, during and after a shared ride in the confined space of a car. I use this study to set the groundwork for the subsequent study that aims to conceptualize trust between drivers and passengers.

The third study aims to theorize and examine the meaning of trust in on-demand, ridesharing interactions by answering the research question: *how does trust—in particular, interpersonal trust between strangers who must interact in person—affect a consumer's decision to use digital ridesharing?* In 2020, I conducted a quantitative survey of 553 passengers from Grab in Singapore to answer this question. In addition to defining a conceptual framework for trust in a sharing economy context, I also aim to test how users' sociodemographic background plays a role in how they consider trust in the act of ridesharing. Singapore is the most developed city/nation in Southeast Asia with a highly developed public transport system, infrastructure and high income per capita. For this reason, I focus the analysis on the Singaporean case, which was the first and remains the largest digital ridesharing market for on-demand, pooled car rides between multiple passengers traveling along a similar or same route in Southeast Asia.

Finally, I note that my thesis research was conducted from 2017 to 2022, which included the COVID-19 pandemic that resulted in varying government-mandated lockdowns and various ridesharing company policies across Southeast Asia that led to the suspension of some or all ridesharing services in early 2020 until as late as early 2023. For example, Grab suspended its GrabShare service, its pooled ridesharing service that enables multiple unknown passengers traveling in the same direction to ride together, on 9 February 2020 and did not resume the service until early 2023, even though the Singaporean government lifted lockdown restrictions for ridesharing in June 2020 and Grab had resumed its other social carpooling service, GrabHitch, at that earlier time (Toh, 2020). GrabHitch differs from GrabShare in that it has non-commercially licensed drivers who carpool with passengers during their regular work or school commutes to share petrol costs. GrabHitch thus is a more informal service that is more akin to acquaintances who would ride together to the same workplace or university and takes place less frequently than GrabShare. Recent literature on the effect of COVID-19 on ridesharing in Southeast Asia also confirmed that the pandemic caused a sharp drop in demand for ridesharing due to lockdowns and movement restrictions, which in turn affected drivers' earnings and challenged the financial health of ridesharing companies (Icasiano and Taeihagh, 2021). The authors also highlight the health and safety protocols introduced by both companies and governments, including mandatory mask usage, regular sanitation of vehicles, and installation of protective barriers to safeguard both drivers and passengers; and that such measures were essential in maintaining user confidence and keeping some ridesharing services operational during the pandemic. Grab was still operating its GrabTaxi, GrabCar, and GrabHitch services in Singapore and other countries during the duration of the pandemic lockdowns with strict rules that adhered to local government mandates on public safety. However, the public media reported that by late 2023, the ridership of digital ridesharing platform companies like Grab had rebounded to pre-pandemic levels (Chiang, 2023).

My first study focuses on a case analysis of Grab and the greater Southeast Asian ridesharing industry from 2012 to 2022, which notes how the COVID-19 pandemic slowed down ridesharing usage in the region overall but also gave companies like Grab the opportunity to refocus their efforts on building their food delivery business, which helped to offset the losses from the ridesharing business (Shu, 2020). My second study involved conducting in-depth interviews in the field in 2017, so the data collected was not affected by the COVID-19 pandemic, but I reflect on how the results of this study would hold considering the disruption by the pandemic in the conclusion in Chapter Seven. My third study centred on an online survey that was administered in October to December 2020, but the participants were recruited for their use of Grab's ridesharing services, GrabShare and GrabHitch, at least once in 2017. I had a disclaimer on some of the questions on the survey to comment on their usage of ridesharing before the COVID-19 pandemic. Overall, I am aware that the disruption in ridesharing usage and the public health and safety concerns arising from riding in close proximity with strangers during the COVID-19 pandemic can affect how the results of my thesis hold post-pandemic.

1.3 Overview of transportation in Southeast Asia

In this section, I provide an overview of (urban) transportation in Southeast Asia, the home to over 620 million people, to situate my thesis in the place- and context-specific characteristics of the region of focus. The major countries in which digital ridesharing platform services are ubiquitous across cities are Singapore, Malaysia, Indonesia, the Philippines, Vietnam, and Thailand. Like other economies in the Global South (Acheampong *et al.*, 2020), Southeast Asia has experienced a growing middle class, high rates of smartphone adoption, and infrastructure growth in mobile connectivity that offered tailwinds for rapid ridesharing adoption in the last decade (Chalermpong *et al.*, 2023). Ridesharing drivers in Southeast Asia are plentiful as the ridesharing platform innovations have also enabled low-income people to earn needed income (Rizkyta *et al.*, 2021). Singapore is unique because it is a city-state with a relatively high-income population and highly developed public transport system, while Malaysia is a middle-income country with a fairly developed public transport system. The rest of the countries–Indonesia, the Philippines, Vietnam, and Thailand–have a growing middle class in urban cities, but stark income disparities remain, in addition to overpopulous, dense cities that have high levels of road traffic congestion and often a dearth of high-quality public transport options.

The political economy characteristics of Southeast Asian cities such as Manila, Bangkok, Ho Chi Minh City, Jakarta, Kuala Lumpur, and Singapore reveal a mixed capitalist model, heavily shaped by developmental states, informal economies, and pragmatic governance structures. These cities often operate within frameworks where public and private sector collaborations are critical, but the quality and reach of public infrastructure, particularly public transport, are highly uneven (Emberger *et al.*, 2008). For instance, Singapore, with its advanced, state-planned public transport systems, exemplifies a high-capital, technocratic approach (Han, 2010; Pow, 2014). Kuala Lumpur has a public transport system, but it remains challenged by financing issues for further development, traffic congestion, and the rise of private vehicle ownership (Kiggundu, 2009). In contrast, cities like Manila, Hanoi, Bangkok, and Jakarta in more developing economies rely more on informal and semi-formal transport modes, such as jeepneys and motorcycle taxis, highlighting a reliance on private, often unregulated systems to meet mobility demands (Chalermpong *et al.*, 2023).

The significant difference between these Southeast Asian cities and European cities lies in the institutional support and universal provision of public transport (Emberger *et al.*, 2008). European cities typically feature comprehensive, subsidized, and integrated public transport systems that are highly accessible to a wide range of socioeconomic classes. Meanwhile, Southeast Asian cities often experience fragmented public transport, with significant gaps filled by informal modes like tricycles or motorcycle taxis. These informal systems cater to low-income populations but lack the reliability, safety, and scalability of formal public transit systems. The stark disparity in income levels, governance models, and historical development trajectories contributes to this divergence, making the Southeast Asian urban transport ecosystem more complex and dependent on both innovation and informal networks (Chalermpong *et al.*, 2023).

As such, informal transport in the form of motorcycle taxis is one of the most widely used and accessible forms of transport in Indonesia, Vietnam, Thailand, and some parts of the Philippines; like other markets in the Global South (Ehebrecht *et al.*, 2018). Motorcycle taxis enable motorcycle drivers to transport passengers in tandem and earn income; while passengers benefit from a relatively cheap service that also enables them to weave through heavy traffic congestion. Some commuters in Indonesia who drive their own cars to go into the city for corporate jobs are estimated to spend at least three hours a day stuck in heavy traffic jams (Ilahi *et al.*, 2021). Thus, for many people across Southeast Asia, motorcycle taxis are the most effective mode of transport from point A to point B in Jakarta, Bangkok, and major cities in Vietnam (Hyunh *et al.*, 2020, Nguyen-Phuoc *et al.*, 2020), where traffic can be gridlocked for cars, taxis, and buses. The Philippines also has a large informal, privately-owned transport modes called jeepneys or tricycles, which are extremely inexpensive and serve lower-income populations who typically have little viable transport options (Guillen *et al.*, 2013).

The ubiquity of informal transport in these countries has launched local innovations in the form of digital ridesharing services for motorcycle taxis, which was first introduced by GoJek in Indonesia in 2009, but was not formally launched as a digital ridesharing platform company until 2015. Grab quickly followed GoJek into offer motorcycle ridesharing services as motorcycle taxi rides were in more demand throughout the countries in which it is a major form of transport due to high traffic congestion, low prices, convenience, and higher availability. Uber finally launched UberMoto, but too late and long after its local competitors had already taken majority market share (Hyunh *et al.*, 2020). By population, Indonesia is the largest market in the region with over 275 million people. As motorcycle taxis are one the main modes of transport in Indonesia, the informal market of motorcycle taxis eclipses the formal market of 4-wheel taxis and other modes of public transport. Recent research on motorcycle taxi digital ridesharing platform services in Greater Jakarta revealed that these services complemented public transport modes of bus (Suatmadi *et al.*, 2019) and commuter train but competed with the traditional motorcycle taxi sector, although the traditional motorcycle taxi sector remains supportive of motorcycle ridesharing platform services (Irawan *et al.*, 2020). Recent research has shown that comfort and reliability are significant factors in the decision to use ridesharing for commuting to work in Bandung, Indonesia; while cost and travel time of a ride is negatively significant and the only significant sociodemographic variable is house ownership (Belgiawan *et al.*, 2022). House ownership signifies a middle to higher income household, which would be the demographic that could afford ridesharing in private cars or taxis because ridesharing is relatively expensive in Indonesia compared to alternative transport options like motorcycles or motorcycle taxis. This study used a revealed preference survey of 497 ridesharing users in Bandung, Indonesia; and also showed that ridesharing services substituted the traditional motorcycle taxi sector.

Similarly, motorcycle taxis are one of the major transport modes in Bangkok, Thailand, but Thailand has a semiformal motorcycle taxi sector that is regulated by local transport authorities and the entry of digital motorcycle taxi platform app services has been highly contested by local transport authorities (Sopranzetti, 2022). Motorcycle taxi drivers in Bangkok were historically assigned to certain outposts where passengers can queue for a ride, which had regulated fares and drivers had to wear an orange vest uniform and register their vehicles and themselves as motorcycle taxi drivers with the transit authority. Because it is the only regulated motorcycle taxi sector in Southeast Asia, the local transport authorities initially banned Grab and Uber from operating motorcycle taxi ridesharing platform services in 2016; and banned Grab again in 2022. A recent survey study of 1,177 ridesharing users aged 18 to 69 years old and residing in Bangkok, Thailand has found that four-wheel ridesharing in cars has a higher market penetration rate than two-wheel motorcycle taxi ridesharing, but the motorcycle taxi ridesharing is used more frequently, particularly by users who have access to a private car and live in places that are highly accessible to rail transit due to a combination of higher disposable income for car owners, traffic congestion, and better access to motorcycle taxis near rail stations (Thaithatkul *et al.*, 2023). Motorcycle taxi rides were used to connect to urban rail transit more than ridesharing in cars, most likely due to high traffic congestion. However, another study shows that the level of complementarity between motorcycle taxi ridesharing services and public transit differs depending on the location and the type and availability of public transit. Specifically, motorcycle taxi ridesharing services significantly complement rail transport in suburban areas with less dense public transit networks; compared to the city centre (Chalermpong *et al.*, 2023).

In Vietnam, where motorcycle taxis and motorcycles are one of the main modes of transport in its largest cities, a survey of 559 ridesharing users in Hanoi, Danang, and Ho Chi Minh City found that passengers were satisfied with ridesharing platform services due to the influences of perceived benefits of the platform app, perceived sales promotions, and perceived service quality; whereby perceived service quality also greatly influenced whether the user is loyal to the service (Nguyen-Phuoc *et al.*, 2020). An additional survey study of 602 ridesharing users across Hanoi, Danang, and Ho Chi Minh City, Vietnam found that perceived safety had a significant, positive direct effect on the loyalty of users for four-wheel taxi rides booked through a ridesharing app, but not for traditional four-wheel taxi passengers (Nguyen-Phuoc *et al.*, 2021). This could be interpreted as that compared to traditional taxi users, ridesharing users are more concerned about safety and their safety perception significantly affected their overall intention to use the services. Another survey study (Hyunh *et al.*, 2020) of 286 Grab or Uber users in Ho Chi Minh City, Vietnam found that the proportion of female users was 28.51% more than that of males, meaning that females may value the safety and convenience of these ridesharing services. The study also found that users in Vietnam tend to use ridesharing services for short distances and usage is more prevalent among younger, higher-income individuals; and that referrals and word-of-mouth marketing by relatives or the community can significantly influence the intention to use ridesharing services.

Malaysia is considered a middle-income nation, but much of its taxi industry was considered unsafe, low quality, and prone to scrupulous price gouging practices prior to the launch of digital taxi ridesharing platform services in June 2012 (Amirul and Hands, 2016). Grab was founded in June 2012 to address the taxi quality problem in Malaysia and then expanded to other countries in the region with an agenda to provide safe, fast, and convenient taxi rides. In a study of the intent to continue using taxi ridesharing platform apps in Malaysia, Weng *et al.* (2018) conducted a survey of 387 adult users in Kuala Lumpur based on a Technology Continuance Theory (TCT) model to find that perceived usefulness, attitude, and satisfaction are significant factors. Users in Malaysia care about a platform app that is easy to use and will meet their expectations, leading to satisfaction with the app. The usefulness of the app's features and subjective norms also influence users' attitudes toward the app.

Singapore is one of the largest markets for digital ridesharing services in terms of revenue, relative to its population size (Chalermpong *et al.*, 2023). Due to low car ownership and consumer preference for convenience and high disposable income, Singapore quickly gained popularity in Southeast Asia and Uber Singapore reported that over 40% of its user base tried UberPool within one year of its launch (Lin, 2017). Across the region, the frequency of ridesharing is high because it is used to commute to work or school, rather than for leisure. Because of the localized ridesharing services for informal transport like motorcycle taxis or lower cost carpooling services like GrabShare and GrabHitch, ridesharing is affordable and accessible in Southeast Asia, making it possible for frequent use (Chalermpong *et al.*, 2023).

I aim to contribute multiple studies on digital ridesharing in Southeast Asia to also add to the growing literature on digital ridesharing platform services in the Global South (Acheampong *et al.*, 2020; Ehebrecht et al, 2018). The first empirical study of this thesis addresses the gap in this literature on how digital ridesharing innovations can be rapidly adopted in the case of Southeast Asia. The second study (Chapter Five) narrows the scope to Singapore and Metro Manila, Philippines; the third study (Chapter Six) focuses solely on ridesharing users in Singapore. I detail the reasons behind my research site selections in Chapter Three on Methodology and Research Design.

1.4 Significance of this thesis

Altogether, the three studies of this thesis culminate in an interdisciplinary approach to understanding the socio-technical dimensions of new digital ridesharing services across urban areas. It integrates insights on the rapid scaling of socio-technical transitions, urban encounters between strangers in shared rides, and trust in the digital sharing platform economy to contribute to the fields of transport geography, innovation studies, urban studies, and information systems research. My thesis illustrates that the multi-dimensional changes that digital ridesharing innovations introduced in Southeast Asia since 2012 are systemic and have affected many facets of the institutional environment, including the region's digital infrastructure, social norms, business models, land use and regulations. Equally important, digital ridesharing innovations have also shaped and have been shaped by individuals' beliefs, behaviors, and disposition in the form of trust towards strangers.

The first study (Chapter Four) contributes to innovation studies literature on socio-technical transitions and the multi-level perspective (MLP) by showing how Southeast Asia's digital ridesharing industry's niche innovations could rapidly upscale and become widely adopted (Geels, 2012). The study reveals that niche competition, depicted as a dynamic cycle and combination of innovation races between niche actors—in the areas of technologies, business model, venture capital funding and regulatory support—have played a role in accelerating company performance and the realization of socio-technical transition pathways. Cross-regime integration strategies of diversifying into new services beyond ridesharing have enabled niche entrants to rapidly expand their user bases and benefit from the positive externalities of indirect network effects, which have further fed the cycle of firm growth.

The second study (Chapter Five) contributes to the following three streams of literature: (1) socialities in transport journeys (Laurier *et al.* 2008; Bissell 2010; Wilson 2011), (2) encounters and prejudice in hyperdiverse neighborhoods (Schuermans 2019; Valentine and Harris 2016; Valentine and Sadgrove 2014; Wilson 2017b) and (3) discrimination in digital platform services (Edelman, Luca, and Svirsky 2017; Cui, Li, and Zhang 2019; Ge *et al.* 2016). This second study shows that dynamic microcosms of the existing social landscape in urban areas are embodied in the act of strangers coming together in a shared space through on-demand digital ridesharing platform services in Singapore and Manila, Philippines. The study reveals that social norms and informal codes about moral conduct emerged in and coevolved with ridesharing between drivers and passengers; and misaligned codes about moral conduct that arose between these parties can threaten consumer safety and privacy. The also study finds that ridesharing has perpetuated the drivers′ and passengers′ existing prejudices of others in the vehicle, which has sometimes led to acts of discrimination, surprise that their preconceived notions about others are contested, or a desire to try new things and meet strangers. The study suggests that, with digital ridesharing becoming mainstream, collective social norms and informal codes about moral conduct have emerged and evolved from the interactions between strangers in the confines of a shared vehicle.

The third study (Chapter Six) contributes to the literatures on information technology systems and trust in the sharing economy as it investigates the role of trust in two digital ridesharing services that enable passengers to carpool with other unknown passengers for a shared ride (Pratt *et al.*, 2019). The main audiences of these literatures are scholars in the business management field interested in how customers perceive and trust in new technologies introduced by firms. This third study revealed that institutional trust (trust in the digital platform company) is the most significant factor affecting usage, while it does not notably influence user satisfaction or intentions to reuse the ridesharing service. Interestingly, in Singapore, dispositional trust (trust in strangers in general society) does not significantly impact ridesharing decisions, despite the inherent face-to-face interactions in ridesharing. Interpersonal trust (trust between passengers and drivers) is more vital for commercial services like GrabShare than for non-commercial options such as GrabHitch. Additionally, sociodemographic factors—like gender, nationality, age, and education—play a crucial role in shaping users' service preferences, satisfaction, and reuse intentions, which contributes to the growing literature on how sociodemographic factors affect the usage of ridesharing platform services (Acheampong *et al.*, 2020). Insights into fostering institutional trust can aid ridesharing companies in developing safer, more appealing services that cater to diverse user needs, especially as face-to-face sharing economy services grow in popularity. Understanding the varied preferences of users will enhance the ability of different ridesharing models to effectively serve various segments of society.

1.5 Structure of thesis

This thesis consists of seven chapters, three of which comprise the feature studies. While the current chapter introduces the overall aim and structure of this thesis, Chapter Two offers a literature review and Chapter Three details the overarching methodology and research design of the thesis. Chapters Four, Five, and Six are the empirical studies. Finally, Chapter Seven concludes the thesis. Figure 1.2 illustrates the structure of this thesis and how the chapters connect.

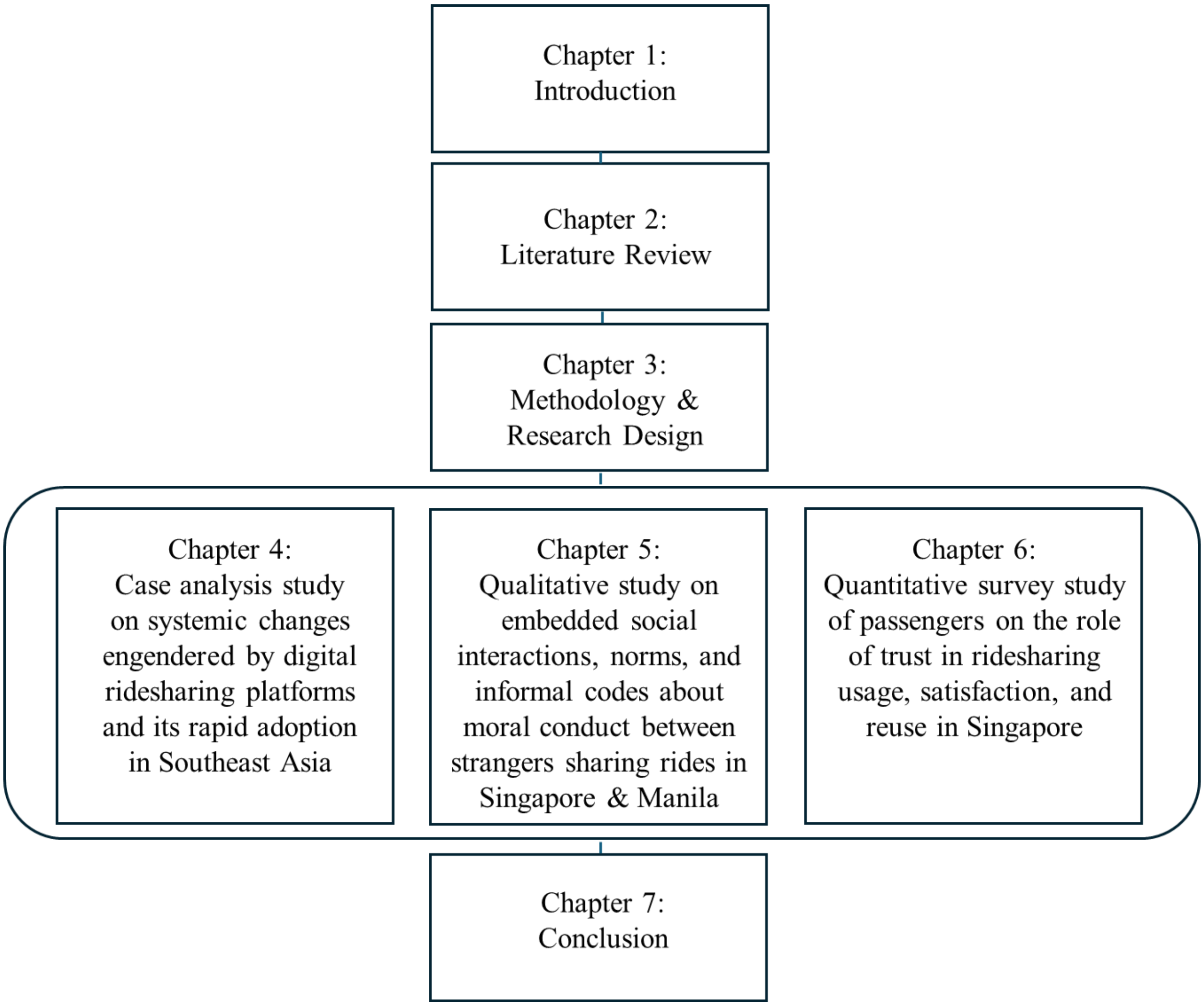

Figure 1.2 Structure of this thesis by chapter

Chapter Two offers a comprehensive literature review on the adoption of digital ridesharing platform innovations and its socio-technical implications. It provides the research context for the three empirical studies of this thesis to build upon regarding the socio-technical transition of digital ridesharing platform innovations, the types of socio-technical encounters that digital ridesharing platforms enable in cities, and the role that trust plays in the decision for consumers to use digital ridesharing platform services.

Chapter Three outlines the multi-method methodology and research design of the overall thesis. It details the research design and data collection methodology for each of the three empirical studies in the following chapters, as well as my positionality and reflexivity as a researcher and former employee of the digital ridesharing platform company, Grab, that is the focus of this thesis.

Chapter Four is the first study of the thesis and utilizes a single case analysis methodology of the history and evolution of the Southeast Asian ridesharing industry to examine how the socio-technical innovation of ridesharing was adopted and scaled rapidly in the timeframe of less than a decade (2012 to 2022).

Chapter Five is the second study of the thesis and gleans insights from inductive, qualitative interviews of digital ridesharing platform drivers and passengers to identify the social norms and informal codes about moral conduct that emerge from, and are reworked through, the act of ridesharing in urban areas in Singapore and Metro Manila, Philippines.

Chapter Six is the third study of the thesis and focuses on a quantitative survey study on whether trust plays a role in the usage, satisfaction, and intent to reuse digital ridesharing services among passengers in Singapore who have used services in which they carpool with fellow passengers who are strangers in an on-demand, shared ride.

Chapters Four to Six should be viewed as interrelated studies that inform one another. While Chapter Four offers a macro-level view of the systemic changes engendered by digital ridesharing platform innovations, particularly those launched by Grab and its peer competitors in Southeast Asia, Chapter Five builds on it by homing in on micro-level socially embedded interactions that take place within a shared ride. Both studies in Chapters Four and Five have motivated the final study in Chapter Six, which specifically examines the role of three different types of trust among passengers' decisions to use and adopt digital ridesharing platform innovations. Together, these studies examine the socio-technical implications of digital ridesharing platform innovations and companies in greater society, as well as among individuals in society.

Chapter Seven concludes the thesis with a summary of major findings, contributions, and their future implications for research and practice.

2. Chapter Two - Literature Review

2.1 Introduction

In this chapter, I review literature on digital ridesharing innovations, digital platform business models in mobility, and transportation infrastructure in Southeast Asia at the macro level. At the micro level, I review literature on how the socio-technical dimensions of the use of digital ridesharing can unfold among users, technology and the firms. I also highlight emerging research on how sharing economy or digital platforms can still engender user bias and discrimination.

Section 2.2 offers an overview of the literature on the rise of digital ridesharing platforms in urban mobility. Section 2.3 focuses on research that explains why digital ridesharing platform services are used. Section 2.4 explores the research on the socio-technical dimensions of digital ridesharing platform services. Section 2.5 specifically addresses research on the state of transportation in Southeast Asia, the region of interest in this thesis. Finally, Section 2.6 offers concluding remarks ahead of the empirical studies in this thesis that aim to contribute to the literature review in this chapter.

2.2 The rise of digital ridesharing platforms in urban mobility

2.2.1 The digital platformization of urban mobility services

Since the early 2010s, the 'digital platformization' of mobility services has given rise to a fast-growing platform mobility economy in dense, urban areas supported by sizable venture capital investments (Stehlin *et al.*, 2020). The platformization of mobility includes ride-hailing services booked through digital platform apps, which I refer to as ridesharing in this thesis, and mobility-as-a-service (MaaS) platforms that enable users to book and coordinate multiple, integrated mobility services from different providers—which could include both public and commercial transport services—that are bundled together in one digital platform app. To date, MaaS has no clear definition (Ho and Tirachini, 2024). I use Pangbourne *et al.'s* (2020, p.39) distinction of MaaS as a digital platform in which "users are purchasing mobility services via a broker (often termed a mobility operator) that provides an interface connected to multiple transport services" and the services could be offered by multiple mobility operators on one interface. For example, a city transit system could offer a MaaS platform that integrates the booking and payment of a range of mobility services for a seamless trip from point A to point B from different providers like bus, train, bike sharing, and taxi companies. Both ridesharing platform apps and MaaS platforms offer users a digital solution to more efficiently book, plan, and pay for mobility services on an on-demand basis; and in this thesis, I consider ridesharing platform apps like Grab and Uber as one type of MaaS platform as they offer multiple mobility services to be booked in one platform app interface.

The platformization of mobility services has given rise to a proliferation of startup companies globally, a few that have become highly valued public companies like Uber, Lyft, Grab, GoTo (formerly GoJek), Didi, and Ola. Ridesharing platforms startups are largely digital-first firms with a highly scalable business model that features low asset ownership and depends on network effects (Srnicek, 2017). They have demonstrated significant potential for rapid growth and the ability to influence local institutional changes (Parente *et al.*, 2018). This low-asset business model means that ridesharing platform companies typically do not own the vehicles used for rides but allow existing vehicle owners or drivers with rented vehicles to register on their platform to offer rides to customers who request rides. This digital platformization of taxi and private vehicle rides has dramatically offered convenience, potential cost savings, and even safety for passengers; and a means of earning new or more income for drivers. However, this lean business model can also lead to precarious working conditions for drivers who may work long hours or for below minimum wage, particularly those who are migrants or from marginalized communities, when drivers are not considered employees who receive mandated employee benefits or a minimum wage (Nowak, 2023; Zhou, 2024).

One main distinct feature of digital ridesharing platform services is enabling users to book a ride and match with an available driver on-demand. As such, this business model works best in dense cities where there are higher network effects for supply and demand of rides to match in real-time (Parente *et al.*, 2018; Cobb *et al.*, 2024). These digital ridesharing firms leverage the positive indirect network effects inherent in their two-sided platform model, where the value of the platform increases as more users from both sides—drivers and passengers—engage with it (Eisenmann *et al.*, 2006; Gawer, 2014; Gawer and Cusumano, 2014; Katz and Shapiro, 1985; Rochet and Tirole, 2003, 2006). Indirect network effects and scale matter because they create a virtuous cycle in which passengers are more likely to use a ridesharing service with a larger number of drivers, ensuring faster ride matching and better availability, while drivers also prefer to join platforms with a higher passenger base to efficiently maximize their bookings and earnings in a given timeframe (Srnicek, 2017).

Ridesharing platforms have enabled private vehicle owners to offer ridesharing services as new income stream, often prompting the need for these platform companies to advocate for new regulations for this innovative category of mobility services in cities globally (Parente *et al.,* 2018). Regulating such ridesharing services involves considering who can be a licensed ridesharing driver, the types of vehicles that can be used, the types of fares that can be charged, and safety measures for passengers. Early ridesharing platform companies launched in 2011 and 2012 generally complied with existing regulations for the taxi and limousine services they offered because their business model aimed to improve the inefficiencies of existing, regulated taxi and limousine services (Fu and Shi, 2019). However, as passenger demand for ridesharing platform services grew, the companies realized that the limited supply of taxi and limousine services needed to be augmented (Chen and Sheldon, 2015). Thus, the introduction of new ridesharing services in privately-owned vehicles by Lyft and Uber in the United States in 2012 addressed the surge in demand for rides for these platform companies, while also igniting regulatory scrutiny of these services in cities across the world, especially as Uber expanded globally and other ridesharing startups like Grab adopted this business model (Harding *et al.*, 2016; Distelmans and Scheerlinck, 2024). These private vehicle ridesharing services were initially deemed illegal or operating in a grey regulatory void in many jurisdictions. As such, these companies that offered private vehicle ridesharing services—namely Uber, among many other peer companies— typically had to engage with local governments to advocate for the regulatory approval or endorsement of their services (Watanabe *et al.*, 2017) and contest the incumbent taxi industry's attempts to ban them (Distelmans & Scheerlinck, 2024).

By the late 2010s, global regulatory headwinds largely legitimized private vehicle ridesharing platform services with new regulations and the ridesharing platform industry proliferated (Chalermpong, *et al.*, 2023). As ridesharing platforms have gained legitimization from government institutions, a large body of research has documented how the rise of ridesharing platform companies has led to significant disruption of the incumbent taxi industry globally (Akimova *et al.*, 2020; Anderson, 2014; Clewlow & Mishra, 2017; Contreras & Paz, 2018; Cramer and Krueger, 2016; Dreyer *et al.*, 2017; Jin *et al.*, 2018; Kim *et al.*, 2018; Laurell &

Sandstrom, 2016; Mair & Reischauer, 2017; Nie, 2017; Watanabe *et al.*, 2017). However, the literature does not yet focus much on the role of competition in startup scaling and how this intense competition between digital ridesharing platform startups attracted venture capital investments to fund subsidies to win over drivers and passengers; other than noting that Uber and its similar rivals engaged in a tug-of-war competition that used competitive pricing tactics to gain a large user base and focused on outcompeting with operational execution (Li, 2024).

2.2.2 The Multi-Level Perspective (MLP) on socio-technical transitions

I look to the socio-technical transitions literature to find precedence in niche innovations that have achieved incumbent, or regime, substitution and have been widely adopted in the span of several years. The dynamic Multi-Level Perspective (MLP) framework is commonly used to explain processes that enable the scaling of niche or new innovations that engender socio-technical transitions over time in society (Geels 2002, 2005; Geels *et al.*, 2017). The MLP offers a conceptual structure for interpreting socio-technical transitions as a complex, non-linear, and dynamic process in which an innovation can undergo three levels (micro, meso, and macro) to achieve a socio-technical transition whereby the incumbent technology (regime) is replaced by the new technology (niche), as shown in Figure 2.1 (Geels, 2018). *Niche innovations* form the micro-level of the framework and depict radical social or technical innovations that can emerge in specific markets or geographies. Niches act as a protective space for radical innovations to incubate and hopefully grow in the face of selection pressures from mainstream market. *Social-technical regimes* at the meso-level of the framework characterize the existing system of incumbent institutions whose actions are legitimized by heavily embedded formal and informal rules in society. The *socio-technical landscape* depicts the macro-level perspective of the MLP framework, which captures the wider exogenous environment that influences socio-technical regimes; and over which the regime actors have little or no control (Geels et al., 2017). For example, landscape factors can include: demographic and macro-economic trends, spatial structures, technological infrastructure, political ideology, societal values, beliefs, concerns and media landscape (Geels, 2012). The MLP posits that socio-technical transitions can occur between these levels, whereby a niche innovation can gain momentum, and changes at the landscape level exert pressure on the regime, and the destabilization of the regime creates an opportunity for the niche to overtake and replace the regime, completing the transition.

A stream of research on strategic niche management specifically focuses on how niche innovations can break through the micro and meso levels and stabilize (Kemp *et al.*, 1998; Smith and Raven, 2012); and a combination of niche momentum drivers and regime tensions (*e.g.*, competition between incumbent technologies and new niche ones) can create opportunities for niche innovations to break through the challenges of the early adoption phase (Geels *et al.*, 2017). Niche momentum depicts the growing adoption and influence of innovations, which can be done through such pathways as learning processes, improvements in performance, and support from influential groups. Regime tensions characterize the pressures and destabilizing processes that are present in the established socio-technical regime; and can arise when this established regime faces pressures from changes at the socio-technical landscape level and from emerging niche innovations. One type of niche momentum driver is innovation races, which depict mass market entry by similar niche competitors after a first mover introduces a niche innovation; culminating in a niche accumulation phase in which the adoption of the niche starts to gain momentum (Geels, 2005). However, these niche scaling phases tend to take time—typically decades—to become a full socio-technical transition whereby the niche innovation reconfigures or replaces the established incumbent regime. The socio-technical transitions literature has addressed how niche innovations can rapidly scale in over a decade, but has not yet examined the rapid trajectory of niche innovations that have transitioned into a mainstream technology quickly, like the case of digital ridesharing platform innovations.

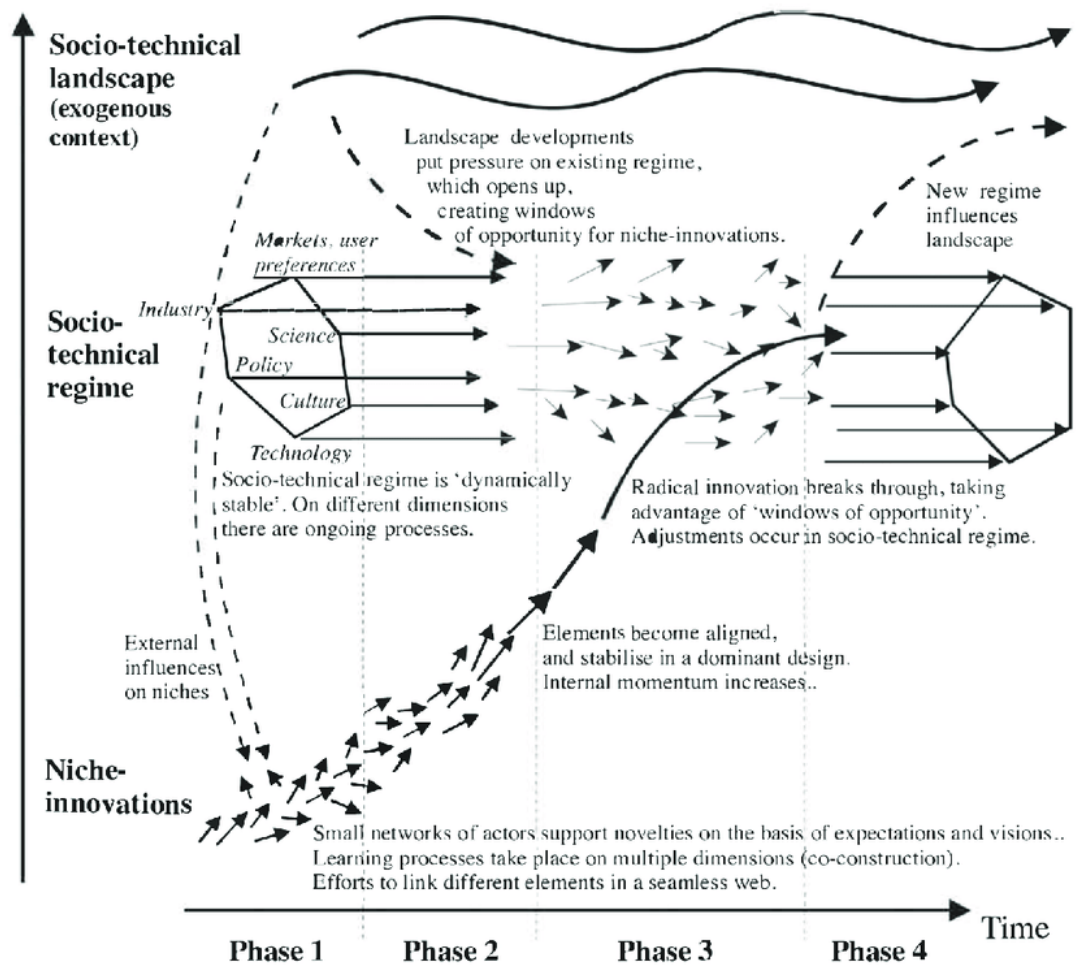

Figure 2.1 The Multi-Level Perspective on socio-technical transitions (Geels, 2018)

2.3 The sociality of digital ridesharing platform services

Digital ridesharing platform services utilize technology to bring strangers together in a shared vehicle for on-demand rides. The social interactions facilitated by these platforms have prompted scholarly interest in how these encounters reshape social relations and urban mobility practices. *Socialities*, in this context, refer to the patterns and dynamics of social interactions and relationships that arise between individuals or groups within specific contexts, such as shared rides. They encompass verbal and non-verbal interactions shaped by the confined physical space of the vehicle, the diversity of participants, and the mediated nature of encounters through a platform. For example, Laurier *et al.* (2008) observe how ritualistic interactions, such as greetings and farewells, characterize socialities in carpooling. Similarly, Bissell (2010) highlights how transient social dynamics in shared transport can foster unique affective atmospheres among train passengers in England. I will detail both studies later in this section. This thesis adopts this lens to explore how ridesharing platforms serve as microcosms of urban socialities, reflecting broader societal dynamics.

Socialities in ridesharing vehicles are closely tied to the emergence of *social norms*—the shared, informal rules and expectations governing behavior in specific social contexts. Within ridesharing, social norms dictate the implicit codes of conduct between drivers and passengers, such as expectations of politeness, appropriate conversation topics, and seat-sharing etiquette. These norms are dynamic and evolve as digital ridesharing becomes more widespread, influenced by both platform design and user negotiation. For instance, Wilson (2011) demonstrates how norms of moral conduct and interpersonal civility are renegotiated through repeated interactions in shared urban spaces. This thesis builds on such studies by examining how these norms manifest in ridesharing contexts, shaping the experiences and expectations of both drivers and passengers.

In this section, I explore the relationship between ridesharing technology and its users, particularly how the technology engenders socialities and social norms between drivers and co-passengers in shared carpooling services enabled by digital ridesharing platforms. A robust user base also enables digital ridesharing platforms to introduce additional services, such as on-demand carpooling services like GrabHitch, UberPool, and Lyft Shared (formerly called Lyft Line), which enable multiple passengers who are traveling on similar routes to book and share a ride with multiple pick-up and drop-off points and save on fare costs, while aiming to improving vehicle occupancy and efficiency (Ruch *et al.*, 2021).

So far, there is growing research on the embedded social interactions between strangers in the confined space of pooled, on-demand rides booked by a digital ridesharing app where multiple strangers ride together as passengers (Pratt *et al.*, 2019; Morris *et al.*, 2020; Hansen and Sener, 2023; Sarriera *et al*., 2017). Pratt *et al.* (2019) analyze over 2,000 tweets about UberPool and Lyft Shared to conclude that users often complained about the unpredictable travel times and forced social interactions with other passengers. Morris *et al.* (2020) surveyed 5,385 pooled ridesharing drivers on UberPool and Lyft Shared across the US to find that they reported the social dynamics between passengers who are strangers in a shared ride to be unpleasant, particularly when the passengers do not interact with one another and there are awkward silences, or when passengers do not get along and argue with one another. Sarriera *et al.* (2017) surveyed 997 ridesharing users (passengers) across the US to find that potentially having a negative social interaction with other users deters pooled ridesharing usage more than the possibility of having a positive social interaction as an incentive to use the service. Overall, recent research reveals that social interactions in pooled ridesharing rides between passengers who are strangers are largely negative.

Beyond ridesharing, there is an established body of research on the socialities of strangers riding together in the confined space of other modes of transport like train travel (Bissell, 2010; Watts, 2008) and airplane travel (Budd, 2011). Watts (2008) conducts a travelogue of train travel across England to observe how passengers interact with their environment on the train and with one another to co-create unique spatial and temporal experiences. She notes that the physical space and layout of the train shape how passengers behave and interact; and that passengers negotiate these shared spaces and engage in fleeting social interactions like smiling at one another or chatting casually about their destinations. She also observes the cultural norms of train travel that were apparent in how passengers arrange their possessions and manage their personal space in deference to other passengers. As such, train travel is a complex social and material practice whereby passengers co-create their own spatial and temporal experiences bounded by the train layout, space, and other passengers. Bissell (2010) also studies train travel in England along the East Coast Mainline between London and Edinburgh between 2005 and 2007 by interviewing 46 passengers and conducting autoethnographic observations on different trains along the train line at different times of the day. He found that ordinary events on trains like doing work, traveling on a Friday evening, and an unexpected train delay can foster different affective atmospheres among passengers such as focus, euphoria, and frustration. These affective atmospheres can arise and affect the passenger experience for others on the train; and the diversity of passengers can lead to a division of passengers into distinct, yet collective groups within the train carriage. For example, passengers who are bothered by others' loud phone conversations on the train may form a collective atmosphere of resentment towards the person using the phone, akin to a collective enforcement of a fellow passenger violating social norms or expectations of how to behave in the public space of the train. In this way, the socialities that are present in a train carriage are like microcosms of society. Both studies note that the sociality of passengers on a train includes both nonverbal and verbal, and indirect and direct communication between passengers. Like the findings from train travel, Budd (2011) analysed firsthand written historical records of airplane passengers from the 1920s and 1930s to conclude that the physical space and layout of the airplane also influenced passenger interactions. She notes social norms that emerged, such as passengers maintaining a stoic demeanour when faced with collective anxieties about the flight experience. These collective anxieties arising from concerns about flight safety, the cold temperature, noise, and airsickness may have shaped passenger interactions and fostered a sense of collective camaraderie or understanding, similar to the collective groups that Bissell (2010) observed in train travel. The passengers were also aware of their etiquette and conscious of their behavior and how it would affect others, indicating that social norms on airplane travel etiquette were present.

Goffman (1963) describes how airplane and bus travel induces strangers to converse and interact due to proximity in a confined space. Prior research has also focused on the social interactions and norms of people before boarding, during and after alighting a private car (Laurier *et al.*, 2008). The ritualistic interactions between a driver and passenger before they board the car and after they alight the car can be meaningful shared experiences between them. Laurier *et al.* (2008) conducted an analysis of video recording clips of carpooling rides from six different vehicles with varying passengers. During a carpooling ride, Laurier *et al.* (2008) found that there is an expectation or obligation for passengers of the car to talk to each other because the car poolers may not want to compromise relations with the fellow car riders with whom they will carpool in the future; but the conversations could be slow or die down with prolonged silences. The main difference with on-demand, pooled rides is that there is little chance that passengers would be matched to share the same ride again. Ultimately, these social interactions between passengers can lead to informal codes about moral conduct to emerge as pooled ridesharing is adopted widely and used frequently by users—shaped by perceptions of moral conduct—and are renegotiated between fleeting, shape-shifting encounters between strangers situated in a confined shared space (Wilson, 2011).

Because this thesis focuses on interactions between strangers who are matched by a digital ridesharing platform app technology to ride together in confined spaces across different geographies, I also draw on research on the geographies of social encounters to understand the social implications of the new technology. Given the prior research that documents an expectation or obligation for strangers in confined, small spaces to interact and converse, recent research asserts that the social encounters between diverse strangers do not necessarily lead to positive, social cohesion because such encounters are mediated by local social norms, personal experiences, asymmetric power relations and public discourses (Schuermans, 2019; Wilson, 2017b). As such, prejudices—the individual judgement of others who are seen as different—can be present in such everyday social encounters between diverse strangers (Valentine, 2010; Valentine & Harris, 2016; Valentine & Sadgrove, 2014). However, such prejudiced social encounters can also be a conduit for social transformation when diverse strangers who normally would not interact have a chance to learn about others, renegotiate, and update their judgments of others (Wilson, 2011).

