Habal-Habal: Characteristics of Motorcycle Taxi Users in Metropolitan Manila

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บริการรถมอเตอร์ไซค์สาธารณะในประเทศฟิลิปปินส์ (ภาษาท้องถิ่นเรียกว่า : habal-habal) ได้รับการพิจารณาให้สามารถบริการได้เฉพาะในพื้นที่ชนบท ที่ระบบขนส่งสาธารณะไม่เพียงพอหรือเข้าไม่ถึง แต่กลับถูกมองว่าเป็นการบริการที่ผิดกฎหมายและไม่มีความปลอดภัย โดยเฉพาะอย่างยิ่งในกรุงมะนิลา จากการบันทึกพบว่ามากกว่าร้อยละ 30 ของการเกิดอุบัติเหตุร้ายแรงเกิดจากรถจักรยานยนต์ อย่างไรก็ตามความแออัดของการจราจรที่ทวีความรุนแรงมากขึ้นในเขตเมืองส่งผลให้เกิดการเจริญเติบโตของเมืองและทำให้ผู้เดินทางสนใจทางเลือกของการเดินทางอื่นๆ ที่มีความรวดเร็ว น่าเชื่อถือ และมีค่าโดยสารที่เหมาะสม สำหรับความเข้าใจที่ไม่เพียงพอเกี่ยวกับบทบาทของ habal-habal ในการให้บริการภายในเมืองอาจทำให้เกิดความเสี่ยงที่มากขึ้น โดยเฉพาะประชาชนที่ต้องการเดินทางไปมา ซึ่งความเข้าใจพื้นฐานของการดำเนินการจำเป็นอย่างมากสำหรับเจ้าหน้าที่เพื่อที่จะสามารถกำหนดหรือดำเนินนโยบายเพื่อใช้ในการหลีกเลี่ยงความซ้ำซ้อนในโครงสร้างของการขนส่งสาธารณะที่มีอยู่ในกรุงมะนิลา การใช้แบบจำลองทางเลือกแบบไม่ต่อเนื่องถูกนำมาใช้เพื่อหาปัจจัยต่าง ๆ ที่ส่งผลต่อความน่าจะเป็นในการเลือกโหมดการเดินทางของผู้เดินทาง ผลลัพธ์ที่ได้จากการศึกษาพบว่าคุณลักษณะที่เกี่ยวข้องกับการเดินทางเช่น ระยะทางและวัตถุประสงค์ของการเดินทางเป็นปัจจัยหลักที่ทำให้ผู้เดินทางเลือกใช้บริการ habal-habal มากกว่ารูปแบบการขนส่งอื่นๆ การวิจัยครั้งนี้มีความสำคัญอย่างยิ่งเนื่องจากเป็นการศึกษาความเข้าใจพื้นฐานเกี่ยวกับผู้ใช้บริการ habal-habal ภายในกรุงมะนิลา ซึ่งจำเป็นอย่างยิ่งสำหรับการกำหนดนโยบายหรือการแก้ไขปัญหาการให้บริการ habal-habal ต่อไป

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Sebastian Mapili Cano : Habal-Habal: Characteristics of Motorcycle Taxi Users in Metropolitan Manila. Advisor: Assoc. Prof. Saksith Chalermpong, Ph.D.

Motorcycle taxi services in the Philippines (locally referred to as *habal-habal*) has been deemed to be operating only in rural areas wherein public transportation is inadequate or is utterly absent. It is also perceived as illegal and unsafe for urban operations, especially in a conurbation like Metro Manila wherein more than 30% of recorded fatal road accidents come from motorcycles. However, the worsening traffic congestion in the metropolis has spurred its growing urban presence and has led the attention of commuters to alternative modes of transport that are fast, reliable, and affordable. Inadequate understanding of habal-habal's role in the urban transportation context could render it as a risk than a service to the commuting public. It is imperative for authorities to understand the fundamentals of habal-habal operations before formulating or implementing policies in order to avoid complications and redundancy in the existing public transportation structure. Discrete choice modeling was utilized in order to adequately gauge the factors that significantly affect the mode choice probabilities of commuters. Empirical results suggest that trip-related characteristics, such as distance and purpose, are perceived by urban commuters as motivating factors for choosing habal-habal services over conventional modes of transport. This research and its findings are significant as it provides the fundamental understanding on urban habal-habal users that is needed for policy formulation or emendation.

Field of Study:	Civil Engineering	Student's Signature .....
Academic Year:	2018	Advisor's Signature .....

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Sebastian Mapili Cano

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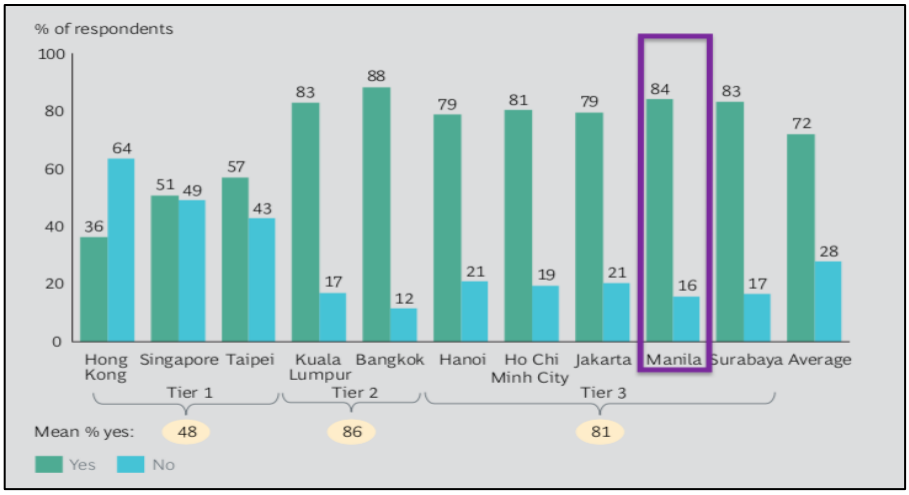
INTRODUCTION

1.1 Background of the Study

The National Capital Region (NCR) or commonly known as Metro Manila is the Philippine's seat of government, it is also the country's center for commerce, culture, education, industry, and trade. The metropolitan region is comprised of 16 highly-urbanized and independent cities and 1 municipality. As the country's primary region, it is home to millions of individuals, thousands of businesses and industries, and hundreds of higher-academic institutions. In an estimate of the Philippine Statistics Authority (PSA) in 2017 (*Gross Domestic Product of the Philippines Highlights for 2017*, 2018), almost 37% percent of the country's gross domestic product (GDP) was produced in the region. This quantity indicates the robust economic activities of the metropolis, which can be translated to the millions of traffic demand generated per day. A study conducted by the Japan International Cooperation Agency (JICA) in 2012 estimated the region's traffic demand at 12.8 million trips per day ("Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas," 2014). Moreover, the provinces surrounding Metro Manila (Bulacan, Rizal, Laguna, and Cavite) generates an additional 6 million trips per day.