These prejudices between diverse strangers can also escalate into discriminatory views or actions against others, as evidenced by the recent research on discrimination in the sharing economy, which encompasses digital ridesharing platform services. Ge *et al.* (2016) conducted two large-scale randomized experiments in the US with 581 ridesharing trips requested by eight research assistants of different racial and gender backgrounds in Seattle and 911 ridesharing trips requested by the eight research assistants in Boston. The authors found that African American passengers in Seattle, US faced longer delays for their ride requests to be accepted by drivers on both Uber and Lyft. African American riders also had longer wait times for an UberX driver to pick them up than White riders; and that waiting times were not significantly different between the two races for riders using Lyft. In the second field experiment, the authors found that UberX drivers were three times as likely to cancel rides for male passengers with African American names. They also found evidence of UberX drivers being more likely to cancel trips for passengers located near subway stops in Boston, suggesting that drivers consider such passengers as hailing from a low-income group or would be taking a multi-modal trip with lower fares. Such discriminatory practices are a negative externality of digital ridesharing platform technology, and this research highlights the importance of understanding the social implications of how technology can be used to exclude others from using it.

This study by Ge *et al.* (2016) also follows the findings of similar audit studies conducted in the home sharing platform industry in which an online marketplace, Airbnb, matches people who are willing to share their homes with guests who are strangers (Cui *et al.*, 2019; Edelman *et al.*, 2017). Two audit studies on the Airbnb platform in the US test racial discrimination in the acceptance of guests with African American names versus White names. Edelman *et al.* (2017) created guest accounts on Airbnb with distinct African American and White names and sent inquiries to about 6,400 rental listings across the following US cities: Baltimore, Dallas, Los Angeles, St. Louis, and Washington DC. They found that guests with African American names are less likely to be accepted compared to guests with identical profiles, but White names. Cui *et* *al.* (2019) conducted four randomized field experiments on Airbnb with fictitious guest accounts with African American-sounding and non-African American-sounding names; and sent requests to 1,801 Airbnb hosts in the US cities of: Boston, Chicago, Seattle, Austin, and Los Angeles. They also found evidence of discrimination by Airbnb hosts against guests with African American-sounding names compared to guests with non-African American names, but that positive user reviews on a guest's online profile made acceptance rates between African American and non-African American guests statistically similar. They also found that nonpositive reviews or ratings with blank descriptive reviews also dampened discrimination.

The social dynamics in ridesharing, including power asymmetries and prejudices, have been well-documented in Western contexts, where racial and gender discrimination significantly affect user experiences like in Ge *et al.* (2016). However, there is limited research examining these dynamics in Asian cities like Singapore, where unique socio-cultural and demographic conditions shape interpersonal interactions. Singapore's status as a multicultural city-state, characterized by its ethnic diversity and strict racial harmony policies, provides a unique setting to explore how implicit biases manifest in shared mobility encounters.

Existing studies suggest that while Singapore is less prone to overt racial discrimination due to its legal and cultural framework, subtler forms of prejudice may still influence interpersonal interactions. For instance, Zainal (2021) highlights how microaggressions and implicit biases are experienced by ethnic minority professionals in Singapore, particularly within multicultural workplaces. Yeoh and Huang (1998) further explore how migrant female domestic workers navigate public spaces in Singapore, revealing how intersections of race, class, and migrant status shape their experiences and strategies. Their findings highlight how implicit biases and social hierarchies influence interpersonal interactions in urban contexts, even within multicultural environments like Singapore. These dynamics are likely to extend into digital ridesharing, where the confined space of shared vehicles and algorithm-driven matching processes create unique opportunities for both implicit bias and positive social encounters to unfold. For example, power asymmetries between drivers and passengers, or among passengers of varying socioeconomic backgrounds, may reflect broader societal structures and prejudices. Incorporating such perspectives provides a foundation for understanding the nuanced ways in which socialities and norms are negotiated in the context of ridesharing.

While digital ridesharing services have become more commonplace, the literature on the antecedents to the rapid scaling of digital, on-demand ridesharing and its effect on trust and social norms among encounters of strangers in society also remains nascent. How ridesharing startups have competed with incumbent taxi firms and other rival entrants and their subsequent effect on driving the rapid scaling of the overall ridesharing industry remain understudied. Although ridesharing firms have advertised how ridesharing can foster positive social relations among strangers in society, recent literature has revealed adverse effects of shared rides among strangers. By addressing these gaps in the literature, this thesis contributes to understanding how digital ridesharing platforms mediate interpersonal interactions in urban mobility, reflecting broader societal dynamics in Singapore and similar multicultural settings. This focus on socio-cultural dynamics helps situate ridesharing as not just a technological innovation but also a microcosm of urban social complexities. Also, addressing these gaps in the literature is critical for understanding the nuances of trust, sociality, and prejudice in Asian contexts, which remain underexplored compared to Western counterparts.

In Chapter Five, I aim to contribute to these urban and transport geography literatures on passengering, social encounters between strangers in hyperdiverse cities, and discrimination in the sharing economy, by exploring what are the social norms and behaviors that arise from social encounters between strangers in a ride booked through on-demand, digital ridesharing platforms in Southeast Asia. From Section 1.2, I aim to build on the literature by studying the following research question: *what are the social norms and behaviors that arise from encounters between strangers in a shared car ride enabled by ridesharing booking applications?*

2.4 The antecedents of digital ridesharing platform services usage

2.4.1 The usage of digital ridesharing platform services

Considering the reasons that people use digital ridesharing platforms is critical for understanding the tailwinds behind its rapid adoption in the past decade. Ridesharing has gained popularity globally among passengers in dense, urban areas due to its ease of use (Rayle *et al.*, 2016), cost savings compared to private transport options or taxis (Santos & Xavier, 2015), and user flexibility to travel from point A to point B efficiently compared to other private and public transport alternatives (Stiglic *et al.*, 2016). However, digital ridesharing platform services can also hinder usage due to safety concerns, discomfort, and inconvenience of riding in a small, confined space with strangers (Acheampong, 2021; Pratt *et al.*, 2019). In a comprehensive literature review on the antecedents to ridesharing usage, Si *et al.* (2023) outlines the motivating factors for ridesharing usage into demographic factors (sociodemographics, social roles, type of transport user, and neighborhood environment), situational factors (sustainability, technological progress, incentives, regulatory risks, cultural differences, and practical applications like overcoming the drawbacks of traditional transport options and optimization of supply and demand), and psychological factors (personal innovation traits, perceptions of risk, trust in the service, utilitarian values, and hedonic values).

Notably, ridesharing platform services are ubiquitous in both developed and developing markets. A substantial amount of research has examined the factors that influence the use of digital ridesharing services globally, including the United States (Brown, 2020; Cui *et al.*, 2021; Wali, 2023), Germany (Kostorz *et al.*, 2021), Brazil (Vaclavik *et al.*, 2020), China (Wang *et al.*, 2020, Kang *et al.*, 2024; Shi *et al.*, 2024; Zhao *et al.*, 2023), Pakistan (Raza *et al.*, 2023), Italy (Mattia *et al.*, 2022), Spain (Arteaga-Sánchez *et al.*, 2020), and Egypt (Elnadi *et al.*, 2024). These studies also acknowledge that their findings are specific to the geographic and cultural contexts in which they were conducted and may not be universally applicable.

Sociodemographic factors influence how people use ridesharing globally and in different ways (Kostorz *et al.*, 2021; Lavieri and Bhat, 2019; Ma *et al.*, 2019; Shao *et al.*, 2022; Shi *et al.*, 2024). For instance, Brown (2020) explored Lyft Shared in Los Angeles County, where she discovered that most riders came from densely populated, lower-income, ethnic-majority neighborhoods, rather than wealthier or more diverse areas. In Adelaide, Australia, Soltani *et al.* (2021) found that population density and housing value at the neighborhood level, higher levels of income and education, casual work status, younger age, and smartphone access were the key reasons correlated to higher ridesharing usage or interest. Studies in Chile and Ghana found that frequent ridesharing users who take rides monthly tend to be younger (18 to 29 years old) and have higher income (Tirachini and del Río, 2019; Acheampong *et al.*, 2020). Shi *et al.* (2024) also found that sociodemographics affected how ridesharing users in China responded to the survey they conducted on the antecedents to ridesharing, whereby older passengers were less responsive to monetary incentives to use cheaper, pooled ridesharing services that may take longer to reach their destination due to multiple passengers because they valued saving time more and may have more income. Recent studies have also noted how sociodemographics play a role in what type of ridesharing users would prefer to be matched with to share a ride. In the Dallas-Fort Worth metroplex of Texas, US, Lavieri and Bhat (2019) found that one of the main factors that dissuaded users from using a pooled ridesharing service is privacy concerns, whereby non-Hispanic White users are accustomed to more privacy than other users of other ethnicities. Cui *et al.* (2021) identified social barriers between strangers in ridesharing, revealing through a survey at the University of Buffalo those individuals with anxiety preferred sharing rides with those who had similar social habits, demographics, and behaviors.

Situational factors of ridesharing played a role in usage regarding public or alternative transport optionality and cost. In Germany, Kostorz *et al.* (2021) found that users of MOIA, a local ridesharing service, typically booked rides for leisure activities, only using the service occasionally. In many cities, particularly in developing markets in the Global South, a dearth of public transport options and taxis, transport connectivity, and vehicle ownership makes digital ridesharing platform services a useful and necessary mode of transport for door-to-door, on-demand mobility, such as the case of cities in Ghana (Acheampong, 2021).

Besides research on the direct reasons why or why not people would use digital ridesharing platform services, a large body of literature examines the externalities of using ridesharing, which can also influence whether new users decide to adopt the service or existing users decide to continue using it. Recent work has focused on the substitution effect that ridesharing usage has induced for taxis, public transport, and private car ownership. There is no consensus on the substitution effect as the research is mixed: ridesharing services can replace public transit usage and taxis (Clewlow and Mishra, 2017; Rayle *et al.*, 2016; Silva *et al.*, 2018; Tirachini and del Río, 2019) and decrease private car ownership (Clewlow and Mishra, 2017; Ward *et al.*, 2021a). Yet, they can also increase car ownership in US urban areas that are car-dependent and have low population growth (Ward *et al.*, 2021b) and increase vehicle ownership due to the influx of new ridesharing drivers (Guo *et al.*, 2019; Wadud, 2020). Ridesharing can also increase the number of new trips or distance that users normally would not take if they were not using this mode of transport (Schaller, 2021; Henao and Marshall, 2019; Tirachini and Gomez-Lobo, 2019); or they can complement public transit (Hall *et al.*, 2018). Recent research has also documented how the use of ridesharing can be a greater societal good in lowering traffic congestion and carbon emissions if vehicle occupancy is increased and the number of private vehicles on the road are decreased due to shared rides, which can be helpful in highly congested cities like in India (Agarwal *et al.*, 2023). These studies of ridesharing across the world show different results because ridesharing is context-specific and place-specific, meaning that how people use the service, and its impact differs according to situational contexts in which ridesharing is embedded in. Thus, the results of one study on the impact of ridesharing in one place cannot be easily generalized to other places and contexts; and a consensus in the literature cannot be reached.

2.4.2 The Technology Acceptance Model for digital ridesharing platform services

Several studies on the psychological factors that motivate ridesharing usage draw on the technology acceptance model (TAM) originally introduced in the information systems field to explain the factors that weigh in users' decision to use a technology (Davis, 1989; Venkatesh & Davis, 2000). The TAM, as shown in Figure 2.2, is a framework for understanding and predicting how users accept technologies and has been applied to understanding the factors that motivate the usage and reusage of digital ridesharing platform services. The TAM comprises of key factors such as perceived usefulness (*e.g.*, the degree to which ridesharing services are perceived as useful, which could mean convenience, cost-effectiveness, and time savings compared to other transport options), perceived ease of use (*e.g.*, the degree to which a user perceives ridesharing app services to be easy to use), attitude toward using (*e.g.*, the users' overall evaluation of ridesharing services based on their perceptions of usefulness and ease of use), the behavioral intention to use (*e.g.*, the likelihood that users will intend to use or reuse ridesharing services), and actual usage (*e.g.*, the frequency and extent of actual ridesharing usage). The TAM model can help to understand the antecedents to ridesharing usage, but a more comprehensive model that extends the TAM with additional constructs like trust, perceived risks, social norms, and confirmation of expectations as antecedents to ridesharing usage, satisfaction, and the intention to reuse would be more appropriate for capturing the complexities of ridesharing. I will explain the trust constructs in the next section.

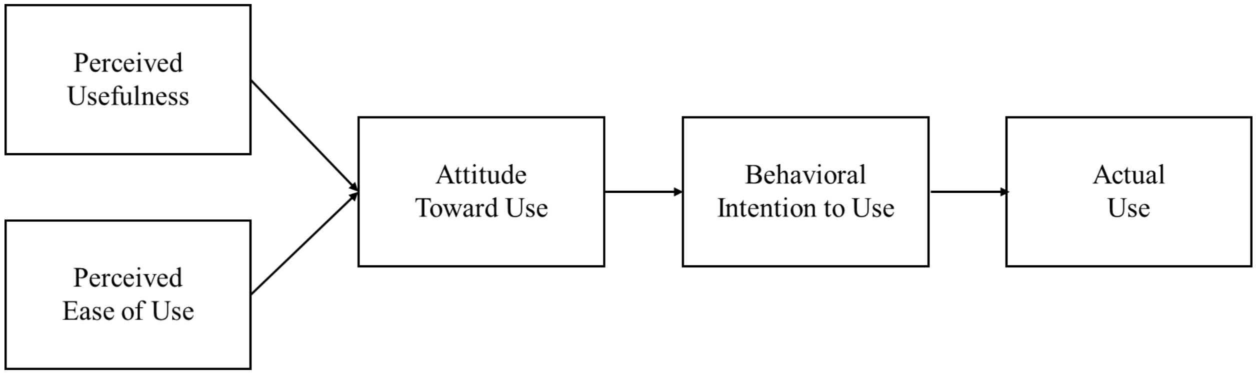

Figure 2.2 The Technology Acceptance Model (TAM) (Davis, 1989)

Wang *et al.* (2020) applied an extended TAM to examine ridesharing in China, discovering that perceived usefulness had the strongest positive effect on the intent to use the service, while perceived ease of use was insignificant, and perceived risk had a negative impact. In a survey of commuters in Ghana, Acheampong *et al.* (2020) found that sociodemographic factors, perceived benefits, the ease of use, perceived safety risks, and car-dependent lifestyles were antecedents to the use of digital ridesharing services. Their study also used an expanded version of the technology acceptance model (TAM) to capture the larger range of social influence and cognitive factors that play a role in ridesharing usage. In a study of intention to reuse digital ridesharing platform services in Egypt, Elnadi *et al.* (2024) concluded that optimism, innovativeness, discomfort, and insecurity affected users' perception of ridesharing usefulness; and that the intention to reuse the service is significantly correlated with their satisfaction, perceived usefulness, and perceived ease of use. These studies point to the importance of user perceptions of benefits, risks, and usefulness in their intention to use, reuse, and be satisfied with ridesharing services. The perceived ease of use had mixed results across the studies, most likely due to the users' comfort and familiarity with using digital ridesharing platform technology in different places.

Recent studies focus on new constructs like environmental awareness and personal innovativeness (*i.e*., willing to try out new innovations) among users as an antecedent to ridesharing usage. Kang *et al.* (2024) conducted a survey of users in Hefei, China and found that their additional constructs, personal innovativeness and environmental awareness, had positive but small effects on the intent to use ridesharing. Likewise, using a survey of ridesharing users in Karachi, Pakistan, Raza *et al.* (2023) found that environmental knowledge and awareness significantly and positively affect their behavioral intention to use ridesharing services but can be negatively moderated by users' perception of the risks of ridesharing. In Brazil, a survey of ridesharing users found that environmental impact significantly affected user satisfaction, but not the intention to use ridesharing (Arteaga-Sánchez *et al.*, 2020).

A growing number of studies also examine the role of safety concerns, a perceived risk, in the use of ridesharing. For example, safety considerations were the top choice when ridesharing users in Chile were asked what issues they would like to prioritize for ridesharing regulations (Tirachini and del Río, 2019). Concerns over safety and security was one of the reasons why people surveyed in Adelaide, Australia did not use or were not interested in ridesharing, in addition to the reasons of being older, digital illiterate, and living in the suburbs (Soltani *et al.*, 2021). In Brazil, Silva *et al.* (2018) found that safety and cost are the main reasons that motivate the usage of ridesharing. Safety concerns and perceived risks relate to how users form trust in digital ridesharing platform services, which are detailed in the next section. I aim to contribute to recent studies on the TAM and ridesharing by focusing on the role of user trust, which has been understudied to date.

2.4.3 The role of trust in the usage of digital ridesharing platform services

In addition to the technology acceptance model (TAM), I draw upon McKnight and Chervany's (2001) definition of trust in e-commerce transactions to apply the following trust constructs for digital ridesharing in the third study (Chapter Six) of this thesis: 1) *institutional trust* between a passenger and a mobile app interface that facilitates the transaction; 2) *dispositional trust* in others, akin to a user's general trust in society, strangers in general, or government institutions; and 3) *interpersonal trust* between the peer consumers in the experiential part of the transaction. Digital ridesharing platform transactions are similar to e-commerce transactions in that the transaction involves an online element of booking and paying for a ride, but they also involve an in-person interaction between two different consumers of the digital platform company: the service provider (drivers) and the end users (passengers). In digital ridesharing, drivers are also consumers of the algorithmic platform that matches them to passengers. Thus, I designate interpersonal trust in the context of ridesharing as the relations between peer consumers—a group of ridesharing passengers and a driver booked on the same ride—rather than between traditional buyers and sellers. The minor drawback I see in using this conceptualization of trust is that there is no distinction between the ridesharing platform app technology and the ridesharing company that provides the app technology in the concept of institutional trust. In the third study (Chapter Six) of this thesis, I assume that institutional trust embodies both the digital ridesharing platform company and the app technology.

Trust has emerged as a common theme in the literature on the decision to use digital ridesharing platform services, yet most of these studies focus mainly on institutional trust in the platform or interpersonal trust between the passenger and drivers or other passengers in a shared ride. Female users were found to be more sensitive to perceived safety risks that affected their perceptions of trust. Shao *et al.* (2022) also studied users of Didi in China to find that trust in the platform significantly and directly affects the perceived benefits and risks of ridesharing, and indirectly affects the intent to continue using the service and word of mouth to refer others to use the service. They also found that female users depend more on interactional justice (*i.e.*, users perceive they are being treated with respect, politeness, and courtesy by ridesharing drivers during a ride) when forming trust in the ridesharing platform. In a similar study with Didi users in China, Ma *et al.* (2019) found that gender, age, and income differences significantly influences users' risk perceptions, trust and intent to discontinue using the ridesharing service. Female users were less likely to trust drivers under the same level of physical risk as male users, whereby physical risk captures how worried a user is about their physical safety when using the Didi platform or they believe that using the Didi platform is relatively dangerous. In a national survey of 5,385 respondents in the US on their willingness to consider pooled ridesharing services like UberPool or Lyft Shared, where passengers are matched with other passengers traveling in the same direction for a shared ride, Su *et al.* (2024) found that trust in the driver and trust in other passengers had the highest number responses of being either "important" or "very important" to respondents in comparison to other variables.

In a qualitative study of ridesharing users and non-users in Ghana, Acheampong (2021) used an online survey with open-ended questions of 548 respondents in two large urban areas, Accra and Kumasi, to identify seven factors that affected passenger perceptions of safety and security in ridesharing. Most of these factors were related to either the driver or the platform app company: driver behavior was viewed as a safety risk in the case of reckless driving or unfair pricing practices, while the identification of the driver and vehicle, trackability and traceability of the ride, and trust of platform app's security features helped respondents to feel safe. However, four respondents—one female ridesharing user in Accra, one female ridesharing user in Kumasi, one male non-user in Kumasi, all of whom are between 30 to 34 years old; and one male ridesharing user in Accra (25 to 29 years old)—had expressed distrust of the platform app's security features because they could invite exposure to malicious activities and crime. Users felt safe when they had privacy when traveling alone and when they are using the service during an emergency when other travel options are not available. This study highlighted that trust in the company's security features on the ridesharing platform app, which would be akin to institutional trust in a company or their technology, as the type of trust that mattered to users.

There are a few studies that highlighted trust as an antecedent to customer satisfaction in ridesharing, but they did not clearly examine how trust is an antecedent to use of ridesharing (Möhlmann, 2015; Vaclavik *et al.*, 2020) or did not clearly delineate what type of trust it is (interpersonal, institutional, or dispositional) (Arteaga-Sánchez *et al.*, 2020), or focused only on one type of trust (Lee *et al.*, 2018; Shao *et al.*, 2022) or two types (Ma *et al.*, 2019). A study on the sharing economy involving a car-sharing platform, which differs from ridesharing as it involves renting a vehicle rather than sharing a ride, found trust to be a key driver of satisfaction (Möhlmann, 2015). Vaclavik *et al.* (2020) conducted a survey of 485 ridesharing users of services like Uber in the southern and southeastern regions of Brazil (Rio Grande do Sul, São Paulo, Paraná, and Rio de Janeiro) and found that users placed more importance on trust in the platform itself than interpersonal trust in the drivers, which makes another case for the importance of institutional trust in ridesharing.

Arteaga-Sánchez *et al.* (2020) used the expectation-confirmation theory (ECT), a theoretical framework focused on the antecedents of consumer satisfaction that incorporates technology acceptance and continuance (Bhattacherjee, 2001), and conducted an online survey of 258

BlaBlaCar users in Spain who were mostly male (93% of total respondents). They found that trust, environmental impact, perceived usefulness, service quality, and social value played key roles in consumer satisfaction with ridesharing. Satisfaction, along with economic benefits and perceived usefulness, strongly influenced the intention to use ridesharing. Their conceptualization of trust involves confidence in the accuracy of trip descriptions and the honesty of other users. Another study of Uber users in Hong Kong also found that trust in the platform, and perceived platform qualities were significant antecedents of intention to use Uber, in addition to perceived risk and benefits (Lee *et al.*, 2018). Ma *et al.* (2019) conducted an online survey of 443 ridesharing users of Didi in China that focused on how different types of perceived risk can influence (dis)trust in ridesharing drivers, and then influence their trust in the ridesharing platform, as well as attitudes towards the platform; both of which all culminate in the decision to discontinue using the ridesharing service. They used an integrated, conceptual model based on the Risk to Trust Unidirectional Model (Kim and Koo, 2016), which posits that perceived risks affect trust and that trust subsequently affects transaction intention, and the technology acceptance model (TAM).

Previous research has also addressed how trust can be barrier to ridesharing adoption and usage. There are multiple factors that can affect passenger safety over which digital ridesharing platform companies have control. These include recording driver and vehicle identification, ride tracking details, and having security features built into the digital application (Acheampong, 2021). Furuhata *et al.* (2013) analysed 39 ridesharing organizations and conducted a literature review to glean insights on how ridesharing companies can address the challenges to widespread ridesharing, emphasizing the role of trust-building mechanisms such as reputation feedback systems and social networking integrations for identity verification. While systems like driver ratings enhance trust, an experimental simulation study found that they introduce a trade-off between increased trust and potential privacy concerns due to the collection of personal data by ridesharing companies (Sanchez *et al.*, 2016). A conceptual study suggests that privacy-focused designs, such as those for dynamic carpooling, may bolster trust in the system but do not fully resolve trust issues between individual users (Friginal *et al.*, 2014).

Altogether, research to date has not thoroughly examined the role of trust—typified as interpersonal, institutional, and dispositional trust, as a precursor to the usage, satisfaction, and intention to continue using digital ridesharing services. Dispositional trust, as explained in the beginning of this sub-section, is the trust one has for strangers or society in general. It addresses the phenomenon of ridesharing passengers interacting with other unknown passengers in the confined space of a pooled ride. Prior research on the antecedents to ridesharing usage or other outcomes have not yet explored the role of dispositional trust in tandem with institutional and interpersonal trust; and I aim to do consider it in this thesis. In Chapter Six, I build on this stream of research on why people use digital ridesharing platform services by also drawing from trust literature on technology adoption from the information technology systems field, where I aim to answer the following research question outlined in Section 1.2: *how does trust—in particular, interpersonal trust between strangers who must interact in person—affect a consumer's decision to use digital ridesharing?*

2.5 Concluding remarks

Overall, my thesis aims to contribute to multiple, interdisciplinary streams of research related to: (1) the role that entrant, niche competition plays in engendering fast, comprehensive socio-technical transitions, (2) how stranger encounters unfold in shared rides in cities and the social norms and informal codes about moral conduct that ensue in digital ridesharing platform services, and (3) the role that different types of user trust plays in the usage of digital ridesharing platform services. These streams of research lie at the intersection of transport geography, innovation studies, urban studies, and information systems research. The interdisciplinary nature of this thesis reflects the multi-faceted approach needed to study the socio-technical implications of the rapid adoption and usage of digital ridesharing platform services in urban mobility. Finally, I also aim to contribute empirical studies on the usage and impact of digital ridesharing platform services on modes of mobility and society in Southeast Asia, which is situated in the growing literature on platform mobility and digital ridesharing innovations in the Global South.

Collectively, the findings in the three studies brought together in this thesis underscore how digital ridesharing platforms both shape and are shaped by the social-technical environments in which they operate. They reveal the intricate role of competition, social interactions, and trust in the success and challenges faced by these platforms. Through interdisciplinary empirical research, this thesis lays a foundation for further exploration of trust in digital platform services, shared mobility innovations, and the broader sharing economy.

3. Chapter Three - Methodology and Research Design

This chapter focuses on the research methodology and design used in this thesis. I build on the previous two chapters to detail how the three studies in this thesis are designed using a multi-methods approach, what methodologies are used, how the research sites were selected, and how data was collected. Finally, I will discuss my positionality in these studies.

3.1 Research design and multi-methods approach

As outlined in Section 1.2, I used a multi-methods approach in this thesis across the three studies that comprise Chapters Four, Five, and Six. Chapters Four and Five employ different qualitative methods, while Chapter Six focuses on a quantitative survey methodology to gather insights from a larger sample of participants to test a conceptual model. The reason for adopting a multi-methods approach is that it has enabled me to use the best methodology to answer the research questions in each of the three studies and use an inductive approach in the first two studies to identify relevant insights that the latter empirical study could focus on. This approach has ultimately allowed me to apply the empirical insights gathered from the studies in Chapters Four and Five to motivate the research question and scope of study in Chapter Six. Specifically, a qualitative case analysis in the first study (Chapter Four) revealed that the rapid rise of ridesharing platform services in Southeast Asia, fueled by intense competition between ridesharing platform companies, helped the innovation become mainstream. The second study (Chapter Five) used qualitative interviews with ridesharing platform drivers and passengers in Singapore and Manila, Philippines to learn that digital ridesharing services are a socio-technical conduit for strangers in cities to interact personally in a shared ride, where issues of interpersonal trust of the driver and other passengers, institutional trust of the digital platform application, and generalized trust of society arose. The third study (Chapter Six) builds on the insights of the first two studies to survey ridesharing passengers about their views on three types of trust that underlie riding with strangers in on-demand rides booked through a digital ridesharing platform company.

Chapter Four utilizes a single case analysis methodology (Berlant, 2007) of the history and evolution of the Southeast Asian ridesharing industry to examine how the socio-technical innovation of ridesharing was adopted and scaled rapidly in the timeframe of less than a decade (2012 to 2022). The study examines a specific case through a flexible approach that deepens the understanding and critical analysis of the situation beyond a single, particular case study (Castree, 2005; Flyvbjerg, 2006). It employs narrative, interpretive, and evaluative techniques, enabling the transition from examining singular events to forming broader insights about their importance within social, ethical, or academic discussions (Berlant, 2007). This case analysis methodology enables researchers to approach and understand the phenomenon studied in new ways that can be applied to other situations and contexts. For example, analyzing the rapid rise of the Southeast Asian ridesharing industry since 2012 from the experiences of focal startups: Grab, EasyTaxi, Uber and Gojek, allows us to understand not only how ridesharing unfolds in other places, but also the dynamics in transition processes in other sectors, systems and places. Analyzing the case of the scaling of this industry ultimately allows us to start from the particularities of the case to reach generalizable insights.

Chapter Five offers a constructivist grounded theory study (Charmaz, 2006) of the social norms and informal codes about moral conduct that emerge from, and are reworked through, the act of ridesharing between drivers and passengers in urban areas. Through an iterative analysis of over

65 semi-structured interviews with drivers and passengers of two major ridesharing platforms in Singapore and Manila in 2017, I contribute rich empirical insights that elucidate how both positive and negative stranger encounters between drivers and passengers unfold before, during and after a shared ride in the confined space of a car. Qualitative interviews are a suitable method for this study because it enabled me to understand the participants' views, feelings, and recollections of their lived experiences (Creswell, 2018). I use this study to set the groundwork for a subsequent study that aims to conceptualize trust between drivers and passengers.

Chapter Six focuses on the results of an online survey of ridesharing passengers in Singapore who have used services in which they ride with fellow passengers who are strangers in an on-demand, shared ride. The survey focuses on understanding the role of user trust in on-demand, digital ridesharing transactions that involve offline and online interactions with strangers and the digital platform company. This third study (Chapter Six) utilizes a quantitative survey of a large sample of passengers from a leading ridesharing company in Southeast Asia. In addition to defining a conceptual framework for trust in a sharing economy context, I also aim to determine how sociodemographics related to trust can enable ridesharing to foster social relations between strangers over time in Southeast Asia.

3.2 Site selection

The Southeast Asian context provides an apt context, as detailed in Section 1.3, for my thesis because of the large size of the digital ridesharing platform market with multiple companies and its diversity of countries, cities, and users. In the first study (Chapter Four), I focus on the broader scope of the Southeast Asian region because the rapid scaling of digital ridesharing platform innovations took place regionally. The scaling did not happen in isolated cities, but because of multi-faceted marketing efforts by regional and global startups like Grab, EasyTaxi, and Uber that focused on entering Southeast Asia as a region. These companies focused on operating digital ridesharing platform services in urban areas across Malaysia, Singapore, Thailand, Vietnam, Indonesia, and the Philippines. The regional context also provided a backdrop of the incumbent taxi and public transport regimes, as well as the regulators' stances and rulings on the legitimacy of digital ridesharing platform services, across different cities and countries to offer a rich research context to examine the effects of niche competition in different places.

In the second study (Chapter 5), I narrow the geographic scope to doing field interviews in two cities: Singapore and Manila, Philippines. First, I selected these two cities because the Grab managers declared them as the most developed markets for on-demand carpooling ride services like GrabShare, GrabHitch, and UberPool, whereby passengers can be instantly matched with other passengers who are travelling in a similar route for a shared ride. Both cities have the most demand for digital ridesharing platform services because both have relatively low car ownership amongst their populations (Chalermpong *et al.*, 2023).

On the other hand, these two cities are ideal for this thesis because within Southeast Asia, they represent two unique settings for comparison, as shown in the criteria in Table 3.1, which shows that Singapore and Manila differ in population, area, GDP per capita, perceived safety, traffic efficiency and public transport options (also explained in Section 1.3). The choice for these two remarkably different cities based on the criteria of Table 3.1 is akin to selecting "extreme cases" of annual GDP per capita, rankings of city safety, public transport availability, and overall institutional environments that can aid in theory development due to an increased comprehension of outlier cases that can help the researcher develop a sense of theories' limits because their dynamics, patterns, and causal mechanisms can be compared in a clearer way (Flyvbjerg, 2011). Extreme cases are those that exhibit particularly pronounced or unusual examples of a phenomenon, often at the ends of a spectrum. Another reason why I selected these two cities is due to their contrasts in ethnic and national diversity, which can help to better understand the social dynamics of ridesharing among strangers who are from different socio-demographics. Singapore is a multi-ethnic city-state nation of 5.7 million people in 2019 with a multiracial, multicultural society comprised of 76.2% ethnic Chinese, 15.0% Malays, and 7.4% ethnic Indian nationals; of which 1.65 million people are also expatriates. In contrast, Metro Manila has over 12 million people and a more homogenous population with a low expatriate population.

Table 3.1 City statistics and characteristics for basis of selection

Cities	Singapore	Metro Manila
Population (Philippine Statistics Authority, 2018; Singapore Ministry of Health, 2019)	5.70 million (2018)	12.88 million (2015)
Area (km^2) (Philippine Statistics Authority, 2018; Singapore Ministry of Health, 2019)	725.7 km^2	619.5 km^2
Annual GDP per capita in USD (CEIC, 2018)	55,182 (high)	9,139 (low)
Safe Cities Index ranking (Kiestra, 2019)	High (#2)	Low (#43)
World traffic congestion ranking (TomTom, 2019)	Low (#96)	High (#2)
Car ownership level (BBC News, 2017; Data.gov.sg, 2018; Euromonitor International, 2017)	Low	Low
Public transport availability (Abad, 2019; Knupfer *et al.*, 2018)	High	Low

This choice is also based on a call to action “towards a relational comparative approach” in modern human geography scholarship that uses qualitative methods to understand the interdependencies and interconnectedness of cities being compared (Ward, 2010). This approach argues for moving away from traditional comparative urban studies that mainly used quantitative approaches and viewed cities as bounded and more static and towards “composing comparisons,” which depicts a localized approach to selecting cities with shared characteristics that can be compared and contrasted (Robinson, 2002, 2016). By comparing Singapore and Metro Manila as relational, dynamic places, this thesis aims to draw insights from one city to better understand if the results exist or not in the other city—and why or why not. This relational comparative approach enables me to examine how these two cities are interconnected through the digital ridesharing services that they both offer and through regulatory policies that are co-created between regulators of both jurisdictions, while also contrasting the findings regarding each city’s unique sociodemographic and institutional contexts. It has been worth implementing this relational comparative approach because it enabled me to have a richer understanding of the variety of social norms, expectations, prejudices, and moral codes that are embedded in the ridesharing experience in the two cities. Specifically, I was able to identify how ridesharing users in each city perceived one digital ridesharing platform service in vastly different ways, whereby contrasting cultures, socioeconomic statuses, and institutional environments shaped how drivers and passengers in each city view common ridesharing experiences.

The third study (Chapter Six) focuses on digital carpooling platform services in Singapore because it was the first country in Southeast Asia to launch commercial carpooling services for ridesharing, which pools strangers together on a shared ride via a route of predetermined stops for each passenger. As such, it is the most mature market with services like GrabShare, GrabHitch, and UberPool for shared rides between unknown passengers who are matched on-demand for rides with similar routes. GrabShare, UberPool, and GrabHitch are similar digital carpooling services where passengers share a ride with other passengers who are travelling in a similar route, except that GrabHitch is a more informal, social carpooling service where the drivers are not commercially licensed, professional ridesharing drivers who earn fares like in GrabShare and UberPool. They are private drivers who enable passengers to “hitch” a ride with them while they commute to work or school. GrabHitch passengers usually end up being a colleague or neighbouring colleague at a workplace and they can arrange to regularly commute with the driver for future rides (Neu, 2018). GrabHitch drivers can only offer two rides a day and do not earn a ride fare but receive some funds from passengers to cover petrol costs for the ride.

I conducted the survey for this third study in late 2020 in the aftermath of global COVID-19 pandemic lockdowns, which may have impacted how survey respondents perceive trust in ridesharing. Grab had suspended GrabShare on 9 February 2020 after a taxi driver and a ridesharing driver were reported in the media to have had COVID, although there was not yet a government ban (Salim, 2020). Grab suspended GrabShare for nearly three years until January 2023 because the company believed that GrabShare posed a larger risk as a more popular, commercial service with unknown riders. On the other hand, Grab only halted GrabHitch on 7 April 2020 for two months due to a government lockdown ban, but mandated safety precautions when the government lifted the ban in June (Toh, 2020). Such precautions included mandating masks to be always worn in the ride, drivers having to submit a health declaration form to the company, and passengers not being allowed to sit in the front seat near the driver (which limits the maximum number of passengers to three instead of four). GrabHitch is a less frequently used service whereby the driver and passengers would more likely know one another; and would be more akin to private citizens arranging to ride together as the drivers are non-commercial.

3.3 Data collection

In the first study (Chapter Four), I collected secondary archival data for documentary analysis (Grant, 2019), which focused on the six major Southeast Asian countries in which ridesharing innovations were operating from 2012 to 2022: Malaysia, Singapore, Philippines, Thailand, Vietnam, Indonesia. Ideally, I wanted to collect primary data through interviews with Grab's former and current employees; and be able to use data from my own personal emails and documents from my time as a former employee at Grab from 2013 to 2017. While such materials could offer valuable insights, ethical considerations and company policies played a critical role in determining which data I could and could not use. Confidentiality agreements and Grab's strict data management protocols, particularly during sensitive periods like their IPO preparations between 2019 and 2021, restricted the use of internal materials. To uphold research integrity and ethical standards, I refrained from using proprietary documents or personal correspondence and instead relied on publicly available data sources, such as press releases, media coverage, and archival information. This approach ensured compliance with both ethical and company guidelines while maintaining the validity and rigor of the research.

Thus, I used archival data from online news articles and company-issued press releases and reports found on company websites. In early to mid-2018, I first conducted a systematic online search on Google News and Google's general search (my IP address was located in the United Kingdom) for all English-language media articles, reports, and press releases published since 2012 of each of the major digital ridesharing platform companies that will be discussed: Grab, Uber, Gojek and EasyTaxi. I bookmarked these articles on Google Bookmarks and read through each one. I then set Google alerts for each of these searches to receive updates on relevant articles monthly to my university email and bookmarked the relevant articles. The search terms included the company name, plus each of the countries and major cities they operated in Southeast Asia—for instance “Uber Malaysia.” I searched in the English language because it is the main language or one of the main languages used for national media throughout the six countries I focused on in Southeast Asia, but did receive some articles in Thai or Vietnamese language. I do not believe that searching for articles in the English language limited my sources because the Thai and Vietnamese language media had corresponding English articles and I was able to check that the English version matched closely due to the Google Translate feature.

In the next phase, I used search terms focused on each company’s major ridesharing services along with the geographic specification – as in “GrabTaxi Bangkok.” In addition, I canvased the companies’ websites to collect relevant press releases, blog entries and reports. The online data was then ordered chronologically to construct a timeline of major ridesharing industry events relating to the entry, scaling, and competition of the ridesharing companies in Southeast Asia. The most relevant articles were selected to construct the case analysis, particularly ones that offered contextual data and viewpoints from diverse stakeholders. I updated the case analysis and timeline in Figure 4.1 in 2019 after a major milestone in which Grab acquired Uber in Southeast Asia, again in 2022 after Grab completed its initial public offering to become a public company in December 2021. In total, my search yielded 696 articles and websites that I bookmarked; with the majority representing Grab throughout the region, most likely because Grab was the remaining company in 2022 with a complete regional presence compared to Uber, GoJek, and EasyTaxi.

When I reflect on my methodology for the first study (Chapter Four) and if I were given the opportunity to redo this study, I would contact the Grab executive team again to ask if I could have permission to interview their former and current employees, now that they are already a publicly listed company. However, because of their ongoing competition with GoJek (now known as GoTo), they may decline again if information regarding their competitive strategy would be revealed as the study focuses on their competition. Another alternative would be to contact the venture capital investors who invested in Grab and its competitors, which would add an important viewpoint. I had also contacted Grab's early venture capital investors, but did not succeed in getting interviews. Given my work experience at Grab, I believe that richer, primary qualitative or archival data could add more context and nuances to how Grab and its entrant competitors were able to rapidly scale. On the other hand, my previous work experience at Grab enabled me to better identify entrant competition, supported by venture capital funding, as important in the upscaling of digital ridesharing platform innovations in Southeast Asia as competitive strategy played an outsized role in my job.

For the second study (Chapter Five), I collected the data by conducting 65 semi-structured, in-depth qualitative interviews with ridesharing platform drivers and passengers from Grab in Singapore and Manila, Philippines from June 2017 to December 2017. Getting the perspectives of both drivers and passengers is crucial for understanding the sociality of shared rides enabled by digital ridesharing platforms. I decided to focus on interviewing drivers and passengers from Grab because it was the largest, regional digital ridesharing company in Southeast Asia at the time with a strong presence in both Singapore and Manila. In June 2017, I had obtained an anonymized list of 21,798 Grab drivers and 51,000 Grab passengers in Manila, Philippines, and 26,210 Grab drivers and 75,000 Grab passengers in Singapore from the Grab Data Science team.

I had asked the Grab team to select all users who had used the platform for at least one ride in the previous eighteen months since January 2016 and did not have a do-not-call privacy status. A total of 71 drivers and 584 passengers in Manila, and 2,909 drivers and 2,105 passengers in Singapore on the list were called and texted to ask if they would be interested in being interviewed for the study and paid a small honorarium worth USD 7. I had randomized the potential contacts on the list using a randomizer variable in Excel, so that the contacts appeared in no particular order and that a more representative sample could be obtained.

To contact the drivers in the Philippines, I worked with a research assistant based in Manila to call drivers one-by-one on the list until we reached our goal of 10 drivers to be interviewed because the Grab team suggested that calling is the best way to reach drivers. For passengers in Manila, the research assistant instead texted passengers in batches of about 100 passengers until we received 20 interviewees. In Singapore, I worked with another research assistant to text both drivers and passengers on the list in large batches of over 100 passengers until 18 passengers and 18 drivers agreed to participate. The costs of the texts and calls limited the number of contacts we texted. In Singapore, I interviewed 11 male and 7 female passengers ranging from ages 21 to 55 years old; and 16 male and 2 female drivers ranging from ages 34 to 64 years old. In Manila, 11 male and 9 female passengers ranging from ages 21 to 62 years old; and 9 male drivers and 1 female driver ranging from ages 36 to 63 years old were interviewed.

All interview participants, except for four passengers and two drivers, were active users of Grab, which means that they were active, registered users of Grab at the time of interview. The inactive Grab users were those who have either never registered for Grab, have registered but stopped using or deactivated the Grab app, or they were banned by Grab and prohibited from using it. As detailed in Section 5.5, the recruitment process involved purposive and snowball sampling techniques to capture diverse participant experiences. It was important to have inactive users in the sample to better understand why some people either refuse or decide not to use ridesharing services.

Most of the interviews were conducted in person in coffee shops or restaurants in Singapore and Manila. A few interviews with drivers were conducted on the phone when an in-person interview could not be arranged. Each participant signed a consent form prior to the interview and agreed to be voice recorded; and received a small honorarium for their time. Monetary incentives in qualitative research can enhance participation and acknowledge participants' time, but they can also raise ethical concerns regarding their influence on voluntary consent and the researcher-participant power dynamic (Head, 2009). Thus, I tried to ensure that the payments were proportionate and appropriate within the context of the study by paying the equivalent of a minimum wage for the participants' time. I do not believe there was selectivity in the final sample because the passenger interviewees were a diverse representation of age, gender and ridesharing usage frequency. The Grab drivers were mostly male to begin with, so the few female drivers interviewed were also representative of the actual population of drivers.

When I reflect on my methodology for the second study (Chapter Five) and if I were given the opportunity to redo this study, I would have tried to interview more drivers and passengers of Indian descent in Singapore because I was only able to interview one driver of Indian descent out of the 18 drivers and two passengers of Indian descent out of the 18 passengers in Singapore. This reflection aligns with the discussion in Section 3.6 on researcher positionality, where the significance of representation and diversity in the sample was highlighted. I would also try to interview more female drivers by asking the Grab team to provide a list of drivers who are female, so that there could be more than two female drivers interviewed in Singapore and more than one female driver interviewed in Manila. I would have liked to ask these interviewees more about whether they have faced prejudices from others during the ridesharing experience and learn more about their perspectives on ridesharing in general.

For the third study (Chapter Six), I used the same anonymized passenger list provided by Grab in June 2017 as in the previous study but focused on passengers in Singapore who had used either GrabShare or GrabHitch because Singapore was the only city where both services were available at the time. This filtered passenger list comprised a total of 26,653 GrabShare passengers and 23,719 GrabHitch passengers; and did not include the three Grabshare and seven GrabHitch passengers who were already interviewed in the second study in order to gather perspectives from new respondents. With the help of a local research assistant in Singapore, a group of participants who had used each of these Grab ridesharing services at least once in 2017 were recruited by email to participate in an online survey conducted in late 2020. All 50,372 passengers from the GrabShare and GrabHitch lists were sent an email asking them to fill out an online survey. In return for their participation, the survey respondents were offered a chance to win one of five SGD 150 gift cards for use at Singaporean retail outlets. The survey aimed to understand ridesharing users' attitudes, preferences, and trust regarding ridesharing with strangers. I collected online survey data using Qualtrics from 6 October 2020 to 31 December 2020, which yielded a total sample size of 278 surveys for GrabHitch users and 275 surveys for GrabShare users. I do not have reason to suspect selectivity in the participating sets of passengers, but I do suspect that many of the people emailed either did not read the email, possibly because it went straight into their spam folder, or ignored the request due to disinterest.

I was aiming for at least 500 respondents, so the survey yield is in line with what I had hoped, but I expected a much higher response than 1.1%. A better monetary incentive could have increased the response rate, but I had to work with a limited budget for this project.

When I reflect on my methodology for the third study (Chapter Six) and given the opportunity to redo this study with a larger research budget, I would have tried to increase the response rate by also texting the targeted respondents, assuming that people would be more likely to check their texts compared to emails. However, texting is costly, and I had chosen emailing due to its cost-effectiveness. Another thing I would change is to ask more survey questions about how their use of ridesharing affects the three types of user trust surveyed. I suggested this as a future research endeavour only because I realized in hindsight that it would have been interesting to have a non-recursive conceptual model with a feedback loop that represents how ridesharing experiences shape trust perspectives in users.