Urban transportation in Metro Manila, as much of how it is in developing cities, is heavily reliant on road-based transportation (Cervero, 2000). As mentioned earlier, the traffic or travel demand in the metropolis was estimated at 12.8 million trips per day, 69% of which comes from the public transportation sector, which holds the largest share in the region's travel demand ("Roadmap for Transport Infrastructure

Development for Metro Manila and Its Surrounding Areas," 2014). Interestingly enough, the National Center for Transportation Studies (2016) estimated that 78% of the Metro Manila's road space is occupied by private vehicles. Given these figures, it is apparent that road space is not shared efficiently between private and public-oriented vehicles ("Reboot, Reconfigure and Rationalize – Statement of the National Center for Transportation Studies on the Proposed Emergency Powers to Solve Transport and Traffic Problems in Metropolitan Manila," 2016). Private mobility is highly preferred by the middle- and high-income citizens of Manila as public transportation is deemed inefficient and inconvenient, primarily due to its poor integration (Mabazza, 2017). The trend of private motorization is deemed to increase significantly in the future as more individuals are enticed to invest on private modes of transport. A considerable proportion of the respondents in Metro Manila from the Boston Consulting Group's (BCG) study in 2017 revealed that 84% plan to buy a car within the next five years.



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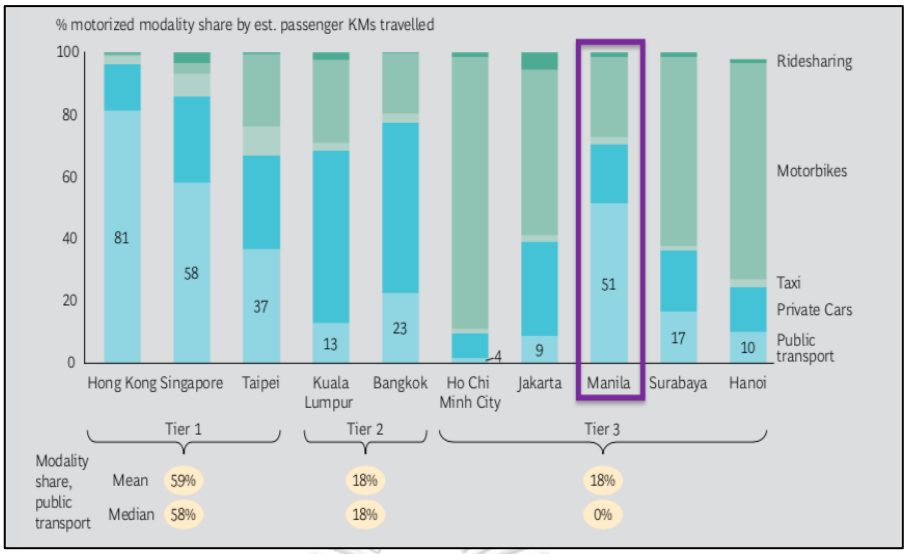


(b)

Figure 1. (a) Percentage of respondents who plan to buy a car within the next five years (b) and mileage mobility share by vehicle type
Source: The Boston Consulting Group, Inc. (2017)

However, the same study (refer to Figure 1) also implies that majority of Metro Manila's population, especially the working-class population, rely heavily on its inefficient public transportation system ("Unlocking Cities – The impact of ridesharing in Southeast Asia and beyond," 2017).

Public transportation in the National Capital Region is widely available in several forms (see Figure 2), both in formal and informal mode, but is dominantly provided and operated by the private sector, especially in road-based public transportation (Mijares et al., 2014). This condition has greatly reduced the function of the government as a provider of basic transportation services to merely grantors of franchises that are contracted to individual transport providers. The inadequacy of public investment in formal modes of transportation plus the increasing demand for urban travel in Metro Manila over the years has resulted to the continuous initiative of private operators to provide paratransit (or informal) services that has greater service

coverage and affordability than existing formal modes of transport (Mabazza, 2017). The privatization of public transport services, specifically road-based transportation modes, has produced a seemingly open-for-all market condition (Cervero, 2000) that fosters fierce competition between modes and operators on the congested and inadequate road network of Metro Manila. Competition is very evident on major arterials of the metropolis; to which, several modes of transport, both formal and informal, conduct their operations. Drivers and operators aim to maximize profits by hoarding as much passengers as they can and by outpacing their competitors along revenue routes (Mijares et al., 2014). This competitive behavior is often imputed for the reckless and undisciplined behavior of public transport drivers, which in turn causes accidents and horrendous traffic congestions on the roads of the metropolis.

Comparable to cities of developing countries, Metro Manila is no stranger to the displeasures brought by traffic congestion, which can be attributed to incoherent urban road networks and inadequate public transport infrastructures. The Boston Consulting Group's (BCG) report in 2017, which was commissioned by UBER Technologies Inc., places Metro Manila as the third most traffic-congested city in Southeast Asia based on an additional 66 minutes of travel time on the road ("Unlocking Cities – The impact of ridesharing in Southeast Asia and beyond," 2017). Moreover, in the previously mentioned study by JICA in 2012, most of Metro Manila's roads are at a volume-to-capacity ratio of 0.80 with travel speeds averaging at or below 20kph. The estimated losses in potential economic income of the region due to congestion was at PHP 2.40 billion per day in 2012 (approximately $60 million daily). Given that no measures or interventions are done by the government, and that traffic demand is expected to increase to 15 million trips per day in 2030, this quantity

could balloon to economic losses estimated at PHP 4.70 billion per day (approx. $140 million daily) (see Table 1).

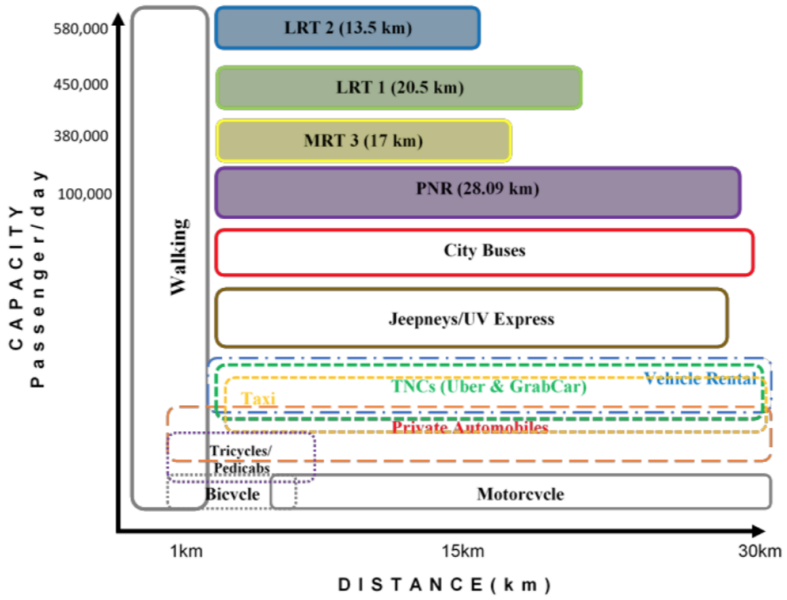


Figure 2. Modes of Transportation in Metropolitan Manila
Source: (Paronda et al., 2016)