3.4 Data analysis

In the first study (Chapter Four), I had engaged in peer debriefing sessions with colleagues at Grab to read the draft of my first study and further validate the details of that case analysis on Grab and the greater Southeast Asian ridesharing platform industry. These discussions provided an external perspective that challenges my interpretations and helped me to identify blind spots in my analysis. This practice of seeking alternative viewpoints is crucial in maintaining the integrity of my research and ensuring that my findings are not overly influenced by my personal experiences. However, I recognize that it could also be problematic because the Grab team could have tried to influence or limit what I could say in the study because of their own business reputation concerns if the case analysis in the first study did not represent them in the way that they prefer, even though the case analysis would have been reporting the truth. For this first study, the Grab Communications team had the final sign-off on what I could say in my first paper in that they did not want primary data to be used for this the topic of entrant competition. Because the company was preparing for their acquisition of Uber and for an initial public offering soon, the Grab executive team let their Public Relations team manage external communications that could be published, which included my first study because I decided to disclose my research study to them and co-opt them in helping to validate the case analysis.

However, I do believe that being relegated to using secondary, public data sources limited the richness of the primary archival data and potential interview data that I had access to for my first study. For example, I had relevant quotes from my former Grab colleagues, and I could have interviewed key Grab executives to provide more detailed perspectives on the role that entrant competition played in the rapid scaling and adoption of Grab's ridesharing platform innovation. The Grab Public Relations team did not dispute, nor discourage me from reporting, my case analysis findings in the first study; but they did not want to go on record with any quotes from the Grab team about their experiences on entrant competition to negatively affect the progress of their pending acquisition of Uber in Southeast Asia, which was announced in March 2018, and their eventual initial public offering in December 2021.

Although Grab's decision to limit my usage of primary data for the first paper may have compromised the richness of the data, it ultimately did not change the results or main findings of my case analysis. Thus, I was willing to honour Grab's request to use secondary data to uphold our signed research memorandum of understanding and nondisclosure agreement. For the second and third studies, the Grab team fully supported me in collecting primary data from their registered drivers and passengers through qualitative, in-depth interviews and an online survey. For those studies, Grab believed that my research insights on the sociality and role of trust in ridesharing could offer valuable user feedback and improve their policies and relationships with their drivers and passengers.

In the second study (Chapter Five), I used a constructivist grounded theory approach to analyze the qualitative interview data collected from Grab drivers and passengers in Singapore and Manila, Philippines by applying rounds of initial and focused coding to the interview transcripts, with the aim of constructing interpretive patterns and deriving theoretical insights from the empirical data (Charmaz, 2006). I began the study with a prior literature review on the sociality of the car ride experience before, during, and after the ride as a guide to inform my interview questions and collect data on these specific stages of a shared ride enabled by a digital ridesharing platform service. I also used these categories of the stages of a shared ride experience to group my data into the initial codes. I also applied a relational comparative approach (Ward, 2010) by comparing similar, connected ridesharing experiences that took place in both Singapore and Manila, two cities that differ in socioeconomic demographics. For example, I was able to interview a passenger who originally hailed from Manila but had relocated to work in Singapore. She had used Grab in both places, but what was interesting was that she brought one of the cultural expectations of ridesharing from Manila, where the experience is seen as an aspirational experience typically used by wealthy or upper middle class citizens. In Singapore, she would use a ridesharing service in a private car instead of a taxi because she would like to be seen being picked up and dropped off by a "private" driver. However, in Singapore, a higher-income city than Manila, a ridesharing service in a private car may be viewed more as a commodity or a similar transport class option as a taxi to Singaporeans, since taxis in Singapore offer higher quality vehicles and service compared to taxis in Manila. If I had analysed the data on each city in isolation, it would have been difficult to develop nuanced insights on how the same ridesharing experiences are experienced and perceived across these two cities.

In the third study (Chapter Six), I analysed the survey data using covariance-based structured equation modelling (CB-SEM) to determine how well the conceptual model I had proposed fit the survey data. I chose the CB-SEM method because it is the most suitable SEM method for confirming a conceptual model that I had proposed compared to the other main method of partial least squares structural equation modelling (PLS-SEM), which is more appropriate for predicting outcomes. Although the quantitative survey method had been advantageous for collecting data for standardized questions on a large scale, it did not provide as much depth as qualitative interviews for analyzing the context and nuances of the data collected. When analyzing some of the survey data results, I sometimes inferred what the results from a group of individuals could mean in the larger context of ridesharing in Singapore. For example, the survey revealed that non-Singaporean national users are less satisfied with the GrabShare service than Singaporean national users. I offered a possible explanation for this result: that non-Singaporean nationals may have felt the effects of less trust towards them from fellow passengers. I was careful to note that it is a potential explanation and not a definitive one. I believe that the in-depth, qualitative interviews of GrabShare passengers in my second study (Chapter Five) may have indirectly informed the inferences I made from the survey data in the third study (Chapter Six). If I could redo this third study, I would see the benefits of conducting in-depth qualitative interviews to follow up with some of the survey respondents to better understand the context and nuances of their survey responses.

3.5 Research ethics

My second and third studies respectively involved interviewing and surveying ridesharing users from Grab, so I applied for and received research ethics approval at the University of Oxford through the Central University Research Ethics Committee (CUREC) after receiving permission from Grab to contact their users for these studies. In addition to agreeing to participate in the study, the consent form ensured that participants were aware: that they understood the aim of the study and could ask questions if needed, that their participation was voluntary and that they could withdraw without penalty at any time during the study, and of how the data collected from their survey would be used, anonymized, and handled for research. All the participants in the second study received a CUREC-approved consent form to fill out and sign prior to being interviewed by me; and all of them also agreed to be audio-recorded. The survey participants in the third study also received a CUREC-approved consent form to read and sign online before beginning the online survey they took.

One unexpected issue arose during the second study on 1 August 2017, early on in the data collection process, when a Grab driver in Singapore who was contacted by email about being an interview participant reached out to the Grab team about data privacy concerns. The Grab driver had thought that Grab was selling his contact data to the University of Oxford's Transport Studies Unit because of the disclaimer in our recruitment text that the research study "is not affiliated with the company Grab." Grab's Public Policy Research Manager subsequently contacted me to ask if we could drop that non-affiliation phrase from the study recruitment communications to prevent future incidents in which respondents may believe Grab had sold their data to a third party, especially since my recruitment email also mentioned that Grab had referred the driver to our University of Oxford research team. The Grab manager also asked me to emphasize that the results of the study will be completely anonymized to the extent that they cannot be traced to the participant. The Grab manager also mentioned the concern that some participants may be worried that what they shared with me in the research study could be shared with Grab, such that I should also state that their answers would not be shared with Grab (which never had been my intention anyway). Finally, the Grab manager requested that the email should emphasize that Grab takes issues relating to personal data seriously and that all personal data is confidential and third parties with whom they disclose data to have similar confidentiality obligations; and that the email should give a clearer option for participants to decline and not be contacted in the future for research purposes. I agreed to honour all of Grab's requests and thought they were all reasonable and could help both parties take more careful measures on research ethics.

In addition to adding more clarity about research ethics to the participant recruitment messages for the rest of the second study and for the third study, the Grab Research manager also asked my department, the University of Oxford's Transport Studies Unit, to sign a memorandum of understanding on the research project dated at the start of the collaboration, in addition to the nondisclosure agreement on data confidentiality already signed with them. Grab then wrote an email to the concerned driver to confirm that Grab was collaborating on a research project with the University of Oxford and that the driver is still protected under Grab's privacy policy. Grab also informed the driver that they had instructed our research team to stop contacting him in the future. Fortunately, this was the only issue I faced of its kind during the research participant recruitment process. For the third study, I was more careful about wording the recruitment emails such that it was clear that Grab was collaborating with the University of Oxford's Transport

Studies Unit on a research study, but that any data that the participants shared would be kept confidential from Grab and completely anonymized.

Apart from having to address these aforementioned data concerns that arose from this one Grab driver's complaint, I did not face any other issues in this thesis from the use of Grab data. In hindsight, my experience dealing with the Grab team and my supervisor at the University of Oxford's Transport Studies Unit to resolve the Grab driver's concerns helped me to be more vigilant going forward in navigating ethical considerations around data confidentiality and the representation of research participants' viewpoints. After the driver's complaint I paid more careful attention to ensure that the participants' identities and experiences were protected under the guidelines of CUREC. Before I started to interview participants in the second study, I made sure to remind them as they were reading the consent form that their data would be kept confidential and not shared with Grab; and any data from their interview that would be used would be anonymized such that it cannot be traced back to them. In this way, I sought for participants to trust that I would not disclose the information they shared with me to the company and would keep my word. Based on the candid nature of many of the interviews I had in the second study, I did not explicitly observe that any of the participants seemed concerned about openly sharing their thoughts and experiences.

3.6 Positionality as a researcher

As a researcher embarking on a study of a company, Grab, where I was previously employed from 2013 to 2017, I have found myself in a unique and complex position that demands careful consideration and ongoing reflexivity in this thesis. In this section, I explore the multifaceted nature of my positionality and the implications it has had for my research process, data collection, analysis, and the overall credibility of my thesis.

In this thesis, I draw upon feminist notions of objectivity that underscore the importance of recognizing personal and social influences on research production and making oneself accountable for how one shapes the knowledge one products (Haraway, 1988; Harding, 2015). Haraway (1988) recognizes that all knowledge is context-dependent and influenced by particular viewpoints; and promotes the notion of situated knowledges by encouraging researchers to recognize their own positions and strive for responsible and interconnected understandings, moving away from the pursuit of impossible neutrality. She suggests that researchers should adopt 'passionate detachment,' which involves maintaining critical involvement while being conscious of the inherent constraints of their viewpoints, thereby cultivating significant and interconnected knowledge. Likewise, Harding (2015) proposes that true objectivity is achieved in research not by eliminating personal or social influences but by consciously acknowledging and examining them within research. Harding suggests that researchers should incorporate perspectives from marginalized or oppressed groups, as these viewpoints can help expose biases that are often invisible within dominant frameworks.

Thus, I recognize that my insider-outsider status forms the core of my positionality in this thesis (Corbin Dwyer and Buckle, 2009). According to Mullings (1999), researchers often move between insider and outsider roles, adapting their representation of identity to facilitate trust with informants, yet these shifts also raise ethical and interpretive challenges. She acknowledges that a shared understanding can emerge between a researcher and research subjects, but notes that this relationship can be laden with power dynamics, especially when involving actors from different social or economic statuses. A researcher’s status can be in flux and defined by one’s identity, space, and context at any given time or lived experience (Bayeck, 2022). Thus, researchers should acknowledge how their social and positional attributes affect the knowledge they produce (Mullings, 1999). By taking a dynamic perspective on positionality that values reflexivity, I recognize that I must critically navigate and negotiate my identities relative to space and context, rather than relying on fixed categorizations, to authentically engage with research subjects while also being mindful of ethical implications and uncertainties in the interpretation of the research produced.

As a former employee of Grab, the focal company studied in this thesis, I possess an insider view through my intimate understanding of the company’s culture, internal dynamics, and operational processes, as well as an understanding of the digital ridesharing platform industry in Southeast Asia as a whole. I had spent time working alongside ridesharing drivers through my previous work experience and understood how to effectively communicate with drivers and use certain language or lingo to present myself as an insider. This insider knowledge also provided me with a valuable foundation for formulating relevant research questions and interpreting subtle nuances within the organizational context. Moreover, my familiarity with the company's language, jargon, and unwritten rules has allowed me to navigate the research terrain with a degree of fluency that could potentially lead to richer, more nuanced data collection. One example of an unwritten rule is that ridesharing drivers regularly congregate at a canteen near the Grab office in Singapore and I used this insider knowledge to schedule interviews at these places that are more familiar and comfortable for the ridesharing drivers whom I interviewed. However, I am aware that my understanding of Grab and the ridesharing industry in Southeast Asia may be outdated or have changed since I left my previous job in 2017, particularly for the first and third studies.

Because I had conducted the qualitative interviews for my second study in late 2017, my insider knowledge would have been relevant at the time of data collection and analysis for that study.

My former work experience helped me to formulate the research questions in these studies, which I deemed relevant not only for theory, but also in practice. In the first study, my positionality enabled me to deeply understand the context of the secondary sources of archival data I collected and connect disparate pieces of data to piece together for a case analysis that also corroborated my personal experiences at Grab and within the Southeast Asian ridesharing platform industry during 2013 to 2017. For the second and third studies, my connection to Grab as a former employee enabled me to obtain proprietary, anonymized driver and passenger lists that I used to contact participants for the respective qualitative interviews and online survey for each study. On the other hand, my former affiliation with Grab was also a drawback as evidenced by the case of the driver from Singapore who was concerned that Grab was selling his data to a third party and did not want to participate in the research study. It is likely that my complex positionality may have confused and turned away other potential research participants like this driver; and therefore, may have lowered the number of willing research participants in the second and third studies.

This insider perspective also presented challenges that require careful navigation and reflexivity as a researcher. The personal experiences and relationships I developed during my employment may have inadvertently coloured my perceptions and interpretations, so I tried as much as possible to be aware of my positionality when conducting the interviews with the research participants in the second study and when analyzing the data collected in the second and third studies. There is a risk of making assumptions based on my prior knowledge, potentially overlooking important details or failing to probe deeply enough into areas I believe I understand, but I aim to alleviate this concern in the second and third studies by focusing on collecting primary data on the experiences and viewpoints of ridesharing platform drivers and passengers.

Additionally, my previous role within the company may have influenced how participants perceived me and responded to my inquiries, potentially affecting the authenticity and openness of their responses. This was the most challenging limitation to address, but at the start of the interviews in the second study, I disclosed to each participant that the information they shared with me in the interviews would be completely anonymized, not shared with third parties, including Grab, and that their participation and identities would be kept confidential. I was transparent about my dual role as a former employee and current doctoral research student at the University of Oxford, clearly communicating the boundaries of my research and ensuring that participation is truly voluntary and that their data and information would be kept confidential and anonymized. Like previous studies on the insider-outsider positionality of a former insider-turned-doctoral researcher (Bandauko, 2024), I was mindful of my outsider identity in the space and context of meeting with the ridesharing drivers and passengers who participated in the research studies I conducted. I am aware of the power dynamics at play as a female doctoral researcher from the University of Oxford with an American English accent that places me as an outsider, and different from the research subjects, particularly when interacting with ridesharing drivers and passengers in Manila and Singapore who may not have received a formal education or spoke with a different accent. I believe that my Southeast Asian ethnicity as a Laotian American did help to downplay my outsider status as a Western-educated and -accented woman because I look like I am from the region when I conducted my fieldwork in Singapore and Manila. In this way, my identity was not static, but hybrid (Fisher, 2014) and embodied an intersectionality that enabled my identity to be made and redefined over the course of my encounters and interviews with the research participants (Valentine, 2007).

Most of the ridesharing drivers I interviewed were male and I was aware that they may not have felt comfortable sharing their views with me as a female, doctoral researcher from overseas. It was difficult to address this potential challenge directly, but I tried my best to not show any judgment when some of the interviewees talked about controversial experiences or views related to racial discrimination, women, and expatriates. I asked follow-up questions when relevant and tried to make the interviewees feel comfortable talking about issues that they believe may offend me or would not want to share with me because of how they view my identity and position. On the other hand, I also consciously asked participants to elaborate on points about ridesharing that they might have assumed I would understand as a former ridesharing platform company employee, ensuring that I capture their perspectives accurately rather than relying on my own assumptions. Overall, I observed that I was able to have better rapport in my interviews with the ridesharing drivers in Singapore than in Manila, most likely due to stronger English fluency among the drivers in Singapore. In Manila, some of the ridesharing drivers with whom I had less rapport were the few drivers whose English was not as fluent. In those interviews, a local, female research associate was able to help translate the interview as needed (Fertaly and Fluri, 2018) and I believe that her presence and positive demeanour made the encounter seem more like a social group outing than a formal interview. The research associate was present for almost all the interviews in Manila and as she became more accustomed with the interview protocol, she also had the chance to ask some of the questions from the interview guide. As those interviews went on, I could observe that the drivers in Manila who spoke in their native language, Tagalog, felt more comfortable, possibly because the interview questions were about their personal experiences and views—all questions that they could answer, and they were able to freely speak in their native language. The research associate acted as an interpreter who translated the drivers' answers into English during the interview.

To address the challenges and leverage the advantages of my unique position, I committed to a rigorous process of reflexivity throughout my research journey yet understand its limitations when the process can lead to an endless loop of self-critique at the expense of producing meaningful research (Rose, 1997). I follow Rose's (1997) suggestion for a balanced approach to reflexivity whereby the researcher can engage in one of many tactics to achieve more contextually aware research, including being aware of and trying to mitigate the power asymmetries between the research participants and me. This involved maintaining a research memo where I regularly reflected on my thoughts, feelings, and decisions related to the research process for the second study where I conducted field interviews on site in Singapore and Manila. By documenting my evolving perspective, I could better identify and examine how my assumptions and identity may have influenced my work. As much as possible during the interviews, I tried to bridge any gap that may have been present by trying to make the interviewees feel at ease by traveling to a place of their convenience, such as coffee shops or canteens that drivers frequent; to conduct my interviews and having a local research associate in Manila in case the research participants were more comfortable speaking in their native language of Tagalog.

4. Chapter Four – Competition and the rapid scaling of niche innovations: The case of Southeast Asia's ridesharing industry (2012-2022)

Abstract[8]

In the 2010s, radical niche innovations by digital sharing economy startups in urban mobility underwent unprecedented, rapid upscaling in user adoption across global cities. How these niche innovations could scale fast through competition between the niche actors has remained understudied in the socio-technical transitions literature. Through a case analysis of the digital ridesharing industry in Southeast Asia across six countries from 2012 to 2022, we explore how four niche actors—Grab, EasyTaxi, Uber and Gojek—rapidly scaled ridesharing innovations between the period of 2013 to 2020. The case analysis revealed that niche competition between market entrants and the underlying support of venture capital funding played important roles in accelerating socio-technical transition processes. We contribute a deeper understanding of rapid socio-technical transitions enabled by digital technology, particularly on the active and innovating role that regime actors play in transition dynamics.

4.1 Introduction

Radical niche innovations in ridesharing have produced unprecedented, rapid socio-technical transitions in the mobility industry in less than a decade, despite significant disruptions from the COVID-19 global pandemic. Ridesharing innovations enable passengers to digitally hail—and

[8] This chapter is written in first person plural because it has been submitted as a co-authored paper with Professor Tim Schwanen to a peer-reviewed journal.

available taxi or private vehicle drivers to digitally accept—a ride through an online smartphone application (app) platform that uses data-driven algorithms to efficiently match drivers and passengers, usually for a fee (Jin *et al.*, 2018). Ridesharing platform firms have tended to take a disruptive, fast-growing approach to the platformization of urban mobility through networked accumulation (Stehlin *et al.*, 2020). Stehlin *et al.* (2020) define networked accumulation as fast-moving ridesharing platform firms that, aided by venture capital, exploit gaps in transport infrastructures and services. They rely on network effects (e.g., a platform firm gains more value as its network of users increases) and large amounts of collected user data from its mobility matching services to create and capture value, instead of physical assets such as vehicles. Thus, ridesharing platform firms can rapidly grow and disrupt the traditional mobility industry by providing a cost-effective, digital service that matches rides for taxis from the incumbent taxi industry or private vehicles from individual owners.

Multiple studies have documented how ridesharing innovations have disrupted incumbent taxi and public transport sectors globally (Clewlow and Mishra, 2017; Dreyer *et al.*, 2017; Jiao *et al.*, 2020; Nie, 2017). The cost-effectiveness and efficiency of ridesharing innovations has led to declines in the traditional hailing of taxis and the use of public transport, particularly in cities in the Global South that lack efficient public transport options. Although the COVID-19 pandemic majorly disrupted ridesharing services globally in early 2020, when governments implemented restrictive transport policies, the ridesharing industry has largely rebounded in 2021 after transport restrictions had begun to ease across the world (Browne, 2021). Nonetheless, how ridesharing startups have competed in their niche and the effects this has had on the rapid scaling of the overall niche market remain understudied.

We apply a socio-technical transitions approach, and more specifically the multi-level perspective (MLP) advanced by Geels (2005, 2019) and others to contextually examine the multi-faceted dynamics of how digital ridesharing platform startups have rapidly scaled in Southeast Asia. Socio-technical transitions entail shifts in the multi-dimensional and interrelated "configuration of elements that include technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge" (Geels, 2012, p. 471) through which societal functions such as mobility are fulfilled. Many MLP studies on mobility-related socio-technical transitions have concentrated on the development of radical innovations that differ on multiple dimensions from dominant configurations, and their potential for scaling and reconfiguring or displacing those dominant configurations (Köhler *et al.*, 2020; Nemeto *et al.*, 2023; Pangbourne *et al.*, 2020; Wu *et al.*, 2021).

The Southeast Asian context provides an apt case to examine the effects of niche competition on the rapid scaling of ridesharing innovations against the backdrop of the incumbent taxi and public transport regimes. Since 2012, the Southeast Asian digital ridesharing market has grown rapidly to reach USD 8.87 billion in gross market value in 2024 and is expected to grow to USD 11.53 billion by 2029 (Statista, 2024). This development has not gone unnoticed: before the COVID-19 pandemic Grab (founded in 2012) and Gojek (founded in 2015) became the most valuable venture-backed, private companies in Southeast Asia, with market capitalizations of nearly USD14 billion and USD 27 billion, respectively as of August 18, 2022 (Gojek is now known as GoTo after merging with Tokopedia, an Indonesian e-commerce platform). This was of course only a fraction of Uber's market capitalization of nearly USD 60 billion). Nonetheless, given Uber's global reach and top position in the ridesharing industry, Grab made international headlines when it acquired Uber's entire Southeast Asian division in March 2018 (Waters and Lucas, 2018).

At the time of Grab's acquisition of Uber, Southeast Asia had already experienced a rapid shift towards the wide adoption of ridesharing services and disrupted the incumbent taxi industry in less than six years (Azhar, 2016; BBC News, 2016; Lasco, 2017; Leesa-Nguansuk, 2017; Tan, 2018; Trang, 2017). The absence of competition prompted concerns about Grab becoming a ridesharing monopoly across the region. In Singapore, it surprisingly led to a reverse shift in transition: Grab's and Uber's private hire vehicle (PHV) drivers, who were former taxi drivers, returned to the traditional taxi industry due to concerns about the ridesharing industry's sustainability (Tang, 2018). Thus, the rapid, widespread adoption of ridesharing in Southeast Asia, along with Grab's acquisition of Uber and its immediate effect on Singapore's taxi industry, motivates the following research questions: *1) what factors enable or constrain the scaling of niche digital ridesharing platform innovations?* and *2) how does competition affect how these radical niche innovations rapidly scale?* We contribute to the socio-technical transitions literature regarding niche innovations by showing how competition in the form of innovation races between niche actors and regulation races between regime actors affect the rapid scaling of niche innovations. We also propose that the current MLP framework should be adapted to include a new socio-technical transition pathway that culminates in a cross-regime integration in Phase 4 (Andersen and Geels, 2023), instead of a regime substitution model.

4.2 Theoretical framework

4.2.1 Strategic niche management approach (SNM) to how niche innovations scale

The strategic niche management (SNM) approach is related to the multi-level perspective framework, which depicts the scaling of socio-technical transitions as a dynamic interplay between three conceptual levels of socio-technical processes and developments over time (Geels, 2002, 2005; Geels *et al.*, 2017). *Niche innovations* form the micro-level of the framework and depict radical social or technical innovations that can emerge in specific markets or geographies; and constitute the focus of this article. *Socio-technical regimes* at the meso-level of the framework characterize the existing systems of incumbent actors whose actions are legitimized by heavily embedded formal and informal rules in society. The SNM literature focuses on processes of niche development and largely defines niches as temporary protective spaces for radical innovations to break through and stabilize (Kemp *et al.*, 1998).

Niches can protect innovations from adverse selection and competitive pressures in the regime through such processes as: passive or active *shielding* from selective environmental pressures (e.g., startup incubation programs, political lobbying and media discourses), *nurturing* path-breaking innovations through supporting learning, expectations setting and networking; and *empowerment* (Smith and Raven, 2012). Smith and Raven (2012, page 1030) define the empowerment of niche innovations as "the sense that its developing competitiveness enables increasingly widespread diffusion" and further establish two forms of empowerment: (1) to fit and conform or (2) to stretch and transform. Empowering niche innovations to "fit and conform" means that the innovations are scaled in a way that fits and conforms to an unchanged selection environment; while to "stretch and transform" depicts innovations that change mainstream selection environments.

However, research on how niche innovations can scale up to effect a socio-technical transition is growing. Geels *et al.* (2017, page 467) propose of 'drivers of niche momentum' and 'regime tensions' that combine to create opportunities for niche innovations to break through. 'Innovation races' are one of their niche momentum drivers; they occur between firms who follow a first mover and play a role in niche accumulation, a critical step in a socio-technical transition process that enables innovations to break through niches and penetrate mainstream markets to compete with existing technologies (Geels, 2005). Geels *et al.* outline the different types of regime tensions as falling into techno-economic, business, social, political and cultural categories. More specifically, they assert that the interplay between niche innovations and existing regimes leads to economic competition between existing and new technologies, business rivalry between entrants and incumbent firms, political tension over reviews of regulations, standards and policies, and discursive debates over problem framings and social acceptance.

Examples of their typology are shown in Table 4.1 and grouped within four development phases of socio-technical transitions over time (Geels, 2005). In Phase 1, niche innovations are unstable and experimental; and do not threaten existing socio-technical regimes. In Phase 2, niche innovations have little opportunity to diffuse more widely if they clash with the existing socio-technical regime, which can entrap the niche innovation in this phase for decades.

For Phase 3, a combination of internal niche momentum drivers and regime tensions, shaped by changes in the socio-technical landscape, can provide a window of opportunity for radical innovations to break through widely and diffuse. Phase 4 represents the replacement of the established regime by the new niche innovation takes place gradually over time, which can also shape developments in the wider landscape.

Table 4.1 Niche momentum and regime tensions during four phases of multi-level perspective framework (developed from: Geels, 2005; Geels et al., 2017)

	Niche innovations	**Socio-technical regimes**
Phase 1	- Radical innovation emerges at the fringe of existing socio-technical regimes as niches - Niche actors experiment with different designs to cater to users, and many may fail - Niche innovator networks are unstable and fragile with no dominant design	- Niche innovation does not threaten existing socio-technical regime
Phase 2	- New niche innovation is used in small market niches that offer resources for technical development and specialization; and develops its own technical trajectory with a dominant design appearing as associated rules and user expectations begin to stabilize - Success of a niche actor may lead to innovation races when other niche actors follow a first mover	- Users become more familiar with using the niche innovation, but it still poses no major threat to existing socio-technical regime that is entrenched institutionally, organizationally, economically and culturally
Phase 3	- Niche innovation gains momentum from a multitude of internal niche factors, and spreads more widely to larger mainstream markets to compete directly against established socio-technical regime - Internal niche factors like economies of scale, price improvements, complementary technologies, advocacy for pro-innovation policies and positive social-cultural discourses that win support can drive wide diffusion of innovation - Powerful actors support innovation and use financial, organizational or political capital to drive diffusion and help overcome resistance from others	- Socio-technical landscape changes can spur regime-level tensions like disruption of infrastructures, decreasing markets, economic losses, reorientation towards alternatives, decreased confidence in existing technologies and business models, defection of key social regime actors, removal of supportive policies and entry of disruptive policies, decreased political power and support of incumbent industries and negative cultural discourses that decrease legitimacy
Phase 4		- Regime substitution occurs with widespread adoption of niche innovations as the regime is institutionalized and restabilized - New regime can influence external changes in infrastructure, policies, industrial and market structures, lifestyles and norms

Other related literature on how to upscale niche innovations finds that social network building, articulation of vision and expectations and learning processes can help stabilize niche innovations from Phase 1 to Phase 2 (Naber *et al.*, 2017); and can potentially be applied to steady transitions from Phase 2 to Phase 3. A recent case study by Geels and Johnson (2018) of the diffusion of the Austrian biomass district-heating system revealed that a modular approach consisting of causal mechanisms from multiple diffusion theories can explain a system upscaling process that took place over three decades. The authors find that a combination of adoption models—epidemic (word-of-mouth information exchange), social-psychological (adoption motivated by norms, attitudes and beliefs) and socio-cognitive models (circulation and aggregation of knowledge and local practices)—and large technical system theory (diffusion as a process of physically building infrastructure and upscaling them) explained niche development; while the societal embedding model (alignment processes between innovation and cultural, regulatory, business and user environments) characterized interactions between the niche and regime levels of the MLP framework applied to their case study.

The SNM literature also explores issues that niche innovations face in upscaling and how niche actors can address them, but again does not yet address how rapid scaling can take place. Ruggiero *et al.* (2018) found that a lack of the following factors constrained upscaling in community energy transitions: a shared vision in the sector, knowledge aggregation, strong social networks and niche empowerment. Exogenous factors like cultural barriers, the specific geographic context and the characteristics of civil society groups can also hinder niche innovation development. Taken together, unwilling actors must be engaged in the upscaling process and conflicting visions and expectations must be resolved for scaling to progress, but the question of how to achieve these feats remains unanswered. Smith and Raven (2012) further argue that niche empowerment through agency and political narratives play an important role in the scaling of niche innovations, since upscaling requires a nonlinear, complex process connected to engendering social change of actors involved and the environment.

Additional studies on the upscaling of electric bus and bike sharing innovations argue for more attention to the exogenous socio-institutional context (Dijk *et al.*, 2018; van Waes *et al.*, 2018). Dijk *et al.* (2018) found constraints related to divergent actor perspectives, lack of capabilities of informal institutions, regulations and lack of supportive technological hardware or infrastructure. They stressed that such constraints must be anticipated and integrated into the planning of niche innovation experiments. Finally, online user communities can accelerate the upscaling of niche innovations due to participant diversity and a strong sense of community in which users organized activities that led to system-building, geographical circulation and the reconfiguration of the existing socio-technical regime (Meelen *et al.*, 2019).

Recent research on the reconfiguration of the MLP on socio-technical transitions focuses on the speed of upscaling niche innovations (Kanger, 2021; Geels and Turnheim, 2022; Andersen and Geels, 2023). A regime life-cycle model perspective of the MLP highlights the interactions between the three levels of the framework and the active role of various stakeholders, who can influence these shifts by facilitating conditions that allow radical innovations to stabilize and rapidly upscale to effect a transition (Kanger, 2021). Kanger (2021) identifies three properties of the MLP levels that can impact the rapid scaling of radical innovations: (1) *landscape pressure intensity:* the extent to which the landscape can exert pressure on the incumbent regime and enable the development of radical innovations, (2) *regime resilience:* the extent to which the incumbent regime can withstand external pressures and co-opt radical innovations without changing its architecture, and (3) *niche maturity:* the extent to which the radical innovation has stabilized along various dimensions. The author proposes that a specific combination of high landscape pressures, low resistance for regimes to change, and high niche maturity can initiate transition pathways that accelerate the widespread adoption and growth of radical innovations.

Geels and Turnheim (2022) contribute to this body of work by investigating how niche innovations—including renewable energy sources and electric vehicles—interact with established systems and regulatory environments to facilitate low-carbon transitions. They outline core drivers for scaling, such as advancements in technology, supportive policy measures, and evolving market conditions. In related research, Andersen and Geels (2023) explore the influence of cross-system interactions—particularly among sectors like energy, transportation, and housing—on the speed of transitions toward net-zero emissions. Their findings underline the necessity of coordinated efforts across different sectors to effectively scale niche innovations and meet broader sustainability targets. Despite this, research has been limited in examining how competitive dynamics from new entrants, frequently bolstered by significant venture capital, can accelerate the upscaling and socio-technical transition of platforms like digital ridesharing services over relatively short periods.

4.2.2 Upscaling of digital platforms

We also draw from literature in innovation studies, strategic management and economics on how digital platforms scale. Because ridesharing startups are internet-based firms without asset ownership and rely on increasing network effects, they have demonstrated the potential to scale quickly and spur local institutional changes (Parente *et al.*, 2018). A study of Uber's global expansion further attributed its growth rate to the company's co-evolution or disengagement with host government institutions (Watanabe *et al.*, 2017). Ridesharing firms particularly rely on positive indirect network effects of its two-sided digital platform model to grow, in which the value of its platform increases as more users from each side of its platform adopt it and grow the network (Eisenmann *et al.*, 2006; Gawer, 2014; Gawer and Cusumano, 2014; Katz and Shapiro, 1985; Rochet and Tirole, 2003, 2006). The idea is that passengers are more likely to choose the ridesharing platform that has more network drivers, so that they can get a ride quicker; and drivers will choose the platform with the highest network of passengers for more bookings. Once a platform has a large base of users, firms can add new platform services like carpooling that provide cheaper, increased options for passengers, thereby further increasing the value of the platform for users.

Digital ridesharing firms exemplify a two-sided platform business model in which the firm utilizes its digital application technology to intermediate between a supply side of drivers and a demand side of passengers. Traditional taxi fleet companies also characterize a two-sided platform business model that typically utilizes a telephone call centre or taxi vehicle branding to enable matching between a supply side of drivers and a demand side of passengers. Competition between innovative entrants and incumbents in two-sided platform industries has been well documented. Extant literature on how innovative entrants can successfully compete against incumbents in two-sided platform industries focus on: growing an existing large installed base (Schilling, 2002), offering high-quality products and services (Cusumano *et al.*, 2008), offering an array of complementary products (Cennamo and Santalo, 2013) and setting strategic pricing (Rochet and Tirole, 2006). However, the intensity of entrant competition, represented by the number of rival entrants, and its effect on the upscaling of niche innovations remains understudied. We aim to contribute insights on how competition can modulate indirect network effects and play a significant role in the rapid scaling of niche ridesharing innovations in Southeast Asia.

Table 4.2 Summary of the factors in the upscaling of niche innovations from extant literature

	Factors in upscaling	Source
1. Vision	- Shared vision for niche among niche actors and community stakeholders	(Dijk *et al.*, 2018; Ruggiero *et al.*, 2018b)
2. Community stakeholders	- Niche empowerment from community stakeholders - Niche stability	(Ruggiero *et al.*, 2018; Smith and Raven, 2012) (Kanger, 2021)
	- Civil society group characteristics - Local (energy) community conditions and logics - Niche embeddedness in the daily practices of communities	(Bögel *et al.*, 2022; Petrovics *et al.*, 2024a, 2024b; Ruggiero *et al.*, 2018)
	- Online user communities	(Meelen *et al.*, 2019)
3. Public and private institutions	- Co-evolution or disengagement with host government institutions and municipal actors - University-industry-government support and interactions - Institutional logics	(Watanabe *et al.*, 2017; Zimmermann and Voytenko Palgan, 2024) (Bossink *et al.*, 2023) (Bauwens *et al.*, 2022)
	- Capabilities of informal institutions - Regulations - Public infrastructure	(Bögel *et al.*, 2022; Dijk *et al.*, 2018)
4. External environment	- Culture - Geographical context and space	(Dijk *et al.*, 2018; Ruggiero *et al.*, 2018; Bögel *et al.*, 2022;)
	- Landscape pressures on regimes - Regime tensions (techno-economic, business, social, political or cultural)	(Geels *et al.*, 2017; Kanger, 2021)
5. Business model	- Business model innovation	(van Waes *et al.*, 2018)
	- Indirect network effects of digital platforms	(Eisenmann *et al.*, 2006; Gawer, 2014; Gawer and Cusumano, 2014; Parente *et al.*, 2018; Rochet and Tirole, 2003)
	- Low asset ownership of digital platforms	(Parente *et al.*, 2018)
	- Technological barriers	(Rae *et al.*, 2020)

4.2.3 Synthesis of niche innovation upscaling factors

Table 4.2 summarizes the key factors of upscaling from relevant literature that form the basis of our case analysis on the evolution of ridesharing niche innovations in Southeast Asia. The first four factors—vision, community stakeholders, public institutions and external environment—characterize the SNM approach to how niche innovations scale up. We added business model type as a new factor of upscaling because of recent literature that focuses on how the structural features of business model innovations, including digital platform models, can enable the upscaling of niche innovations.

4.3 Data and Methodology

4.3.1 Research design

Rather than offering a case study, this paper analyses a case. The difference may seem minimal but we follow Berlant's (2007) distinction between a case and a case study. The latter is an exemplar or explanation of a closed object of knowledge like a person, thing or event; the former is more open and problematizing. A case therefore allows analysts to think and experience whatever is analysed in new ways that extend to situations and contexts elsewhere. As a result, analyzing a case thus offers a mode of generalization that starts from the particularity of the case. In other words, analyzing the rise since 2012 of the Southeast Asian ridesharing industry, as configured around the major startups of Grab, EasyTaxi, Uber and Gojek enables us to learn and think about not only ridesharing elsewhere, but also dynamics in transition processes in other sectors, systems and places.

The focus on the Southeast Asian ridesharing industry follows in part from the first author's experience in 2013 to 2017 as the founding Regional Business Development Lead, Country Heads of Thailand and Vietnam, and subsequently the Vice President of Public Affairs at Grab. The first author had joined the company as the first regional employee and gained experience in launching ridesharing innovations in multiple frontier markets, as well as leading government affairs across six countries in Southeast Asia to collaborate with local policymakers on legalizing ridesharing services. The first author's experience provides the "substantive knowledge of the empirical domain and theoretical sensitivity that help the analyst 'see' interesting patterns and mechanisms" (Geels, 2012, page 474) in the case under study.

4.3.2 Data collection and analysis

The case analysis focuses on the six major Southeast Asian countries in which ridesharing innovations were introduced from 2012-2014: Malaysia, Singapore, Philippines, Thailand, Vietnam, Indonesia. We omit coverage of Myanmar and Cambodia because ridesharing innovations only recently entered those markets after 2017. To construct the case for analysis, we used archival data from online news articles and company-issued press releases and reports found on company websites. First, we conducted a systematic online search for all English-language media articles published since 2012 for each of the major companies that will be discussed: Grab, Uber, Gojek and EasyTaxi. The search terms included the company name, plus each of the countries and major cities they operated in Southeast Asia—for instance "Uber Malaysia." In the next phase, we used search terms focused on each company's major ridesharing services along with the geographic specification – as in "GrabTaxi Bangkok." In addition, we canvased the companies' websites to collect relevant press releases, blog entries and reports.

We then grouped the data chronologically to construct a timeline of major ridesharing industry events relating to the entry, scaling, and competition of the ridesharing companies in Southeast Asia. We selected the most relevant articles to construct this case, particularly ones that offered contextual data and viewpoints from diverse stakeholders. We then constructed the data into a detailed case narrative and analysed it using the MLP as a system-wide, interpretative framework.

The first author's former career at Grab had exposed her to first-hand knowledge of what transpired inside the company, which may have shaped the case construction and interpretation. However, we use member checks (Lincoln and Guba, 1985) to refer the case data and analysis back to publicly available data sources to enhance our accountability and ensure that deployed information can be traced back by interested readers. We have decided to utilize the first author's personal knowledge only if it could be supported by public data and to corroborate selected media content (since the latter may have been constructed to achieve specific purposes).

4.4 Rapid transition towards digital ridesharing in Southeast Asia

In this section we analyze the case of ridesharing in Southeast Asia with a focus on the four firms of Grab, Uber, Gojek and EasyTaxi, and using the MLP's four phases introduced above. The bibliographic references for this section are listed in Appendix A.

4.4.1 Phase 1: Digital ridesharing innovations emerge in niches (June 2012- June 2013)

A niche innovation emerged in Southeast Asia's private transport sector when Grab launched the first digital ridesharing service in June 2012 and garnered 11,000 downloads on its first day (Freischlad, 2015). Grab had experimented with its ridesharing innovation for taxis in September 2011 in Kuala Lumpur with an initial group of 40 taxi drivers from Comfort Taxi, one of Malaysia's major taxi companies (Singh, 2018). Comfort Taxi's chairman explained his satisfaction with Grab's innovation: "We have been using [GrabTaxi] since last September and passengers are happier with the better service they receive" (Singh, 2012). His company had been using the same telephone booking system for twenty years and he coincidentally sought an upgraded solution at the time Grab approached him. In their pilot stage, the Grab team relied on early adopters who could share reviews of their experiences with Grab through social media. The early Grab drivers also started their own online user communities to help each other learn how to use the app more effectively and find out the best locations with the most user demand.

The original idea for Grab was developed by two Malaysian Harvard Business School graduates, who had come across the Uber model while studying in the US. However, the Grab co-founders set out to solve key local problems—low driver income and job satisfaction, and lack of safety for female customers (Freischlad, 2015)—faced by Malaysia's taxi industry, once rated as one of the worst taxi services in the world in 2008 (Malaysia Today, 2008). Grab used its online smartphone booking app to make booking taxi rides safer, more convenient and their pricing more transparent. The Grab app provided: instant booking confirmations, transparent fares, details of the driver and taxi plate number, and an online link to the GPS-tracked ride journey that could be shared digitally with friends and family. Before ridesharing technology, taxi users had to either hail a taxi from the street or make a phone call for a booking, which required waiting at least several minutes for an operator to find an available cab and did not always guarantee a booking. At the same time, Grab aimed to improve the lifestyle and income-earning opportunities of its taxi drivers through an efficient matching technology that enabled drivers to receive a continuous stream of ride bookings from its app; and save time and fuel from driving around to find new customers.

Outside of Singapore, where taxis offered a safe, high-quality service in newer vehicles compared to Malaysia, the incumbent taxi regime in the rest of the region was plagued with regulation enforcement, service quality, car quality and safety problems (Bland, 2014). The Malaysian taxi industry, along with its regional counterparts, were infamous for additional problems such as the lack of enforcement of unmetered taxi fares that required haggling with drivers and drivers refusing rides to certain passengers and destinations at their whim (Lasco, 2017; Mahitthirook, 2015). In addition, taxi drivers were not earning enough income because of ride matching inefficiencies and usually worked long shifts at odd hours with inadequate rest. Much of the taxi regime outside of Singapore faced an additional problem of run-down, aged vehicles with poor maintenance, except for one or two high-quality major taxi fleets in Indonesia, Vietnam, and Thailand.

From its start, Grab established an intention to work closely with government regulators to improve the taxi industry (Bland, 2014). By cooperating with the existing taxi regime, Grab also received full endorsement from local government authorities such as the Land Public Transport Commission (SPAD), which regulates the taxi industry and public transport in Malaysia, at its launch event when its chairman said that GrabTaxi "also involves 20 taxi service companies which cater to about 8,000 taxi drivers and the move is seen as an effort to revive the industry.

[GrabTaxi] will also help SPAD because all the [data] used by taxi companies can be obtained for collecting data" (The Star, 2012). The Malaysian government viewed Grab as an opportunity to improve the taxi industry and offer better transport options to the public.

Growing the ridesharing service was nonetheless difficult for Grab at this stage, because hardly any taxi drivers used a smartphone in 2012, unreliable wireless internet coverage plagued Malaysia, and credit card penetration rates were low. Grab took a collaborative approach to addressing these issues. They helped drivers buy a phone, taught them how to use the app, and developed a workaround feature that enabled drivers to collect cash payments from passengers directly. Nonetheless, growth did occur at sector level in Southeast Asia when Uber entered Singapore and launched its premium, executive car service UberBLACK in February 2013. This service catered to higher-income users who desired a luxury private driver experience and had a credit card, since Uber's global technological system was not designed to accept cash payments. Considering Grab's initial scaling challenges and Uber's focus on a small new niche market, Uber nor Grab posed a threat to the strong, incumbent taxi industries in Malaysia and Singapore by early 2013.

4.4.2 Phase 2: Ridesharing innovations expand regionally and diversify into new services (June 2013-May 2015)

Southeast Asia, home to over 620 million people, was suited to the introduction of ridesharing app technology by mid-2013 because of favourable conditions and trends in the socio-technical landscape: low car ownership, high urban population densities, high smartphone subscription growth rates by middle and upper class populations, a fast-growing middle class with purchasing power and a large informal urban employment sector that provided a large pipeline of potential ridesharing drivers (Ericsson, 2016; Martinez-Fernandez *et al.*, 2009; Nielsen, 2015). Also, the region's limited public transportation infrastructure, along with heavy traffic congestion and limited parking spaces, outside of Singapore boosted demand for ridesharing as an affordable, convenient transport option.