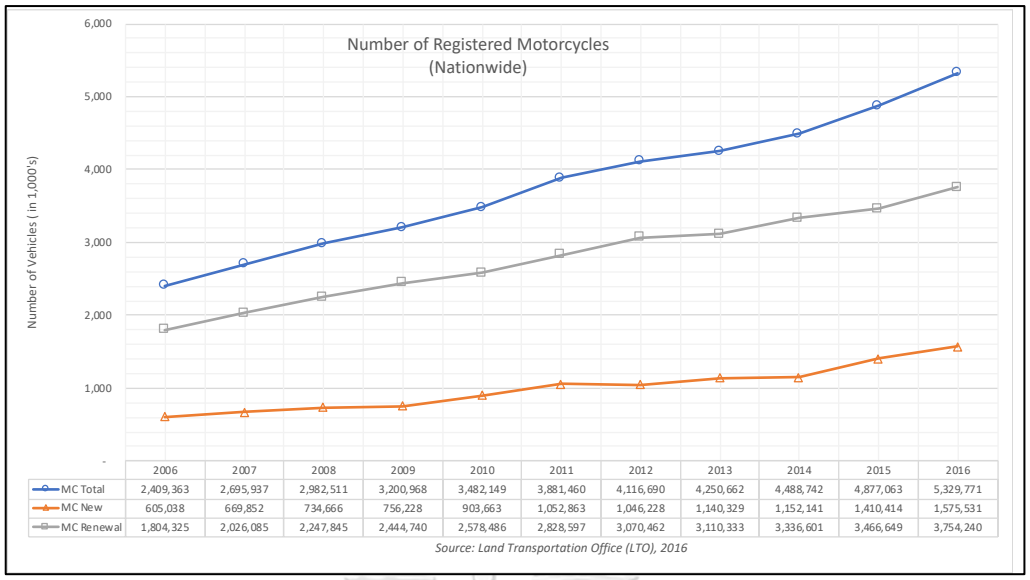
The severe congestion in Metro Manila has turned the attention of commuters to alternative modes of transport that are either fast, reliable, and congestion-free (Bartolay, 2017). In recent years, motorcycles have seen a significant increase in volume and presence in the streets of the metropolis (see Figure 3). The number of registered motorcycles in the country has been significantly increasing as it meets the required basic mobility of people, especially for urban dwellers, at a much affordable rate as compared to an automobile. Furthermore, public conveyance with the use of a motorcycle has been becoming a popular mode of transport in Metro Manila to rid commuters of the complications brought by traffic congestion (Napalang et al., 2017).

Table 1. Traffic Demand and Impacts in Metro Manila (2012 Study)

			2012	2030	'30/'12
Traffic demand (mil. trips/day)	Metro Manila		12.8	14.5	1.13
	Bulacan, Rizal, Laguna, Cavite (BRLC)		6.0	8.0	1.33
Public transport share in total demand			69%	69%	1.00
Occupancy of road space by private vehicles			78%	78%	1.00
Transport cost (PHP billion/day)	Metro Manila		2.4	4.7	1.96
	Bulacan, Rizal, Laguna, Cavite (BRLC)		1.0	2.4	2.40
Air quality (million Tons/year)	Metro Manila	GHG	4.79	5.72	1.19
		NOx	0.049	0.059	1.20
		PM	0.014	0.019	1.36
	BRLC	GHG	3.20	4.49	1.40
		NOx	0.032	0.046	1.44
		PM	0.005	0.010	2.00

Source: JICA Study Team.
[1]This is the "without" projects or "Do Nothing" scenario.

Motorcycle taxi services in the Philippines, locally referred to as *habal-habal*, has been deemed to be operating only in rural areas wherein public transportation is inadequate or is utterly nonexistent (Guillen & Ishida, 2004). But as congestion rates continue to worsen mobility levels in Metro Manila, urban operations have transpired in order to address travel demands of urban dwellers. In the government's perspective, motorcycle taxi or *habal-habal* operations, especially in the context of urban transportation, is inappropriate and illegal. But as Cervero and Golub (2007) mentioned in their study, an informal transport mode that meets the basic mobility requirements of a niche market, will thrive and continue to do so unless the problems that caused its proliferation are addressed (Cervero & Golub, 2007). The operation of motorcycle as a public mode of conveyance is also considered a risk, particularly when operating in a conurbation like the National Capital Region, due primarily to safety and accountability issues of relevant stakeholders involved (Tuffour & Nkrumah, 2014).



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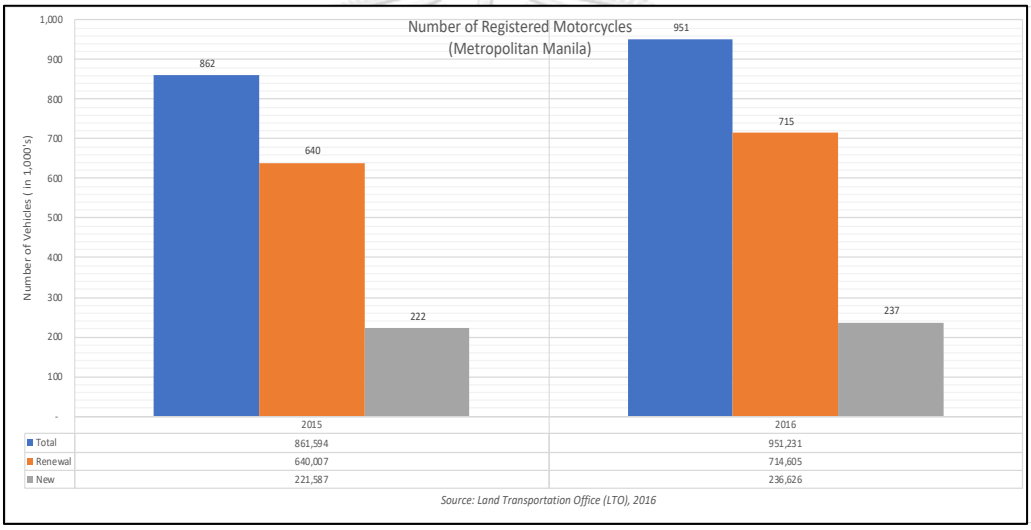


(b)

Figure 3. Number of registered motorcycles in (a) The Philippines and (b) Metropolitan Manila

1.2 Problem Statement

Motorcycle operation in the Philippines is essentially permitted for private or personal trips only. Under the Republic Act 4136 (RA 4136) or otherwise known as the "*Land Transportation and Traffic Code*" enacted in 1964, motorcycle vehicles must be duly registered annually and that operators must meet the necessary requirements in order to operate the vehicle. Although it was not explicitly stated, the

law implies the usage of motorcycles for private purposes only. Furthermore, the Department of Transportation (DOTr, previously known as the Department of Transportation and Communications) issued a department order in 1997 (DO 97-1097) that provides a standard classification for public transport conveyances in the country (see Figure 4).

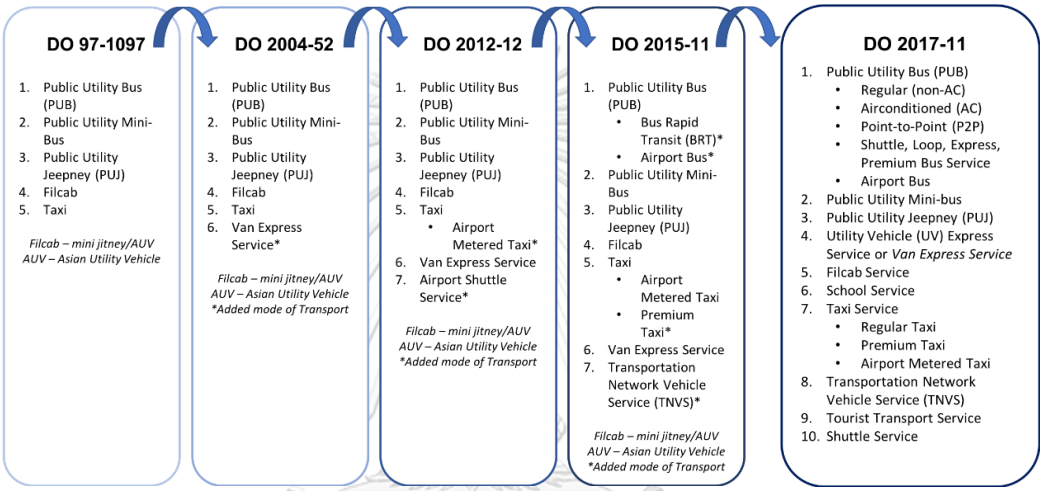


Figure 4. Standardized Classification of Road-based Public Transportation in the Philippines

Source: Online Records of the LTFRB and DOTr

The department order aimed to resolve confusions among transport service providers and commuters, and to provide a basis for the issuance of the Certificate of Public Convenience (CPC). A CPC permits a private operator to serve in the public transport industry with a registered public utility vehicle (PUV) and to collect regulated fares from passengers. The Land Transportation and Regulatory Board (LTFRB) is the agency responsible for the issuance of the CPC; which is an agency under the DOTr. Department Order 97-1097 was further amended in the following years, examples of which are in 2004 (DO 2004-52), 2012 (DO 2012-12) and in 2015

(DO 2015-011). Revisions were made in order to accommodate additional modes of innovative and adaptive public transport conveyances.

In addition to existing regulations mentioned above, the DOTr has implemented Department Order 2017-011 in the last quarter of 2017. This department order is otherwise known as the *Omnibus Guidelines on the Planning and Identification of Public Road Transportation Services and Franchise Issuan*ce or the *Omnibus Franchising Guidelines (OFG)* in its condensed term. The hierarchy and selection of appropriate road-based public transportation is stipulated in the department order (see Figure 4). It follows the prescribed hierarchy of roads in the Philippines. In essence, larger vehicles (i.e., buses) are for wider and higher-volume roads. In addition, it is in the department's interest to disseminate the function of determining public transport services to local government units. In their principle, public transportation plans are better prepared at a local level in order to meet efficiency in local travel demand. From these regulations, it is clear that motorcycles providing transport services (*habal-habal*) are not recognized as road-based public modes of conveyances, hence illegal in the eyes of transportation regulators.

With the perceived flexibility in operating motorcycles in urban centers and its adaptability to provide basic mobility in rural conditions, it is certain that motorcycle dependency will continue to grow over the years (Nelson, 2016). As noted, before, the number of motorcycle vehicles in the Philippines have been significantly increasing over the past decade. It has outpaced the growth of other motorized vehicles at a rate of 10.5% per annum from 2009 to 2015 (Napalang et al., 2017). However, the tremendous growth in motorcycle volume is not without concerns from matters

involving congestion, pollution, and most significantly, safety. From traffic accident data collected by government agencies such as the Department of public Works and Highways (from 2007 to 2009) and the Metropolitan Manila Development Authority (from 2012 to 2016), motorcycles are highly involved in both fatal and injury accidents. In fact, motorcycles have the largest share in fatal road accident involvement in Metropolitan Manila (see Figure 5). The figure below exposes the risks and hazards in operating a motorcycle in a conurbation like Metro Manila. More so, the complications brought by a fragmented legal framework on accountability of involved stakeholders in operating illegal habal-habal services.

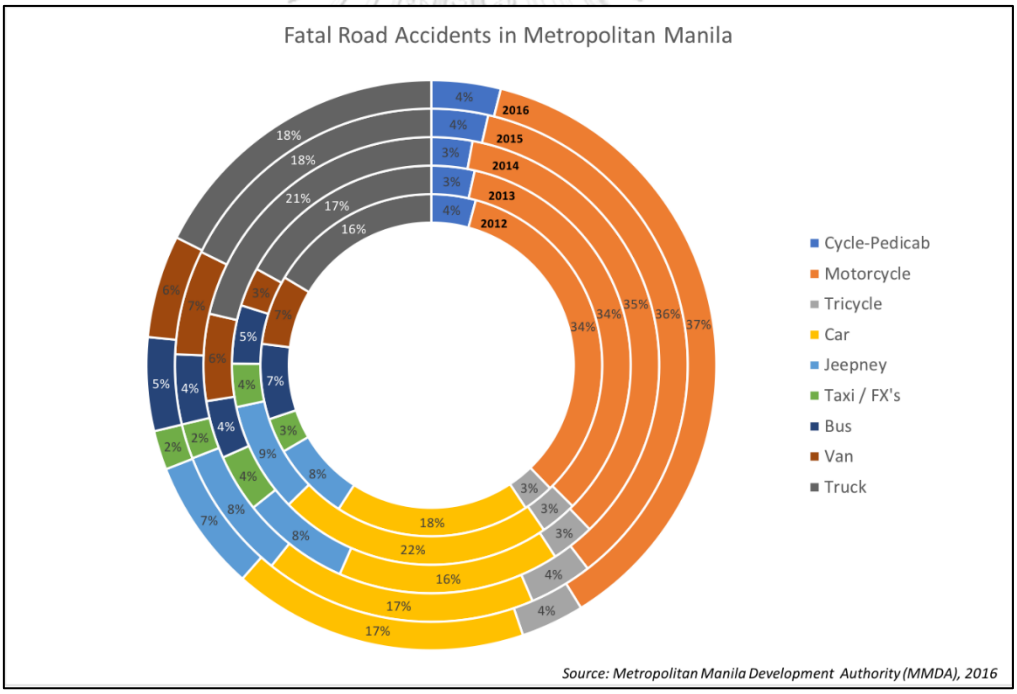


Figure 5. Fatal Road Accidents per Mode in Metro Manila (2012 to 2016)

Considering that the legal nature of habal-habal operations in the Philippines as illicit, and the circumstance that motorcycles are highly involved in fatal road accidents, it is apparent that safety and accountability issues would arise as the

demand for motorcycle taxi services continuously increases, not only in Metro Manila, but in the whole country as well. Concerns regarding matters related to habal-habal operations have reached the attention of national legislators. Under the current session of the 17th Congress of the Philippines, several house bills from the House of Representatives were filed, an example of which is House Bill No. HB06909 ("Motorcycles-For-Hire Act of 2017," 2017). This bill seeks to legalize motorcycle taxi operations nationwide by empowering local government units (LGU) to grant franchises of such operations; similar to motorized three-wheelers (*tricycles*) that serve as feeder modes for local city roads (Guillen & Ishida, 2004; Shimazaki & Rahman, 1996). However, the house bill limits the extent or coverage of habal-habal operations within the city's jurisdiction only and that inter-city or inter-municipality habal-habal franchises must be agreed upon by the relevant LGU's. This operating condition might be beneficial for transport-deficient areas, particularly in rural regions; but for an urban conglomeration like Metro Manila, wherein majority of the trips are made between adjoining cities, the condition might be the opposite. Given these circumstances, the problem that this study aims to resolve is the lack of essential information about habal-habal services, particularly in the urban context and on the user's perspective, which is necessary for public transport policy formulation and emendation. It is imperative for authorities to understand the fundamentals of habal-habal operations before formulating policies in order to appropriately gauge its characteristics and function in the country's public transportation scene.