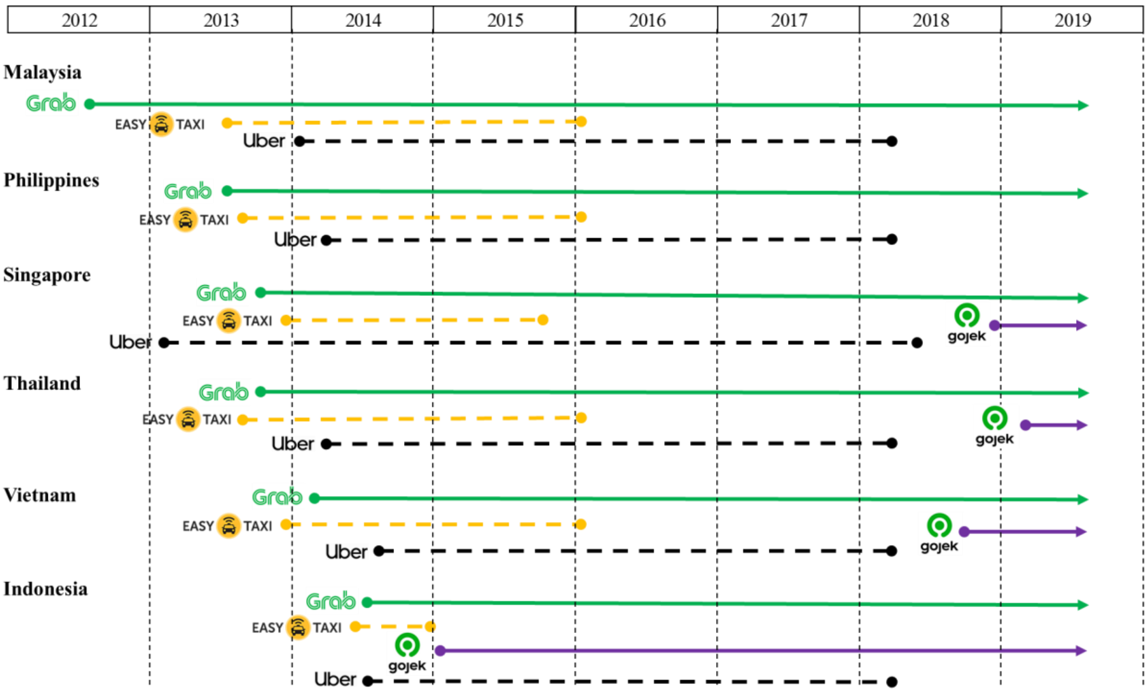

Figure 4.1 Operations timeline with launch and exit times for major ridesharing firms in Southeast Asia: 2012 to 2019

In 2013 Grab also secured its first significant round of venture capital investment of more than USD10 million from Vertex Ventures Holdings, a subsidiary of Temasek, Singapore's sovereign investment fund (Yusof, 2017). The Group President and CEO of Vertex Ventures Holdings, explained: "We invest in potential champions which have developed new technology platforms or business models that disrupt the incumbents and old inefficient ways of doing things" (Huang, 2014). The favourable conditions for ridesharing attracted well-funded, global startups to

Southeast Asia. EasyTaxi, a global taxi ridesharing company from Brazil with USD25 million of funding, launched in Kuala Lumpur in July 2013 (Lunden, 2013). Grab used its funding to compete with EasyTaxi in expanding its taxi-hailing services across five countries in quick succession (Figure 4.1).

The first shift away from digital taxi-hailing in the region began in March 2014, when Uber introduced an economy PHV-hailing service, UberX, in Singapore that undercut regulated taxi fares and offered an affordable, high-quality alternative to Grab's taxi-hailing service. UberX drivers were private citizens who used their personal car to pick up passengers, which expanded the potential supply of ridesharing drivers beyond the constraints of licensed taxi drivers. Singaporean regulators endorsed the service, but other regulators in the Southeast Asian region initially deemed it illegal or banned it. Unlike Grab, Uber did not initially collaborate with government regulators outside of Singapore and relied on petitions signed by its online user communities to advocate against government bans of its service in Malaysia, the Philippines, Vietnam and Indonesia (Wuniar, 2017). In 2022, a global investigation of leaked Uber files revealed that Uber had forcefully entered new markets in European cities with little regard for the incumbent taxi regime and regulatory institutions that deemed its service illegal (Davies *et al.*, 2022). In contrast, the Grab team hesitated to launch an UberX-type service at the time due to regulatory concerns and an initial perception that the service could compromise passenger safety (Aravindan and Nguyen, 2014; Bernama, 2014). Instead, Grab competed directly with Uber by introducing its regulated, executive private hire vehicle service with professional drivers and licensed limousines for hire starting in Singapore in July 2014. Meanwhile, EasyTaxi remained focused on competing only in digital taxi-hailing against Grab.

Throughout 2014, the competition in Singapore intensified as Grab, Uber and EasyTaxi competed on price, which the local media deemed as ‘price wars.’ The startups offered lucrative cash discounts and incentives to attract users that amounted to sunk costs at the expense of profits. A 2015 online field experiment conducted on a taxi-hailing company in Southeast Asia also revealed that customer discount promotions increased new demand, but did not sustain long-term demand beyond the promotional period (Singh *et al.*, 2019). The price wars required significant amounts of funding for the startups to compete for market share and scale their base of new users, many of whom would not use the service again without promotions at that time. Thus, competition between the ridesharing startups translated into raising enough capital to fund the price wars in Southeast Asia, and more capital further fueled competition.

Grab emerged as the region’s market leader in attracting venture capital: USD65 million in October 2014 and USD250 million in December 2014 from Softbank, a Japanese multi-national conglomerate, that brought its total funding to USD340 million. Grab’s spokesperson explained: “Growth remains a key focus for [Grab], and we now have a considerable war chest to accelerate our rapid expansion in Southeast Asia. Our strong focus in this region also means that each of six [Grab] markets stands to receive a significant portion of funding, compared to larger players that have to stretch their funding much further” (Tay, 2014). The war chest metaphor aligns with the price war concept, as is the stab at larger players like Uber.

By early 2015, consumers gained trust and familiarity in using Uber and increasingly preferred to be driven in an unmarked, high-quality car with drivers who could be rated for service quality (Naidu, 2015). Uber had started to recruit taxi drivers with attractive incentives to meet growing demand and partnered with car rental companies to provide vehicles for any licensed driver who did not own one. As more Grab taxi-hailing drivers switched to Uber and taxi-hailing demand dampened, the Grab team finally decided to face regulatory risks and launch a PHV-hailing service with private cars in April 2015 to compete with Uber. The unregulated PHV services enabled the companies to set their own pricing and collect a percentage from fares, offering greater profits than regulated taxi-hailing fares. The cheap subsidized fares and driver cash bonuses offered by the competing ridesharing apps further incentivized passengers and drivers to rapidly adopt Grab's and Uber's PHV-hailing services, thereby growing the startups' indirect network effects and user bases.

Grab also realized that not entering the dominant motorcycle taxi-hailing business in Indonesia, a digital service already launched in January 2015 by the Indonesian firm, Gojek, threatened their survival as a ridesharing start-up there. Grab thus started GrabBike, a motorcycle taxi-hailing service, in Jakarta in late May 2015, when Gojek had already acquired over 3,000 drivers (Lee and Ho, 2016; Pratama, 2016). An intense price war ensued between Grab and Gojek, with an unprecedented amount of promotions that rendered many motorcycle taxi rides free for passengers for several months (Coconuts Jakarta, 2015; Grab, 2016; Maulia, 2016; Tay, 2015). That same month, Gojek also entered the 4-wheel PHV-hailing industry.

In December 2014, the taxi ridesharing industry in Southeast Asia reached another turning point when EasyTaxi quietly shut down operations in its newest market, Jakarta, Indonesia, after launching there in May 2014. EasyTaxi was unable to compete with the largest taxi company, Blue Bird Group, which prohibited its drivers from using external ridesharing apps (Yeoh, 2014). EasyTaxi's retreat, and taxi companies in Vietnam barring their drivers from joining Grab or EasyTaxi, were testament to the strength of the incumbent taxi regime actors.

4.4.3 Phase 3: Ridesharing innovations break through more widely to become mainstream and threatens established taxi industry regime (May 2015– November 2016)

In May 2015, the Philippines Department of Transportation issued the world's first regulations that legalized ridesharing companies, despite months of strong lobbying against the policy by the Philippine taxi associations. According to the former Secretary of Transportation, ridesharing services offered an alternative solution to Manila's existing taxi and public transport services: "We should not see it as something that will damage the old taxi industry, but merely to offer better services and compel them to modernize and innovate," (Morales, 2015). Starting with the Philippines, the regulatory environment for ridesharing favoured ridesharing companies over the incumbent taxi regime when in July 2015, GrabCar became the first legal transportation network company in the Philippines under the new regulation (Newsbytes Philippines, 2015). Regulation also became more favourable to ridesharing services in Indonesia, Vietnam and Singapore in late 2015 or early 2016, albeit in slightly different ways in each country and at least in Indonesia amidst fierce taxi driver protests (Lee, 2016). The ridesharing industry's shift away from taxi-hailing towards PHV-hailing and motorcycle taxi-hailing took a toll on EasyTaxi, which officially exited its Singapore market in September 2015. It closed its remaining businesses across the region in January 2016, after a gradual retreat since late 2014 (see above) due to low funding allocated to the region by its global management and market share loss (Russell, 2016). For comparison, EasyTaxi's funding totalled USD77 million to serve its 162 markets in 32 countries globally at the time versus Grab's funding of USD340 million to focus solely on Southeast Asia (Cunningham, 2015).

Despite wide losses due to competing for market share, with Gojek reportedly losing USD73 million in subsidies between October 2015 and March 2016, venture capital funding continued to pour into the industry (Al Azhari *et al.*, 2016; Hutton, 2016). Prominent venture capital investors believed that the ridesharing industry was a winner-take-all market. In June 2015, Chris Sacca, the founder of Lowercase Capital Ventures from Silicon Valley and an Uber investor, told Bloomberg News that Carl Icahn, another prominent investor, made a mistake in investing USD100 million in Lyft, the second largest ridesharing platform in the US after Uber: “This is a winner-take-all game. And Travis [Uber’s founder and former CEO] will take all” (Bloomberg, 2015). In August 2015, Grab raised an additional total of USD350 million from global investors and one of its executives confirmed the venture capital industry’s view of the market dynamics of the ridesharing industry: “We believe that this is a winner-take-all market and that it is important to invest in growth in the near-term. We are very blessed to have supportive shareholders who believe in [Grab] and want to help us succeed to build the largest mobile platform in Southeast Asia” (Russell, 2015).

Because Grab and Gojek were local companies that could adapt their technology, financial resources and business model to their home country and region, both companies were able to out-innovate Uber in local services (Zhong, 2017). For example, Uber only entered the motorcycle taxi business in February 2016 in Bangkok and started accepting cash payments in the region in March 2016 (Le, 2016) in a region with low credit card penetration (Choudhury, 2017). Gojek’s CEO remarked, “We have huge respect for Uber as a technology company, but we just out-innovate them. We just move that much faster,” (Zhong, 2017). Grab’s CEO emphasized its local competitive advantage: “Our local teams in every country know the local problems and challenges inside-out. Our deep local understanding, know-how, and operations are critical differentiators, especially when it comes to scaling locally, navigating regulatory environments and adapting to local infrastructure challenges. This has allowed us to innovate faster, forge more meaningful partnership and find solutions different from our competitors," (D'Souza, 2017).

Following the legalization of ridesharing for private hire vehicles in the Philippines, Singapore and Vietnam, the Malaysian Ministry of Transportation announced in August 2016 that it would legalize Grab's and Uber's PHV ridesharing services from August 2017 onwards (The Star, 2016). This caused major unrest among incumbent taxi firms about industry collapse due to taxi drivers leaving to become Uber drivers *en masse*; it as asserted at the time that almost eighty percent of taxi drivers in many taxi companies had left to work with Grab and Uber (Tamrin, 2016). The Malaysian government announced that 130,000 Grab and Uber drivers and about 67,000 taxi drivers nationwide would co-exist legally under this new regulation (Tamrin, 2016). Statistics suggest similar regime substitution in Vietnam, Singapore, and Indonesia.

Partly in response to this shift, major incumbent taxi companies like Vinasun and the Blue Bird Group launched their own taxi ridesharing apps in mid-2016, and ComfortDelGro revamped its app in 2015. No app, however, was widely adopted because only company drivers could use them (Cheng, 2017; Nguyen, 2016; Rahmiasri, 2016). These companies could not achieve network effects due to smaller driver bases, insufficient funding to lower fares competitively and decreased customer demand for taxis. Instead, the major regime actors who had lobbied against the startups began to partner with them. Thus, Gojek began to collaborate with the Blue Bird Group in May 2016 to enable its users to book Blue Bird taxis.

4.4.4 Phase 4: Cross-regime integration occurs with widespread adoption of niche innovations, in addition to other diversified services (November 2016- July 2022)

Competition intensified between Gojek and Grab in offering a cashless payment solution for app services. In November 2016, Gojek's reached a new milestone when its Go-Pay purchases outnumbered the dominant method of cash payments on its services, showing how its innovation had changed consumer spending habits. Grab followed Gojek in launching a loyalty points program and a cashless payments system for offline merchants. Meanwhile, the incumbent taxi fleets across the region experienced more regime substitution when Uber partnered with Express Transindo in December 2016 and ComfortDelGro in January 2018 (Abdullah, 2018; Jakarta Post, 2016).

In July 2017, Grab received another unprecedented round of funding worth USD2.5 billion to focus on becoming a regional full-services financial technology platform. In February 2018, Gojek raised USD1.5 billion in funding from global investors, while Grab launched Grab Financial, a joint venture with a consumer services bank to offer loans to unbanked and underbanked customers and consumer insurance services (Hungerford, 2018). A month later, Gojek partnered with a major Indonesian bank to offer similar financial inclusion services. Through head-to-head competition in financial technology, fueled by unprecedented amounts of venture capital funding from global investors, Grab and Gojek changed service provision beyond ridesharing in Southeast Asia.

Uber fell even more behind in the new growth trajectory of the ridesharing industry, led by regional firms with cashless payment options, loyalty programs and a larger range of services to lock in their user bases (Freischlad, 2017). By the end of 2017, Grab had completed its billionth ride after five years of operation and reported that it was the leading on-demand transportation platform in Southeast Asia with a 95% market share in third-party taxi-hailing and 71% market share in private vehicle hailing (Grab, 2017). In Indonesia, Gojek remained the ridesharing platform leader (Suzuki and Iwamoto, 2018).

By March 2018, Grab changed the competitive dynamics of the ridesharing industry when it acquired Uber's entire transport and food delivery businesses in Southeast Asia, where Uber operated in 51 cities across eight countries, in return for Uber's 27.5% stake in Grab (Grab, 2018). Uber's global headquarters had been plagued with scandals in 2017 and a change in CEO leadership in August opened an opportunity for Grab's major investor, Softbank, to also become Uber's largest shareholder with a USD9.3 billion investment in December 2017. Softbank's representative on the Uber board of directors had told Uber that it could be profitable faster if it returned to its core markets in the US, Europe, Latin America and Australia (Hook, 2018).

Following the acquisition, Grab vowed to venture beyond transport by focusing on three major initiatives: (1) food delivery through their acquisition of the UberEATS service, (2) more localized transport and innovative mobility solutions with industry partners and governments, and (3) a continued expansion of its Grab Financial and GrabPay services. By mid-2018, Gojek and Grab have coined their business model of diversifying into multiple business sectors and offering a variety of lifestyle offerings in one digital app platform as a "super app" strategy (Grab, 2019a; Ponnappa, 2019). Figure 4.2 depicts an example of the multitude of services—ranging from transport, food, ticket reservations and hotel bookings— that Grab offers its users on its digital app interface.

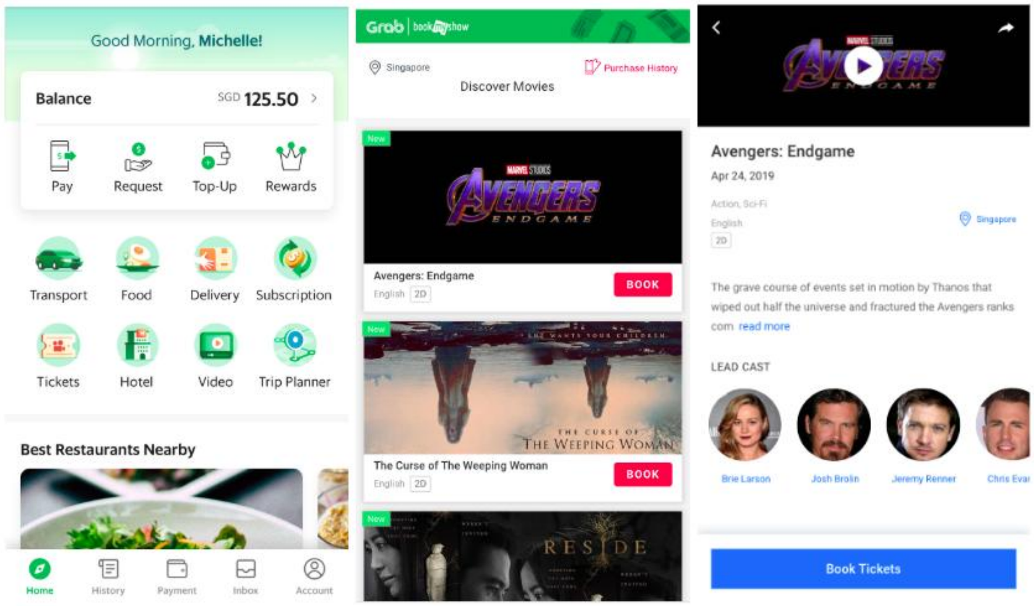

Figure 4.2 Screenshot of Grab's super app interfaces in July 2019 (from left to right): (a) the home app interface for all Grab services, (b) Grab Tickets page to discover movies to book, and (c) Grab Tickets booking page to book and purchase movie tickets for Avengers: Endgame

Meanwhile the morphing of the ridesharing industry into integrated service provision, underpinned by a cashless payment system, continued apace. In August 2018, Gojek's CEO announced the firm had almost reached profitability in all of their business segments, except for transportation services (Potkin, 2018). In March 2019, Grab considered spinning out Grab Financial, so that potential investors from the financial services sector—PayPal and Alibaba—could make strategic investments in Grab's non-transportation business (Russell, 2019). In that same month, Grab's CEO articulated a new vision for the firm after receiving a USD1.4 billion venture capital investment to grow their super app strategy: "The investment is a clear statement of belief in our vision to grow Southeast Asia's technology ecosystem as the region's number one super app. Looking ahead, we aim to continue improving the lives of many millions of Southeast Asians by providing enhanced income opportunities through our platform, and giving our users more choice and convenience” (Grab, 2019b). In July 2019, Gojek changed their logo and brand to reflect their official designation as a super app operating beyond Indonesia in Singapore, Vietnam and Thailand (Glenday, 2019).

Grab’s super app model also helped the company to respond to the global mobility disruptions from various country responses to the COVID-19 pandemic in 2020 and 2021. In September 2020, Grab reported that more than 149,000 drivers had been reallocated to deliver food and groceries for the first time, when COVID-19 lockdown rules prohibited ordinary citizens from leaving their homes unnecessarily in many of the cities in which it operated (Shu, 2020). In addition, Grab grew the number of food merchants, who needed a way to digitize its operations to offer online deliveries, on its platform by almost 80,000 small businesses. While most of Grab’s transport services were suspended or scaled back during the COVID-19 pandemic lockdowns, the company’s growing, new online food and grocery delivery vertical helped to provide alternative employment for a proportion of its existing ridesharing drivers and make up for lost revenue from transport services. In the fiscal year of 2021, the gross merchandise value (GMV) for Grab’s deliveries and financial services verticals grew by 56% and 37% compared to 2020, respectively (Grab, 2022a). This helped to compensate for the shortfall of 14% year-on-year in the GMV for mobility services (Grab, 2022a).

By mid-2021, many cities began to ease ridesharing restrictions from the COVID-19 pandemic. Grab started to resume its ridesharing services per regulations across the region, while mandating safety precautions like requiring drivers and passengers to wear face masks during rides. Grab’s fourth quarter results in 2021 increased by 45% from the third quarter to USD 765 million, as mobility services started to rebound. For the fiscal year 2021, Grab reported that its overall GMV grew by 29% year-on-year to reach USD 16.1 billion (Grab, 2022a). On December 2, 2021, Grab was publicly listed on the Nasdaq stock exchange and closed with a market capitalization of around USD 34.6 billion at the end of opening day. Grab's first quarter 2022 results showed that the number of ridesharing drivers on its platform increased vis-à-vis the preceding quarter, but they still remained 76% below pre-pandemic levels in December 2019 (Grab, 2022b). As of 10 October 2024, Grab's market capitalization had decreased significantly from its opening day to a market capitalization of USD14.4 billion.

4.5 Discussion of key factors for the rapid upscaling of niche innovations

4.5.1 Structural factors enabled upscaling of niche innovations

The brief history of ridesharing in Southeast Asia confirms the significance of the key factors for rapid scaling in Table 4.1 according to which innovations scaling out of their niche: having a supported vision, garnering the support of community stakeholders, receiving support from public institutions and operating in an enabling external environment. Niche actors and local community stakeholders across Southeast Asia shared a vision that digital ridesharing platforms would improve the taxi industry and address urban transport gaps, thereby easing the upscaling of niche innovations in Phase 1 of the transition process (Dijk *et al.*, 2018; Ruggiero *et al.*, 2018). Consumers, particularly women, in Southeast Asia viewed ridesharing as a safer, price-transparent and more convenient solution to errant taxi practices in countries like Malaysia, where some women did not feel safe taking a taxi alone and price haggling prevailed (Chan, 2014). From 2012 to 2013, many taxi drivers and fleet companies viewed ridesharing innovations by Grab and EasyTaxi as an added value that could increase driver efficiency and the number of allocated jobs due to more optimal matching between driver supply and customer demand. Government and regulatory stakeholders welcomed taxi ridesharing as a private solution for bridging public transportation gaps and improving the regulated taxi services for the public.

The shared vision also opened opportunities for experimentation and collaboration in Phase 1 of the transition. For example, powerful taxi regimes in Malaysia collaborated with Grab to provide its first supply of taxi drivers to pilot the ridesharing app and publicly launch the service with the national regulatory authority in June 2012. In line with Smith and Raven's (2012) points about niche empowerment, community stakeholders advocated the ridesharing niche as: having a positive expectation for the future to justify it to larger audiences, receiving present-day supportive institutional reforms and a necessary innovation by revising the past to criticize the flaws of existing regimes. The development of Grab and EasyTaxi's innovations are examples of "fit and conform" because these companies partnered with the existing regulated taxi regime to provide complementary, value-added ride-matching services that did not upend the dominating regime but supported it.

The niche innovations also benefitted from embeddedness in the daily practice of the community since ridesharing addressed unfulfilled needs in everyday urban mobility. The upscaling of ridesharing innovations was also enabled by existing and newly emerging online communities of early adopters—drivers and passengers—who would try out the ridesharing apps and post their experiences online for discussion and knowledge dissemination of user advice and feedback for improvement. In Phase 2, online community groups played another integral role in the entry of Uber and the ensuing introduction of a disruptive PHV ridesharing service that operated in a grey regulatory area and would prove later to threaten the viability of existing regimes in Phases 3 and

4. Uber strategically set up and appropriated online user communities to petition and protest against regulatory bans on their PHV ridesharing service from the government and taxi regimes. Overall, online user communities played an important role in the system building and geographical circulation of ridesharing innovations in the early phases of the transition process (cf. Meelen *et al.*, 2019).

Public institutions were important to the creation of a protective layer around the ridesharing startups in Phase 1 in Southeast Asia. Because the latter began solely with regulated taxi-hailing services, they initially received enabling support and protection from government and regulatory agencies. Local startups like Grab also actively sought the regulatory support of local regulatory agencies from their entry in each location they launched. Grab's early strategy to co-evolve with government institutions created the foundational relationships necessary for Grab to advocate for more controversial regulations later when they followed Uber in launching PHV ridesharing services in Phase 2 that were deemed illegal or operating in a grey area across the region, except in Singapore. Eventually, other countries in the region followed Singapore's favourable stance on PHV ridesharing by endorsing or legalizing PHV ridesharing in Phase 3.

Ridesharing innovations in Southeast Asia remained in Phase 1 of the socio-technical transition for one year only because a confluence of existing structural factors in an enabling external environment made the innovations ripe for rapid user adoption. As mentioned before, high population densities, low car ownership, increases in income and wealth, plus a clear market need for urban transport services were relevant long-term changes in the region. Their favourability was amplified by rapid smartphone adoption due to a growing smartphone and mobile data network infrastructure across the region. Smartphone technology also made working in the ridesharing taxi sector more accessible to young and male rural-to-urban migrants and urbanites, many of whom are underemployed. It also allowed the niche to leverage the existing population of taxi drivers, who could switch between driving for regime and niche firm and between competing niche firms. The short timeframe of Phase 1 supports extant MLP literature on how landscape pressures on existing regimes can create windows of opportunity for niche stabilization if niche innovations are sufficiently developed at opportune times (Geels and Schot, 2007).

4.5.2 Business model innovation and competition in the rapid upscaling of niche innovations

The ridesharing niche's digital platform model characterizes a key upscaling factor—business model composition—from Table 2. Extant research establishes that the ease of scalability due to low asset ownership (Parente *et al.*, 2018) and enabling network effects unique to digital platforms can accelerate upscaling of innovative products or services (Eisenmann *et al.*, 2006; Gawer, 2014; Gawer and Cusumano, 2014; Parente *et al.*, 2018; Rochet and Tirole, 2003; Watanabe *et al.*, 2017). The business models of all the ridesharing firms in the case satisfied both conditions of having large indirect network effects in the local cities in which they operated and no asset ownership of ridesharing vehicles.

However, the current literature does not adequately explain the unique key driver we identified as underlying the rapid upscaling of digital platform businesses—*niche competition*—in the form of innovation races (Geels *et al.*, 2017). Such races between the ridesharing startups drove niche momentum in Phase 2 for ridesharing innovations to break through and progress towards a socio-technical transition. The innovation races involved a dynamic cycle and combination of competing technologies, business model, venture capital fundraising and regulatory support between the niche actors. On the contrary, competition between the niche actors did not yet ensue in Phase 1 when the niche was unstable with Grab and Uber piloting their innovations on a small scale. At this nascent stage, competition would have instead had a negative effect on upscaling.

The innovation races based on technologies in the region played out when local firms like Grab and Gojek followed Uber's innovative introduction of PHV-hailing using private cars. In Indonesia, the innovation races took the opposite turn when the global firms, Uber and Grab, imitated Gojek's first mover foray into offering motorcycle-taxi hailing services, a localization strategy that catered to the needs of local passengers due to the ease of motorcycle taxis in navigating through heavy traffic jams and its extreme low cost compared to conventional four-wheeled taxi vehicles.

In terms of business models, competition had a positive effect on the upscaling of niche innovations in Phases 2 and 3 when price wars and differentiated business model strategies of the niche actors drove wide user adoption of ridesharing services. For example, Grab felt pressured by its competitors to expand its market share geographically across the region, as well as by diversifying into multiple lower-cost services for consumers like private hire vehicle- and motorcycle taxi-hailing. The lower price differentiation of these new ridesharing services drove rapid user adoption, particularly in Indonesia, Vietnam and Thailand, where high price elasticity and local demand for a motorcycle taxi-hailing service that addressed severe traffic congestion problems reigned.

We further argue that the ridesharing industry in Southeast Asia could not have scaled without rampant price-driven competition as rapidly as it did. In addition to providing lower-priced services to consumers, the niche actors engaged in intense price and incentive wars with their competitors, which further increased operation costs at the expense of economic profits. The subsequent price and driver incentives wars that ensued between these companies lowered prices even more for non-taxi services like PHV and motorcycle taxi services, which did not have to adhere to regulated taxi fare pricing; thereby increasing customer demand and attracting hordes of drivers away from the taxi industry. This niche competition enabled the individual startups to scale faster by increasing their network effects in Phases 2 and 3, thereby accelerating the widespread adoption of niche innovations and disrupting the traditional taxi regime much faster than in the absence of competition.

Three sets of factors drove the fierce competition on rapid upscaling dynamics in Phases 2 and 3, suggesting a transnational political economy of socio-technical transition that has so far remained under-examined in academic literature. First, unprecedented levels of venture capital funding and activism enabled competing digital ridesharing startups, as the 'darlings' of the sharing economy (Lunden, 2013), to rapidly scale up their innovations in the region, accelerating socio-technical transition processes. Monetary resources play a critical role in the breakthrough of niche-innovations (Geels et al., 2017), both directly and indirectly through the (fierce) competition they can enable. In our case, venture capital investors were integral supporting actors who funded innovative startups engaged in loss-making price wars and technological innovation races to grow market share.

Second, the consensus of a masculine, winner-take-all view of the niche market championed by the venture capital investors and start-up founders and employees—and further reinforced by the mass media—fueled a sense of urgency among the niche actors to grow fast at significant costs through price wars to outcompete one another until one winner remains. This dominance view of competing for market share prevails in other digital platform-enabled mobility services like dockless bicycle sharing as well (Dudley et al., 2019). Billions of US dollars of venture capital funding were required to sustain the remaining two major startups in Southeast Asia's ridesharing industry, Grab and Gojek. EasyTaxi and Uber both exited the Southeast Asian market when their investors and management team decided not to allocate more funds to costly price and innovation wars with no guarantee of market dominance (Davis et al., 2018).

Third, business model innovation in the form of cross-regime integration enabled Grab and Gojek to outcompete Uber in Phase 4 by becoming super apps that further grew their customer bases through diversified services in other regimes like financial services and a range of other lifestyle services like ticketing, hotel bookings and food delivery. This finding is supported by MLP literature that has shifted from the growth of a single regime to account for cases in which multiple regime integration plays a critical role in the upscaling and adoption of new regimes (Raven and Verbong, 2007; Geels, 2018). Uber's initial business model in Southeast Asia was dictated by a standardized playbook set by its US headquarters and the region was less of a priority to Uber than the much larger markets like China and India in Asia (Davis et al., 2018). Thus, Uber lacked the business model flexibility to become a super app to compete effectively with local firms like Grab and Gojek, which were able to expand their business models dynamically to cater to the local needs of each local city they operated in.

Grab and Gojek's business model transformation from solely providing ridesharing services to expanding into super apps also provided an alternative, viable path to profitability. As discussed above, it was non-ridesharing services that made Gojek approach profitability in 2019. In addition, the rumoured discussions that Grab held with potential investors, PayPal and Alibaba, to fund only its Grab Financial services segment reinforces the added value of Grab's diversification into financial services as investors shift away from transportation services to more profitable business segments. Grab's diversified super app business model helped it to weather ridesharing service disruptions caused the COVID-19 pandemic in 2020 to 2021, whereby a considerable share of ridesharing drivers could still earn a living by partaking in the increased demand for food and grocery delivery services during that time.

4.5.3 Regime actors and dynamics

In the case of ridesharing in Southeast Asia, regime actors have played important roles throughout the transition process. As explained above, Grab collaborated closely with Malaysia's largest taxi fleet company and the Malaysian government in Phase 1 and maintained good relationships with public authorities throughout subsequent phases. However, the role of regime actors has not been limited to direct collaboration with niche-innovators, for they started their own innovation race, which became a separate driver of niche momentum. Competition was not limited to ridesharing companies; regulation races emerged between national governments across Southeast Asia. In Phase 3, a rapid imitation of government regulations occurred throughout Southeast Asia after the Philippines raced to be the world's first national-level jurisdiction to legalize and regulate digital ridesharing companies. Shortly after, Indonesia, Singapore and Vietnam announced intentions to regulate ridesharing services; followed by Malaysia.

Finally, the socio-technical transition of ridesharing innovations in this case does not fully map onto the four phases of the most discussed multi-level transition process (Geels, 2002; Geels *et al.*, 2017). Phases 1, 2 and 3 of the case maps well onto the phase characteristics outlined in

Table 1, but Phase 4 does not. Phase 4, which also can be identified in the alternative transition pathways (Geels and Schot, 2007), establishes that after a period of rapid changes a new or revised regime is institutionalized and restabilized within a sector. Even recent ‘whole system analyses’ (Geels, 2019, 2018) remain focused on a sector a societal function (e.g., mobility). The case of ridesharing niche innovations in Southeast Asia warrants its own re-characterization of what would occur in Phase 4 of the MLP framework because the remaining major companies in the region—Grab and Gojek—are not sticking to the transport sector. Instead, we witness a much more radical form of regime integration than previously observed, which is driven by the firms' adoption of the super app model to diversify their services beyond ridesharing and transport to include financial services, delivery of food and other goods, and on-demand lifestyle services like housekeeping and beauty treatments on one proprietary platform. The other niche ridesharing actors—EasyTaxi and Uber—who did not survive the transitions process in Southeast Asia and exited the market failed to offer cross-regime services within and beyond transport, respectively, to compete effectively with their local counterparts who did. Thus, we further argue for a modification of Phase 4 of MLPs model to include a socio-technical transition pathway that ends in integration across many previously siloed regimes, rather than change in a singular regime or the integration of two or three regimes (as with, for instance, electric vehicles or vehicle-to-grid developments).

4.6 Conclusion

The case of the rapid rise of digital ridesharing innovations in Southeast Asia suggests at least three ways in which thinking on multilevel socio-technical transitions can be developed further. First, further conceptualization of and research on innovation races and competition as drivers of transition is required. In our case, niche competition, depicted as a dynamic cycle and combination of innovation races between both niche service providers—in the areas of technologies, business model, venture capital funding and regulatory support—and regulating national authorities played a role in accelerating socio-technical transition processes. We found that niche competition between similar two-sided digital platform startups required: significant venture capital funding to execute a 'winner-takes-all' view to dominate competitors through price wars and strategic growth from integration across many, rather than two or three, regimes. Future research should look critically at the political economy and geopolitics of venture capital within transitions, and the question what the downsides and unintended consequences are of the acceleration that fierce, venture capital-driven competition and innovation races.

Second, more reflection on the 'end-state' of socio-technical transitions—Phase 4 above—is required, especially when attention is directed towards trajectories that involve sustainable innovations, such as electric vehicles and PVs, breaking out of their niches: will they result in system changes that leave old sector boundaries around transport or heating intact and meaningful? Or might a radical redrawing of system boundaries occur? The case of ridesharing in Southeast Asia indicates that strategies of radical service diversification first within a regime and later across many—not two or three—regimes enabled Grab and Gojek to rapidly expand their user bases, benefit from the positive externalities of indirect network effects, and force out competitors. They are shedding their ridesharing/transport identities and further integration across domains through super apps and online payment systems can be expected. A major uncertainty, however, is how regulators will respond, given their lock-in in existing policy, regulatory and legal specializations.

Third, our case lends further support to avoid narrowly focusing on niche-innovations and consider the active and innovating role that regime actors play in transition dynamics (e.g., Geels and Schot, 2007; Ghosh and Schot, 2019; Geels and Turnheim, 2022). In our case, the latter did much more than "just [optimizing] the existing old-fashioned and outdated regimes" (Ghosh and Schot's, 2019, p. 83) as both incumbent taxi operators and the Malaysian government seemed fully committed to systemic change in what, with hindsight, were the early transition phases. Yet, because of that commitment, a neat segmentation of niche and regime and of actors whose activities can be allocated to one or the other starts to become difficult to sustain. Using the categories of niche and regime as more than heuristic tools that sensitize researchers to the possibility of specific inclinations, interests and dynamics entails the risk of failing to grasp the polyvalent and entangled nature of socio-technical system change. A methodological strategy of reconstructing a detailed timeline of events in and across specific localities without a priori setting boundaries on who/what is relevant and only afterwards drawing on the categories of niche and regime helped us to make sense of the many entangled processes in and around ridesharing in Southeast Asia.

5. Chapter Five - Stranger Encounters in Ridesharing: Urban Microcosms of Social Norms and Informal Codes About Moral Conduct

Abstract

The rise of on-demand ridesharing smartphone applications has made algorithmically matched rides between strangers—both drivers and passengers—increasingly common in urban areas worldwide. This raises questions of how strangers on on-demand shared car rides interact through transient, mobile encounters with one another, and how these social interactions shape collective social norms and informal codes about moral conduct. This study focuses on shared rides in Southeast Asia, which began in 2012 when a major company first introduced digital ridesharing services across dense, urban areas in the region. Through qualitative interviews with 65 drivers and passengers in Singapore and Manila, Philippines, the study finds evidence of a set of social norms and misaligned codes about moral conduct that shape the practices and experiences of ridesharing participants before, during and after shared rides. Pre-existing prejudices by drivers toward passengers of different races, nationalities and socio-economic statuses shaped how drivers selected which passengers to pick up or exclude before a ride is matched by a digital application. Evidence is also found of social norms that emerged because of the ridesharing process, such as passengers asking to be dropped off in inconspicuous locations near their true location for privacy. Ultimately, this study contributes to research on social interactions in transport journeys, encounters between strangers in hyper-diverse urban areas,

and discrimination in digital sharing platform services, respectively in the fields of transport geography, urban studies, and the sharing economy.

5.1 Introduction

The growth of on-demand ridesharing smartphone applications has made algorithmically matched rides between strangers—both drivers and passengers—increasingly mainstream in urban areas globally. This raises questions of how strangers sharing on-demand rides booked by a digital platform technology interact through transient, mobile encounters with one another (Pratt *et al.*, 2019). In this context, the current study focuses on how transient social encounters between strangers in digital ridesharing services can reflect pre-existing prejudices and expectations; and shape social norms and informal codes about moral conduct between users, including both passengers and drivers, through everyday shared car rides.

I argue that the social interactions within shared car rides can represent microcosms of everyday social encounters between strangers in public spaces. The smaller, intimate space of a car forces its occupants to interact in what Goffman (1963, p. 243) considers a social situation, the presence of "the full set of persons mutually present to one another during any one continuous period of time." Extant research has studied social interactions in public transport (Goffman, 1963; Wilson, 2011) and in cars rides with known drivers and passengers (Laurier *et al.*, 2008), yet the recent research on shared encounters between strangers in a ride booked by a digital ridesharing platform centres on passengers' prejudices (Sarriera *et al.*, 2017) and discriminatory attitudes towards others (Middleton and Zhao, 2020; Moody *et al.*, 2019). In addition, prior research on social encounters among strangers in neighborhoods has not reached a consensus on whether such encounters can increase social cohesion among different social groups or simply reflect the preconceived judgments and biases that individuals inherently have towards others who are different from them (Schuermans, 2019; Valentine, 2010; Wilson, 2017a, 2017b). As encounters among strangers in urban areas increase through new ridesharing services, I aim to understand the social expectations, thoughts and dynamics underlying these driver-passenger and passenger-passenger interactions. Thus, I aim to answer: *what are the social norms and behaviors that arise from encounters between strangers in a shared car ride enabled by ridesharing booking applications?*

In this paper, I examine the sociality of digital ridesharing in Southeast Asia, which began in 2012 when the company, Grab, first introduced digital ridesharing services across dense cities in the region. Through in-depth qualitative interviews with 65 drivers and passengers from Grab's ridesharing services in Singapore and Manila, Philippines in 2017, I analyze narratives of social interactions, expectations, norms, and informal codes about moral conduct to conceptualize how previously unknown private car drivers and passengers interact with each other before, during and after a shared ride. Ridesharing firms like Grab and Uber, its US-headquartered competitor in Southeast Asia from 2013 to 2018, offer diversified services that include the matching of on-demand taxi (GrabTaxi or UberTaxi), and chauffeured (GrabCar or UberX) and carpooling rides in private vehicles (GrabShare or UberPool) between a driver and passenger(s) who are unknown to each other. Uber and Grab respectively launched ridesharing—on-demand, commercial carpooling—services, UberPool[9] and GrabShare, in July and December 2016. Ridesharing enabled more than one passenger to share rides with another passenger to final destinations with overlapping routes.

[9] UberPool ceased operations in Southeast Asia in March 2018 after Uber exited the Southeast Asian market (Waters & Lucas, 2018).

Ridesharing quickly gained popularity in Southeast Asia and Uber Singapore reported that over 40% of its user base tried UberPool within one year of its launch (Lin, 2017). The rapid adoption of ridesharing by both passengers and drivers was driven by lower fares—GrabShare charged up to 40% less than its private ridesharing (GrabCar) or taxi-hailing options (GrabTaxi) (Grab, 2020)—and higher income per ride for drivers due to the efficiency of maximizing the occupancy of rides. The efficiency of ridesharing potentially reduced traffic congestion, while providing more flexibility compared to public transport alternatives like buses and rail. Interestingly, the ridesharing firms promoted the social networking opportunity of the service. Grab launched a marketing campaign to advertise the opportunity for passengers to "meet new people" and even partnered with the online dating application Tinder to give passengers a chance to share a ride with popular social media influencers in Singapore (DMA News Desk, 2017). Before the COVID-19 pandemic, ridesharing was pervasive across 36 cities in eight countries in the region (Grab, 2019a). In 2024, Grab is present across over 700 cities across the eight countries in Southeast Asia (Grab, 2024).

Although on-demand ridesharing services have been lauded for efficiency and promoted for social cohesion, our findings revealed some of the drawbacks of public encounters when discriminatory practices emerged, and prior prejudices persisted between stranger passengers and drivers throughout the process of a shared ride. Ridesharing drivers' and passengers' preconceived perceptions and biases of one another based on race, nationality, gender and social class led to prejudices between strangers that occurred before a ride started or during the ride. Our findings also elucidated how informal social norms and code of conduct arose from social encounters between strangers, creating both social tension and cohesion between different individuals. Thus, on-demand, digital ridesharing transforms vehicle spaces into dynamic microcosms of existing social relations in urban areas. Both of our findings offer opportunities for policies to eliminate discriminatory practices and formalize codes of conduct that can improve user experiences for both drivers and passengers in on-demand shared rides.

5.2 Socialities in Transport Journeys

This paper contributes a new perspective on driver-passenger interactions between strangers sharing car rides matched through a digital, on-demand ridesharing application. It builds on existing mobilities literature focused on passenger interactions between strangers in public transport (Bissell, 2010; Levine *et al.*, 1973; Watts, 2008) and airplane travel (Budd, 2011), as well as previous research on the socialities before boarding, during and after alighting a private car (Laurier *et al.*, 2008; Levine *et al.*, 1973). Most recently, Pratt *et al.* (2019) analyze over 2,000 tweets about UberPool and Lyft Shared (formerly called Lyft Line), revealing that while these pooled ridesharing services may reduce vehicle occupancy when multiple, unknown passengers share an on-demand ride to similar destinations, they are often met with negative perceptions commentary focused on the unpredictable travel times and forced social interactions with other passengers. Morris *et al.* (2020) surveyed pooled ridesharing drivers on UberPool and Lyft Shared in the US to find that the social dynamics between passengers who are strangers in a shared ride could be unpleasant, particularly when the passengers do not interact with one another and there are awkward silences, or when passengers do not get along and argue with one another. Sarriera *et al.* (2017) also surveyed ridesharing users in the US to find that potentially having a negative social interaction with other users deters pooled ridesharing usage to a greater extent than the possibility of having a positive social interaction as an incentive to use the service.

Laurier *et al.*’s (2008) video analysis methodology of in-car interactions presents an opportunity to further understand the driver and passenger interactions from the first-hand perspectives of the participants of the car ride. By examining in-car interactions between unknown drivers and passengers, this paper builds on the following relevant themes from Laurier *et al.*’s (2008) analysis of drivers and passengers who know each other collective private transport in a car via third-party expert analysis of video observations. The first theme is ‘driving together,’ which describes how arriving at a destination can be a shared experience between driver and passenger (e.g., passenger giving directions). The next theme is the ‘distinctiveness of talk-in-cars,’ in which cars become spaces where there is an expectation or obligation to talk when there are passengers. A third theme depicts the ‘hospitality of drivers and passengers,’ in which drivers are in a position of a host when they own the car; and the resulting host-guest/driver-passenger relationship in a shared journey could be an extension of the workday for passengers. The final theme encompasses ‘slow conversations in the car,’ which delineates how being confined to the car during the ride enables people to have types of conversations that could elicit more pauses, silent breaks and slow, contemplative talks. For example, there could be other activities that provide a refuge from conversation like listening to the radio, looking out the window and background conversations in the back seat. Laurier (2004) also examines people multi-tasking and doing work on the motorway.

5.3 Stranger Encounters in Hyperdiverse Neighborhoods

To further understand the behavior and interactions between the occupants of the social space in a vehicle, this paper examines relevant mid-20th century examples of mobility and public encounters in sociology literature. Goffman (1963) observed public encounters of passengers in airplane and bus travel; as well as strangers walking on the street, building upon his earlier work on the concepts of constructing identities of oneself and others that influence one's "performance" and social interactions with others (Goffman, 1959). However, his work is mostly derived from ethnographic observations and not from personal perspectives of the passengers themselves, the methodology in which this paper employs.

Goffman (1963, p. 139) describes how passengering on airplane and bus travel induces strangers to engage in conversation and interactions due to close proximity in a confined space: "Seatmates, while likely to be strangers, are not only physically too close to each other to make non-engagement comfortable, but are also fixed for a long period of time, so that conversation, once begun, may be difficult thereafter either to lose or sustain." Goffman (1963, p. 84) also observed how strangers in public places engaged in civil inattention, an act of minimizing communication with others to avoid physical or further contact: "What seems to be involved is that one appreciates that the other is present…while at the next moment withdrawing one's attention from him so as to express that he does not constitute a target of special curiosity or design." Finally, Goffman (1963, p. 120) linked the building of trust among strangers to street encounters which facilitated "engagements among unacquainted."