1.3 Objectives of the Study

The primary objective of this study is to understand the role habal-habal services provide in the public transportation scene of Metro Manila. In order to achieve this objective, the following specific objectives must be accomplished as well:

i. Review and summarize existing policies and regulations pertinent to habal-habal operations;
ii. Determine the characteristics of the trips made using habal-habal, including the socioeconomic characteristics, attitudes, and perceptions of its users;
iii. Recommend appropriate public transport policies regarding habal-habal services based on trip and user characteristics.

1.4 Hypothesis of the Study

The propensity of assiduous commuters to avoid inconveniences, such as congestion and delays, leads the study to consider multiple working hypotheses. The first hypothesis considers the availability of alternatives in different areas of the metropolis. In areas wherein public transportation is copious, and sometimes overlapping, habal-habal's main function is to provide feeder services to larger forms of conveyances; the opposite is true in transit-deficient areas. Moreover, in areas wherein public transportation is copious, and occasionally competitive, travel time savings is the principal motivator to use habal-habal services; on the other hand, service availability is the primary motivator of users in transit-deficient areas. Another hypothesis in this study considers the ride-hailing behavior of service users with

respect to trip distance. Users typically conduct on-street hailing of habal-habal for short-distance trips; the opposite is true for trips hailed using online-hailing applications. Lastly, user's socioeconomic characteristic (i.e., gender) in relation to hailing behavior is also considered. On-street habal-habal hailing is more likely to occur for male users as compared to female users that are more likely to prefer online-haling services.

1.5 Assumptions of the Study

The governing assumption of this study specifies that commuters in Metro Manila are motivated to seek alternative modes of transport that would meet their required mobility in order to bypass inconveniences brought by periods of severe congestion and occasions of deficiency in public transportation services (e.g., flooding caused by rainfall). Moreover, habal-habal services in Metro Manila are illicit and are therefore presumed to operate discreetly. Discreet operations would involve operators to covertly search for passengers on busy transport corridors or by using digital mediums (i.e., online hailing applications) in order to avoid apprehensions and exploitations from authorities.

1.6 Scope and Limitations of the Study

As mentioned before, Metro Manila's public transportation is widely available in several forms, both in formal and informal modes. The scope of the study encompasses these modes of public transportation and the relevant stakeholders involved in it (e.g., users or commuters, operators, and transport regulators).

However, the study will primarily concentrate on habal-habal services; its perceived characteristics (e.g., operational transactions) and the individuals involved in it. Moreover, the study would primarily consider the commuter's perspective in characterizing the trips made using habal-habal. The study would also limit habal-habal's form of transaction into two: (i) physical and (ii) online transactions. Physical transactions are habal-habal trips that are made corporeally between a commuter and an operator, similar to conventional modes of transport. Online transactions on the other hand are habal-habal trips similar to ride-hailing services, those that involve the use of technology or digital mediums. Lastly, the study is delimited by the use of mode choice analysis as it aims to characterize the trips made by using habal-habal services.

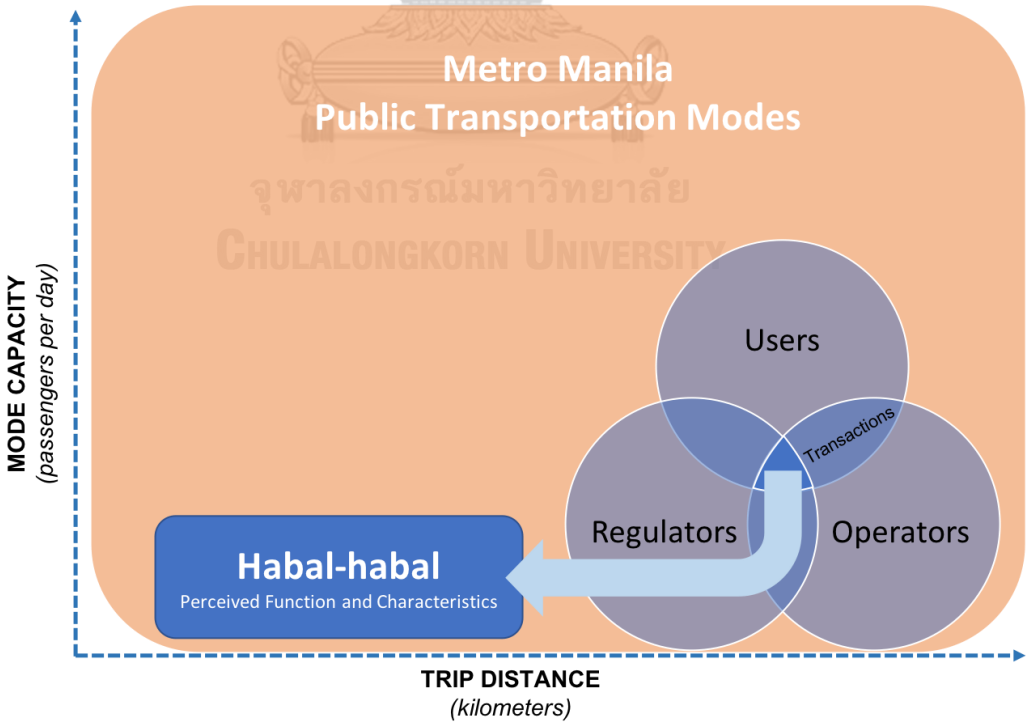


Figure 6. Research Scope and Limitations

CHAPTER II
REVIEW OF RELATED LITERATURE

2.1 Informal Transport and Paratransit Services

In transportation studies, paratransit is a term used to define a flexible type of public transport service in which a fixed schedule is often-to-not followed and typically utilizes vehicles that are small-to-medium in size (Cervero & Golub, 2007). Paratransit services, in the context of the developed world, are demand-responsive transport services that supplement the existing public transport system. In the context of the developing world however, this kind of service is provided at a much larger scale and often operate outside the jurisdiction of relevant authorities. Hence, informal transport is often used to label paratransit services in developing nations (Behrens et al., 2016). In many places of the developing world, informal transport is sometimes the sole backbone of a city's (or a region's) transportation system. Moreover, paratransit services act on the purpose of providing a link between public modes of transport and private automobiles (Mabazza, 2017). Paratransit services in many developing nations today operate under the pretense of being a middle ground as its role and function in the overall transportation system is not inherently defined as the way formal modes are. Limited regulations from the government and its negligence to improve transport systems has also led to the growth and expansion of paratransit services over the years.

2.1.1 Emergence of Paratransit Services

According to a study by Robert Cervero (1991), paratransit services have emerged as a response to poor road conditions that are merely inaccessible to larger formal modes of transport (i.e., busses) (Cervero, 1991). Furthermore, the continuous motorization and stagnation of urban infrastructure has made transport in cities immobile and inefficient at certain times of the day. Governments and citizens alike spend millions of dollars and thousands of hours a year wasted in unproductive and uneconomical activities like waiting idly in a car or in a bus during severe congestion ("Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas," 2014). This degradation, or inadequacy thereof, in public transport services has led to the emergence of adaptive modes of transport that could respond quickly to the dynamic changes in urban mobility. As an example, motorcycle vehicles were formally recognized as a public transport mode in Thailand, and as a first of its kind in the world, through the Motor vehicle Act of 2004 (Department of Land Transport, 2004). This act stipulates the standards for motorcycle taxi services and protocols to be followed such as fare setting, operational safety standards, and rider's conduct and behavior. Although the act was only formalized recently (relatively), Thailand's motorcycle taxi service has long been serving as an essential element of the public transport system, most significantly in Bangkok (Ratanawaraha & Chalermpong, 2015). Motorcycle taxi services in Bangkok originally provided services for people walking in long and narrow alleyways to main arterial roads serviced by formal transport services (i.e., bus). At the age of urbanization, in which the development pattern was mostly left at the hands of private developers, the dependence of people in motorcycle services grew as the

city expanded rapidly (Sopranzetti, 2013). The public transport-deficient alleyways (locally known as a '*soi*') has resulted to motorcycle taxi services to become a vital link (or feeder mode) in Bangkok's urban transportation system.

2.1.2 Operations of Paratransit Services

Most informal transport services operate in an *owner-operator* scheme wherein the owner of the paratransit vehicle is also its operator (Behrens et al., 2016; McCormick et al., 2015); in essence, all the day's profit is solely at the hands of the operator. In other cases, paratransit vehicles are operated by drivers that pay a fixed amount of rent to the vehicle owner on a daily basis. This type of informal operation is characterized by the ubiquitous 'target system' which encourages competition in the market. The target system – wherein the vehicle drivers pay a fixed amount of money to the vehicle owners daily and keep the remaining profit as revenue – justifies the behavior often observed with paratransit operations (e.g., overloaded vehicles, over-speeding, and queue-jumping at terminals or stations) (McCormick et al., 2015). These unruly behavior of paratransit operators, which directly affects the riding public's safety and convenience, are often the basis of the authorities' push for its suppression, more so its formalization in the public transport system (Schalekamp et al., 2016). Furthermore, as argued by Cervero and Golub (2007), informal transport relies heavily on laborious and low-skilled work as it operates more than the typical eight-hour work shift. Paratransit operations are also characterized by 'cream-skimming' wherein operators offer frequent services for customers during peak time periods while customers at off-peak periods can expect lesser frequency rates as operators deem it uneconomical (Cervero & Golub, 2007). Cream-skimming, as

enticing as it may sound, can be harmful and may not be beneficial in some aspects of the public transport system as paratransit operators try to compete, albeit sometimes violently, with other modes of transport – be it with fellow informal or formal operators – to maximize daily profits. In addition to cream-skimming, paratransit operations are also characterized by its fare-setting conducts which can either be settled independently (between driver and passenger) or be controlled (semi-formally) by transport regulators. A study conducted by Phun et al. in 2015 point out that a paratransit transaction begins with the settlement of the fare between a driver and his or her passenger. In their study about paratransit operational characteristics and fare setting in Phnom Penh, Phun et al. (2015) argued that paratransit operators highly prefer flat or negotiated fares as the primary method of fare setting as it meets the maximum desirable profit and utility for both drivers and passengers respectively (Phun et al., 2015). It was also noted that paratransit operators define the trip fare based on several subjective factors that includes trip distance, passenger or freight quantity, congestion levels, travel time period, and weather conditions.

2.1.3 Political Economy of Paratransit Services

Klopp and Mitullah (2015), in their paper about politics and policy in the Nairobian paratransit context, discusses about the political power held by paratransit operators. According to the authors, the *matatu* operators play a vital role in political economy of the city (Mitullah & Klopp, 2015). Because of its immense size, in terms of operations, coverage, and penetration, the matatu business has the capacity to sever Nairobi's public transport system if regulations imposed by authorities displeases the business owners. The matatu industry has become a major stakeholder in Nairobi's

public transport scene as it was able to provide the missing or inadequate formal transport services that should have been provided by proper authorities in the first place (Sclar & Touber, 2011).

In the case of Metro Manila, in the Philippines, a jeepney transport group called PISTON (Filipino: *Pinagkaisang Samahan ng mga Tsuper at Operator Nationwide*) declared a two-day nationwide transport strike that caused the government to suspend public work and classes on October 16 and 17, 2017. The transport group staged this strike to oppose the recently government-initiated PUV (Public Utility Vehicle) Modernization Program on June 2017 and to demand an audience with the president in order to comprehensively discuss the terms of the said program. The modernization program intends to replace old and unsafe transport vehicles that are either 15 years and older or those that do not comply with standards set by the government (*Department Order No. 2017-011 or the Omnibus Guidelines on the Planning and Identification of Public Road Transportation Services and Franchise Issuance*, 2017). According to the transport group, it is “anti-poor” and it aims to benefit only the capitalists who are capable of complying with the program’s fleet management system, which sets a minimum of 10 vehicles per franchise (Francisco, 2017; Rey, 2017). Based from local transport regulators, PISTON’s strike efforts did not cripple, most if not all, the urban transport networks of the country ("Regulators: Strike failed to paralyze transport service," 2017). Provisional government vehicles were dispatched in some areas of the country, most significantly in the National Capital Region, to aid stranded commuters affected by the strike. The political and bargaining power of paratransit operators (let alone the union of national

operators) anywhere in the world can be clearly defined by its capacity to cripple the very network or ‘niche’ market it aims to serve.

2.2 Motorcycle Taxi as a Public Mode of Transport

Swift mobility was probably the underlying motivation for the development of motorcycles; the motorized version of the conventional two-wheeled bicycle. As a form of public transport, motorcycle taxis play a vital role primarily as feeder services to larger modes of transport (Sopranzetti, 2013). This statement however is contextual and is not entirely applicable in different settings. As Cervero and Golub (2007) describes, the cities of the developed world, or the global north per se, motorcycle taxi service is supplemental to the existing systems of transport and is characterized as *demand-responsive*. In other words, these type of transport services can substitute for the existing transport facilities, perhaps for better convenience or faster mobility (Cervero & Golub, 2007). However, for the cities of developing nations, or the global south, motorcycle taxi service is characterized as *demand-driven*. In this case, demand-driven transport services can either (1) substitute completely for existing formal modes of transport, given that its level of service is abysmal; or it can (2) complement the existing transport system which could provide satisfactory mobility and efficiency in a city’s public transport system (Iles, 2005). As argued in their study, Phun et al. (2017) states that the survival of paratransit services in developing Asian countries would also be dependent on the service user’s operational perception and the level of acceptance from the general public (Phun et al., 2017).

As Nelson (2016) described it, motorcycle taxis are commercial public transport services provided using a motorcycle vehicle to people and goods in exchange for a reasonable sum of money, or in limited cases, through regulated pricing (Nelson, 2016). Such services are increasingly becoming popular in developing cities as it can weave through heavy traffic congestions and are widely flexible in terms of service coverage and frequency (Starkey & Njenga, 2010). In other cases, such as in rural areas, wherein formal modes of transport are less ubiquitous or are either deemed uneconomical to operate, motorcycle taxis are a cheap way to provide motorized forms of transport (Nelson, 2016). Motorcycle taxis services also provide employment opportunities to many under skilled citizens in a city or a region. In a study conducted by Tuan and Mateo-Babiano (2013), thousands of young migrants move into Vietnam's urban centers every year in order to reap financial benefits from the country's economic expansion. But due to the limited number of jobs in the formal market and the migrant's limited competencies, most of these workers tend to end up in the informal industries, such as motorcycle taxi services (Tuan & Mateo-Babiano, 2013). The same is true for the nature of motorcycle taxi industry of Thailand. As Sopranzetti (2013) described in his study, one condition for the appearance of such services is due to the migration of hundreds of thousands of young and unskilled rural folks into the rapidly expanding Thai capital of Bangkok. Deeper in his argument, rural wages, which predominantly is derived from agricultural works, were initially higher than the wages found in the capital (Sopranzetti, 2013). In order to attract more people to come work at the capital, during the time of rapid expansion, taxes on agricultural products were imposed which ultimately lessened the rural wages. The flock of young workers into

the Thai capital and the sudden prominence of motorcycle vehicles, as a cheap mechanized transport, has made motorcycle taxi services in Thailand a thriving industry then and until now. Tuan and Mateo-Babiano (2013), stated in their findings that due to the industry's success in serving the niche market created by the lack of adequate urban transport in developing cities, motorcycle taxi services are likely to remain and play an important role in the future.