Recent research in the geographies of encounters show that the effects of encounters between different people in hyperdiverse places do not necessarily lead to positive, social cohesion because such encounters are mediated by local social norms, personal experiences, asymmetric power relations and public discourses (Schuermans, 2019; Wilson, 2017b). Studies of how prejudices—the individual judgement of others who are seen as different—unfold in hyperdiverse urban areas have shown that individuals' personal and collective histories, in addition to the cognitive ability to control affect and identifications, shape such judgements and (in)tolerances of others in everyday encounters (Valentine, 2010; Valentine & Harris, 2016; Valentine & Sadgrove, 2014). In particular, the majority group often justify their prejudiced views towards a minority group seen as different (e.g., via social class, race or ethnicity and nationality) as a desire to protect the group's social identity and rights (Valentine, 2010). These justifications of prejudiced views by the majority group are typically ignored by social policies aimed at protecting the minority group and addressing this latter group's concerns of oppression; which exacerbates the persistence of intolerances between different social groups in hyperdiverse cities (Valentine, 2010).

The persistence of existing prejudices among individuals in public encounters between strangers in hyperdiverse, intercultural contexts present disadvantages in a paradox of organized encounters, which are politically and pedagogically charged (Wilson, 2017b). The counterpart argument for the other end of the paradox takes an optimistic view—that organized social encounters in hyperdiverse settings can foster intercultural interactions, education and understanding between different people that ultimately lead to social transformation. In a relevant study, Wilson (2011) examined forced public encounters between strangers on everyday bus travel and found that key social encounters and identity formation among people are constantly renegotiated and reordered through the constant shifts in the movement of people. She observed that these encounters in public mobility spaces were politically charged when issues of social position, identity and histories constantly shaped the emergence of public codes of conduct, bodily orientations and affects that influence judgements in future social encounters. Our research aims to extend this understanding of how such encounters among different strangers in shared public spaces can lead to positive or negative social interactions and cohesion in hyperdiverse cities (Valentine, 2008, 2010; Wilson, 2017b) through the smaller, more intimate confines of shared car rides.

5.4 Discrimination in Sharing Economy Platforms

Ge *et al.* (2016) have conducted an audit study on racial and gender discrimination in ridesharing platforms in the US cities by sending 16 passengers representing different genders and race into the field to book and test rides on the Uber and Lyft platforms. UberX drivers can view a passenger's location and star rating when a passenger requests a ride; and then can view the rider's name after accepting the ride. On the other hand, Lyft drivers can view the passenger's name and photo before accepting or declining the ride request. They found that African American passengers in Seattle faced longer delays for their ride requests to be accepted by drivers on both Uber and Lyft. African American riders also had longer wait times for an UberX driver to pick them up than White riders; and that waiting times were not significantly different between the two races for riders using Lyft. In the second field experiment, the authors found that UberX drivers were three times as likely to cancel rides for male passengers with African American names. They also found evidence of UberX drivers being more likely to cancel trips for passengers located near subway stops in Boston, suggesting that drivers consider such passengers as hailing from a low-income group or would be taking a multi-modal trip with lower fares.

Likewise, audit studies on the Airbnb platform in the US test racial discrimination in the acceptance of guests with African American names versus White names. Edelman *et al.* (2017) found that guests with African American names are less likely to be accepted compared to guests with identical profiles, but White names. Cui *et al.* (2019) also found evidence of discrimination by Airbnb hosts against guests with African American-sounding names compared to guests with non-African-American names, but that positive user reviews on a guest's online profile made acceptance rates between African American and non-African American guests statistically similar. They also found that nonpositive reviews or ratings with blank descriptive reviews also dampened discrimination.

I combine the different streams of literature to argue that on-demand, digital ridesharing could represent a highly moral, regulated and contested social practice. Ridesharing can be moral because it can be infused with, and generate, ideas about what is right and wrong. It can be regulated because it is shaped by, and can affect expectations, norms and (informal) codes of conduct for social relations. This follows what Wilson (2011) observed in the case of bus passengering, whereby informal codes of conduct emerged—shaped by perceptions of moral codes—and were renegotiated between momentary, shifting encounters between strangers situated in a confined shared space. Finally, ridesharing can be contested because relationships between drivers and passengers are not necessarily equal and are possibly constituted by, and representative of, prejudices; and at an extreme, even discrimination among different people.

5.5 Data and Methodology

To understand the expectations, observations and insights of how drivers and passengers interact in ridesharing, I conducted 65 semi-structured, in-depth qualitative interviews with ridesharing drivers and passengers in Singapore and Manila, Philippines from June to December 2017. I focus on our interviewees' experiences in ridesharing with the two competing on-demand, commercial carpooling services offered at the time, GrabShare and UberPool, which had launched within six months of each other in 2016. Appendix B includes the interview guide that I used in the field. I initially recruited willing participants from a randomized list of drivers and passengers who had taken at least one ride in the previous six months and did not have a do-not-call privacy status, which was provided by Grab, the leading ridesharing platform company in Southeast Asia. All interview participants, except for four passengers and two drivers, were active users of Grab. The six inactive users of Grab at the time of interview are considered as such because they either: have never registered with Grab, have registered but no longer use their account or have deactivated their account, or they had been banned by the company to render them inactive. These four passengers and two drivers were recruited using a snowballing method of asking interview participants if they knew any inactive users of ridesharing services. In Singapore, I interviewed 11 male and 7 female passengers ranging from ages 21 to 55 years old; and 16 male and 2 female drivers ranging from ages 34 to 64 years old. In Manila, 11 male and 9 female passengers ranging from ages 21 to 62 years old; and 9 male and 1 female driver ranging from ages 36 to 63 years old were interviewed.

After the interviews were transcribed, they were coded in NVIVO 12 according to the temporal distinctions of whether the event related to: 1) before the passenger is picked up, 2) the passenger is inside the car and 3) after the passenger alighted from car. I used constructivist grounded theory to employ rounds of initial and focused coding to the interview transcripts with the aim of constructing interpretive patterns and deriving theoretical insights from the empirical data (Charmaz, 2006). I began the study with prior literature on the sociality of the car ride experience before, during, and after the ride as a guide to inform my interview questions and collect data on these specific stages of a shared ride enabled by a digital ridesharing platform service.

Table 5.1 City statistics and characteristics for basis of selection

Cities	Singapore	Metro Manila
Population (Philippine Statistics Authority, 2018; Singapore Ministry of Health, 2019)	5.70 million (2018)	12.88 million (2015)
Area (km^2) (Philippine Statistics Authority, 2018; Singapore Ministry of Health, 2019)	725.7 km^2	619.5 km^2
Annual GDP per capita in USD (CEIC, 2018)	55,182 (high)	9,139 (low)
Safe Cities Index ranking (Kiestra, 2019)	High (#2)	Low (#43)
World traffic congestion ranking (TomTom, 2019)	Low (#96)	High (#2)
Car ownership level (BBC News, 2017; Data.gov.sg, 2018; Euromonitor International, 2017)	Low	Low
Public transport availability (Abad, 2019; Knupfer *et al.*, 2018)	High	Low

I focus on comparing results across two major Southeast Asian urban areas, Singapore and Metropolitan Manila, to study the particularity of ridesharing experiences recounted by ridesharing drivers and passengers. These two cities were selected as representations of extreme ends of comparison based on the criteria related to ridesharing, illustrated in Table 5.1, which shows that Singapore and Manila are divergent in population, area, GDP per capita, perceived safety, traffic congestion and public transport options. They are similar in that both cities exhibit relatively low car ownership amongst their populations. The choice for these two remarkably different cities is akin to selecting “extreme cases” of income disparity, sense of safety in the city, and the availability of other public transport options that can aid in theory development due to an increased comprehension of outlying cases that can help the researcher develop a sense of theories' limits (Flyvbjerg, 2011). Thus, the results of this paper may apply to a wide range of cities, which fall within the extreme limits of the criteria set forth for this city sampling.

5.6 Thematic Results

5.6.1 Implications of passenger pick-up locations

The location of ridesharing passenger pick-ups by drivers served as point of contention for both drivers and fellow ridesharing passengers. Even before drivers physically picked up passengers, the digital ridesharing app enabled them to view the location of potential jobs and decide whether to accept the job. Multiple interviews revealed that Singaporean ridesharing drivers of Chinese origin often discriminated against accepting jobs from riders, particularly foreigners of Indian origin, with pick-up locations from known ethnic neighborhoods like 'Little India' in Singapore. "They like to group together, so there [are] a few hotspots for them which we try to avoid," said a 47-year-old Singaporean Chinese male, full-time ridesharing driver.

Singaporean Chinese drivers explained that foreigners in Singapore, particularly Indian nationals, acted more superior to the drivers and drivers felt they were disrespected and were not treated as equals by such passengers. As a 40-year old Singaporean Chinese male, part-time ridesharing driver explained:

> "But one particular group that I try to avoid is...Indians, India Indians, because they are much more demanding. Because they are the ones that I mentioned that are...they sort of place themselves as more superior to the driver.... So, it's like these people don't

> understand...I mean, apart from the also mutual respect like, I mean, they don't how to really treat a normal human being as...I mean on par with them,"

Other ways in which drivers felt passengers acted superior to them during the passenger pick-up phase manifested in instances when some Singaporean passengers attempted to board the ride with infants under two years old without a car seat, which is required by law.

Likewise, a 55-year-old female Chinese Singaporean passenger expressed the discomfort she felt when her and her female friend took a shared ride that picked up two Indian national construction workers "with very dirty clothing" from a construction site in Singapore. Interestingly, a 35-year-old Indian expatriate male passenger acknowledged an awareness of the underlying discomfort he believed other fellow passengers, especially women, would feel when sharing a ride with him due to the perception that Indian national males could act inappropriately towards women arising from recent media of rape incidents in India. "I feel that, being an Indian, I feel that, eh, if it is a female passenger, then they might not be very comfortable with me, is what I feel, okay….There have been some incidents in India which are, you know, blown out by the media because of, you know, some rape cases against women in India and also some foreigners were, you know, tortured and raped. So, that mindset is in me maybe that a person might not be liking it, so okay, that's what I feel, maybe because of ethnicity…. I don't know if that person is feeling that because they wouldn't be telling it on my face," he explained.

Passenger pick-up locations provided ridesharing drivers with inferences about passengers in other ways. Several drivers avoided picking up drunk passengers by strategically not accepting jobs from certain locations known for drinking establishments at night and weekend nights. In addition, drivers associated passengers with the socioeconomic status of the location or neighborhood of the pick-up. In Manila, Philippines, one driver was expected to pick up a high-class passenger from a wealthy neighborhood when he accepted the job and was surprised to find that the passenger was a working-class housekeeper who was returning to her lower status neighborhood. In Singapore, drivers expected passengers from high-end shopping or residential destinations to be wealthy and/or expatriates.

5.6.2 Perceptions of the driver-passenger pick-up experience

In addition to passenger pick-up location, ridesharing drivers perceived riders differently based on the type of ridesharing app company or service they use. Many drivers in Singapore used both the local and global competing ridesharing apps; and based on their experiences, perceived local Singaporeans as more likely to use the local app and expatriates to use the global app more. Accordingly, many drivers remarked how White expatriate passengers tended to be more friendly, cooperative and flexible in that they did not make as many demands as Indian expatriates and local Singaporean passengers. The carpooling service in which multiple passengers who are strangers share a ride is cheaper than ridesharing service in which passengers do not need to share with other strangers. Thus, several drivers in Singapore expected the passengers on the cheaper shared service to be Singaporean locals and/or students or Indian construction workers, all of whom are stereotyped as cost-conscious or of lower socioeconomic status.

On the other hand, some passengers viewed being picked up by a ridesharing driver in a private car as a status symbol. A 37-year-old Filipina expatriate in Singapore admitted that she used ridesharing services because she liked to be seen being picked up or dropped off in a private car by a private driver, instead of a marked taxi that is accessible to the public. She relished the attention she received from friends who would notice that she was being picked up or dropped off by a private car as if she was using a service that connotates a higher social status. In addition, she explained that she would purposefully use a ridesharing service for work events where others would be able to observe her arrival in a car because of the image of a successful professional she aimed to project. In Manila, Philippines, using a ridesharing service is inherently associated with passengers who are wealthy or professional because it costs more than other types of public transport options in a lower-income country compared to a higher-income country like Singapore.

5.6.3 Social norms for ridesharing before the ride

Passengers across Singapore and Manila were price sensitive and described the common practice of comparing the fares of competing ridesharing apps and the services within the apps to select the service with the cheapest fare. Regarding the selection of different ridesharing services within the app, some passengers decided to take the cheapest option of ridesharing with other unknown passengers as a last resort, contingent upon whether they could be flexible with longer ride times. Some passengers expressed an unwillingness to ride with other unknown passengers and would rather pay a premium to share the ride only with the driver. Other frequent riders found that booking the option to share a ride with unknown passengers at off-peak times or to unpopular destinations meant that they would be the lone passengers; in this case, the passengers benefitted from paying the lowest price for a more premium-priced service due to lack of full capacity for the carpooling service at all times of the day and all locations. Some riders, particularly in Manila, would only use ridesharing in the presence of heavily discounted ride promotions.

Ridesharing drivers and passengers also commonly acknowledged a set of expectations for the waiting time and experiences before a passenger is picked up for a ride. Drivers strongly preferred that passengers do not make them wait too long during pick-up and attributed long wait times to some of the most negative ridesharing experiences they have encountered because of the opportunity costs associated with their time. On the other hand, passengers expected drivers to find them at the pick-up points they designate and arrive in the estimated arrival time that the digital app algorithm provided, but sometimes issues with the app's map or GPS accuracy lengthened wait times. Some Singaporean drivers felt a tension between breaking the law and pleasing customers. They lamented that some passengers insisted that they pick them up from locations that were illegal for them to stop at; and that passengers were angered when the driver would ask them to meet them in a more appropriate pick-up point. Some passengers ended up cancelling the ride if the driver cannot locate them in a timely manner or at all, which also creates frustration for the driver, especially when the driver is on the way to picking that passenger up. Such issues have led to the app company issuing new policies later to encourage drivers and passengers to chat with one another about the location and time of arrival; in addition to designating conspicuous, nearby pick-up points that both passengers and drivers can meet at.

5.6.4 Power asymmetries between drivers and passengers

Multiple ridesharing drivers further elaborated on how they faced issues of passenger entitlement and power imbalance during the ride. The 47-year-old Singaporean Chinese male driver in Singapore explained: "They have this entitlement mentality, okay? Like 'I booked a Grab okay or an Uber, I take your car, you belong to me, you listen to me… Another mentality is 'Back in my country it can be done, why [...] cannot?'". "For example, they will ask me to turn up the aircon, turn down the music, no music. They'll tell you, 'Can you turn down…?' They won't tell you please no music. Then, they feel like they are the boss of this ridesharing," added the 40-year-old Singaporean Chinese male driver in Singapore. Other drivers have experienced this type of demanding behavior from passengers when being told to drive at a different (usually faster) speed or go in a particular route. Again, ridesharing drivers faced a conundrum in these cases because they were at times reluctant to break Singaporean laws for speed limits or go against the designated route chosen by the app's guided map.

When asked about driving experiences with passengers from different races, ethnicities or nationalities, several drivers explicitly said that they were either not a racist or that their perceptions were not specific to passengers' inherent characteristics, but rather about how a passenger acts or presents themselves. These conversations raised discrepancies between drivers' self-perception of not being racist and the subsequent racist remarks they would inadvertently make. "Race…I wouldn't say it's based on nationality because it depends on [the] individual. I've met nasty locals; I've met nasty [Whites] or whichever races or nationalities. So, it's actually based on individuals," said the 40-year-old Singaporean Chinese male driver in Singapore who then would go on to say that he avoided picking up Indian national passengers. Other drivers alluded to stereotypes associated with nationality or race. For instance, one 55-year-old female Singaporean Chinese driver in Singapore was very upset about how passengers from mainland China would start eating in her car without asking for her permission, which she considered rude because they did not ask, and her car could get dirty. The same driver described how she perceived passengers from the Philippines as acting like they are "big shots" because they work as professionals in an office building in Singapore; explaining that the Filipino expatriates who work in corporate jobs are arrogant because they tell her what to do and speak to her rudely. She specifically lamented: “But to me if you want to be arrogant, you can be arrogant … go back to your country and be arrogant, you are in somebody’s country. You respect the country citizens, yeah. Doesn’t matter whether if I’m a salesperson or I’m a waitress or I’m a driver. You are in my country. You jolly well respect me as a citizen of the country, yeah.”

5.6.5 Informal codes about moral conduct between drivers and passengers

An informal code of conduct emerged regarding drivers’ expectations of how passengers should behave and vice versa; in addition to how passengers should behave towards fellow unknown passengers in a shared ride. Drivers mentioned that they tried to have eye contact and greet passengers when they entered the ride. They also tried to gauge the body language of passengers to determine whether they should engage them in a conversation or not. Drivers were cognizant that passengers they picked up in the evenings tended to be tired and would not want to engage in conversation; like passengers who seemed more stressed out or busy in the mornings on their way to work. Passengers described an awareness of eye contact, body language, where to sit in the car and whether they should converse with the driver and/or other passengers. Some passengers made it a point to always greet the driver or sit in the front seat (even when the back seat was available) to gesture a more friendly demeanour towards the driver.

Gender differences emerged in passengers’ reflections in Singapore, whereby some female Singaporean passengers would not feel comfortable sitting in the back with an unknown male passenger. Male Singaporean passengers also implicitly acknowledged this phenomenon and would sit in the front seat with the driver rather than in the backseat if a female passenger was already sitting in the backseat. Additionally, some male passengers in Singapore felt safe sharing a ride with other unknown passengers but admitted that they would not feel comfortable if their girlfriend or spouse shared a ride with strangers. One of those passengers would not allow his female significant other to use ridesharing even if she was the lone passenger; while the other male designated that he would feel comfortable with his female partner riding as a lone passenger in Singapore, but not any other country in Southeast Asia due to safety concerns.

A cultural comparison could be made regarding how conversant passengers are to drivers and/or passengers who are strangers. Local Singaporean passengers remarked that White expatriates were more talkative and friendly than local passengers, who are more reserved and not as chatty with strangers. In the Philippines, most of the shared rides were between local Philippine passengers who usually greeted and chatted with each other. In one case, a Filipino male passenger in Manila chatted with a fellow male passenger who was picked up in the same large office building and shopping mall complex he worked in. They remained in contact after the ride and the passenger ended up hiring his fellow passenger at his company, which is one example of how ridesharing was used for professional networking. In Singapore, drivers observed age differences in passengers’ behavior when they noticed that younger passengers tended to use headphones during shared rides and preferred not to socialize. Drivers also noted that many passengers are occupied by using their phones during the ride. Overall, drivers in Singapore observed that shared rides that bring together an assortment of passengers unknown to each other usually culminated in awkward silences during the ride. The drivers attributed these awkward silences to passengers who used the shared carpooling service to save money, not to socialize as the app company advertised.

Other issues such as the preferred route had a more inconsistent code of conduct contingent on the individual characteristics and preferences of the drivers and passengers. For example, several drivers were proactive about asking passengers which route they preferred to take from the start of the ride to provide good customer service. More inexperienced drivers, however, would rely on the GPS-guided map built in the app for directions and would not stray from the default designated route. Some passengers would pay attention to the route that drivers took—and complained or felt cheated if the driver took what they deemed a longer route than necessary. Other passengers did not prefer which path drivers took. Some drivers also would ask passengers if they had a preferred radio station or music they would like to listen to during the ride; while at least one driver in Singapore felt that he should be able to listen to whatever radio station he wishes to, despite passenger demands to turn it off.

Passengers did have convergent expectations on how drivers should act related to safety. Passengers have commented on drivers' driving skills and abilities—from negative to positive—and expect drivers to drive in a safe manner by following road laws and not speeding or driving recklessly. Passengers also seemed to respond more positively to or are surprised and curious when they have a female driver. Some passengers in Singapore were delighted to have a female driver, while some ascribed to the stereotype that female drivers were worse drivers than males. Another perspective regarding safety was that many drivers in Manila felt safer using Grab because they have been robbed in their previous experiences as a public taxi driver; and the Grab app provided GPS location tracking and enabled them to carry less cash due to an electronic payments system.

Drivers in Singapore expected passengers to follow the same rules within the shared car ride as public transit rules and to follow national laws. For example, as mentioned before, some drivers disliked it when passengers ate or drank in their cars. Many drivers in Singapore also disliked it when foreign passengers made requests that blatantly disregarded the law: dropping them off in prohibited places, taking young children without a car seat, and driving beyond the speed limit. For example, one Singaporean driver lamented about foreign passengers who travelled in a large group that was beyond the legal vehicle occupancy allowed in Singapore: “In some countries...they don’t have a policy where one car can seat how many people and they bring that mentality here [and say], ‘Oh my country, one car can seat 5 people, 6 people, no problem.’ And the very famous phrase is this, ‘Why other driver[s] can do it, [and] you cannot?’“

On the other hand, passengers expected drivers to keep the car clean and free of foul smells; and some expected drivers to look presentable with appropriate attire and grooming. Some passengers were impressed by drivers who also provided free in-car amenities like tissues, snacks, drinks and/or phone chargers and wireless internet. Other passengers expected the driver to open car doors for them and help with loading luggage, strollers or bags. Some passengers insisted that drivers should drop them off at the point closest to the door or driveway of their destination.

Passengers who shared rides with other unknown passengers had mixed feelings about how they expected other passengers to behave. Some thought that other passengers should be friendly and chat; while others preferred to be left alone during the ride and felt awkward speaking to strangers. One male passenger in Singapore intended to take shared rides so that he could flirt with other female passengers he found attractive during the ride. One female passenger in Singapore enjoyed meeting new people during the ride and making friends, especially when taking a shared ride to university, where she would meet other fellow students with a similar shared experience.

One surprising result that was common across Singapore and Manila was children taking ridesharing services alone—usually to school or to and from afterschool activities— without parental or guardian supervision. Almost all the drivers were surprised when they first encountered young children riding alone, but still accepted the rides. In these instances, drivers had a different code of conduct for driving children riding alone on ridesharing rides. Some drivers would make it a habit to call or message the parent after safely dropping off the child to their destination. Some drivers took more precautions while driving to ensure a safer ride. Some had candy in the car to give out as behavioral incentives for the children. Many drivers would intentionally engage in conversation with child passengers to make the ride comfortable and enjoyable for them.

Safety concerns on maintaining the privacy of passenger drop-off locations in a shared ride were common among female passengers across Singapore and Manila. In particular, the passengers felt uncomfortable or unsafe about other unknown passengers and drivers knowing where they live when being dropped off, especially at night. Thus, several passengers have addressed their concerns by asking to be dropped off in non-specific locations like a street corner or at another location that is within walking distance of their home. Some passengers who lived in large, high-occupancy condominiums or apartment buildings complex felt safer because their drop-off location did not reveal the specific location of their home. Other passengers in Manila adopted a similar remedy, but for different reasons. Passengers who live in more undesirable neighborhoods were embarrassed to be dropped off in those locations in front of other unknown passengers in the car and did not want to be judged for where they lived.

The ridesharing apps allowed passengers to tip drivers for the digital taxi-hailing service in Singapore. The ridesharing drivers who drove the taxi service generally expected that foreigners would tip more than locals because tipping is not prevalent in the local culture. The app also encouraged passengers to rate drivers after the ride. Some drivers and passengers did not believe that the rating system meant much in terms of ascertaining driver quality or that it accurately captured the quality of service; and did not take the ratings seriously. Some drivers felt that ratings from passengers could be unfair or one-sided since they would not have a chance to dispute them. On the other hand, some passengers felt the rating system was important for maintaining safety standards on the app.

After the ride, some female passengers had negative experiences when drivers would harass them by texting or calling their phone number, which was obtained through the ride booked through the app. In these cases, the passengers reported the incidents to the app company and felt unsafe and violated when errant drivers exploited access to their private contact information. In addition, some drivers admitted that they solicited repeat business off the app by giving customers their personal business card to bypass the app′s commission take-up and capture the full monetary value of the fares they would receive. Although the app company prohibited this type of driver conduct, it was not explicit enough for the drivers to acknowledge what they did was wrong.

5.7 Discussion

First, the findings about the informal norms and code of conduct that emerged in, and coevolved with, ridesharing between strangers adds to extant literature on the sociality of riding in cars

(Laurier *et al.*, 2008) and encounters between strangers in public urban spaces and transport (Goffman, 1963; Schuermans, 2019). For instance, before the ride, drivers commonly expected passengers not to make them wait at the pick-up location for too long, while passengers expected drivers to easily find them at the pick-up location or arrive within the designated time estimated by the digital ridesharing application. During the ride, tensions arose when drivers and passengers had different expectations regarding initial greetings, making conversation, where passengers should sit in shared rides, who decides what to listen to on the radio, who decides which route to take, and how drivers should adhere to speed limits and traffic rules. Some drivers in Singapore expected passengers to adhere to the same rules that govern public transit, such as not eating or drinking inside the vehicle. Throughout both Singapore and Manila, drivers had created and stuck a new code of conduct of driving more safely and taking extra precautions when picking up young children who rode alone without parental supervision.

Previous research on stranger encounters in transport has mostly examined larger-scale public transit options like buses or trains (Bissell, 2010; Wilson, 2011), but the smaller, intimate space of a car during a shared ride can also be the site of social gatherings of more than two individuals. The observation that the interactions on that ride are shaped to such a strong extent social norms and rules for everyone involved to adhere to as this study has suggested may be explained by the fact that ridesharing brings strangers in the immediate presence of one another within a tightly confined space. Drawing on Goffman (1963, p.3), I propose that the “little social systems” in which drivers and passengers are guided by a unique set of rules help to pre-empt the risks and uncertainties of sharing a small space among strangers.

Second, I find evidence of misaligned codes about moral conduct between drivers, passengers and the ridesharing platform firms, and this mismatch can have serious implications related to consumer safety and privacy. For example, after a shared ride, predominantly female ridesharing passengers across both Singapore and Manila concealed their actual drop-off location for safety and privacy from drivers and other stranger passengers. One reason for this lies in a former safety and privacy flaw in ridesharing applications that enabled some female passengers to experience inappropriate communication and attention from male drivers. These drivers were at odds with ridesharing platform companies, which touted policies that prohibited drivers from calling or messaging passengers after the ride through the contact information provided by the application. The ridesharing application also introduced a one-sided rating feature for passengers to rate drivers that has mixed reviews by both drivers and passengers. Some passengers believe that the ratings can measure and increase the quality of the ridesharing service given by drivers, while some drivers believe that the ratings can be unfairly biased or unwarranted because of a misalignment in what passengers and drivers considered as a good or bad ride service.

Third, this study adds a perspective of how historic prejudices perpetuated between strangers through ridesharing shaped and were reinforced by public encounters. Reyes (2018) similarly found that the local Philippine cultural orientations given to foreign missionaries aboard ships docked in the Philippines reflected outdated, historic stereotypes of Philippine culture. Although (informal) social norms and codes of conduct in ridesharing emerged and can guide strangers to behave courteously towards one another, we found that mutual respect for differences among people are not a given and underlying prejudices can dominate the opportunities or instances of such shared encounters (Valentine, 2008). Ridesharing drivers' and passengers' prejudices of one another based on race, nationality, gender and social class sometimes led to discriminatory behaviors and revealed pre-existing biases that were perpetuated in social encounters enabled by shared mobility. It is important to note that not all drivers and passengers whom I interviewed engaged in discriminatory behaviors or expressed prejudices, but we found frequent instances of certain discriminatory practices and prejudiced statements across the 65 interviews.

For example, the hostility of several Singaporean Chinese drivers (the majority group) toward diverse groups of Indian expatriate passengers (the minority group)—including high-income corporate workers and low-income construction workers—and other foreign passengers shaped and reinforced the normative prejudices that the drivers already had towards these passengers, which were mainly affected by prior negative encounters through previous shared rides and preconceived biases. I found that the majority group often articulated their prejudiced views as wanting to be treated fairly based on previous negative experiences in which they felt disrespected or treated as a lower class, rather than as equals, by members of the minority groups; and many prefaced their views by claiming they were not racists (Valentine, 2010). Interestingly, all the Singaporean Chinese drivers who expressed such prejudices against Indian and other expatriates did not direct any hostilities against Singaporean passengers of Indian origin, with whom they shared a national identity and who they viewed as one of their own with a strong sense of comradeship. Thus, this study corroborates previous research that argues how tackling prejudice in public spaces cannot only hinge on addressing the injustices experienced by minority groups, but must also consider how to reconcile the strong injustices faced by the majority group, who aim to protect the boundaries of their identified communities from perceived threats (Valentine, 2010).

In addition, several drivers in Singapore and Manila discriminated against passengers from certain ethnic and low-income neighborhoods by refusing to accept and pick up rides requested by passengers from particular ethnic neighborhoods, either by avoiding the neighborhoods altogether or not accepting the requested ride that shows up on the ridesharing application. This finding extends research by Ge *et al.* (2016) on how drivers discriminate against passengers outside the purview of digital ridesharing platforms and passengers *after* a driver had accepted a ride on a ridesharing application. This study showed how drivers discriminate against certain passengers *before* an online booking even shows up on their location-sensitive ridesharing application. This study's qualitative methodology was critical in this regard and brought out unobserved factors in the ridesharing process that experimental or quantitative methods as in Ge *et al.* (2016) cannot reveal as easily. The findings are broadly in line with literature on how inhabitants of hyperdiverse cities avoid encounters of difference, which can further exacerbate social divisions in urban areas (Schuermans, 2019; Wilson, 2017b). As explained above, an Indian male expatriate passenger sharing a ride with fellow strangers in Singapore felt self-conscious about how fellow passengers would view him negatively or feel uncomfortable sitting in the same car with him because of the commonly perceived prejudices towards his gender, race and nationality. More generally, this study found that individuals' perceptions and judgments of others pre-existed and became more pronounced in ridesharing; and did not necessarily translate into more respect and tolerance between different people sharing an encounter inside a car ride (Valentine, 2008; Wilson, 2017b). These examples of pre-existing, perpetuated prejudices in ridesharing supports geographic encounters literature on how unexpected encounters between different social groups confirm preconceived biases, rather than challenge them (Schuermans, 2016, 2019; Valentine, 2008; Wilson, 2017b). The driver practices of avoiding certain neighborhoods or refusing certain rides also constitute a microstructure that prevent certain encounters across majority and minority groups of people that might—or might not—over time translate into respect and tolerance from happening.

Overall, place-specific, pre-existing local cultures underlie this study's findings on the social norms and informal codes about moral that either arose or were perpetuated through ridesharing experiences between strangers in Singapore and Metropolitan Manila. The female, Philippine expatriate from Manila working in Singapore, as mentioned in Section 5.6.2, offered a salient example of how such a phenomenon can unfold in trans-national services like ridesharing in Southeast Asia. The Philippine passenger, who had lived and worked in Singapore for several years, preferred to use ridesharing services using a private car instead of a marked taxi to portray an image of high social class and privilege to others who would see her being picked up or dropped off by a private driver. This exemplifies the notion of performance in public places, whereby an individual consciously exhibits how she wants to be perceived by an external audience in everyday life (Goffman, 1959). In Manila, ridesharing services connotate a perception of wealth and higher social class because owning a private vehicle and having it chauffeured by a driver is a high-status symbol in Philippine culture. In addition, most ridesharing users in Manila are overwhelmingly from upper- or higher middle-class and income brackets; or are corporate executives who have rides paid for by their workplace. Taxis are generally viewed as low quality, unsafe services in Manila, so they do not convey the same status as private car rides. However, in Singapore, taking a taxi is synonymous with being driven in a private car; and both are viewed as common forms of transportation for the masses and ridesharing in private cars does not confer an elite status like in Manila. Thus, I found that the specificities of previous places and cultures are embedded in people's experiences, histories and worldviews; and cannot be separated from the wider local cultures and histories of cities in which they are situated.

Finally, I identify some directions for future research. I have observed how on-demand, digital ridesharing has given rise to social norms and informal codes about moral conduct to govern civil conduct, that clash with pre-existing, dynamic prejudices that persist through shared encounters between strangers with differences. Further studies could explore how norms and informal codes about moral conduct can be shaped to address such prejudices and discriminatory actions that could emerge in shared public encounters and cities. In particular, digital innovations like ridesharing applications have the potential to provide equitable access to services compared to offline alternatives like traditional taxi-hailing on city streets that further enable consumer selection (Ge *et al.*, 2016). In addition, issues of trust, safety and information privacy concerns arising from the offline, in-person aspect of location-based digital applications could be further studied to assess how they shape users' interactions and mobilities in cities. Both research directions contribute to literature on how digital innovations affect social relations and cohesion in urban areas (Pratt *et al.*, 2019).

5.8 Conclusion

This study's analysis of the narratives from drivers and passengers, who share rides with strangers through on-demand, digital ridesharing, reveals that the vehicles used for this service transform into dynamic microcosms of the existing social landscape in urban areas (Pratt *et al.*, 2019). Building on Reyes' (2018) study of foreign-local encounters on ships, I find that ridesharing not only perpetuated the drivers' and passengers' existing prejudices, but also transformed them. In addition, digital ridesharing enabled collective social norms and informal codes about moral conduct to emerge and evolve from the actors' interactions. Three main findings arose from our interviews with drivers and passengers of shared mobility services and contribute to the following streams of literature: (1) socialities in transport journeys (Bissell, 2010; Goffman, 1959, 1963; Laurier *et al.*, 2008; Wilson, 2011), (2) encounters and prejudice in hyperdiverse neighborhoods (Schuermans, 2019; Valentine & Harris, 2016; Valentine & Sadgrove, 2014; Wilson, 2017b) and (3) discrimination in digital platform services (Cui *et al.*, 2019; Edelman *et al.*, 2017; Ge *et al.*, 2016).

This study is relevant to digital ridesharing firms and regulators who seek to institute social norms and codes of conduct regarding driver-passenger interactions because of public concerns over safety and privacy. The interviews were conducted in 2017 when the ridesharing application company we studied did not yet have formal codes of conduct for passengers. Interestingly, in late 2019, Grab has emailed registered users a formal code of conduct that both drivers and passengers are expected to follow, or risk being banned from using the ridesharing application. For example, Grab now has a zero-tolerance policy against drivers who contact passengers after a trip has completed for personal purposes. Also, passengers are required to allow drivers to take the route designated by the Grab app, rather than ask drivers to take alternate preferred routes. In addition, the company has since added a technical update to the ridesharing application that masks passenger contact information to prevent drivers from making unwarranted private communication with passengers after a ride is completed. Because ridesharing drivers can still choose to accept or reject rides based on the pick-up location information, the issue of discriminating against passengers booking rides from certain ethnic neighborhoods has not been resolved. This study's findings present an opportunity for digital ridesharing companies to institute policies that can prohibit such discriminatory behavior by ridesharing drivers.

6. Chapter Six – In Strangers We Trust? Analyzing the Role of Trust in the Adoption of On-Demand Digital Ridesharing

Abstract

This study extends the technology acceptance model (TAM) with multi-dimensional trust antecedents to estimate models of trust in the usage, satisfaction, and intent to reuse two different digital ridesharing services: GrabHitch (a non-commercial ridesharing service) and GrabShare (a commercial ridesharing service). After surveying 278 GrabHitch and 275 GrabShare ridesharing users in Singapore in 2020, I find that constructs of interpersonal, institutional, and dispositional trust significantly impact the antecedents to use two types of ridesharing services in different ways. My study contributes to transportation research on how trust plays a significant role in digital sharing economy services that involve face-to-face interactions between strangers in an intimate space.

6.1 Introduction

The global rise of digital, on-demand ridesharing services—where unknown passengers and drivers are algorithmically matched in real time to share a car ride—highlights the need to understand how social trust dynamics between strangers affect the adoption and usage of these services. Dynamic ridesharing, referred to simply as "ridesharing" in this study, is the act of sharing a ride—either between a driver and a single passenger or between a driver and multiple passengers—through app-enabled, on-demand ridesharing (Siddiqi and Buliung, 2013). Digital ridesharing innovations have become cheaper and more energy-efficient through on-demand, commercial carpooling—a service that algorithmically enables multiple passengers traveling on similar routes to share a ride with strangers. Pratt *et al.* (2019) studied online commentary from ridesharing passengers who shared rides with other unknown passengers on UberPool or Lyft Line in the US and found that although these passengers were paying lower fares, they complained about the inconveniences of longer ride and wait times, and of having to share a confined space with other passengers. Thus, understanding the social interactions and trust between strangers seated in proximity in a digital ridesharing service becomes increasingly important.

There is a wide body of research on the factors that make people adopt ridesharing (e.g., Brown, 2020; Kostorz *et al.*, 2021; Wang *et al.*, 2020), some of which relies on the technology acceptance model (TAM), originally developed in the information systems literature (Davis, 1989; Venkatesh and Davis, 2000). Some studies have explored how the concept of trust is an antecedent to the usage and satisfaction of digital platform services. A study on the sharing economy that features a car sharing platform, which is distinct from ridesharing in that a user is merely renting car, found that trust is an antecedent to satisfaction of a sharing economy service (Möhlmann, 2015). Another study focuses on the antecedents to trust in the ridesharing service (Vaclavik *et al.*, 2020). However, these studies mainly focus on institutional trust between the user and the digital platform company; and not much on interpersonal trust between drivers and passengers who share a ride or dispositional trust on how users trust strangers in society in general. Interpersonal trust and dispositional trust may factor in users' decisions to use new digital ridesharing innovations, where they are algorithmically matched to share on-demand rides with strangers. A relevant study has alluded to interpersonal trust in the context of potential barriers to ridesharing (Furuhata *et al.*, 2013), and assume that trust must be built between ridesharing users who are strangers.

Thus, I aim to address this research gap of how different types of user trust (McKnight and Chervany, 2001)—one's *institutional trust* in the digital platform company, one's *interpersonal trust* in drivers and other passengers, and one's *dispositional trust* in strangers in society in general—play a role in consumers' decision to use digital ridesharing; in addition to their satisfaction and intent to reuse the service. McKnight and Chervany's (2001) conceptualized these three types of trust for e-commerce transactions that involve both online and offline interactions between an online seller and buyer. I argue that these three types of user trust also relate to the offline and online aspects of a digital ridesharing platform transaction; and should be considered in understanding why consumers decide to use digital ridesharing platform innovations. I build on the TAM and related theory from information systems research to develop and test a conceptual model that focuses on how the aforementioned types of user trust (McKnight and Chervany, 2001) can interact with consumers' sociodemographic characteristics and affect a consumer's decision to use digital ridesharing, their satisfaction with the service, and their intention to reuse it. I test the model by conducting a survey to study the empirical context of digital ridesharing passengers of Grab in Singapore.

Grab, founded in Malaysia in June 2012, is the dominant digital ridesharing company in Singapore and across Southeast Asia. In 2023, Grab operated in over 500 cities across eight countries with 38 million monthly transacting users and over five million drivers on its platform (Grab, 2024). The company went public in December 2021 and has a market capitalization of USD14.4 billion.[10] Grab offers multiple ridesharing services, all of which enable multiple passengers who are strangers to share a ride with an unknown driver. GrabShare is a commercial,

[10] As of 10 October 2024

private hire vehicle service that uses a licensed professional driver who earns a fare, while GrabHitch is a non-commercial carpooling service that uses a non-professional driver who is compensated for fuel costs only. GrabHitch is mainly used by private car owners who wish to share their commute to work or school; its non-commercial drivers are limited to providing up to two rides a day and cannot charge a fare beyond being compensated for the fuel cost of the shared ride. Thus, GrabHitch drivers and passengers who ride together may have a more familiar social network (colleagues from the same workplace or school) than those on the commercial GrabShare service.

Both GrabShare and GrabHitch entail the following transaction processes: 1) a consumer books a ride through a mobile application that matches them to any available driver nearest to them (the consumer cannot select which driver or co-passengers they will ride with); 2) the consumer takes a ride with the randomly matched driver and potentially other passengers from the ridesharing platform who share a similar route; and 3) the consumer can pay for the ride virtually through the online application to the complete the economic transaction. The first and third processes—the interactions among unfamiliar actors and the organization of economic transactions—are inherent in every digital ridesharing transaction, but this study focuses on the second process: interactions among unfamiliar actors. In this study, I also compare the conceptual models of trust between commercial and non-commercial ridesharing services, drawing from surveys of GrabShare and GrabHitch users in Singapore.

6.2 Theoretical Framework

6.2.1 Trust and other antecedents to digital ridesharing

A growing body of research focuses on the factors that determine how and why people use digital ridesharing services in the United States (Brown, 2020; Cui *et al.*, 2021; Wali, 2023), Germany (Kostorz *et al.*, 2021), Brazil (Vaclavik *et al.*, 2020), China (Wang *et al.*, 2020, Kang *et al.*, 2024; Shi *et al.*, 2024; Zhao *et al.*, 2023), Pakistan (Raza *et al.*, 2023), Italy (Mattia *et al.*, 2022), Spain (Arteaga-Sánchez *et al.*, 2020), and Egypt (Elnadi *et al.*, 2024). In a comprehensive literature review on the antecedents to use ridesharing, Si *et al.* (2023) categorizes the motivating factors for ridesharing usage into demographic factors (sociodemographics, social roles, type of transport user, and neighborhood environment), psychological factors (personal innovation traits, perceptions of risk, trust in the service, utilitarian values, and hedonic values), and situational factors (sustainability, technological progress, incentives, regulatory risks, cultural differences, and practical applications like overcoming the drawbacks of traditional transport options and optimization of supply and demand).

The global studies on the antecedents to ridesharing show that the results are geographically, culturally, and contextually specific, and therefore may not generalize to ridesharing in other places. In Los Angeles County, Brown (2020) examined Lyft Shared, which is like GrabShare and comprised one-third of Lyft rides in the county. She found that many passengers lived in dense, lower-income neighborhoods with ethnic majorities, rather than in racially diverse or higher-income neighborhoods. Cui *et al.* (2021) acknowledge such social barriers between strangers and surveyed students at the University of Buffalo, where they found that individuals with anxiety preferred to share rides with passengers who were similar in terms of social habits, age, hobbies, income, education experience, smoking and drinking habits, race, and gender. In Germany, Kostorz *et al.* (2021) found that most ridesharing users of MOIA booked a ride occasionally and primarily used the service monthly for leisure purposes. In China, Wang *et al.*

(2020) surveyed university students to test an extended TAM to find that a user's level of perceived usefulness had the largest positive effect on the intent to use digital ridesharing, while consumers' perceived ease of use of the technology was insignificant and perceived risk had a significant negative effect on the intent to use the service. Kang *et al.* (2024) conducted a survey of users in Hefei, China and found that their additional constructs, personal innovativeness (the willingness to try out new innovations like digital ridesharing) and environmental awareness had positive but small effects on the intent to use ridesharing. Similarly, in a survey of ridesharing users in Karachi, Pakistan, Raza *et al.* (2023) found that environmental knowledge and awareness significantly and positively affect their behavioral intention to use ridesharing services but can be negatively moderated by users' perception of the risks of ridesharing. In a study of intention to reuse digital ridesharing platform services in Egypt, Elnadi *et al.* (2024) concluded that optimism, innovativeness, discomfort, and insecurity affected users' perception of ridesharing usefulness; and that the intention to reuse the service is significantly correlated with their satisfaction, perceived usefulness, and perceived ease of use.

The most relevant studies for this paper have surveyed digital ridesharing users and examined the role that trust plays in consumers' intention to use the service. Two studies have focused on the role of trust, among other antecedents, in the decision to use BlaBlaCar in Europe, a pooled ridesharing service like GrabHitch except that the rides usually span longer distances across countries in Europe. Mattia *et al.* (2022) surveyed BlaBlaCar non-users in Italy to find that institutional trust in the platform provider company, particular the brand reputation of the company, matters in their intention to use the service. Arteaga-Sánchez *et al.* (2020) surveyed BlaBlaCar users in Spain and found that trust, environmental impact, perceived usefulness, service quality, and social value (value derived from making friends, meeting people, and social enjoyment in ridesharing) played a significant role in consumers' satisfaction with ridesharing. Satisfaction, economic benefits, and perceived usefulness played a significant role in consumers' intent to use ridesharing. In the authors' conceptualization of trust, a BlaBlaCar user trusts that the trips offered in BlaBlaCar will be as described, and that other BlaBlaCar users will be truthful in dealing with others and not take advantage of the respondent themselves. In the US, Su *et al.* (2024) found that trust in the driver and trust in other passengers had the highest number responses of being either "important" or "very important" to survey respondents in the US on their willingness to consider pooled ridesharing services like UberPool or Lyft Shared, where passengers are matched with other passengers traveling in the same direction for a shared ride. These studies mainly focused on the importance of user trust in the digital platform company or provider (driver) and other passengers in the decision to use and reuse digital ridesharing platform services.

Other studies focused intently on trust in the platform. Lu *et al.* (2021) surveyed ridesharing users of Didi in China and found that institutional trust in the digital platform company has a significant and positive impact on the intention to reuse Didi ridesharing services. They also examined how the users' perceived effectiveness of the structural factors of the digital platform, such as user feedback functions, escrow payment services, driver certification, and an urgent rescue feature, were also significant in how users developed trust in the digital platform. The perceived effectiveness of the driver's certification had the highest impact, followed by the perceived effectiveness of feedback mechanisms, escrow services, and the urgent rescue function in descending order of importance. Acheampong (2021) interviewed ridesharing users in Ghana to find that their trust in the company's security features on the ridesharing platform app was the type of trust that mattered to users when considering the safety and security of the service.

Likewise, Lee *et al.* (2018) found that perceived platform qualities led users in Hong Kong to trust in the ridesharing platform, which were significant antecedents of the intention to use, and the perceived risk and benefits of, Uber. They found that perceived platform qualities of Uber led to perceptions about the platform's information and system qualities.

Shao *et al.* (2022) studied users of Didi in China to find that trust in the platform (defined as the user's perception that the platform will fulfil its commitments and achieve fair outcomes reliably, credibly, and competently) significantly and directly affects the perceived benefit and risk of ridesharing, and indirectly affects the intent to continue using the service and word of mouth to refer others to use the service. They only studied trust in the ridesharing platform; and focused on defining significant antecedents to trust in the platform using the concept of justice. They delineated three types of justice: distributive justice (perceived fairness in terms of obtained benefits from the ridesharing service in light of monetary costs), procedural justice (perceived fairness of the consistency and transparency of the ridesharing process), and interactional justice (users perceive they are being treated with respect, politeness, and courtesy by ridesharing drivers during a ride); and found that they all are significant indicators of how users formulate trust in a ridesharing platform.

Vaclavik *et al.* (2020) consider two types of trust in their study of the antecedents of consumers trusting digital ridesharing services like Uber in Brazil. Surveying consumers' trust in the digital app platform and in ridesharing drivers, they find that consumers care more about trust in the app than in drivers. Likewise, Blut and Wang (2024) conducted a meta-analysis study of the sharing economy that includes ridesharing users of Uber and found that two types of trust are important in passengers' decision to use ridesharing: trust in the platform and trust in the provider (driver).

They find that on highly competitive platforms, trust in the platform is important because customers depend on it to facilitate a good experience despite resource scarcity; while for platforms with less competition, trust in the ridesharing driver becomes more crucial as customers look for reassurance in direct interactions with the provider. Ma *et al.* (2019) also conducted a study of Didi users in China that focused on how different types of perceived risk can influence (dis)trust in ridesharing drivers, and then influence their (dis)trust in the ridesharing platform, as well as attitudes towards the platform; both of which all culminate in the decision to discontinue using the ridesharing service. Altogether, the research to date has not thoroughly examined the role of dispositional trust—the generalized trust one has for strangers or society, which is important because it addresses the phenomenon of ridesharing passengers interacting with other unknown passengers in the confined space of a pooled ride. Thus, I aim to build on this prior literature to focus on testing three dimensions of trust—interpersonal (trust between drivers and passengers in a shared ride), institutional (user trust in the digital platform), and dispositional trust (user trust in society and strangers in general), as antecedents to the usage, satisfaction, and intention to continue using digital ridesharing services.

Prior studies have also approached the issue of trust in ridesharing through identifying potential barriers to ridesharing; they assume that trust must be built between ridesharing users who are strangers. Furuhata *et al.* (2013) propose a classification framework to identify key challenges in the mass adoption of ridesharing and recognize trust-building amongst unknown users in an online system as a factor, particularly through reputation feedback systems like driver ratings on the ridesharing app and social-networking integration for identity verification (i.e., matching user profiles from social media services such as Facebook). A reputation management system utilized by a centralized agency, such as a third-party ridesharing company, can expose users to a trade-off between 1) increased trust of strangers based on a reputation management system and 2) the loss of their own data privacy due to data collection and monitoring by a centralized ridesharing company to facilitate a reputation management system (Sanchez *et al.*, 2016). A privacy-driven design for dynamic carpooling can potentially increase trust in the ridesharing system itself, but does not resolve how to increase trust between users (Friginal *et al.*, 2014).

Sociodemographic characteristics of users in terms of age, gender, education level, and income also play a role in how people use and trust ridesharing services (Shi *et al.*, 2024). Acheampong *et al.* (2020) incorporated sociodemographics into a model of factors that determine ridesharing usage in Ghana and found that being female, younger (18 to 39 years old), highly educated and having higher income were positively associated with using ridesharing, although this study did not consider factors of trust. Shi *et al.* (2024) found that sociodemographic factors like gender, age, income, and education level affected how ridesharing users surveyed in China responded to the survey they conducted on the antecedents to ridesharing. For example, older passengers were less responsive to monetary incentives to use cheaper, pooled ridesharing services that may take longer to reach their destination due to multiple passengers because they valued saving time more and may have more income. Shao *et al.* (2022) found that female users depend more on interactional justice when forming trust in the ridesharing platform, Didi, in China. In a similar study with Didi users in China, Ma *et al.* (2019) found that gender, age, and income differences significantly influences users' risk perceptions, trust and intent to discontinue using the ridesharing service. Female users were less likely to trust drivers under the same level of physical risk as male users, whereby physical risk captures how worried a user is about their physical safety when using the Didi platform or they believe that using the Didi platform is relatively dangerous. Lavieri and Bhat (2019) found that ethnicity may matter when they found that non-Hispanic White ridesharing users in the Dallas-Fort Worth metroplex in Texas, US were more sensitive to privacy than individuals of other ethnicities; and would prefer not to take a pooled ride with other passengers traveling on the same route. In this study, I intend to consider the impact of sociodemographics as well to understand how they affect the role of trust in the usage of, satisfaction in, and the intent to reuse ridesharing services.

6.2.2 The role of trust in e-commerce and the sharing economy

There are several definitions and theoretical models of online trust for traditional online stores and e-commerce marketplaces that characterize the role played by trust in business-to-consumer transactions (Gefen, 2000; Gefen *et al.*, 2003; McKnight and Chervany, 2001). The technology acceptance model (TAM) (Davis, 1989) is commonly used in the information systems field to understand a consumer's individual acceptance of an innovation. The TAM posits that the actual use behavior of a technological innovation is driven by a cascade of the following constructs: the perceived ease of use and perceived usefulness of the technology shape the attitude towards using it, which shapes the behavioral intention to use it. The extended TAM includes subjective norms, or social influences, as a construct that affects the intention to use the technology (Venkatesh and Davis, 2000).

In the case of mobile e-commerce, researchers have included trust as an antecedent and outcome, in addition to personal innovativeness, perceived risk, and environmental awareness of the consumer as significant antecedents of the behavioral intention to use an innovation (Lin *et al.*, 2014). Lin *et al.* (2014) combined the extended valence theory (Kim *et al.*, 2009; Peter and Tarpey, 1975), self-perception theory (Bem, 1972), and IS expectation confirmation theory (Bhattacherjee, 2001) to formulate a conceptual model that shows how trust in the pre-use stage of mobile commerce leads to usage, satisfaction, and post-use beliefs of trust for a consumer. The authors' extended valence theory combined the constructs of pre-use trust with elements of the valence theory—perceived benefit and perceived risk—to explain the consumer use of mobile commerce. Self-perception theory in information systems research was used to explain how prior usage of a technology can affect consumers' motivation and their beliefs about future usage. Finally, the authors used the expectation confirmation theory from information systems to explain how the extent of user confirmation of expectations, perceived usefulness, and satisfaction of a technology from prior usage affects a consumer's intent to reuse the technology.

Ridesharing transactions between peers matched through an online platform also falls under a new sharing economy business model of online peer-to-peer marketplaces, which began to appear during the 2010s. Both e-commerce and peer-to-peer online marketplaces involve similar online marketing and payment transaction processes mediated by an online interface, but they differ in that peer-to-peer mobile platform applications for ridesharing necessitate an additional layer of in-person transaction between the peers who provide (driver) and use (passengers) the ridesharing service. Most empirical studies on the sharing economy focus on the determinants of the sector's utility and satisfaction among peers or consumers (Cha and Lee, 2021; Hallem *et al.*, 2021; Hawlitschek *et al.*, 2016; Li and Wang, 2020; Möhlmann, 2015; Vaclavik *et al.*, 2020). Mittendorf *et al.* (2019) found that trust in the platform service itself matters more to end users (*e.g.*, ridesharing passengers) of the platform services in their willingness to use the platform service, compared to the service providers (*e.g.*, ridesharing drivers) of the platform service. In particular, Hawlitschek *et al.* (2016) found that trust in peers, the digital sharing economy platform company, and the sharing economy service are positively correlated with a consumer's intent to use online peer-to-peer platforms among young people surveyed in Germany. These studies conclude that institutional trust in the digital platform and interpersonal trust in peers and service providers are significant determinants for users' intent to participate in the sharing platform economy, yet it is still unclear how generalized trust in strangers overall plays a role the decision to use sharing platform services like ridesharing that involve the element of being matched and riding with complete strangers in the span of a shared ride.

6.2.3 Proposed conceptual model of trust in digital ridesharing

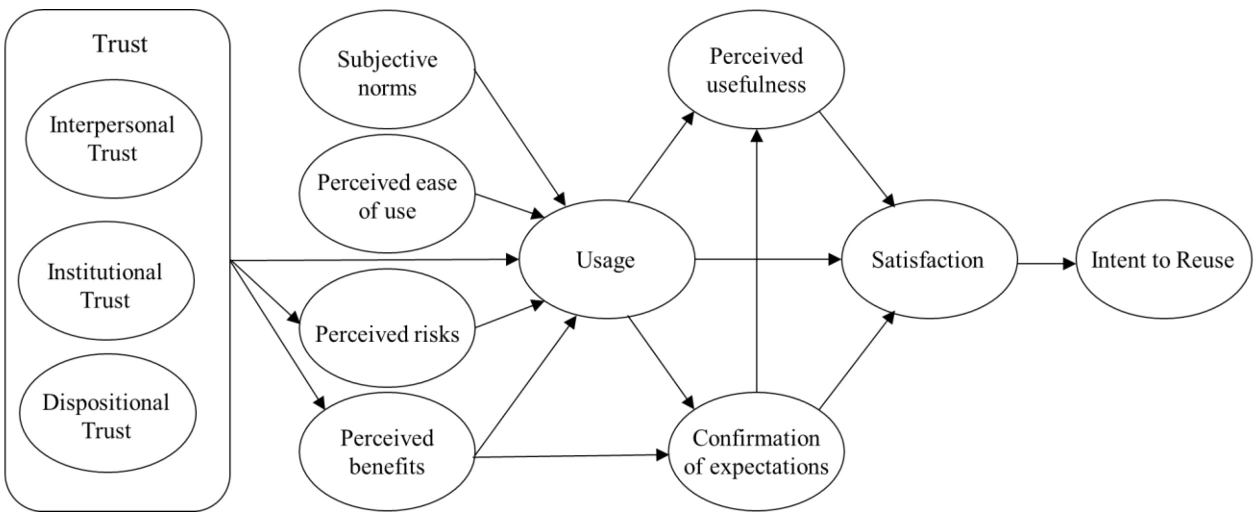

Figure 6.1 Proposed conceptual model of trust in digital ridesharing

Recent research on applying the TAM to consumers' intention to use digital ridesharing services does not yet incorporate trust as an antecedent or outcome (Wang *et al.,* 2020). I propose the conceptual model of trust in digital ridesharing between strangers in Figure 6.1, which draws on several prior models of technology adoption in online commerce from the information research literature. First, I adapt Lin *et al.*'s extended valence model (2014) with pre-trust for digital ridesharing by delineating trust into three separate constructs: interpersonal, institutional, and dispositional trust (McKnight and Chervany, 2001). Then, I combine elements of the extended

TAM (Davis, 1989; Venkatesh and Davis, 2000), self-perception theory (Bem, 1972) and the information systems expectation confirmation theory (Bhattacherjee, 2001).

In this model, I conceptualize trust from a multi-dimensional perspective on trust processes involved in a two-sided digital platform transaction that typifies ridesharing, drawing on information systems research on empirically derived trust constructs for online marketplace transactions. Based on McKnight and Chervany's (2001) definition of trust in e-commerce transactions, I adopt the following trust constructs for digital ridesharing in this study: 1) *institutional trust* between a passenger and a mobile app interface that facilitates the transaction; 2) *dispositional trust* in others, akin to a user's general trust in society, strangers in general, or government institutions; and 3) *interpersonal trust* between the peer consumers in the experiential part of the transaction. I redefine interpersonal trust in this study as the relations between peer consumers—a group of ridesharing passengers and a driver booked on the same ride—rather than between traditional buyers and sellers. In digital ridesharing, drivers are also consumers of the algorithmic platform that matches them to passengers.

I also examine the sociodemographic variables of *gender*, *age*, *education level*, and *nationality*. I follow previous studies that showed how attitudinal, personal, and social norms variables, along with sociodemographic factors, were significant in predicting outcomes in examining the use of cars and travel behavior (Hunecke *et al.*, 2007). Other studies have focused on how car users' psychological motives can mediate the relationship between sociodemographic variables on car usage (Bergstad *et al.*, 2011), which show the importance of including sociodemographic variables alongside sociopsychological factors that motivate transport usage. I also follow studies that examine gender, age, education status, and disposable income in the study of usage and user characteristics in ridesharing (Kostorz *et al.*, 2021; Lavieri and Bhat, 2019; Ma *et al.*, 2019; Shao *et al.*, 2022; Shi *et al.*, 2024).

6.3 Data and Methodology

6.3.1 Research design

I conducted a quantitative survey to collect information on how ridesharing users in Singapore view trust and other antecedents to usage, user satisfaction, and the intent to reuse the two digital ridesharing services, GrabHitch and GrabShare. I then used covariance-based structural equation modelling (CB-SEM) to estimate models of trust and antecedents for these two ridesharing services, which I compared to the proposed conceptual model in Figure 6.1.

This study focuses on digital carpooling services in Singapore, a city-state nation of 5.7 million people in 2019 with a multiracial, multicultural society comprised of 76.2% ethnic Chinese, 15.0% Malays, and 7.4% ethnic Indian nationals. Singapore also has a sizable expatriate population of 1.65 million people. In addition to Singapore's ethnic and nationality diversity, I focus on Singapore because it was the first country in Southeast Asia to launch commercial carpooling services for ridesharing, which pools strangers together on a shared ride via a route of predetermined stops for each passenger. Uber, the U.S. digital ridesharing company, launched UberPool in June 2016, while Grab launched GrabShare in December 2016. Since Uber exited the Singapore market by mid-2018, GrabShare has been the only remaining digital carpooling service in Singapore.

6.3.2 Data collection

I utilized an anonymized passenger list provided by Grab in June 2017, which consisted of the entire population of 26,653 GrabShare passengers and 23,719 GrabHitch passengers up to that time. I then used random sampling to draw a group of participants, who had used the respective Grab ridesharing service at least once in 2017, to recruit for an online survey in late 2020. The survey aimed to understand ridesharing users' attitudes, preferences, and trust regarding ridesharing with strangers. I collected online survey data using Qualtrics from 6 October 2020 to 31 December 2020, which yielded a total sample size of 278 surveys for GrabHitch users and 275 surveys for GrabShare users. The low survey response rates of about 1% for GrabHitch and GrabShare could be attributed to the lack of a guaranteed incentive offered to participants, which was a chance to win one of five SGD 150 gift cards for use at Singaporean retail outlets. The surveys were also distributed by email, which could have gone to a spam folder. The descriptive statistics of the recruited samples for GrabHitch and GrabShare users are shown in Table 6.1.

6.3.3 Survey scale development and analysis using structural equation modelling (SEM)

The online survey, which is documented in Appendix C, was designed to be completed in about thirty minutes and consisted of 106 questions on: demographics, institutional trust, dispositional trust, interpersonal trust, ridesharing and transport usage, ridesharing satisfaction, perceived risks of ridesharing, perceived benefits of ridesharing, perceived ease of use of ridesharing, subjective norms, and perceived usefulness of ridesharing. The questions were adapted from the survey questions and scales used in the extended TAM (Venkatesh and Davis, 2000), self-perception theory (Bem, 1972), the information systems expectation confirmation theory (Bhattacherjee, 2001), and McKnight and Chervany's (2001) definition of trust. For survey analysis, I used covariance-based structural equation modelling (CB-SEM) to test how well the proposed conceptual model fits with the survey data. As preparation for the CB-SEM, I applied confirmatory factor analysis (CFA) to analyze the convergent validity of the latent variables, which measures the extent to which measures are correlated with other measures for the same construct. For model estimation, I selected survey questions with loading factors above 0.5, which signifies an adequate level of convergent validity, as shown in Tables 6.2 and 6.3 respectively for the GrabHitch and GrabShare.

Next, I evaluated the average variance extracted (AVE) and composite reliability (CR) values (also shown in Tables 6.2 and 6.3) of each variable in the models to test the internal consistency and discriminant validity, respectively, of the estimated models. I included the variables with CR values above 0.7, which indicate that an instrument has high internal consistency and reliability. Comparing the square root of the AVE values and its relationship to other variables in the model can measure discriminant validity, or the extent to which constructs that are not supposed to be related to one another are highly uncorrelated.

Finally, I conducted the structural model analysis with the MPlus software to test the relationships between the variables in the respective models for GrabHitch and GrabShare users, including the sociodemographic variables *gender*, *age*, *education level*, and *nationality*. I then worked iteratively through six versions of the model specification and assessed each version's goodness of fit measures to see how well the constructed SEM model could describe the observational data. The measures include: the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). The sixth version yielded the best fit model for both the GrabHitch and GrabShare data, as shown in Figure 6.1. The indirect effects of the constructs in the model were analysed using the Sobel test.

Table 6.1 Description of Survey Respondent Characteristics

Characteristics	Category	GrabHitch (n = 278)		GrabShare (n = 275)	
		n	%	n	%
Gender	Female	149	53.6	138	50.2
	Male	128	46.0	136	49.5
	Other	1	0.4	1	0.4
Age	18 – 24 Years	41	14.7	40	14.5
	25 – 34 Years	160	57.6	155	56.4
	35 – 44 Years	53	19.1	58	21.1
	45 – 54 Years	20	7.2	16	5.8
	55 – 64 Years	4	1.4	6	2.2
Singaporean Nationality	No Answer	2	0.7	3	1.1
	No	21	7.6	28	10.2
	Yes	255	91.7	244	88.7
Ethnicity	No Answer	13	4.7	15	5.5
	Chinese	225	80.9	222	80.7
	Indian	13	4.7	19	6.9
	Malay	27	9.7	19	6.9
Employment Status	No Answer	6	2.2	5	1.8
	Employed	197	70.9	199	72.4
	Self-employed	27	9.7	25	9.1
	Student	33	11.9	30	10.9
	Unemployed	15	5.4	16	5.8
Marital Status	Divorced	6	2.2	4	1.5
	Live with a partner	12	4.3	12	4.4
	Married	93	33.5	96	34.9
	Single	166	59.7	162	58.9
	Widowed	1	0.4	1	0.4
Income	No Answer	1	0.4	1	0.4
	2,500 - 4,499 SGD	88	31.7	82	29.8
	4,500 - 6,499 SGD	53	19.1	56	20.4
	6,500 - 8,499 SGD	23	8.3	23	8.4
	8,500 - 10,499 SGD	22	7.9	21	7.6
	Above 10,500 SGD	17	6.1	20	7.3
	Less than 2,500 SGD	74	26.6	72	26.2
Education	Degree (bachelor)	149	53.6	152	55.3
	Post-graduate degree	32	11.5	42	15.3
	Pre-university education	66	23.7	54	19.6
	Secondary education	10	3.6	10	3.6
	Vocational education	21	7.6	17	6.2

Table 6.2 GrabHitch Measurement Model Variables

Variable	Indicator	Loading	AVE	CR
Dispositional Trust	Trust in people (WV2)	0.705	0.476	0.754
	Trust in other institutions (WV3)	0.674		
Institutional Trust	Trust in ridesharing companies (Q0)	0.664	0.465	0.745
	Trust in Grab (Q2)	0.700		
Interpersonal Trust	Overall trust in driver (Q1)	0.982	0.903	0.973
	Trust in driver by type (Q3)	0.917		
Perceived Ease of Use	How easy it is to book a ride on GrabHitch (Ease4)	0.623	0.495	0.832
	How easy it is to contact GrabHitch customer service (Ease5)	0.724		
	How easy it is to complete a ride from point origin using GrabHitch (Ease6)	0.757		
Perceived Risks	Industry (Prisk2)	0.652	0.449	0.871
	GrabHitch safety (Prisk4_1)	0.715		
	Ridesharing concern (Prisk5)	0.644		
	Grab service app safety (Prisk6)	0.730		
	Personal information concern (Prisk7)	0.601		
Subjective Norms	The people close to me are supportive of me using GrabHitch (Snorm2)	0.830	0.840	0.967
	The people close to me are supportive of me riding with drivers who are strangers in shared rides (Snorm4)	0.953		
	The people close to me are supportive of me riding with other passengers who are strangers in shared rides (Snorm5)	0.961		
Perceived Benefits	Convenient ranking of GrabHitch versus other services (Benefit1)	0.689	0.427	0.710
	Reliability ranking of GrabHitch versus other services (Benefit3)	0.616		
Perceived Usefulness	Makes life easier (Puseful4)	0.843	0.485	0.739
	Feels useful (Puseful7)	0.510		
Confirmation of Expectations	My experience with GrabHitch has usually been better than expected (Confirm1_1)	0.896	0.690	0.920
	The service level provided by GrabHitch has usually better than expected (Confirm1_2)	0.904		
	Overall, most of my expectations from using GrabHitch have usually been confirmed (Confirm1_3)	0.671		
Satisfaction	Overall satisfaction (Sat2)	0.796	0.605	0.845
	Likelihood of recommending service (Sat5)	0.759		
Usage	In a typical month, before COVID-19, how often did you use the GrabHitch service?	1.000	1.000	1.000

Note: AVE = average variance extracted; CV = composite reliability

Table 6.3 GrabShare Measurement Model Variables

Variable	Indicator	Loading	AVE	CR
Dispositional Trust	Trust in people (WV2)	0.806	0.498	0.762
	Trust in other institutions (WV3)	0.588		
Institutional Trust	Trust in ridesharing companies (Q0)	0.700	0.518	0.787
	Trust in Grab (Q2)	0.739		
Interpersonal Trust	Overall trust in driver (Q1)	0.999	0.870	0.961
	Trust in driver by type (Q3)	0.861		
Perceived Ease of Use	How easy it is to book a ride on GrabShare (Ease4)	0.571	0.502	0.833
	How easy it is to contact GrabShare customer service (Ease5)	0.764		
	How easy it is to complete a ride from point of origin using GrabShare (Ease6)	0.772		
Perceived Risks	Industry (Prisk2)	0.624	0.464	0.876
	GrabShare safety (Prisk4_2)	0.781		
	Ridesharing concerns (Prisk5)	0.602		
	Grab service app safety (Prisk6)	0.762		
	Personal information Concern (Prisk7)	0.614		
Subjective Norms	The people close to me are supportive of me using GrabShare (Snorm2)	0.834	0.836	0.966
	The people close to me are supportive of me riding with drivers who are strangers in shared rides (Snorm4)	0.948		
	The people close to me are supportive of me riding with other passengers who are strangers in shared rides (Snorm5)	0.956		
Perceived Benefits	Convenient ranking of GrabShare (Benefit1)	0.572	0.415	0.695
	Reliability ranking of GrabShare (Benefit3)	0.709		
Perceived Usefulness	Makes life easier (Puseful5)	0.954	0.940	0.984
	Feels useful (Puseful8)	0.985		
Confirmation of Expectations	My experience with GrabShare has usually been better than expected (Confirm1_1)	0.873	0.668	0.914
	The service level provided by GrabShare has usually better than expected (Confirm1_2)	0.859		
	Overall, most of my expectations from using GrabShare have usually been confirmed (Confirm1_3)	0.710		
Satisfaction	Overall satisfaction (Sat3)	0.866	0.614	0.845
	Likelihood of recommending service (Sat6)	0.691		
Usage	In a typical month, before COVID-19, how often did you use the GrabShare service?	1.000	1.000	1.000

Note: AVE = average variance extracted; CV = composite reliability

6.4 Results

In this section, I compare key insights between the estimated structural models for GrabHitch (Figure 6.2) and GrabShare (Figure 6.3) and between those models and the conceptual model in Figure 6.1. Tables 6.4 and 6.5 illustrate the direct and total effects of each respective model with standardized coefficients. I have included only the statistically significant effects (* denotes a *p*-value <0.10 and ** denotes a *p*-value < 0.05) for the estimated models. Table 6.6 shows that the estimated structural equation models for both GrabHitch and GrabShare have met the goodness of fit criteria.

6.4.1 GrabHitch

The estimated model for GrabHitch in Figure 6.2 confirms the conceptual model's proposed relationships in Figure 6.1 on the central axis from *trust* to *usage* to *satisfaction* to *intention to reuse*. More specifically, *perceived benefits* and *institutional trust* influence *usage* in both the estimated and conceptual models. *Interpersonal trust* has a direct effect on perceived risks, but dispositional trust does not significantly affect other psychological constructs in the estimated GrabHitch model at all. As expected, *usage* is greater if passengers have higher *perceived benefits* of using GrabHitch and have greater *institutional trust*.

However, there are important differences between the estimated and conceptual models. First, *usage* of GrabHitch is explained by fewer variables in the estimated model, with only *institutional trust*, *perceived benefits*, and a new sociodemographic variable—*gender*—having significant effects. The *gender* effect shows that women use GrabHitch more than men. *Social norms*, *perceived ease of use,* and *perceived risks* do not play a significant role in determining *usage*, as posited by the conceptual model.

While *perceived risks* are not related to *usage*, they are lower when users have greater *institutional* and *interpersonal trust*. Female passengers also *perceive* greater *risks* than male passengers in GrabHitch. There are also sociodemographic influences on *perceived benefits,* which are greater among highly educated and younger users. However, the indirect effects of *education* and *age* via *perceived benefits* on *usage, satisfaction* and *intention to reuse* are too small to be statistically significant at the 10% level. *Subjective norms* have no effect on any of the variables in the GrabHitch model and have been omitted from Table 6.4 and Figure 6.2.

As in the conceptual model, *satisfaction* is directly influenced by *perceived usefulness, usage,* and *confirmation of expectations*. The direct effect of *nationality* indicates that Singaporean nationals were less satisfied by GrabHitch than non-Singaporean nationals. There are also total effects from the indirect relationships of *perceived benefits, perceived ease of use, institutional trust, age, education,* and *gender* on satisfaction, but only those of *perceived benefits* and *perceived ease of use* are significant at the 10% level.

Only *perceived benefits* and *perceived ease of use* directly affect *confirmation of expectations* and *perceived usefulness* in the estimated model; usage does not affect either construct. This may be because GrabHitch is a non-commercial carpooling service in which people expect the driver and other potential passengers to be someone in their professional network, since they are traveling to the same place, which often is a company or university. GrabHitch passengers expect that the service is easy to use, reliable, and convenient, which are factors that not only confirm their expectations, but also influence how useful they perceive the service to be. As such, GrabHitch passengers do not need to use the service to form such expectations and perceive its usefulness.

Following the conceptual model, only *satisfaction* has a significant direct effect on the *intention to reuse* GrabHitch in the estimated model. However, there are multiple significant total effects at the 10% level resulting from indirect effects from *perceived benefits, perceived ease of use, confirmation of expectations*, *perceived usefulness*, and *nationality*.

6.4.2 GrabShare

The estimated model for GrabShare in Figure 6.3 is more closely aligned to the conceptual model in Figure 6.1 than that for GrabHitch. The main difference is that all *dispositional, institutional,* and *interpersonal trust* variables play a significant role in the estimated GrabShare model. These three trust dimensions significantly affected the *perceived risks* of GrabShare, while *institutional trust* is positively related to its *usage*, and *interpersonal trust* is negatively related to its *perceived benefits*. However, like the GrabHitch estimated model, s*ocial norms, perceived ease of use,* and *perceived risks* do not play a significant role in determining *usage*, as posited by in the conceptual model.

Usage is also explained by *institutional trust and perceived benefits* in the estimated GrabShare model, but also *age*. *Age* is related negatively to *usage* for GrabShare users, which means that older passengers are less likely to use GrabShare. Female passengers also perceived more benefits and risks related to GrabShare than male counterparts, which higher educated passengers perceive more benefits compared to those with lower levels of education. However, these effects of gender and education do not translate into significant indirect effects on *usage* through *perceived benefits*. *Interpersonal trust* uniquely has a negative relationship with GrabShare's *perceived benefits*, which were measured by survey questions about how users rated its convenience and reliability. This means that higher *interpersonal trust* led to a decrease in how GrabShare passengers perceive its convenience and reliability.

For GrabShare, only *confirmation of expectations, age, and nationality* influence *satisfaction*. Notably, *usage* does not have a significant influence on *satisfaction*, unlike what the conceptual model predicts. This may reflect that passengers do not form their views on their overall *satisfaction* and likelihood of recommending GrabShare to others based on the actual rides they took. As with GrabHitch, non-Singaporean nationals are less *satisfied* than Singaporean nationals with GrabShare. It could be that non-Singaporean nationals felt the effects of less trust towards them from fellow passengers. Older passengers are also less *satisfied* with GrabShare. The GrabShare model reveals a significant indirect effect of the perceived ease of use on user *satisfaction* and *perceived usefulness* through the *confirmation of expectations* construct. Thus, the easier a user *perceives* GrabShare to use, the higher their *satisfaction* and *perceived usefulness* of the service.

Confirmation of expectations plays a significant role for *perceived usefulness* in the estimated GrabShare model, which contrasts with the conceptual model. *Perceived benefits* and *perceived ease of use* did not significantly influence GrabShare's *perceived usefulness*. This could be explained by passengers' greater reliance on GrabShare as a more necessary and regular mode of transport versus GrabHitch, which is not a commercial service and limits drivers to only giving two rides maximum a day (usually in the form of carpooling) to limited destinations. Older passengers perceived GrabShare's usefulness less than younger passengers, while higher education passengers perceived GrabShare's usefulness more than less educated passengers. *Usage* also did not significantly influence *confirmation of expectations* in GrabShare, which departs from the conceptual model. Instead, the *perceived ease of use* was the only factor to play significantly affect GrabShare.

User *satisfaction* has a positive relationship with a passenger's intention to reuse for and GrabShare, validating the relationship proposed in the conceptual model. There are multiple significant total effects at the 10% level resulting from indirect effects from *confirmation of expectations and perceived usefulness*.

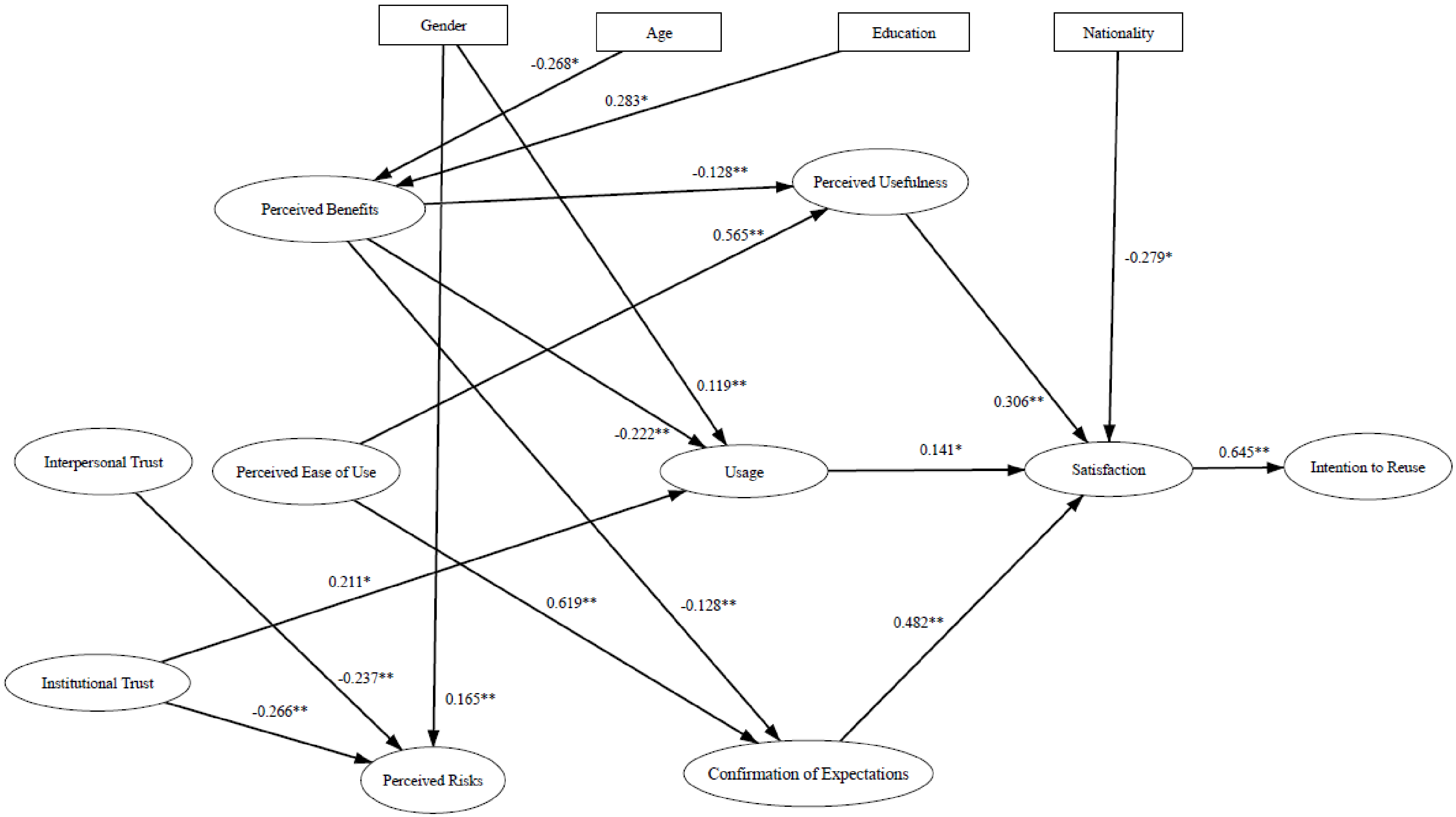

Figure 6.2 Estimated model of trust in GrabHitch (digital ridesharing service with private drivers) with unstandardized coefficients

(* denotes a p-value < 0.10 and ** denotes a p-value< 0.05)

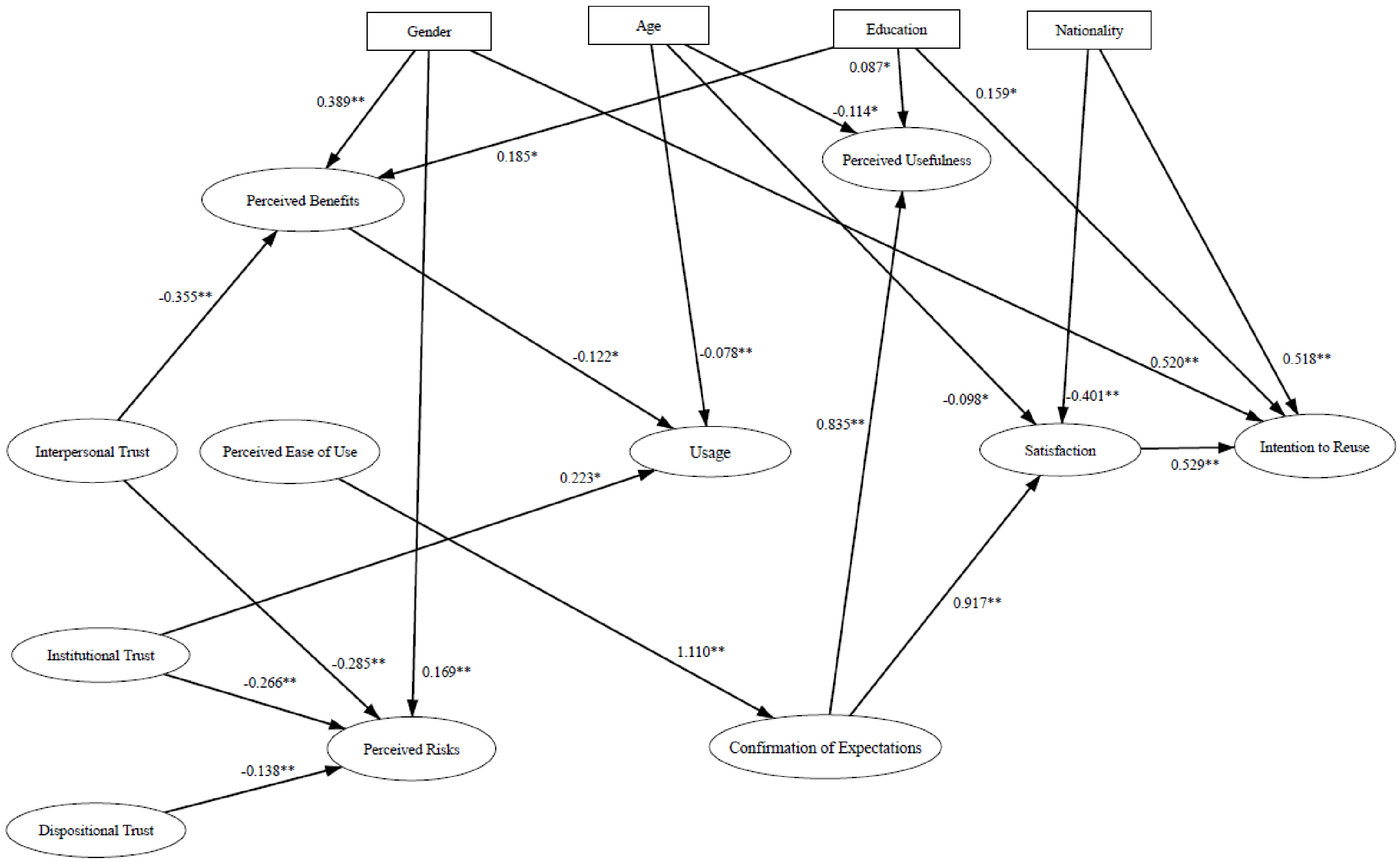

Figure 6.3 Estimated model of trust in GrabShare (digital ridesharing service with commercial drivers) with unstandardized coefficients (* denotes a p-value < 0.10 and ** denotes a p-value< 0.05)

Table 6.4 GrabHitch Structural Model with Standardized Direct and Total Effects

Variable	Effect	Perceived Risks	PB	U	CoE	PU	S	Intention to Reuse
Institutional Trust	D	-0.284**		0.211*				
	T	-0.284**		0.211*			0.019	0.006
Interpersonal Trust	D	-0.409**						
	T	-0.409**						
Perceived Benefits (PB)	D			-0.222**	-0.263**	-0.357**		
	T			-0.222**	-0.263**	-0.357**	-0.257**	-0.084*
Perceived Ease of Use	D				0.648**	0.621**		
	T				0.648**	0.621**	0.507**	0.167**
Usage (U)	D						0.088*	
	T						0.088*	0.029
Confirmation of Expectations (CoE)	D						0.495**	
	T						0.495**	0.163**
Perceived Usefulness (PU)	D						0.300**	
	T						0.300**	0.099**
Satisfaction (S)	D							0.329**
	T							0.329**
Age	D		-0.147*					
	T		-0.147*	0.033	0.039	0.052	0.038	0.012
Education	D		0.168*					
	T		0.168*	-0.037	-0.044	-0.06	-0.043	-0.014
Gender	D	0.179**		0.135**				
	T	0.179**		0.135**			0.012	0.004
Nationality	D						-0.101*	
	T						-0.101*	-0.033*

Note: D = Direct Effect; T = Total Effect; * = significant at 10% level; ** = significant at 5% level

Table 6.5 GrabShare Structural Model with Standardized Direct and Total Effects

Variable	Effect	Perceived Risks	PB	U	CoE	PU	S	Intention to Reuse
Institutional Trust	D	-0.310**		0.250*				
	T	-0.310**		-0.310**				
Interpersonal Trust	D	-0.498**	-0.241**					
	T	-0.498**	-0.241**	0.073				
Dispositional Trust	D	-0.181**						
	T	-0.181**						
Perceived Benefits (PB)	D			-0.303*				
	T			-0.303*				
Perceived Ease of Use	D				0.883**			
	T				0.883**	0.582**	0.697**	
Usage (U)	D							
	T							
Confirmation of Expectations (CoE)	D					0.659**	0.789**	
	T					0.659**	0.789**	0.239**
Perceived Usefulness (PU)	D							
	T							
Satisfaction (S)	D							0.303**
	T							0.303**
Age	D			-0.134**		-0.109*	-0.102*	
	T			-0.134**		-0.109*	-0.102*	-0.031
Education	D		0.138*			0.090*		0.102*
	T		0.138*	-0.042		0.090*		0.102*
Gender	D	0.185**	0.165**					0.189**
	T	0.185**	0.165**	-0.050				0.189**
Nationality	D						-0.149**	0.110**
	T						-0.149**	0.110**

*Note: D = Direct Effect; T = Total Effect; * = significant at 10% level; **= significant at 5% level*

Table 6.6 The Goodness of Fit of Structural Equation Models

Criteria		**GrabHitch**	**GrabShare**
RMSEA	≤ 0.08	0.048	0.055
CFI	≥ 0.90	0.926	0.921
TLI	≥ 0.90	0.908	0.902

6.5 Discussion

This multi-dimensional, empirical study of the effect of trust on the *usage, satisfaction, and intention to reuse* digital ridesharing services extends relevant research that analyses the effect of trust as a single dimension (Möhlmann, 2015) or a variable that combines multiple dimensions (Amirkiaee and Evangelopoulos, 2018). This study's estimated models for GrabHitch and GrabShare reveal that different dimensions of trust—*interpersonal, institutional, and dispositional trust*— play a statistically significant role in users' *perceived risks, perceived benefits*, and *usage* of digital ridesharing services to different degrees.

Dispositional trust does not play a significant role in GrabHitch, but it does for GrabShare on *perceived risks*. This could be because passengers are more likely to share rides with more distant strangers on this service compared to GrabHitch. GrabHitch passengers are typically carpooling to the same workplace or school, so passengers are more likely to share commonalities with the private driver and other passengers, such that *dispositional trust* in strangers in general may not be a significant factor for this service.

Institutional trust between the passenger and the Grab app that facilitates the ride transaction has significant effects for both GrabHitch and GrabShare. As expected, *usage* is greater if passengers have greater *institutional trust*. Vaclavik *et al.* (2020) also studied digital ridesharing services and found that institutional trust in the digital platform app was more important than trust in drivers in the passengers' motivation to use the ridesharing service. Likewise, Acheampong (2021) found that institutional trust in the company's security features on the ridesharing platform app was the type of trust that mattered to users interviewed in Ghana. My study extends their work by showing that institutional trust is the only dimension of trust that has a statistically significant effect on a person's decision to use both private carpooling and commercial ridesharing models.

In the model for GrabShare, greater *interpersonal trust* is associated with weaker *perceived benefits* but there is no significant *indirect effect* of interpersonal trust on usage. At the same time, the direct effect of *perceived benefits* on *usage* is negative, which is unexpected and in contradiction with the conceptual model. This finding may reflect the tension between the convenience of taking a ridesharing service, GrabCar, as a lone passenger versus the cost-saving benefits of taking the carpool-like ridesharing services, GrabHitch. The inverse relationship of perceived benefits and usage level is consistent with findings from in-depth interviews (discussed in [self-citation, omitted for peer review]). In those, passengers lamented that GrabShare is less convenient and reliable because of the increased time it takes to pick up and drop off other passengers in the shared ride—but that costs savings motivated their usage all the same. This finding could also explain why the total effect of *perceived benefits* on *satisfaction* is negative.

Sociodemographics play a significant role in the estimated models. They have direct effects on *usage (gender)* and *satisfaction (nationality)* for GrabHitch users; and on the *usage (age), satisfaction (age* and *nationality),* and *intention to reuse (gender, education,* and *nationality)* for GrabShare users. The results suggest that women use GrabHitch more frequently than men despite perceiving greater risks, possibly because the former have fewer mobility options available to them, possibly like how Acheampong (2021) found that women use ridesharing services more frequently in Ghana. Yet, female users in China who sense the same level of physical risk as male users may distrust ridesharing drivers less, leading to a higher propensity to discontinue using the service (Ma *et al.*, 2019). Singaporean nationals are less satisfied with both Grab carpooling services compared to non-Singaporean nationals, which can reflect local versus foreign preferences for sharing private carpool rides with strangers. This could be that non-Singaporean nationals may be more familiar with carpooling services from their home countries or international experience. For example, BlaBlaCar has popularized digital carpooling platform services in Europe, so European expatriates in Singapore may be more likely to prefer and be satisfied with private carpool rides with strangers. The results also show that older passengers are less likely to use GrabShare and that women, more highly educated people, and Singaporean nationals are more likely to reuse the service.