2.2.1 International Cases of Motorcycle Taxi Services

Several studies of motorcycle taxi services in some parts of the world were reviewed in this paper. Topics would range from socioeconomic impacts, monopoly rents, policy provisions, to urban and rural transport applicability.

The study conducted by Tuffour and Nkrumah (2014) discusses the motorcycle taxi services in the urban metropolis of Accra, Ghana. In 2004, Ghana's parliament passed the Road Traffic Act (Act 683) into law; this law clearly prohibits the use of motorcycles as public modes of conveyance. However, due to the increasing congestion rates experienced by the city, motorcycle taxi services are gradually gaining a foothold in its transport system, especially for short-distance urban passengers (Tuffour & Nkrumah, 2014). It was found that 38% of the respondents use motorcycle taxi services for personal and multi-purpose trips; however, majority of the respondents did not consider such services as their main mode of urban conveyance. In operational characteristics, motorcycle services in Accra are generally localized since it tends to operate only on routes deemed profitable by operators. Moreover, disaggregation and discoordination among

operators cultivates their oversupply in some routes of the city. Among the interviewed users, 46% have complained about over-speeding and reckless-driving habits of operators; in addition, disobedience and disregard of traffic laws was also a major concern. On the safer side, 85% of respondents agreed that safety of riders and users were at relatively acceptable levels.

Moving into rural settings, the study of Nelson (2016) about the provision of public transport services in the rural regions of Ghana (i.e., the Volta Region) revolves around the use of motorcycle taxis. As a reiteration, the Road Traffic Act of 2004 (Act 683) prohibits the use of motorcycles for commercial operations. However, as Nelson argues, the law does not distinguish motorcycle taxi operations in urban centers and rural areas. The rural areas of Ghana are generally characterized to have a low population and are broadly detached from one to another. In addition, the road condition between these towns or settlements are severely undermaintained which makes provision of formal modes of transport economically inviable. These underlying conditions depicting the rural areas of Ghana, makes motorcycle taxi services, as Nelson argues, to be a viable option for rural transport. Unlike in urban settings wherein the operator's main source of income is through the taxi business, Nelson's research found that in rural areas, operators work in the motorcycle taxi business for additional income; majority of the operators are either involved in professions such as farming or trading. Lastly, 84% of rural respondents (i.e., users) have fully supported the proper regulation of motorcycle taxi services in their respective areas.

Socioeconomic impacts of motorcycle taxi services and relevant policy considerations in Vietnam were discussed in the study conducted by Tuan and Mateo-Babiano in 2013. It was mentioned that the respondents from Ho Chi Minh City, Vietnam's largest urban center, take motorcycle taxi services once a month or even less since majority of them have access to personal modes of travel. An astounding 100% of the households from which respondents belong to have at least one motorcycle and more than 60% have access to two or more. Furthermore, the city's department of transport estimated that there were around 680 motorcycles per 1,000 population in 2011, perhaps the highest of its kind in all of Vietnam. This number justifies the heavy reliance of urbanites in Vietnam to private motorcycle vehicles, which indeed holds the largest share in the city's daily trips. However, the modal share of motorcycle taxi is only comparable to those of the bus and bicycle (which is roughly 17% only of the trips made by private motorcycles), this is due to the fact that such services cost more than taking private motorcycle or the public bus system (approximately 4.5 and 7.5 times more respectively). In terms of productivity, it was found that working efficiency of the drivers was very low as much of their time is spent on waiting for passengers (dwell time). It was initially known that motorcycle taxi services provide employment opportunities for migrants that flock the urban centers of Vietnam. However, without proper operational management, the externalities could end up costing authorities more than any good it could provide. As such, the authors have recommended to shift the current business model of individual operation to association-based operations in order to promote efficiency and equity across relevant sectors of the industry.

The study conducted by Chalermpong and Ratanawaraha (2015) examines the various sources of monopoly rents and its existence in the motorcycle taxi services in Bangkok, Thailand. As postulated by the authors, territorial and locational rents exist among the many motorcycle stations across Bangkok; this presumption will depend on their proximity to mass transit stations, their established operating coverage, or their monopoly power over other feeder services. The authors define monopoly rent as any excess in wealth created by selling goods or services that are sold beyond competitive-market prices. Rent-seeking on the other hand, are any form of activities that aims to exploit excess benefits produced by monopoly rents. Rent-seeking is considered unproductive as it does not create new wealth, rather it only transfers wealth from productive individuals to rent-seeking entities. The authors identified three sources of monopoly rents in Bangkok's motorcycle taxi services; the first of which is (1) locational rent, it pertains to a non-tangible value that circumscribes the level of accessibility a motorcycle station has. In general, motorcycle stands that are closer to transit stations enjoy higher locational rents. The second monopoly rent identified was (2) quota rent, which is subjectively created because of the rent-seeking activities of operators. Quota rents are established in order to limit the number of operators so that incumbent operators could maximize the benefits in each motorcycle stand. The third type of monopoly rent is (3) territorial rent, which is created by defining the operational coverage of each motorcycle stand. Some motorcycle stands enjoy an extra premium when it operates near bus stops, as argued, complementary feeder services is provided by motorcycle taxis near transit stations. Territorial rent is also defined by the fees paid by operators to police officials or influential people in order to warrant their operations in a specific area. The type of rents mentioned by the

authors justifies the presence of economic rent enjoyed by motorcycle taxi operators in Bangkok. However, the local influential people, or those that impose control over motorcycle taxi operations, reap the most benefits from the industry. As suggested by the authors, it is important that authorities come up with value-capture mechanisms in order to distribute economic rents evenly among pertinent stakeholders of the industry.

2.2.2 Local Cases of Motorcycle Taxi Services

Several motorcycle taxi services in the Philippines have been studied prior to this research, most of which are rather outside the National Capital Region (NCR). The operational nature of motorcycle taxis in several urban and rural areas of the country might differ from the ones found in Metro Manila due to possible reasons of cultural, economic, and functional disparities. As implied by Regidor et al. (2017) in their study, the discrepancy between urban and rural motorcycle taxi operations is relatively small. However, the local setting itself defines the adaptive role motorcycles play in public transportation (Regidor et al., 2017). In the urban context, wherein congestion hampers mobility levels, motorcycles can easily maneuver narrow spaces between larger vehicles. In the rural context however, inadequacy of public transportation and the extensive distance between towns caters for an adaptive mode of transport that is cheap, fast, and reliable. This section will further discuss local cases on the use of motorcycle taxi services in specific areas and how it impacts the locality's transportation structure.