Overall, this study contributes to transportation research on the antecedents of digital ridesharing usage (Brown, 2020; Kostorz *et al.*, 2021; Wang *et al.*, 2020) and validates the growing research on how different dimensions of trust affect these users' decisions to use the service and their intentions to reuse it (Vaclavik *et al.*, 2020). Vaclavik *et al.* (2020) also found that users' institutional trust, characterized by trust in the ridesharing platform, is higher than interpersonal trust in ridesharing drivers. My study extends their findings by showing the importance of distinguishing between the types of trust that influence users' decision to use digital services like ridesharing and of the type of ridesharing service. This means that the work reported in this paper adds more nuances to the extended technology acceptance model (Venkatesh and Davis, 2000) with the inclusion of three dimensions of trust that play a role in the usage and satisfaction of ridesharing services; and sociodemographic variables like *gender, age, education level,* and *nationality*. To my knowledge, nascent research on the role of trust in ridesharing has not examined its relationship to sociodemographics, although studies on the general antecedents to ridesharing have. Brown (2020) found significant effects of neighborhood income group, age, and race on the probability that users will take a trip using shared versus non-shared ridesharing services in the US. Likewise, I have found that sociodemographic variables should be considered in understanding people's decision to use ridesharing, which ridesharing services they will use, how satisfied they are with the service, and their propensity to reuse the service.

This study is based on a survey of ridesharing users in Singapore, which may not be generalizable to all instances of ridesharing in other countries. Future studies could test the proposed conceptual model in other ridesharing markets and contexts—particularly those in which dispositional trust in strangers in general differs from the Singaporean market. Future studies may also focus on empirically testing the recursive part of my proposed conceptual model, which was ultimately removed for this study: the effect of the *intention to reuse* ridesharing services on trust dimensions. How ridesharing *usage, satisfaction*, and *intention to reuse* the service indirectly and directly affect different dimensions of trust would also be a valuable contribution to understanding how a dynamic model of trust in ridesharing works. Finally, my study found a weak relationship between the *usage* and *satisfaction* of ridesharing services, in addition to no relationship between *usage* and the *confirmation of expectations*—as would be expected. Future studies could benefit from re-examining how to better operationalize and measure *usage* in the user surveys.

6.6 Conclusion

The estimated models of trust in the usage, satisfaction, and intention to reuse two different digital ridesharing services developed in this study have shown that institutional trust in the ridesharing company platform is the dimension of trust that has the greatest impact on usage, even if it had no statistically significant ($p < 0.05$) effects on either user satisfaction or the intention to reuse the services. Surprisingly, dispositional trust in strangers did not play a significant role in the decision to use ridesharing services at all in the context of Singapore, despite the service involving face-to-face interactions between strangers in an intimate space. This could be because Singapore is generally considered to be a safe city state as it is ranked second in the Safe Cities Index ranking (Kiestra, 2019). Interpersonal trust between passengers and drivers in a shared ride matters more for the commercial carpooling service of GrabShare than for the private, non-commercial ridesharing service of GrabHitch. Equally importantly, sociodemographics play a significant role in determining what type of services men, women, users of different nationalities, age, and education levels will use, be satisfied with, and will intend to reuse.

Understanding how ridesharing platform companies can foster more institutional trust in their service can help companies and policymakers design better services and policies that increase users' safety, privacy, and adoption of innovative services like digital ridesharing between strangers. As sharing economy services that involve face-to-face interactions between strangers become increasingly popular, understanding the unique preferences of different types of users can be valuable in understanding how multiple ridesharing business models can serve different segments of society.

7. Chapter Seven – Conclusion

This conclusion chapter begins with an overview of the thesis and my critical reflections on taking an interdisciplinary approach to this research. The subsequent sections detail the research questions and main findings of the three papers that comprise this thesis and the theoretical and practical contributions of these findings. Then, I discuss the future implications of the thesis, in which I consider the role of trust in emergence of new ridesharing innovations such as autonomous vehicle rides. Finally, I offer concluding remarks.

7.1 Overview of thesis

In this thesis, I have explored how the entry of shared mobility platform innovations, namely digital ridesharing, constitutes a new socio-technical system that has brought about systemic changes in Southeast Asia's urban mobility space. As a new socio-technical system, digital ridesharing engenders people and institutions to interact with its technology in ways that reshape how people travel, relate to one another, and trust ridesharing platform companies, in urban areas. Specifically, digital ridesharing platform innovations combine cutting-edge technologies—such as algorithms, real-time GPS tracking, data analytics, and smartphone applications—with social systems that include drivers, passengers, ridesharing platform companies, regulatory bodies, and urban mobility infrastructures. Digital ridesharing platform services have become increasingly commonplace in urban areas globally in the past decade, yet the literature on the factors driving their rapid expansion and their effects on user trust, social norms, and informal codes about moral conduct in encounters between strangers remains underexplored.

Recent research highlights the ability of disruptive innovations, like digital ridesharing platforms, to expand rapidly and undergo socio-technical shifts that replace established systems, such as the conventional taxi industry. Key players within these transitions actively shape the process by impacting factors that help radical innovations gain stability and traction. This influence extends to assessing the robustness of existing systems and recognizing external conditions that may create opportunities for new technologies to reshape or take over incumbent structures (Kanger, 2021). Despite this, limited attention has been given to how competition from new entrants—backed by substantial venture capital—can accelerate the growth and socio-technical shift of digital ridesharing platforms within a short timeframe. Furthermore, while ridesharing firms often promote the idea that their platforms foster positive social interactions among strangers, recent studies have also revealed negative social effects. The dynamics between ridesharing drivers and multiple passengers—strangers connected by an algorithm—underscore the critical issue of social trust in these interactions (Pratt *et al.*, 2019).

The thesis thus culminates in a study of how three different types of user trust play a role in the user adoption of digital ridesharing platform technology: *interpersonal trust* (trust between users), *institutional trust* (user's trust in the platform or service), and *dispositional trust* (user's general propensity to trust strangers in society). Studying user trust in the context of ridesharing advances transportation research by examining factors that influence digital ridesharing usage and by validating existing findings on how various dimensions of trust shape users' decisions to use and reuse these services (Brown, 2020; Kostorz et al., 2021; Wang et al., 2020).

Through interdisciplinary empirical research, this thesis lays a foundation for further exploration of trust in digital platform services, shared mobility innovations, and the broader sharing economy. One of the key strengths of adopting an interdisciplinary approach was the ability to draw from and synthesize diverse perspectives, which enriched my analysis of ridesharing services. In this thesis, I tried to bring together the literatures on: the rapid scaling of socio-technical transitions from innovation studies, the sociality of encounters between strangers in shared transport from mobilities and transport geography and from urban studies, and user trust in online and offline transactions from the management information systems field. Adopting an interdisciplinary approach to research enabled me to synthesize theoretical concepts from disparate fields like information systems management to transport studies. For example, I was able to apply the concepts of user trust in e-commerce transactions from the management information systems field to the study of digital ridesharing platform services in transport geography. The inclusion of trust theories from information technology was particularly instrumental in expanding my understanding of trust beyond a psychological construct to one shaped by platform design, user interface, and broader social interactions. This integrative framework allowed me to explore how users negotiate their trust in the digital platform company, the drivers, and the strangers they encounter within the ridesharing context, ultimately enriching the depth of my investigation into these services.

However, this interdisciplinary approach also presented some challenges, particularly in reconciling different theoretical frameworks and levels of analysis. Each discipline operates with its own terminologies, methods, and metrics, and aligning them required a meta-level understanding of how each study fits together and builds on one another to generate meaningful insights. My first study looked at industry-level dynamics of digital ridesharing platform innovations in the entire region of Southeast Asia, which served as a primer to understand and set the overall context of the thesis. The second study focused on the social dynamics of individual users of digital ridesharing platform services through qualitative interviews done through fieldwork in two cities: Singapore and Manila, Philippines. Here, I had to make a trade-off on selecting only two cities to conduct fieldwork in that would offer the most diverse, yet comprehensive study of strangers sharing on-demand rides booked through a digital platform. With the time and research resources available, I was only able to conduct deep fieldwork in these two cities, which represented the most mature markets in Southeast Asia for digital carpooling services like GrabShare, and GrabHitch; which enabled unknown passengers to be pooled together in a shared ride. My third study built on the first two studies by focusing intently on surveying GrabShare and GrabHitch users on their usage of pooled ridesharing services with other strangers and their views on the role of trust in their decision to use and satisfaction of such services.

Looking ahead, and with more time and research resources, I would like to focus on three improvements to the research scope and design of this thesis. First, I would like to approach future research with a more complete perspective of digital ridesharing services in the rest of the Southeast Asian region or world and conduct comparative studies of how the role of trust would differ in different geographies and socio-technical dynamics. Second, I would also prioritize one or two key disciplines, allowing for a more focused narrative while still drawing on insights from other fields. This approach could enhance clarity and allow for more targeted analysis without losing the multi-dimensionality of the subject matter. Third, I would like to conduct mixed methods studies that collect both quantitative and qualitative data to better manage the trade-off between gathering insights from a larger study sample using a quantitative survey and collecting richer, in-depth insights from qualitative interviews with research participants.

Ultimately, an interdisciplinary approach has enriched my research, allowing me to think beyond disciplinary boundaries and fostering a more integrated understanding of contemporary transportation systems. Reflexivity, as detailed in Section 3.6, has been central to navigating the complexity of interdisciplinary research, ensuring that my contributions meaningfully engage with multiple literatures while remaining mindful of the broader societal and technological implications of my work. Throughout this process, I have been mindful of the inherent tensions in bridging multiple disciplines. The integration of diverse frameworks required constant balancing to ensure no single perspective dominated the analysis. My reflexivity involved a continuous process of self-questioning: How do my disciplinary preferences shape the questions I ask and the methods I choose? Am I prioritizing certain dimensions of the research at the expense of others? This awareness has allowed me to critically engage with the material and maintain a nuanced interpretation of the complex socio-technical phenomena surrounding ridesharing.

7.2 Summary of findings

Through three distinct research studies, I unpack the socio-technical dimensions of digital ridesharing in urban areas, focusing on key aspects such as (1) rapid scaling of socio-technical transitions, (2) the sociality of encounters between strangers in shared rides, and (3) user trust. This interdisciplinary thesis contributes to the fields of transport geography, innovation studies, urban studies, and information systems research. Collectively, the findings underscore how digital ridesharing platforms both shape and are shaped by the social-technical environments in which they operate. They reveal the intricate role of competition, social interactions, and trust in the success and challenges faced by these platforms.

7.2.1 Summary of first study (Chapter Four)

The first study (Chapter Four) focused on the macro level of understanding the rapid, comprehensive systemic changes engendered by the entry and rise of digital ridesharing services in Southeast Asia. I answered these two research questions: *1) what factors enable or constrain the scaling of niche innovations?* and *2) how does competition affect how radical niche innovations rapidly scale?* To answer these questions, I analysed the case of the rapid scaling of niche innovations in the digital ridesharing platform industry in Southeast Asia, focusing on four key players: Grab, EasyTaxi, Uber, and Gojek (now GoTo). These companies introduced radical new approaches to urban mobility that introduced the practice of using a smartphone platform application to book and share an on-demand ride with drivers and other passengers who are strangers in the intimate, confined spaces of cars, taxis, and motorcycle taxis.

The first study uses the multi-level perspective (MLP) framework from socio-technical transitions literature to analyze how these ride-hailing companies quickly gained market dominance. The MLP framework categorizes the scaling of niche innovations into four phases: emergence, early adoption, mass adoption, and regime shift (Geels, 2012). The paper focuses on how these companies moved through those phases and proposes a reworked version of the phases by redefining the fourth phase as a socio-technical transition pathway that ends in integration across many previously siloed regimes, rather than change in a singular regime or the integration of two or three regimes, emphasizing the role of competition in driving innovation and growth. The analysis also discusses how ride-hailing firms like Grab and Uber capitalized on network effects, leveraging their growing user base to attract more drivers and passengers, further accelerating their expansion. The study found that competition between these firms, supported by venture capital and favourable socio-economic conditions, enabled them to scale rapidly across Southeast Asia, ultimately leading to significant socio-technical changes in urban mobility.

7.2.2 Summary of second study (Chapter Five)

The second study (Chapter Five) offers a grounded theory study of the social interactions, norms, and informal codes about moral conduct that emerge from, and are reworked through, the act of ridesharing between drivers and passengers in urban areas. I answered the following research question: *what are the social norms and behaviors that arise from encounters between strangers in a shared car ride enabled by ridesharing booking applications?* This paper focused on the social dynamics that occur in shared ridesharing services in Southeast Asia, specifically in Singapore and Manila, and how these interactions reflect larger social prejudices, expectations, norms, and informal codes about moral conduct. The study is based on qualitative interviews with 65 drivers and passengers of GrabShare and UberPool, both commercial ridesharing services where passengers share pooled rides with strangers on overlapping routes.

The interviews revealed a wide range of behaviors that illustrate the complexity of these social encounters in shared rides. Drivers and passengers often bring pre-existing expectations of others and prejudices into these rides, which can influence their willingness to pick up or ride with certain individuals. For instance, the study found that racial prejudices influence drivers' decisions to accept rides, as well as passengers' discomfort when sharing rides with individuals from different social or economic backgrounds. The study also documents how passengers adjust their behavior to conform to certain social expectations—such as requesting to be dropped off at a location different from their true destination to avoid judgment or protect their privacy. Thus, the study emphasizes the emergence of social norms and informal codes about moral conduct within these transient spaces. These norms are not dictated by the platform itself but arise organically from the shared experiences of users. These social interactions between ridesharing passengers can also lead to informal codes about moral conduct to emerge—shaped by each person's perceptions of moral conduct—and are renegotiated between fleeting, shape-shifting encounters between strangers situated in a confined shared space.

7.2.3 Summary of third study (Chapter Six)

The third study (Chapter Six) aimed to theorize and examine the meaning of trust in on-demand, ridesharing interactions by answering the research question: *how does trust—in particular, interpersonal trust between strangers who must interact in person—affect a consumer's decision to use digital ridesharing?* This paper focuses on understanding the role of trust in the adoption, user satisfaction, and intent to reuse two pooled ridesharing services offered by Grab in Singapore: GrabHitch, a social carpooling service in private cars driven by non-commercially licensed drivers who are compensated for their time and petrol (do not earn a fare) for taking additional passengers in their normal commute, and GrabShare, a commercial service in private cars with commercially licensed drivers who drive passengers to earn income. I conducted a large-scale survey of 553 users (278 GrabHitch and 275 GrabShare) and found that trust is indeed a crucial determinant of adoption and user satisfaction, but its role varies depending on the type of service. For GrabHitch, which involves non-professional drivers and more peer-to-peer interactions, interpersonal trust (trust between passengers and drivers) is more significant. In contrast, for GrabShare, a commercial service where drivers are licensed professionals, institutional trust (trust in the platform itself) plays a larger role in shaping users' confidence and willingness to reuse the service. The study further explores the effects of sociodemographic factors, including age, gender, education level, and nationality, and how these influence users' trust perceptions. For instance, younger users and women were found to place a higher emphasis on institutional trust, suggesting that they rely more on the platform’s reputation and safety mechanisms rather than interpersonal dynamics.

7.2.4 Overall summary of findings

In summary, as the competition between ridesharing platform companies intensifies and leads to greater adoption of ridesharing, as I found in the first study, issues of sociality between ridesharing users and trust between users and the ridesharing platform companies becomes more important as ridesharing platform technologies induce more face-to-face encounters between strangers in the close confines of a shared ride. In this way, ridesharing platform innovations have changed how transport providers and users interact in cities globally and will continue to significantly influence the future landscape of urban transportation. The second study found that the act of ridesharing embodies social norms and informal codes about moral conduct that drivers and passengers have; and these preconceived notions are enacted, renegotiated, and co-created in the experience of booking and sharing a ride with strangers. The study revealed that these interactions could be negative. Thus, the issues of interpersonal trust between drivers and passengers; and especially trust between users and the digital ridesharing platform companies become paramount. As explored in the third study, addressing the complexities of trust among passengers, drivers, and ridesharing platforms is essential to fostering an inclusive, safe, and equitable environment for urban mobility in cities globally. By acknowledging the critical role of institutional trust in companies; and proactively working to build and maintain it, ridesharing companies can better navigate the challenges and opportunities that lie ahead, ultimately enhancing the user experience and contributing to a more sustainable urban transportation future.

7.3 Study contributions

The three studies of this thesis collectively offer both theoretical and practical contributions to understanding the socio-technical dimensions that underlie digital ridesharing platform innovations as a new socio-technical system in Southeast Asia. The role of competition and capital in the scaling of disruptive innovations, the social dynamics of shared rides, and the integration of trust in technology adoption provide a multidimensional view of how ridesharing platforms function as both technical systems and social spaces. These contributions are valuable for scholars working at the intersection of technology, society, and business, emphasizing the interconnectedness of these factors in shaping the future of urban mobility. In this section, I first detail the contributions of the three studies in Sections 7.3.1 to 7.3.3; and then synthesize how they contribute to the domain of transport geography in Section 7.3.4.

7.3.1 Contributions of the first study (Chapter Four)

The first study (Chapter Four) makes significant contributions to the literature on socio-technical transitions in urban mobility and digital platform scaling in management studies, specifically by exploring the rapid scaling of digital platforms in emerging markets. The analysis of niche competition between entrant ridesharing companies such as Grab, Uber, and Gojek reveals the critical, outsized role that venture capital played, alongside supportive regulatory tailwinds, in fostering rapid growth through innovation races that took place between these niche players. The extant literature on strategic niche management (Smith and Raven, 2012) mention that conflicts or competition could arise between various actors during the upscaling of niche innovations in a socio-technical transition but does not go into detail about what types of competition could enact such rapid change. Recent work (Kanger, 2021; Ayoub and Geels, 2024) focuses on how niche innovations can scale up faster than previously thought, but also does not examine a pathway of niche competition of digital platform startups, fueled by private venture capital and a highly scalable, asset-light business model that can grow fast with indirect network effects from a large user base. This insight extends beyond transportation, offering a blueprint for understanding how disruptive innovations can flourish in underdeveloped markets undergoing digital transformation. This insight can contribute to the strategic niche management literature in innovation studies and socio-technical transitions in transport geography in that a digital platform business model, combined with intense competition between other niche players, and funded by venture capital can upscale and effect a rapid socio-technical transition in under a decade.

The first study's main theoretical contribution is a new pathway in the socio-technical transitions framework (Geels, 2002; Geels and Schot, 2007; *Geels et al.*, 2017) whereby competition between niche actors, the digital ridesharing platform startups, and support of this competition by the private venture capital industry enabled niche innovations to rapidly upscale and effect a transition in the span of several years. The niche players did not aim to compete with the incumbent regime, but instead focused on out-competing and out-innovating their peer rivals to gain user adoption, which propelled the entire niche to break through and enact a transition as the regulatory landscape later supported the niche actors and innovations due to this wide user adoption from the bottom-up. Instead of viewing niche innovations as completely replacing incumbent regimes, the study supports emerging research that advocates a model of cross-regime integration whereby change in multiple systems are involved in the socio-technical transition of one system (Andersen and Geels, 2023; Geels and Turnheim, 2022). Geels and Turnheim (2022) assert that the cross-regime integration of urban planning, transportation, and energy systems, which are traditionally separate sectors, aimed at collectively reducing carbon emissions may be required for transitioning to a low-carbon mobility future. They highlight the convergence and collaboration between such initiatives as renewable energy-powered public transit and the development of electric vehicle charging infrastructure as an example of cross-regime integration. In Southeast Asia, ridesharing companies did not entirely replace traditional taxis but integrated with them in certain markets (*e.g.*, GrabTaxi), while also converging with the financial and food delivery sectors to offer multiple services onto one platform. This finding contributes to a more nuanced understanding of socio-technical transitions, suggesting that niche innovations can coexist with incumbent technologies rather than entirely displace them. More specifically, this finding enriches the multi-level perspective (MLP) in the socio-technical transitions literature by emphasizing the role of competition between startups in rapid adoption and scaling of niche innovations. While traditional MLP literature often highlights internal niche dynamics and external regime pressures (Geels, 2005, 2019), this research adds another layer by showing how competition between niche actors accelerates innovation and adoption. Prior literature has mentioned that competition can exist, but not as an official pathway for rapid upscaling. For example, Smith and Raven (2012) underscore the concept of "protective space" as a vital component for the development of niche innovations, enabling their potential integration into mainstream markets. Although they do not explore the competitive dynamics among niche actors in detail, they do examine broader influences that emerge during the upscaling phase like the pressures niche innovations face to conform to established market norms and the challenges in maintaining unique niche values and practices. This perspective suggests that while scaling up facilitates entry for niche innovations into larger markets, it may also lead to friction as niche players adapt to conventional market expectations. Instead, my first study shows that how "innovation races" unfold between niche players can be a key theoretical contribution, underscoring how competitive pressures push companies to innovate rapidly, ultimately leading to more widespread adoption of new technologies. This perspective fills a gap in the strategic niche management perspective of the socio-technical transitions literature, which has previously underplayed the impact of entrant competition on niche scaling.

The study also highlights the crucial role of venture capital, which enabled ridesharing companies to scale quickly and participate in innovation races that involved using substantial monetary incentives to entice drivers and passengers to use their services; and spending funds to out-innovate rivals on local solutions like launching motorcycle taxi rides or building an electronic payments solution. The strategic niche management literature has highlighted the challenges of funding scarcity to support niche innovations in the high-risk, early stages of technological uncertainty; and that winning over investors has been a key priority and concern for niche actors (Smith and Raven, 2012; Schot and Geels, 2008). The substantial financial backing provided by venture capitalists ultimately allowed companies like Grab and Uber to pursue aggressive expansion strategies with a 'winner-take-all' logic, enabling these niche players to subsidize rides to attract users and build the necessary infrastructure for large-scale operations. The first study found that the abundance of venture capital funding to support an initially loss-making business model and rampant niche competition that led to cash-burning price wars to subsidize rapid user adoption was unique and unprecedented. The institutional logic of digital platform business models winning by being a dominant unicorn after gaining monopoly-like market share first; and then focusing on profit-making and business model sustainability after other competitors leave the market is characteristic of a new type of platform capitalism (Srnicek, 2017). The temporalities involved in this platform capitalism logic is not dictated by calendar time or business profitability, but different units of measure that prioritizes building a rapid user base to enact the flywheel of indirect network effects for one company's digital platform (Srnicek, 2017; Parente *et al.*, 2018).

In terms of business model innovation (Parente *et al.*¸2018*)*, the first study illustrates how adapting to local conditions can be a critical factor in the success of digital platforms. For instance, Grab's decision to accept cash payments in markets with low credit card penetration was pivotal in outcompeting Uber. This insight contributes to the literature on business model innovation, highlighting the need for companies to tailor their offerings to local market conditions to achieve competitive advantage.

7.3.2 Contributions of the second study (Chapter Five)

The second study (Chapter Five) focuses on the social dimension of ridesharing, highlighting how societal prejudices and biases manifest in the shared spaces of ridesharing vehicles in hyperdiverse cities (Valentine, 2008, 2010; Wilson 2017b; Schuermans, 2019). The study contributes to the broader discourse in urban studies on how digital platforms impact societal norms regarding how people should behave before, during, and after a shared ride booked by a digital platform (Wilson, 2011) and can be leveraged to promote positive social interactions among strangers who share rides. However, the study also reveals that negative social interactions are present and that there are limitations to consider when strangers with diverse backgrounds, sociodemographics (*e.g.*, gender, age, ethnicity, nationality, etc.), expectations, and prejudices are spontaneously matched in on-demand, temporary social encounters in the confined space of a shared ride.

Theoretically, the study extends the literature on the sociality of transport, where social, public interactions between riders in the confined spaces of a car, airplane, or public transport are examined (Goffman, 1963; Laurier *et al.*, 2008; Bissell, 2010; Wilson, 2011) by applying these ideas to the digital age of on-demand ridesharing. The intimate social interactions facilitated by ridesharing platforms offer a new perspective on how technology-mediated encounters can mirror and amplify societal biases (Pratt *et al*., 2019) and discrimination (Ge *et al.*, 2016). Drawing on Goffman (1963, p. 3), the study proposes that the informal "little social systems" of greater society offer a set of informal rules for drivers and passengers to behave and offers norms to pre-empt the uncertainties and risks of strangers sharing a small, confined space of a rideshare. These informal microcosms of greater society can be diverse due to a diverse population; and ridesharing platform companies have an opportunity to help shape and enforce social norms that would generate the greatest good for most users. Social norms that were apparent in this study could be categorized as bottom-up, arising and formed from the ridesharing users; or top-down, imposed by the ridesharing platform company. For example, some of the bottom-up social norms revealed that passengers in Singapore do not necessarily want to socialize with other strangers in the car, particularly with those who they deem are different from them in gender and nationality. The digital platform company, Grab, may reconsider imposing a top-down expectation in their marketing campaigns for ridesharing to be a social experience whereby it could be used as a means for random people to socialize and develop personal relationships beyond the shared ride. As such, ridesharing drivers would not feel awkward when passengers do not interact with them or other passengers during shared rides, as sometimes observed in the second study in Singapore. This lack of interaction from passengers may diverge from the expectation, often insinuated by the ridesharing company's marketing campaigns, that drivers and passengers should be engaging with each other and developing social relations. More generally, the study offers a fresh theoretical contribution to the understanding of how rides engendered by digital platforms function as microcosms of broader social dynamics; which extend prior literature on the geography of unexpected encounters between diverse social groups (Valentine, 2008; Wilson 2017b; Schuermans, 2019).

Regarding this second study, I acknowledge that the COVID-19 pandemic may have affected how the results hold post-pandemic in light of the disruption in ridesharing usage and the public health and safety concerns arising from riding in close proximity with strangers during the COVID-19 pandemic. In the case of Grab, ridesharing had rebounded by late 2023 when all ridesharing services, particularly GrabShare, had fully resumed (Chiang, 2023). During COVID-19, I assume that drivers and passengers would be more wary of using ridesharing and increasing their risk of being exposed to the disease through pooled ridesharing options like GrabShare, which was suspended by Grab from the onset of the pandemic lockdown in early 2020 until full COVID-19 restrictions by the Singaporean government were lifted in early 2023. As such, I believe that in the current post-COVID-19 period, it is possible that ridesharing users are more concerned about other drivers' and passengers' physical co-presence, particularly when people cough or exhibit signs of illness. Such ridesharing users may be less willing to share rides with other unknown passengers in the pooled ridesharing services like GrabShare or GrabHitch because of such concerns about their health.

In practical terms, the study summarized in Chapter Five provides valuable insights for policymakers and platform designers aiming to mitigate the negative social dynamics in ridesharing. The emergence of bottom-up social norms and informal codes about moral conduct, such as passengers asking to be dropped off in inconspicuous locations, illustrates how these platforms often reflect existing societal tensions rather than creating new social dynamics. This second study suggests that companies can implement policies to promote fairness and minimize discriminatory practices in ridesharing, such as blind matching using algorithms alongside policies that mandate or incentivize drivers to pick up all rides allocated to them or improved driver training.

7.3.3 Contributions of the third study (Chapter Six)

Finally, the third study (Chapter Six) has focused on trust as a multi-dimensional concept in the context of digital ridesharing platform services. The finding that institutional trust (trust in the platform itself) is more important than interpersonal trust (trust between passengers and drivers) and dispositional trust (trust in strangers in greater society) in both the pooled ridesharing services, GrabShare and GrabHitch, extends recent research (Acheampong, 2021; Vaclavik *et al.*, 2020). Theoretically, this work expands the extended technology acceptance model (TAM) (Venkatesh & Davis, 2000) by incorporating three dimensions of trust, alongside sociodemographic factors such as gender, age, education, and nationality, which play significant roles in ridesharing use and satisfaction. The role of trust has been underexplored in previous TAM studies in the sharing platform economy (Wang *et al.*, 2020). Although prior research has linked sociodemographic characteristics to general ridesharing behaviors, few studies have specifically examined their relationship to trust in ridesharing. By introducing three forms of trust—interpersonal, institutional, and dispositional—the study provides a more nuanced understanding of how trust influences technology adoption in the context of ridesharing (McChervany and Knight, 2001). This contribution is crucial for digital platforms where human interaction is inevitable, offering a more comprehensive framework for understanding user behavior. The study also provides an understanding of how sociodemographic factors, such as age, gender, and education, influence trust perceptions (Acheampong, 2020; Ma *et al.*, 2019) and user behavior (Brown, 2020).

Practically, the study provides actionable insights for platform designers and policymakers. The findings suggest that fostering interpersonal trust through reputation systems or social network integration can alleviate concerns about riding with strangers. On the other hand, maintaining robust institutional trust through platform transparency and safety protocols is crucial for commercial success. These insights offer practical guidance for improving user retention and satisfaction in ridesharing platforms. The comparative analysis of GrabHitch (a non-commercial, peer-to-peer carpooling service) and GrabShare (a commercial carpooling service) provides valuable insights into how different business models shape trust dynamics and user behavior. This comparison contributes to the literature on sharing economy platforms by illustrating how trust plays out differently in non-commercial and commercial contexts, offering practical guidance for companies operating across these models.

7.3.4 Overall contributions to transport geography

Situating this research within the domain of transport geography, the thesis offers significant contributions to understanding how digital platform-based innovations interact with urban mobility systems, particularly in the Southeast Asian context. By analyzing the rapid diffusion and socio-technical transitions of ridesharing platforms like Grab, this thesis extends the transport geography literature to encompass the interplay between innovation ecosystems and urban mobility. The findings highlight how socio-technical transitions, driven by market forces and digital platform dynamics, intersect with micro-level trust relationships between users, drivers, and platform companies. This nuanced lens reveals how shared mobility innovations are not merely technological solutions but active agents reshaping urban interactions, spatial practices, and socio-economic inequalities.

Specifically, the integration of socio-technical transitions with micro-level trust dynamics underscores the relational and spatial implications of ridesharing in dense urban areas. The research demonstrates how trust—interpersonal, institutional, and dispositional—acts as a catalyst for adoption and acceptance of platform-based mobility solutions, influencing patterns of interaction within the confined spaces of shared rides. This insight situates ridesharing as both a disruptor and integrator within transport systems, blending informal transport modes with formal urban mobility networks in ways that reflect local socio-cultural and economic contexts. For instance, the findings from Southeast Asia illustrate how ridesharing complements public transport in cities with limited infrastructure while competing with and formalizing informal transport modes like motorcycle taxis.

As cities worldwide aim to adopt sustainable and integrated mobility systems, these insights offer valuable lessons on aligning technological advancements with local socio-cultural contexts. The study highlights the importance of policy frameworks and business models that adapt to the diverse regulatory, economic, and cultural landscapes that define urban mobility across regions. Future research in transport geography could extend the findings of this thesis to explore comparative studies to assess how these political economy factors vary, particularly in cities with stronger public transit systems or different levels of socio-economic inequality. Examining how ridesharing platforms are integrated into multi-modal transport systems, their effects on land use, and their role in fostering or hindering equity and accessibility can deepen our understanding of their long-term impact on urban geographies. Furthermore, the role of sustainability—such as promoting carpooling, electrification of vehicle fleets, and reducing congestion—offers fertile ground for interdisciplinary exploration that bridges transport geography with environmental and social justice goals.

Finally, a unique contribution of this thesis is its focus on Southeast Asia, a region in the Global South that has been underrepresented in the literature. By analyzing the specific socio-technical conditions that were shaped by and reshaped the digital ridesharing industry in this region, the thesis broadens the geographic scope of digital platform research. The region's diversity of car ownership rates, GDP per capita, safety rankings, population density, and/or public transportation availability in many cities has created a complex, dynamic environment for how and where digital ridesharing innovations thrive. This regional focus not only contributes to a more comprehensive understanding of global ridesharing dynamics but also offers practical insights for companies and policymakers operating in similar contexts.

The findings of this thesis also reveal that while explicit racism and prejudice were not dominant themes in the Singaporean ridesharing context, subtler forms of bias emerged in the second study detailed in Chapter Five, such as preferences for certain passenger profiles or discomfort with perceived "foreignness" among riders and drivers. This aligns with broader research on microaggressions in Singapore's multicultural society, where overt racism is rare, but implicit biases persist in shaping interpersonal interactions. The limited representation of Asian contexts in the existing literature underscores the need for more localized research that addresses the interplay of race, class, and nationality within the socio-technical systems of shared mobility. Future studies could explore these dynamics more deeply, examining how ridesharing platforms can design features or policies to mitigate implicit bias and foster inclusivity in culturally diverse urban environments.

7.4 Implications for future research

The findings of this dissertation highlight the evolving nature of trust in digital ridesharing platform companies, such as Uber and Grab, as their services become increasingly normalized in urban settings worldwide. There are three sets of key issues that warrant further research: understanding the implications of the COVID-19 pandemic on user trust and willingness to (re)use digital ridesharing platform services, the future growth of the ridesharing market, and the role of trust in newer innovations such as autonomous vehicles (AVs) and robotaxis. I end this section with a discussion of the policy and industry implications of this thesis.

7.4.1 Implications of the COVID-19 pandemic on user trust and ridesharing usage

First, I explore the implications of the COVID-19 pandemic on user trust and ridesharing usage. As more individuals engage in ridesharing with strangers, my thesis found that, prior to the COVID-19 pandemic, institutional trust in these companies was a critical factor influencing passengers' willingness to participate in shared rides. Thus, there is a need for future studies to better understand how the COVID-19 pandemic impacted user trust in other drivers, passengers, the ridesharing platform company, and the general public. Since COVID-19 restrictions by the government in Southeast Asia were fully lifted only in 2023, there is an opportunity for new research to explore how long the effects of the pandemic could persist and how they affect users' intention to use and reuse various ridesharing services. Looking ahead, the implications of this evolving trust dynamic will shape not only user behavior, but also the broader landscape of transportation technologies, including the rise of autonomous vehicle innovations like Waymo in the US. Waymo, owned by Google, launched its first autonomous ridesharing service in 2020 in Phoenix, Arizona and since June 2024, has offered this service to all of San Francisco, California (Reuters, 2024).

7.4.2 Implications on the future growth of the ridesharing market

Second, I consider the future of the ridesharing market as it recovers from the COVID-19 pandemic after 2023. Digital ridesharing platform companies such as Grab and Uber are navigating a landscape filled with new challenges and opportunities. Since AVs and robotaxis have not yet been widely implemented, these ridesharing platforms must continue to strategically expand beyond conventional mobility services to foster growth. One significant opportunity is in enhancing or even replacing public transportation in urban areas with inadequate last-mile connectivity. This can attract users who generally depend on personal cars or traditional public transit, positioning ridesharing as a middle ground that combines the convenience of private vehicles with the accessibility of public transportation. By focusing on urban youth, who often prefer subscription or pay-per-use models over car ownership, companies can strengthen customer loyalty. Emphasizing user experience and cost-effectiveness allows ridesharing firms to establish themselves as sustainable, long-term mobility solutions, potentially shaping urban transportation trends.

Another growth avenue for these companies is in expanding their platforms into multifunctional super apps that consolidate services like transport, payments, food and grocery delivery, and telemedicine into a single ecosystem, as Grab has done since 2018. Diversifying services in this way has transformed Grab from a simple ridesharing platform into a comprehensive lifestyle application embedded in daily user routines. Integrating mobility and non-mobility services into super apps fosters higher user engagement, paving the way for sustained revenue growth and a cohesive digital experience. Scholarly research is crucial in analyzing the economic, social, and environmental impacts of these cross-regime, multi-industry system changes and transitions, and its effect on the mobility industry and the other interconnected industries.

Moreover, trust issues extend beyond passenger safety and include the welfare of the ridesharing drivers operating within traditional ridesharing platforms. Many ridesharing drivers, especially migrants and those in precarious employment situations, face significant challenges regarding job security, benefits, and support (Nowak, 2023; Zhou, 2024). As ridesharing companies continue to grow and evolve, they must address these concerns by developing fairer employment practices and ensuring that drivers are treated as valued partners rather than mere contractors. Legal jurisdictions around the world are currently grappling with whether to mandate that ridesharing companies employ drivers as official employees with benefits, which goes against the nature of these digital ridesharing platform companies' asset-light business model (Srnicek, 2017) and will affect their bottom lines. As such, a rising trend in mandating employee benefits for freelance ridesharing drivers may push digital ridesharing platform companies to strive for a future of autonomous ride-hailing without human drivers.

7.4.3 Implications on the role of trust in autonomous vehicle (AV) ride-hailing and robotaxis

Third, in the longer term, as cities move toward a future where autonomous ride-hailing without human drivers become more prevalent (Mladenović *et al.*, 2020), the foundational aspects of institutional trust that passengers place in ridesharing platform companies and their algorithmic technologies, as well as dispositional trust in strangers in general, will be tested in new ways compared to ridesharing services with human drivers. Unlike traditional taxis or ridesharing services where drivers play a dual role as navigators and potential mediators between passengers, autonomous vehicles (AVs) eliminate this human component. This driver absence underscores the importance of fostering user confidence in the technology’s ability to handle transportation needs reliably, including managing unforeseen circumstances, as well as the importance of users’ dispositional trust in strangers and society in general. Without a driver to observe or moderate behavior, individuals might experience concerns about locking themselves into sharing a tight vehicle space with other strangers and not being able to escape the ride if and when they would desire.

For those less inclined to trust strangers (low dispositional trust in strangers and society in general), this could create a psychological obstacle to adopting shared AV services. My thesis found that current ridesharing users for GrabShare, the pooled ridesharing service with commercially licensed drivers, significantly value institutional trust (trust in the platform itself) and this shapes users' willingness to reuse the service. This finding was especially salient for younger users and women, who placed a higher emphasis on institutional trust, suggesting that they rely more on the platform’s reputation and safety mechanisms rather than interpersonal dynamics. If the future of ridesharing indeed transitions toward autonomous vehicles, the notion of users’ institutional trust in the digital ridesharing platform company and their technology remains relevant and perhaps even more important as ever as interpersonal trust between drivers and passengers may be increasingly irrelevant. The lack of a driver may shift informal codes about moral conduct and affect the enforcement of social norms. In current shared rides with human drivers, the drivers can subtly uphold social norms, but in AVs, passengers may feel freer to disregard traditional behavioral boundaries and codes of moral conduct and thus compromise other passengers’ sense of safety and comfort. It remains unclear whether younger passengers and female passengers would trust AV services more or less with regard to the absence of human drivers. Thus, future research can explore how the notion of users' institutional trust in the AV platform company and their technology, as well as dispositional trust in strangers in general, unfolds across different sociodemographic groups. Understanding these dynamics is where future social science research can also play a critical role—by also understanding the social norms, informal codes about moral conduct, and passenger experiences that affect user trust, safety, comfort, and usage behavior for AV users.

7.4.4 Policy and industry implications

From a policy perspective, the results of this thesis, particularly from the second study in Chapter Five, emphasize the importance of designing regulatory frameworks that balance technological innovation with inclusivity, fairness, and safety. Governments and policymakers must consider how digital ridesharing platforms can foster trust not only between users and the platform but also within the broader community, addressing issues such as discriminatory practices, accessibility barriers for underserved populations, and uneven service coverage in urban and peri-urban areas. Policies should prioritize equity-focused measures, such as mandating service accessibility for low-income and differently-abled users, and provide clear guidelines on pricing transparency to prevent predatory practices. In particular, the role of institutional trust, as discussed in Chapter Six, underscores the necessity of robust platform governance. Mechanisms should include stringent data protection protocols to safeguard user privacy, transparent safety standards for both drivers and passengers, and enforceable accountability structures, such as independent auditing of platform practices. These efforts can help ensure that trust is built and sustained at multiple levels, creating a foundation for long-term industry viability and public acceptance.

For ridesharing platform companies, the research findings from the third study in Chapter Six also emphasize the critical need to build both interpersonal and institutional trust to ensure the long-term sustainability of the ridesharing platform industry. Companies can invest in driver training programs that go beyond technical skills to address interpersonal interactions, cultural sensitivity, and conflict resolution. For example, scenario-based training can prepare drivers to handle conflicts, such as disagreements override preferences, while emphasizing empathy and professionalism in interactions with diverse passengers. Periodic refresher courses supported by passenger feedback mechanisms can help drivers maintain high standards of service. Platforms could also enhance passenger experiences with user-centric innovations, such as offering "quiet mode" for those preferring minimal interaction or "assistance mode" for elderly or disabled users needing extra help.

Safety features such as integrated SOS buttons, real-time tracking shared with emergency contacts, and driver background checks are now standard across many ridesharing platforms. To further address the concerns of vulnerable groups like women or seniors, companies could enhance these existing measures by introducing additional layers of safety. For instance, implementing AI-driven monitoring systems that detect unusual ride patterns or sudden route deviations and automatically alert support teams could provide an added sense of security. Ridesharing platform companies could also offer optional in-app features like discreet, coded safety signals that passengers can use to communicate concerns without escalating the situation during the ride. Expanding verified ride-sharing options, where passengers can choose to be matched only with drivers or co-passengers of the same gender, could cater to specific user preferences and increase overall trust.

Transparency and accountability mechanisms are equally critical. Ridesharing platform companies can build institutional trust by publishing detailed fare breakdowns within their apps, clearly explaining surge pricing, and committing to robust data privacy policies with secure, anonymized data storage. Regular third-party safety audits and accessible in-app systems for reporting safety issues, with clear timelines for resolution, can further bolster user confidence. Beyond internal improvements, companies should pursue equitable pricing models to make services accessible while ensuring drivers receive fair compensation. Partnerships with public transit systems to provide first- and last-mile connectivity and collaborations with local communities to address cultural and contextual concerns can position ridesharing platforms as indispensable partners in urban mobility ecosystems. Additionally, adopting sustainable practices, such as incorporating electric vehicles, aligns with societal goals of reducing congestion and emissions. By addressing these areas, ridesharing platforms can evolve from being mere service providers to trusted partners in sustainable urban mobility, fostering user loyalty, societal trust, and long-term growth.

7.5 Concluding remarks

In conclusion, the three studies presented in this thesis offer an interdisciplinary approach to understanding the socio-technical dimensions of digital ridesharing services in urban areas. By integrating insights from transport geography, innovation studies, urban studies, and information systems research, this work provides a comprehensive view of how digital ridesharing has transformed Southeast Asia since 2012. These innovations have brought about systemic, multi-dimensional changes that have influenced various aspects of the institutional environment, including digital infrastructure, social norms, business models, and regulatory frameworks. Additionally, the findings highlight how digital ridesharing not only reshapes but is also shaped by individual beliefs, behaviors, and trust among people with strangers, a digital platform company, and in greater society. This work underscores the profound socio-technical impact of ridesharing innovations, offering a foundation for further exploration of their broader societal implications as these innovations rapidly evolve towards a more autonomous ride-hailing future.

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Appendix B: Qualitative Interview Guide for Chapter Five

Interview Guide for Ridesharing Drivers and Passengers

Mobility

1. In a normal week, could you please describe the trips that you usually make?
    a. Shopping
    b. Church
    c. School
    d. Work
    e. Visiting family/relatives & friends

Ridesharing utility

2. Do you use ridesharing for any of the trips?
    a. If so: Which companies do you use? Which services do you use? Why?
    b. If not: Could you see yourself using ridesharing for any of those trips? Why or why not?
    c. What other forms of transport do you use for those other trips?
3. How did you first hear about ridesharing?
4. Why did you decide to sign up/not sign up for the ridesharing app(s)?
5. What was your experience in using ridesharing app(s) like?
    a. What are some positive experiences you've had?
    b. What are some negative experiences with the ridesharing app(s)?
    c. Are there changes in your experiences over time?
    d. What makes you decide/not decide to keep using the app(s)?

Trust in app

6. How do you feel about putting in your contact information and payment details online into the app(s)?
7. Do you use other sharing apps/services? Online shopping sites?
8. How do you feel about the ridesharing app company(ies)?

Trust in people

9. How do you feel about ridesharing drivers/passengers?
    a. Taxis vs. private hire vehicles vs. carpooling services?
    b. Male vs. female driver?
    c. Being alone or with others?
    d. Time of day? Day vs. night?
    e. Type of trip
    f. Origin/destination

10. How do you feel about riding in the same car with other ridesharing passengers who you don’t know?
    a. If a GrabShare/GrabHitch user: What was your experience like? Positive? Negative? What made you decide/not decide to keep using this carpooling service?
    b. Male vs. female passengers?
    c. Riding alone or with others?
    d. Time of day? Day vs. night
    e. Type of trip
    f. Origin/destination

Trust in society

11. How do you feel about Singaporean/Philippine society? (Are you willing to share services or things with others in Singaporean/Philippine society?)
12. What does trust mean to you?

Appendix C: Survey Questionnaire for Chapter Six

Start of Block: Intro

Q105 Thank you for your time and interest in participating in this study! The aim of this survey is to better understand the user experiences of digital ridesharing platforms in Singapore, where users can share rides with other drivers and passengers who are strangers. The online survey should take about 25 minutes to complete and no background knowledge is required. The survey information will be anonymised and used solely for academic study at the University of Oxford.

End of Block: Intro

Start of Block: DEMOGRAPHICS

X→

D1 What is your age group?

- ○ Less than 18 years old (7)
- ○ 18 - 24 (1)
- ○ 25 - 34 (2)
- ○ 35 - 44 (3)
- ○ 45 - 54 (4)
- ○ 55 - 64 (5)
- ○ 65+ (8)

Skip To: End of Block If D1 = Less than 18 years old

Display This Question:

If Test = TRUE

This is a confirmation that you qualify for the survey. If you have any questions before taking part in the survey, contact Nina Teng (nina.teng@ouce.ox.ac.uk) or Professor Tim Schwanen (tim.schwanen@ouce.ox.ac.uk).

Important to note: Your participation is voluntary. If for any reason you choose to withdraw mid-way through the survey, you may click the 'Exit' button which will automatically close the browser. However, you will not be rewarded if you do not complete the full survey.

- Your response will be anonymised and will remain confidential.
- Your data will be stored in a password-protected file and may be used in academic publications.
- Your IP address will not be known to the University of Oxford research team.
- A "Prefer not to say" option for questions classified as personal data which include (but not subjected to) postcode, year of birth, and income.
- Research data will be stored for a maximum of three years after publication or public release. The University of Oxford is a data controller with respect to your personal data, and as such will determine how your personal data is used in the study. The University will process your personal data for the purpose of the research outlined above.
- Research is a task that we perform in the public interest. Further information about your rights with respect to your personal data is available at https://compliance.admin.ox.ac.uk/individual-rights.
- Your anonymised data could be used in future studies by the University of Oxford.
- Any personal information that could identify you will be kept strictly confidential, stored securely, and will be removed or changed before files are shared with other researchers/results are made public.
- Responsible members of the University of Oxford and research funders may be given access to data for monitoring and/or audit of the study to ensure we are complying with guidelines, or as required by law.

If you have read the information above and agree to participate with the understanding that the data (including any personal data) you submit will be processed accordingly, please check the relevant box below to get started.

○ Yes, I agree to take part (1)

○ No, I do not agree to take part (2)

Skip To: End of Block If Consent = No, I do not agree to take part

D2 With which gender do you identify?

- ◯ Female (1)
- ◯ Male (2)
- ◯ Other (3) ____

D3 In which Singapore region do you currently live?

- ◯ Central (1)
- ◯ East (2)
- ◯ North (3)
- ◯ North East (4)
- ◯ West (5)

Display This Question:

If D3 = Central

D4_Central In which zone do you currently live?

▼ Bishan (1) ... Toa Payoh (20)

Display This Question:

If D3 = East

D4_East In which zone do you currently live?

▼ Bedok (21) ... Tampines (26)

Display This Question:

If D3 = North

D4_North In which zone do you currently live?

▼ Central Water Catchment (27) ... Yishun (34)

Display This Question:

If D3 = North East

D4_NorthEast In which zone do you currently live?

▼ Ang Mo Kio (35) ... Serangoon (41)

Display This Question:

If D3 = West

D4_West In which zone do you currently live?

▼ Benoi (42) ... Western Water Catchment (64)

D5 Please indicate your nationality. If you have more than one, indicate all your current nationalities under the other category.

- ▢ Singaporean (1)
- ▢ Other (please specify as many as you need) (98) ____

D6 Which ethnic background do you identify with most with?

- Chinese (1)
- Indian (2)
- Malay (3)
- Other (please specify) (98) ____

D7 Which religion/belief (if any), do you identify most with?

- Buddhism (1)
- Christianity (2)
- Hinduism (3)
- Islam (4)
- Taoism (5)
- None (6)
- Other (please specify) (98) ____

D8 What is your current employment status?

- Employed (1)
- Self-employed (2)
- Student (3)
- Retired (4)
- Unemployed (currently looking for a job) (5)
- Other (please specify) (98) ____

D9 What is your marital status?

- Single (1)
- Married (2)
- Divorced (3)
- Widowed (4)
- Live with a partner (5)

D10 Do you have children under 18 years of age who live with you?

- Yes (1)
- No (2)

D11 Please indicate your gross monthly individual income (before taxes):

- Less than 2,500 SGD (1)
- 2,500 - 4,499 SGD (2)
- 4,500 - 6,499 SGD (4)
- 6,500 - 8,499 SGD (6)
- 8,500 - 10,499 SGD (8)
- Above 10,500 SGD (10)

D12 How many people (including you) live in your household?

____

D13 What is your highest level of education?

- Primary education (1)
- Secondary education (2)
- Vocational education (5)
- Pre-university education (6)
- Degree (bachelor) (3)
- Post-graduate degree (Master, PhD, MD, JD) (4)

End of Block: DEMOGRAPHICS

WV1 Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

- Most people can be trusted (1)
- Need to be very careful (2)

WV2 To what extent do you trust people from these groups? *Indicate your level of trust by selecting one response per group listed below.*

	Do not trust at all (1)	Do not trust very much (2)	Trust somewhat (3)	Trust completely (4)	Don't know (5)
Your family (1)					
Your neighborhood (2)					
People you know personally (3)					
People you meet for the first time (4)					
People of another religion (5)					
People of another nationality (6)					

V3 How much confidence do you have in the following organizations?

	None at all (1)	Not very much (2)	To some extent (3)	Very much (4)	Does not apply (5)
Your religious/belief institution (1)					
The armed forces (2)					
Newspapers (3)					
Radio and television (4)					
Labor unions (5)					

The police (6)	○	○	○	○	○
The courts (7)	○	○	○	○	○
The government (8)	○	○	○	○	○
Political parties (9)	○	○	○	○	○
Other civil services (10)	○	○	○	○	○
Educational institutions (11)	○	○	○	○	○
Elections (12)	○	○	○	○	○
Major companies (13)	○	○	○	○	○
Banks (14)	○	○	○	○	○
Environmental organizations (15)	○	○	○	○	○
Women's organizations (16)	○	○	○	○	○
Charitable or humanitarian organizations (17)	○	○	○	○	○

T1 **Before COVID-19**, how regularly did you use the following modes of transportation?

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Bus (1)	○	○	○	○	○
Rail (2)	○	○	○	○	○
Ridesharing (Grab, Gojek, Ryde, TADA, etc.) (3)	○	○	○	○	○
Taxi (4)	○	○	○	○	○

T2 How often do you have access to these modes of transportation in your household?

	Never (1)	Rarely (5)	Sometimes (2)	Often (3)	Always (4)
Personal car (to drive) (1)	○	○	○	○	○
Personal car (to ride) (2)	○	○	○	○	○
Bicycle (3)	○	○	○	○	○
E-scooter (4)	○	○	○	○	○
Motorcycle (5)	○	○	○	○	○

USE1 Which of the following ridesharing services have you used in the past?

- ☐ Grab (1)
- ☐ Gojek (2)
- ☐ Ryde (3)
- ☐ TADA (4)
- ☐ Uber (when it was available in Singapore) (7)
- ☐ ⊗None (99)
- ☐ Other (please specify) (98) ____

Skip To: End of Survey If USE1 = None

USE2 In a typical month **(before COVID-19)**, how often did you use each of the following ride services?

Display This Choice:

If USE1 = Grab

Display This Choice:

If USE1 = Gojek

Display This Choice:

If USE1 = Ryde

Display This Choice:

If USE1 = TADA

Display This Choice:

If USE1 = Uber (when it was available in Singapore)

	Several times a month (1)	Several times a week (2)	Daily (3)
Display This Choice: If USE1 = Grab Grab (1)	○	○	○
Display This Choice:	○	○	○

If USE1 = Gojek Gojek (2)			
Display This Choice: *If USE1 = Ryde* Ryde (3)	○	○	○
Display This Choice: *If USE1 = TADA* TADA (4)	○	○	○
Display This Choice: *If USE1 = Uber (when it was available in Singapore)* Others (please specify) (5)	○	○	○

Display This Question:

If USE1 = Grab

USE3 Which of the following Grab's services have you used in the past?

- ☐ GrabAssist (A ride that caters to accessibility needs) (1)
- ☐ GrabCar (Private ride) (2)
- ☐ GrabDelivery (Send or receive packages safely and quickly) (3)
- ☐ GrabFamily (Includes child restraints and additional safety features) (4)
- ☐ GrabFood (Get a meal delivered) (5)
- ☐ GrabHitch (Carpool service) (6)
- ☐ GrabPay (Make cashless payments) (7)
- ☐ GrabPet (Ride with your pets) (8)
- ☐ GrabShare (Split the cost and share a ride with others heading in the same direction) (9)
- ☐ Grab Standard Taxi (Taxi service via the Grab app) (10)
- ☐ JustGrab (Get the closest car or taxi) (11)

Page Break

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = GrabCar (Private ride)

USE4 In a typical month, **before COVID-19**, how often did you use each of the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

	Several times a month (1)	Several times a week (2)	Daily (3)
Display This Choice: If USE3 = GrabHitch (Carpool service) GrabHitch (1)	○	○	○
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)	○	○	○
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (3)	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = GrabCar (Private ride)

USE5 **Before COVID-19**, when did you typically use the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

	Weekends only (1)	Weekdays only (2)	Both weekends and weekdays (3)
Display This Choice: If USE3 = GrabHitch (Carpool service) GrabHitch (1)	○	○	○
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)	○	○	○
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (3)	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

Or USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

USE6 Please indicate for what purpose you used each of the following Grab Services before COVID-19. *(Select all that apply)*

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

	Work (1)	School (2)	Entertainment/Leisure (3)	Shopping (4)	Other (5)
Display This Choice: If USE3 = GrabHitch (Carpool service) GrabHitch (1)	☐	☐	☐	☐	☐
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)	☐	☐	☐	☐	☐
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (3)	☐	☐	☐	☐	☐

Display This Question:

If USE3 = GrabHitch (Carpool service)

USE6_1 Please indicate the reasons why you have used GrabHitch *(Select all that apply)*

- ☐ Convenience (1)
- ☐ Environmentally friendliness (2)
- ☐ Novelty (3)
- ☐ Price (4)
- ☐ Safety (5)
- ☐ Promotions (6)
- ☐ Less crowded than public transportation (7)
- ☐ Easy to pay (8)
- ☐ Efficient/Fast way to get where I need to be (9)
- ☐ Availability (10)
- ☐ Reliability (11)
- ☐ Timeliness (12)
- ☐ Comfort (13)
- ☐ Better than a taxi (14)
- ☐ Riding with other passengers (15)
- ☐ I want to socialize with other drivers and passengers (16)
- ☐ I do not drive (18)

☐ It is cheaper than paying parking fees (19)

☐ Traffic congestion (20)

☐ Other (please specify) (17)

____

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

USE6_2 Please indicate the reasons why you have used GrabShare. *(Select all that apply)*

☐ Convenience (1)

☐ Environmentally friendliness (2)

☐ Novelty (3)

☐ Price (4)

☐ Safety (5)

☐ Promotions (6)

☐ Less crowded than public transportation (7)

☐ Easy to pay (8)

☐ Efficient/Fast way to get where I need to be (9)

☐ Availability (10)

☐ Reliability (11)

☐ Timeliness (12)

- [ ] Comfort (13)
- [ ] Better than a taxi (14)
- [ ] Riding with other passengers (15)
- [ ] I want to socialize with other drivers and passengers (16)
- [ ] I do not drive (18)
- [ ] It is cheaper than paying parking fees (19)
- [ ] Traffic congestion (20)
- [ ] Other (please specify) (17) ____

Display This Question:

If USE3 = GrabCar (Private ride)

USE6_3 Please indicate the reasons why you have used GrabCar. *(Select all that apply)*

- [ ] Convenience (1)
- [ ] Environmentally friendliness (2)
- [ ] Novelty (3)
- [ ] Price (4)
- [ ] Safety (5)
- [ ] Promotions (6)
- [ ] Less crowded than public transportation (7)
- [ ] Easy to pay (8)

☐ Efficient/Fast way to get where I need to be (9)

☐ Availability (10)

☐ Reliability (11)

☐ Timeliness (12)

☐ Comfort (13)

☐ Better than a taxi (14)

☐ I do not drive (18)

☐ It is cheaper than paying parking fees (19)

☐ Click to write Choice 18 (20)

☐ Other (please specify) (17) ____

Display This Question:

If USE3 != GrabHitch (Carpool service)

USE7_1 Please indicate reasons why you haven't used **GrabHitch** services in the past? *(Select all that apply)*

☐ Safety (1)

☐ I've heard from others' bad experiences (2)

☐ Friends don't recommend it (3)

☐ I like to ride alone (4)

☐ I don't have a need for this type of service (5)

- [ ] Price (6)
- [ ] I've never heard of this service (7)
- [ ] I don't know how to use these service (8)
- [ ] Other (please specify) (9) ____

Display This Question:

If USE3 != GrabShare (Split the cost and share a ride with others heading in the same direction)

USE7_2 Please indicate reasons why you haven't used GrabShare services in the past? *(Select all that apply)*

- [ ] Safety (1)
- [ ] I've heard from others' bad experiences (2)
- [ ] Friends don't recommend it (3)
- [ ] I like to ride alone (4)
- [ ] I don't have a need for this type of service (5)
- [ ] Price (6)
- [ ] I've never heard of this service (7)
- [ ] I don't know how to use these service (8)
- [ ] Other (please specify) (9) ____

Display This Question:

If USE3 != GrabCar (Private ride)

USE7_3 Please indicate reasons why you haven't used GrabCar services in the past? *(Select all that apply)*

- ☐ Safety (1)
- ☐ I've heard from others' bad experiences (2)
- ☐ Friends don't recommend it (3)
- ☐ I like to ride alone (4)
- ☐ I don't have a need for this type of service (5)
- ☐ Price (6)
- ☐ I've never heard of this service (7)
- ☐ I don't know how to use these service (8)
- ☐ Other (please specify) (9) ____

Display This Question:

If USE3 != Grab Standard Taxi (Taxi service via the Grab app)

USE7_4 Please indicate reasons why you haven't used Grab Standard Taxi services in the past? *(Select all that apply)*

- ☐ Safety (1)
- ☐ I've heard from others' bad experiences (2)
- ☐ Friends don't recommend it (3)
- ☐ I like to ride alone (4)
- ☐ I don't have a need for this type of service (5)

- [ ] Price (6)
- [ ] I've never heard of this service (7)
- [ ] I don't know how to use these service (8)
- [ ] Other (please specify) (9) ____

Display This Question:

If USE3 != JustGrab (Get the closest car or taxi)

USE7_5 Please indicate reasons why you haven't used JustGrab services in the past? *(Select all that apply)*

- [ ] Safety (1)
- [ ] I've heard from others' bad experiences (2)
- [ ] Friends don't recommend it (3)
- [ ] I like to ride alone (4)
- [ ] I don't have a need for this type of service (5)
- [ ] Price (6)
- [ ] I've never heard of this service (7)
- [ ] I don't know how to use these service (8)
- [ ] Other (please specify) (9) ____

USE8 How likely are you to use the following services in the future after COVID-19 has passed?

	Very unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Very likely (5)
GrabHitch (1)	○	○	○	○	○
GrabShare (2)	○	○	○	○	○

USE9 Have you ever considered not using Grab's services anymore?

○ Yes *(please indicate why)* (1) ____

○ No (2)

SAT1 How satisfied are you with the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

	Very dissatisfied (1)	Dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Satisfied (4)	Very satisfied (5)
Display This Choice: *If USE3 = GrabHitch (Carpool service)* GrabHitch (1)	○	○	○	○	○
Display This Choice:	○	○	○	○	○

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)					
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (3)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

SAT2 How satisfied are you with the following characteristics of **GrabHitch**?

	Very dissatisfied (1)	Dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Satisfied (4)	Very satisfied (5)
Convenience (1)	○	○	○	○	○
Cost (2)	○	○	○	○	○
Safety (3)	○	○	○	○	○
Promotions (4)	○	○	○	○	○
Availability (5)	○	○	○	○	○
Punctuality (6)	○	○	○	○	○

Driver (7)	○	○	○	○	○
Comfort (8)	○	○	○	○	○
Riding with other passengers (9)	○	○	○	○	○

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

SAT3 How satisfied are you with the following characteristics of **GrabShare**?

	Very dissatisfied (1)	Dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Satisfied (4)	Very satisfied (5)
Convenience (1)	○	○	○	○	○
Cost (2)	○	○	○	○	○
Safety (3)	○	○	○	○	○
Promotions (4)	○	○	○	○	○
Availability (5)	○	○	○	○	○
Punctuality (6)	○	○	○	○	○
Driver (7)	○	○	○	○	○
Comfort (8)	○	○	○	○	○

Riding with other passengers (9)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

SAT4 How satisfied are you with the following characteristics of **GrabCar**?

	Very dissatisfied (1)	Dissatisfied (2)	Neither satisfied nor dissatisfied (3)	Satisfied (4)	Very satisfied (5)
Convenience (1)	○	○	○	○	○
Cost (2)	○	○	○	○	○
Safety (3)	○	○	○	○	○
Promotions (4)	○	○	○	○	○
Availability (5)	○	○	○	○	○
Punctuality (6)	○	○	○	○	○
Driver (7)	○	○	○	○	○
Comfort (8)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

SAT5 How likely are you to recommend using **GrabHitch** to family and friends?

	Very unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Very likely (5)
Female friend (1)	○	○	○	○	○
Female relative (2)	○	○	○	○	○
Male friend (3)	○	○	○	○	○
Male relative (4)	○	○	○	○	○

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

SAT6 How likely are you to recommend using **GrabShare** to family and friends?

	Very unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Very likely (5)
Female friend (1)	○	○	○	○	○
Female relative (2)	○	○	○	○	○
Male friend (3)	○	○	○	○	○
Male relative (4)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

SAT7 How likely are you to recommend using **GrabCar** to family and friends?

	Very unlikely (1)	Somewhat unlikely (2)	Neither likely nor unlikely (3)	Somewhat likely (4)	Very Likely (5)
Female friend (1)	○	○	○	○	○
Female relative (2)	○	○	○	○	○
Male friend (3)	○	○	○	○	○
Male relative (4)	○	○	○	○	○

Q0_TRUST How much do you trust each of the following ridesharing companies?

	None at all (1)	Not very much (2)	To some extent (3)	Very much (4)	Unsure (5)	Do not use services (6)
Grab (1)	○	○	○	○	○	○
Gojek (2)	○	○	○	○	○	○
Ryde (3)	○	○	○	○	○	○
TADA (4)	○	○	○	○	○	○
Uber *(when it was available in Singapore)* (5)	○	○	○	○	○	○

Display This Question:

If USE3 != GrabHitch (Carpool service)

And USE3 != GrabShare (Split the cost and share a ride with others heading in the same direction)

Q1_NonUser Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)	Not applicable (6)
Grab drivers are trustworthy (1)	○	○	○	○	○	○
I don't mind sharing a ridesharing service with people I don't know (2)	○	○	○	○	○	○
I'm most comfortable riding with people who look like me, even when I don't know them (3)	○	○	○	○	○	○
When I use ridesharing services, I prefer to ride alone (4)	○	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Q1_User Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)	Not applicable (6)
Grab drivers are trustworthy (1)	○	○	○	○	○	○
I don't mind sharing a ridesharing service with people I don't know (2)	○	○	○	○	○	○
I'm most comfortable riding with people who look like me, even when I don't know them (3)	○	○	○	○	○	○
When I use ridesharing services, I prefer to ride alone (4)	○	○	○	○	○	○

Display This Question:

If USE3 != GrabHitch (Carpool service)

And USE3 != GrabShare (Split the cost and share a ride with others heading in the same direction)

Q2_NonUser Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Grab keeps its promises (1)	○	○	○	○	○
Grab's services meet my needs (2)	○	○	○	○	○
Grab is trustworthy (3)	○	○	○	○	○
I think that Grab is concerned with the present and future interests of its users (4)	○	○	○	○	○

Display This Question: If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Q2_User Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Grab keeps its promises (1)	○	○	○	○	○
Grab's services meet my needs (2)	○	○	○	○	○
Grab is trustworthy (3)	○	○	○	○	○
I think that Grab is concerned with the present and future interests of its users (4)	○	○	○	○	○

Display This Question:

If USE3 != GrabHitch (Carpool service)

And USE3 != GrabShare (Split the cost and share a ride with others heading in the same direction)

Q3_NonUser Assuming you had to share a ride, to what extent do you trust each of the following?

	Not at all (1)	Not very much (2)	To some extent (3)	Very much (4)
Male ridesharing drivers (1)	○	○	○	○
Female ridesharing drivers (2)	○	○	○	○
Taxi drivers (3)	○	○	○	○
Sharing a ride with a stranger (4)	○	○	○	○
Sharing a ride with more than one stranger (5)	○	○	○	○
Sharing a ride with a friend (6)	○	○	○	○
Male ridesharing passengers who are strangers to you (7)	○	○	○	○
Female ridesharing passengers who are strangers to you (8)	○	○	○	○
Older male ridesharing passengers who are strangers to you (9)	○	○	○	○
Older female ridesharing passengers who are strangers to you (10)	○	○	○	○
Younger male ridesharing passengers who are	○	○	○	○

strangers to you (11)				
Younger female ridesharing passengers who are strangers to you (12)	○	○	○	○
Foreign ridesharing passengers who are strangers to you (13)	○	○	○	○
Local ridesharing passengers who are strangers to you (14)	○	○	○	○

Display This Question: If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Q3_User To what extent do you trust each of the following?

	Not at all (1)	Not very much (2)	To some extent (3)	Very much (4)
Male ridesharing drivers (1)	○	○	○	○
Female ridesharing drivers (2)	○	○	○	○
Taxi drivers (3)	○	○	○	○
Sharing a ride with a stranger (4)	○	○	○	○
Sharing a ride with more than one stranger (5)	○	○	○	○
Sharing a ride with a friend (6)	○	○	○	○
Male ridesharing passengers who are strangers to you (7)	○	○	○	○

Female ridesharing passengers who are strangers to you (8)	◯	◯	◯	◯
Older male ridesharing passengers who are strangers to you (9)	◯	◯	◯	◯
Older female ridesharing passengers who are strangers to you (10)	◯	◯	◯	◯
Younger male ridesharing passengers who are strangers to you (11)	◯	◯	◯	◯
Younger female ridesharing passengers who are strangers to you (12)	◯	◯	◯	◯
Foreign ridesharing passengers who are strangers to you (13)	◯	◯	◯	◯
Local ridesharing passengers who are strangers to you (14)	◯	◯	◯	◯

Display This Question:

If Q3_NonUser = Foreign ridesharing passengers who are strangers to you [Not very much]

Or Q3_NonUser = Foreign ridesharing passengers who are strangers to you [Not at all]

Q4_NonUser Please list the countries where people come from that you don't trust when sharing a ridesharing service:

____

Display This Question:

If Q3_User = Foreign ridesharing passengers who are strangers to you [Not at all]

Or Q3_User = Foreign ridesharing passengers who are strangers to you [Not very much]

Q4_User Please list the countries where people come from that you don't trust when sharing a ridesharing service:

____

Display This Question:

If USE3 = GrabHitch (Carpool service)

Q5_User Please indicate which of the following you do/have done, when using **GrabHitch** services? *(Select all that apply)*

- ▢ Engage in conversation with the driver (1)
- ▢ Engage in conversation with other passengers even when I don't know them (2)
- ▢ Greet driver (3)
- ▢ Greet other passengers (4)
- ▢ Use phone (5)
- ▢ Listen to music/watch videos with headphones (6)
- ▢ Stay silent (7)
- ▢ Read (8)
- ▢ Do work (9)
- ▢ Tip driver (10)
- ▢ Move seats for other passengers (11)
- ▢ Listen to radio (played by driver) (12)
- ▢ Sleep (13)
- ▢ ⊗None of the above (14)

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Q6_User Please indicate which of the following you have done/do, when using **GrabShare** services? *(Select all that apply)*

- ☐ Engage in conversation with the driver (1)
- ☐ Engage in conversation with other passengers even when I don't know them (2)
- ☐ Greet driver (3)
- ☐ Greet other passengers (4)
- ☐ Use phone (5)
- ☐ Listen to music/watch videos with headphones (6)
- ☐ Stay silent (7)
- ☐ Read (8)
- ☐ Do work (9)
- ☐ Tip driver (10)
- ☐ Move seats for other passengers (11)
- ☐ Listen to radio (played by driver) (12)
- ☐ Sleep (13)
- ☐ ⊗None of the above (14)

Display This Question:

If USE3 = GrabCar (Private ride)

Q7_User Please indicate which of the following you have done/do, when using **GrabCar** services? *(Select all that apply)*

- [ ] Engage in conversation with the driver (1)
- [ ] Engage in conversation with other passengers even when I don't know them (2)
- [ ] Greet driver (3)
- [ ] Greet other passengers (4)
- [ ] Use phone (5)
- [ ] Listen to music/watch videos with headphones (6)
- [ ] Stay silent (7)
- [ ] Read (8)
- [ ] Do work (9)
- [ ] Tip driver (10)
- [ ] Move seats for other passengers (11)
- [ ] Listen to radio (played by driver) (12)
- [ ] Sleep (13)
- [ ] None of the above (14)

Display This Question:

If D10 = Yes

Q8_CHILDTRUST On which of the following ridesharing service firms would you send your child on their own? *(Select all that apply)*

- ☐ Grab (1)
- ☐ Gojek (2)
- ☐ Ryde (3)
- ☐ TADA (4)
- ☐ ⊗I would not send my child on a ridesharing service on their own (5)

Display This Question:

If Q8_CHILDTRUST = Grab

Q9_CHGRABTRUST Which one of the Grab ridesharing services would you use? *(Select all that apply)*

- ☐ GrabCar (1)
- ☐ GrabHitch (2)
- ☐ GrabShare (3)
- ☐ GrabTaxi (4)
- ☐ JustGrab (5)

End of Block: TRUST

Start of Block: PERCEIVED RISK

PRISK_1 How safe would you feel using the following transportation services?

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Taxi (1)	○	○	○	○	○
Bus (2)	○	○	○	○	○
Rail (3)	○	○	○	○	○
Ridesharing service (4)	○	○	○	○	○

PRISK_2 How safe would you feel using the following Grab services?

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
GrabCar (1)	○	○	○	○	○
GrabHitch (2)	○	○	○	○	○
GrabShare (3)	○	○	○	○	○
Grab Standard Taxi (4)	○	○	○	○	○
JustGrab (5)	○	○	○	○	○

PRISK_3 How safe would you feel if you shared/had to share a ride with strangers from the following ethnic backgrounds?

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Chinese Singaporean (1)	○	○	○	○	○
Indian Singaporean (2)	○	○	○	○	○
Malay Singaporean (3)	○	○	○	○	○
Other Singaporean (4)	○	○	○	○	○
Indian foreigner (5)	○	○	○	○	○
Chinese foreigner (6)	○	○	○	○	○
Caucasian foreigner (7)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

PRISK_4_1 Please indicate how safe you feel when using **GrabHitch** in the following situations:

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Falling asleep in a shared ride (1)	○	○	○	○	○
Falling asleep when only riding with the driver (2)	○	○	○	○	○
Having passengers you share a ride with see where you are picked up (3)	○	○	○	○	○

Having passengers you share a ride with see where you are dropped off (4)	○	○	○	○	○
Having the driver know our actual pick up location (the exact place where you are coming from, not where you are being picked up) (5)	○	○	○	○	○
Having the driver know your actual drop off location (the exact place where you are going to, no where you are being dropped off) (6)	○	○	○	○	○
Riding during the day (7)	○	○	○	○	○
Riding in the early evening (8)	○	○	○	○	○
Riding at night (9)	○	○	○	○	○
Riding after midnight (10)	○	○	○	○	○
Sending my child on a ridesharing ride on their own (11)	○	○	○	○	○
Sending my child on a ridesharing ride with passengers	○	○	○	○	○
I don't know (12)					

Display this question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

PRISK_4_2 Please indicate how safe you feel when using **GrabShare** in the following situations:

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Falling asleep in a shared ride (1)	○	○	○	○	○
Falling asleep when only riding with the driver (2)	○	○	○	○	○
Having passengers you share a ride with see where you are picked up (3)	○	○	○	○	○
Having passengers you share a ride with see where you are dropped off (4)	○	○	○	○	○
Having the driver know our actual pick up location (the exact place where you are coming from, not where you are being picked up) (5)	○	○	○	○	○
Having the driver know your actual drop off location (the exact place where you are going to, no where you are being dropped off) (6)	○	○	○	○	○
Riding during the day (7)	○	○	○	○	○

Riding in the early evening (8)	○	○	○	○	○
Riding at night (9)	○	○	○	○	○
Riding after midnight (10)	○	○	○	○	○
Sending my child on a ridesharing ride on their own (11)	○	○	○	○	○
Sending my child on a ridesharing ride with passengers I don't know (12)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

PRISK_4_3 Please indicate how safe you feel when using **GrabCar** in the following situations:

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Falling asleep when only riding with the driver (2)	○	○	○	○	○
Having passengers you share a ride with see where you are picked up (3)	○	○	○	○	○
Having passengers you share a ride with see where you are dropped off (4)	○	○	○	○	○

Having the driver know our actual pick up location (the exact place where you are coming from, not where you are being picked up) (5)	○	○	○	○	○
Having the driver know your actual drop off location (the exact place where you are going to, no where you are being dropped off) (6)	○	○	○	○	○
Riding during the day (7)	○	○	○	○	○
Riding in the early evening (8)	○	○	○	○	○
Riding at night (9)	○	○	○	○	○
Riding after midnight (10)	○	○	○	○	○
Sending my child on a ridesharing ride on their own (11)	○	○	○	○	○
Sending my child on a ridesharing ride with passengers I don't know (12)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

PRISK_5 With regards to GrabShare and/or GrabHitch, do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
I am concerned that I would be harassed by ridesharing drivers (1)	○	○	○	○	○
I am concerned that I would be harassed by other ridesharing passengers (2)	○	○	○	○	○
I am concerned about getting into a car accident using ridesharing services (3)	○	○	○	○	○
I am concerned that GrabShare and/or GrabHitch do not have proper insurance (4)	○	○	○	○	○
I am concerned that I would not reach my destination in time using ridesharing services (5)	○	○	○	○	○
I made the correct decision when I decided to use GrabShare and/or GrabHitch (6)	○	○	○	○	○

Display This Question:

If USE1 = Grab

PRISK_6 Please indicate how safe you feel when using Grab ridesharing service app in the following situations:

	Very unsafe (1)	Unsafe (2)	Neither safe nor unsafe (3)	Safe (4)	Very safe (5)
Adding my credit/debit card information to the ridesharing service app (1)	○	○	○	○	○
The ridesharing firm storing my personal information (pick up, drop off location, gender, picture, etc.) on their service app (2)	○	○	○	○	○
My data being shared with other companies (3)	○	○	○	○	○

Display This Question:

If USE1 = Grab

PRISK_7 Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
I am concerned that my personal information will be shared or showed to others when I	○	○	○	○	○

use ridesharing services (1)					
I am concerned that ridesharing services collect too much personal information from me (2)	○	○	○	○	○
I am concerned about sharing my credit card or bank payment information on ridesharing services (3)	○	○	○	○	○

PRISK_8 Which zones within Singapore, if any, do you feel unsafe taking a ridesharing service? Type None if you feel safe everywhere or type the zone where you feel unsafe.

____

PRISK_9 Have you experienced harassment on public transportation (bus or rail?)

○ Yes (1)

○ No (2)

Display This Question:

If PRISK_9 = Yes

PRISK9_1 When did you last experience harassment on a bus or rail?

○ In the last month (1)

○ In the last 6 months (2)

○ In the last 12 months (3)

○ More than a year ago (4)

PRISK_10 Have you experienced harassment while using a taxi?

- Yes (1)
- No (2)

Display This Question:

If PRISK_10 = Yes

PRISK10_1 When did you last experience harassment on a taxi?

- In the last month (1)
- In the last 6 months (2)
- In the last 12 months (3)
- More than a year ago (4)

PRISK11 Have you experienced harassment while using a ridesharing service (Grab, Gojek, Uber, etc.)?

- Yes (1)
- No (2)

Display This Question:

If PRISK11 = Yes

PRISK11_1 When did you last experience harassment on a ridesharing service?

- In the last month (1)
- In the last 6 months (2)
- In the last 12 months (3)
- More than a year ago (4)

Display This Question:

If USE3 = GrabCar (Private ride)

Or USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

PBENEFIT_1 Please rank the following transportation services in order of how **convenient** you find them, where 1 = Most convenient. *(Drag and drop the options to rank them)*

______ GrabHitch (1)
______ GrabShare (2)
______ GrabCar (3)
______ GrabTaxi (4)
______ JustGrab (5)
______ Bus (6)
______ Rail (7)
______ Taxi (8)
______ Your own car (9)
______ Carpooling with a friend or relative in their car (11)

Display This Question:

If USE3 = GrabCar (Private ride)

Or USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

PBENEFIT_2 Thinking about **more value for money**, rank the following transportation services where 1 = gives you most value for the money. *(Drag and drop the options to rank them)*

______ GrabHitch (1)
______ GrabShare (2)
______ GrabCar (3)
______ GrabTaxi (4)
______ JustGrab (5)
______ Bus (6)
______ Rail (7)
______ Taxi (8)
______ Owning a car (9)
______ Carpooling on my own (10)

Display This Question:

If USE3 = GrabCar (Private ride)

Or USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

PBENEFIT_3 Thinking about how **reliable** each of the following transportation services are, rank the following transportation services where 1 = most reliable. *(Drag and drop the options to rank them)*

_______ GrabHitch (1)
_______ GrabShare (2)
_______ GrabCar (3)
_______ GrabTaxi (4)
_______ JustGrab (5)
_______ Bus (6)
_______ Rail (7)
_______ Taxi (8)
_______ Owning a car (9)
_______ Carpooling on my own (10)

EASE_1 What is your payment experience for the following ride sharing services?

Display This Choice:

If USE1 = Grab

Display This Choice:

If USE1 = Gojek

Display This Choice:

If USE1 = Ryde

Display This Choice:

If USE1 = TADA

Display This Choice:

If USE1 = Uber (when it was available in Singapore)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)	Never used services (6)
Display This Choice: If USE1 = Grab Grab (1)	○	○	○	○	○	○
Display This Choice:	○	○	○	○	○	○

If USE1 = Gojek Gojek (2)						
Display This Choice: *If USE1 = Ryde* Ryde (3)	○	○	○	○	○	○
Display This Choice: *If USE1 = TADA* TADA (4)	○	○	○	○	○	○
Display This Choice: *If USE1 = Uber (when it was available in Singapore)* Uber *(when it was available Singapore)* (5)	○	○	○	○	○	○

EASE_2 What is your customer service experience for the following ride sharing services?

Display This Choice:

If USE1 = Grab

Display This Choice:

If USE1 = Gojek

Display This Choice:

If USE1 = Ryde

Display This Choice:

If USE1 = TADA

Display This Choice:

If USE1 = Uber (when it was available in Singapore)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)	Never contacted (6)

Display This Choice: If USE1 = Grab Grab (1)	○	○	○	○	○	○
Display This Choice: If USE1 = Gojek Gojek (2)	○	○	○	○	○	○
Display This Choice: If USE1 = Ryde Ryde (3)	○	○	○	○	○	○
Display This Choice: If USE1 = TADA TADA (4)	○	○	○	○	○	○
Display This Choice: If USE1 = Uber (when it was available in Singapore) Uber *(when it was available Singapore)* (5)	○	○	○	○	○	○

EASE_3 What was your experience when completing a ride from point of origin to your intended destination for the following ridesharing companies?

Display This Choice:

If USE1 = Grab

Display This Choice:

If USE1 = Gojek

Display This Choice:

If USE1 = Ryde

Display This Choice:

If USE1 = TADA

Display This Choice:

If USE1 = Uber (when it was available in Singapore)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)	Never used services (6)
Display This Choice: If USE1 = Grab Grab (1)	○	○	○	○	○	○
Display This Choice: If USE1 = Gojek Gojek (2)	○	○	○	○	○	○
Display This Choice: If USE1 = Ryde Ryde (3)	○	○	○	○	○	○
Display This Choice: If USE1 = TADA TADA (4)	○	○	○	○	○	○

Display This Choice: *If USE1 = Uber (when it was available in Singapore)* Uber *(when it was available Singapore)* (5)	○	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = GrabCar (Private ride)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

EASE_4 What was your experience when booking a ride on the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

Display This Choice:

If USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Display This Choice:

If USE3 = JustGrab (Get the closest car or taxi)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)
Display This Choice: *If USE3 = GrabHitch*	○	○	○	○	○

(Carpool service) GrabHitch (1)					
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)	○	○	○	○	○
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (4)	○	○	○	○	○
Display This Choice: If USE3 = Grab Standard Taxi (Taxi service via the Grab app) Grab Standard Taxi (3)	○	○	○	○	○
Display This Choice: If USE3 = JustGrab (Get the closest car or taxi) JustGrab (5)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = GrabCar (Private ride)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

EASE_5 What is your customer service experience for the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

Display This Choice:

If USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Display This Choice:

If USE3 = JustGrab (Get the closest car or taxi)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)	Never contacted (6)
Display This Choice: If USE3 = GrabHitch (Carpool service) GrabHitch (1)	○	○	○	○	○	○
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)	○	○	○	○	○	○

GrabShare (2)						
Display This Choice: If USE3 = GrabCar (Private ride) GrabCar (3)	○	○	○	○	○	○
Display This Choice: If USE3 = Grab Standard Taxi (Taxi service via the Grab app) Grab Standard Taxi (4)	○	○	○	○	○	○
Display This Choice: If USE3 = JustGrab (Get the closest car or taxi) JustGrab (5)	○	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Or USE3 = GrabCar (Private ride)

Or USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Or USE3 = JustGrab (Get the closest car or taxi)

EASE_6 What was your experience when completing a ride from point of origin to your intended destination for the following Grab services?

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabCar (Private ride)

Display This Choice:

If USE3 = Grab Standard Taxi (Taxi service via the Grab app)

Display This Choice:

If USE3 = JustGrab (Get the closest car or taxi)

	Very difficult (1)	Difficult (2)	Neither easy nor difficult (3)	Easy (4)	Very easy (5)
Display This Choice: If USE3 = GrabHitch (Carpool service) GrabHitch (1)	○	○	○	○	○
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) GrabShare (2)	○	○	○	○	○

Display This Choice: *If USE3 = GrabCar (Private ride)* GrabCar (3)	○	○	○	○	○
Display This Choice: *If USE3 = Grab Standard Taxi (Taxi service via the Grab app)* Grab Standard Taxi (4)	○	○	○	○	○
Display This Choice: *If USE3 = JustGrab (Get the closest car or taxi)* JustGrab (5)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

PUSEFUL_4 Do you agree or disagree that **GrabHitch** makes it **easy** for you to... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Be environmentally friendly (1)	○	○	○	○	○
Find a ride (2)	○	○	○	○	○
Travel to destination efficiently (3)	○	○	○	○	○
Expand your social network (4)	○	○	○	○	○

Travel around town at any time of day (5)	○	○	○	○	○

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

PUSEFUL_5 Do you agree or disagree that **GrabShare** makes it **easy** for you to... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Be environmentally friendly (1)	○	○	○	○	○
Find a ride (2)	○	○	○	○	○
Travel to destination efficiently (3)	○	○	○	○	○
Expand your social network (4)	○	○	○	○	○
Travel around town at any time of day (5)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

PUSEFUL_6 Do you agree or disagree that **GrabCar** makes it **easy** for you to... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Be environmentally friendly (1)	○	○	○	○	○
Find a ride (2)	○	○	○	○	○
Travel to destination efficiently (3)	○	○	○	○	○

Expand your social network (4)	○	○	○	○	○
Travel around town at any time of day (5)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

Or USE3 = GrabHitch (Carpool service)

Or USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

SNORM Do you agree or disagree with the following statements?

Display This Choice:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

Display This Choice:

If USE3 = GrabHitch (Carpool service)

Display This Choice:

If USE3 = GrabCar (Private ride)

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)	Does not apply (6)
Display This Choice: If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction) The people who are close to me are supportive of me using GrabShare (1)	○	○	○	○	○	○
Display This Choice:	○	○	○	○	○	○

If USE3 = GrabHitch (Carpool service)						
The people who are close to me are supportive of me using GrabHitch (2)						
Display This Choice: If USE3 = GrabCar (Private ride)						
The people who are close to me are supportive of me using GrabCar (3)	○	○	○	○	○	○
The people who are close to me are supportive of me riding with drivers who are strangers in shared rides (4)	○	○	○	○	○	○
The people who are close to me are supportive of me riding with other passengers who are strangers in shared rides (5)	○	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

PUSEFUL_1 Please rank the following in order of importance when using **GrabHitch** with 1 = most important and 5 = least important. *(Drag and drop the options to rank them)*

______ Getting to my destination more quickly (1)
______ Improving my commute productivity (2)
______ Mitigating traffic congestion (3)
______ Being environmentally friendly (4)
______ Expanding my social network (5)

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

PUSEFUL_2 Please rank the following in order of importance when using **GrabShare** with 1 = most important and 5 = least important. *(Drag and drop the options to rank them)*

______ Getting to my destination more quickly (1)
______ Improving my commute productivity (2)
______ Mitigating traffic congestion (3)
______ Being environmentally friendly (4)
______ Expanding my social network (5)

Display This Question:

If USE3 = GrabCar (Private ride)

PUSEFUL_3 Please rank the following in order of importance when using **GrabCar** with 1 = most important and 5 = least important. *(Drag and drop the options to rank them)*

______ Getting to my destination more quickly (1)
______ Improving my commute productivity (2)
______ Mitigating traffic congestion (3)
______ Being environmentally friendly (4)
______ Expanding my social network (5)

Display This Question:

If USE3 = GrabHitch (Carpool service)

PUSEFUL_7 Do you agree or disagree that **GrabHitch** is **useful** for... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Finding a ride (1)	○	○	○	○	○
Traveling to your destination (2)	○	○	○	○	○
Being environmentally friendly (3)	○	○	○	○	○
Expanding your social network (4)	○	○	○	○	○

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

PUSEFUL_8 Do you agree or disagree that **GrabShare** is **useful** for... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Finding a ride (1)	○	○	○	○	○
Traveling to your destination (2)	○	○	○	○	○
Being environmentally friendly (3)	○	○	○	○	○
Expanding your social network (4)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

PUSEFUL_9 Do you agree or disagree that **GrabCar** is **useful** for... ?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
Finding a ride (1)	○	○	○	○	○
Traveling to your destination (2)	○	○	○	○	○
Being environmentally friendly (3)	○	○	○	○	○
Expanding your social network (4)	○	○	○	○	○

Display This Question:

If USE3 = GrabHitch (Carpool service)

CONFIRM_1 Do you agree or disagree with the following?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
My experience with GrabHitch has usually been better than expected. (1)	○	○	○	○	○
The service level provided by GrabHitch has usually been better than expected. (2)	○	○	○	○	○
Overall, most of my expectations when using GrabHitch have usually been confirmed. (3)	○	○	○	○	○

Display This Question:

If USE3 = GrabShare (Split the cost and share a ride with others heading in the same direction)

CONFIRM_2 Do you agree or disagree with the following?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
My experience with GrabShare has usually been better than expected (1)	○	○	○	○	○
The service level provided by GrabShare has usually been better than expected (2)	○	○	○	○	○
Overall, most of my expectations when using GrabShare have usually been confirmed (3)	○	○	○	○	○

Display This Question:

If USE3 = GrabCar (Private ride)

CONFIRM_3 Do you agree or disagree with the following?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
My experience with GrabCar has usually been better than expected (1)	○	○	○	○	○
The service level provided by GrabCar has usually been better than expected (2)	○	○	○	○	○
Overall, most of my expectations when using GrabCar have usually been confirmed (3)	○	○	○	○	○

CONFIRM_4 Have you ever experienced one or more of the following? *(Select all that apply)*

- ☐ Credit card fraud (1)
- ☐ E-payment fraud (2)
- ☐ Online privacy violations (3)
- ☐ ⊗None of the above (4)

Display This Question:

If USE1 = Grab

CONFIRM_5 Have you ever contacted Grab's customer service?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If CONFIRM_5 = Yes

CONFIRM_5B How satisfied were you with the outcome of your most recent interaction with Grab's customer service?

- ○ Very dissatisfied (1)
- ○ Somewhat dissatisfied (2)
- ○ Neither satisfied nor dissatisfied (3)
- ○ Somewhat satisfied (4)
- ○ Very satisfied (5)

Display This Question:

If CONFIRM_5 = Yes

CONFIRM_5A Was your issue resolved when you last contacted Grab's customer service?

○ Yes (1)

○ No (2)

ENVIRON Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
I consider the potential environmental impact of my actions when making travel decisions (1)	○	○	○	○	○
I am concerned about wasting the resources of our planet (2)	○	○	○	○	○
I would like to describe myself as environmentally responsible (3)	○	○	○	○	○
I am willing to be inconvenienced to take actions that are more environmentally friendly (4)	○	○	○	○	○

INNOV Do you agree or disagree with the following statements?

	Completely disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Completely agree (5)
If I hear about a new technology or service, I would look for ways to experiment with it (1)	○	○	○	○	○
I am usually the first one to try new technologies or services among my peers (2)	○	○	○	○	○
I like to experience new technologies or services (3)	○	○	○	○	○