The operational characteristics of the motorcycle taxi services in selected municipalities of North Cotabato was discussed by Alucilja and Fillone in 2017. In their study, motorcycle taxi services in selected municipalities of North Cotabato predominantly operate on routes that connects the municipality's commercial center to its remote *barangays* – barangays are villages or settlements that makes up a municipality (Alucilja & Fillone, 2017). They provide services for people living in far flung places or remote areas of the provinces. Due to poor infrastructure, motorcycle taxis are deemed viable as a public transport mode due to its suitable operational characteristics. Although the province's public mode of transport comprises formal modes such as buses, jeepneys (local jitney), utility vans, multicabs (smaller version of jeepney), and tricycles; these modes frequently operate on busy routes that pass-through municipalities that are adjacent to national highways only. Motorcycle taxis have emerged as mobility providers for a niche market created by an incomplete link in the province's transportation system. The authors found that ride-sharing is possible for motorcycle taxi service in North Cotabato. Typically, a motorcycle is boarded by the driver and by one passenger. However, in this case, three to six passengers can share a single motorcycle; an intriguing finding that could pose serious safety and liability concerns. Despite concerns, people still use the service as it is the only option available for them.

Another case to consider is the study made by Guillen and Ishida (2004) which describes motorcycle-propelled public transport and policy development in Davao City. The study revolves around the significance of innovative modes of transport in the public transportation system of Davao city. As the argument goes, one of the reasons for the worsening environmental quality of the country is because of

the proliferation of motorized transport; the authors specifically pointed out the abundance of tricycles in Davao city (Tricycle is a motorcycle with an attached cab on its side that has one wheel). The motorcycle taxi service is limited in Davao city, the service itself was said to have a small share in the city's public transportation system, but nevertheless significant because of the employment opportunities it provides for under-skilled laborers. Motorcycle taxi service in Davao city is considered illegal as the local ordinance states that private motorcycles cannot be commercialized into carrying passenger or freight in exchange for a reasonable fare. Despite the local ordinance on the ban of motorcycle taxi services, local enforcers tolerate the operations due to the absence of alternative modes of transport and that it actually helps in solving mobility issues of the city.

The cases mentioned above describes some of the operational characteristics of motorcycle taxis in urban and rural areas of the Philippines. Several reasons for their existence were mentioned such as for employment opportunities, for provision of mobility, and for adoption of a flexible mode of transport (in response to poor infrastructure).

2.3 Motorcycle-related Regulations in the Philippines

Motorcycle regulation in the Philippines is primarily done for certification purposes only and is used largely by local government units in order to fabricate local transport policies for tricycle (motorized three-wheelers) operations (Guillen & Ishida, 2004). The following sections will discuss existing laws and regulations, on the national and local levels, that presides over the operation of motorized two-wheelers.

2.3.1 National Regulations

The study conducted by Napalang et al. (2017) focuses on the provision of pertinent regulations that could improve the safeness of operating motorcycles in the Philippines. In their study, it was mentioned that motorcycle sales have grown at an average rate of 10.5% per year from 2009 to 2015, outgrowing the overall vehicle growth rate of the country (Napalang et al., 2017). Due to the perceived flexibility and affordability, the motorcycle has become a popular mode of transport in country's urban centers. However, recent data on road accidents indicate that motorcycles constituted 35% of the total number of fatal road incidents in the National Capital Region alone. With this alarming figure, the authors noted the urgency to evaluate existing regulations that covers motorcycle operations and its enforcement. The following are a review of existing laws covering all motorized road transport vehicles, some are specific to motorcycles, in the country.

A. The principal regulation of land transportation in the Philippines was enacted on June 20, 1964 through Republic Act (R.A.) 4136, which is also known as the *Land Transportation and Traffic Code*. Laws stipulated in this act that are relevant to motorcycle operations are as follows: (i) registration of motor vehicles, (ii) driver licensing, (iii) driving on the right side of the road, (iv) overtaking on the left side, and (v) speed limits according to road type.
B. Republic Act (R.A.) 10054 or the *Motorcycle Helmet Act of 2009* was enacted on March 23, 2010. This law stipulates the mandatory use of safety helmets for motorcycle driver and back rider in either short or long trips and in any type of road within the country. Moreover, the law prescribes the usage of

standardized motorcycle helmets bearing the Philippine Standard (PS) mark or the Import Commodity Clearance (ICC) mark. Penalties for operator violations may range from PHP3,000.00 to PHP10,000.00, with corresponding confiscation of the driver's license.

C. Republic Act (R.A.) 10586 or the *Anti-Drunk and Drugged Driving Act of 2013* stipulates that drivers of public utility vehicles (PUV), trucks, buses, and motorcycles should have a blood alcohol level of 0.00%. Penalties for violators may ranges from three (3) months imprisonment, plus its corresponding fines, to perpetual revocation of driver's licensing, depending on the level of violation and its effect to the public.

D. Republic Act (R.A.) 10666 or the *Children's Safety on Motorcycle Act of 2015* stipulates that it is unlawful for any person to drive a motorcycle with a child on board in public roads where there is heavy volume of vehicles, there is high density of fast-moving vehicles, or where a speed limit of more than 60kph is imposed, unless; (i) the child can comfortably rest his/her feet on the standard foot peg of the motorcycle, (ii) the child is able to wrap around his/her arms the waist of the motorcycle driver, and (iii) the child is wearing a standard protective helmet with specifications prescribed in Republic Act 10054. Exceptions from this law is applicable to children that require immediate transport for medical attention.

E. Republic Act (R.A.) 10913 or the *Anti-Distracted Driving Act of 2016* specifically prohibits the use of mobile and other electronic devices while the motor vehicle is in motion or in a temporary halt due to a red light at intersections. Exceptions from this law includes, but is not limited to, devices

that has hands-free function but does not in any way interfere with the driver's line of sight and safe operation of the vehicle.

The research of Napalang et al. (2017) also included interviews on motorcycle drivers or operators. It was found that majority of the riders in the sample group were aware of the existing laws but admitted that they do not ardently comply with it most of the time. As the authors argued, the low level of enforcement of laws mentioned above has failed to impose a deterrent threat to motorcycle riders, who were aware of their violations.

2.3.2 Local or City Ordinances

This section will review the existing local ordinances that specifically targets the operation of motorcycles within the cities of Metro Manila. It is worthy to note however that an ordinance coming from one city is not applicable and, in any way, implemented in the entire metropolis, unless otherwise authorized by a higher government agency. As a review, Metropolitan Manila is composed of seventeen (17) highly-urbanized independent cities or in political terms, local government units (LGU). No unified governing body that overpowers the LGUs of Metro Manila was present at the time of writing of this research paper.

A. Ordinance No. 2002-069 of the City of Muntinlupa otherwise known as: *An ordinance requiring all drivers and passengers of single motorcycles to wear safety helmet and providing penalties of violation thereof*. As stipulated in Section 1 of the ordinance, all drivers and passengers of single motorcycles are required to wear safety helmet when driving and riding along the streets of

the City of Muntinlupa. Penalties for violating the ordinance are stipulated in Section 2 and can range from PHP150.00 to PHP500.00. This ordinance was first put into implementation even before the ratification of R.A. 10054. But unlike the national law, this local ordinance can only recommend the suspension or revocation of the driver's license.

B. Ordinance No. 21, Series of 2008 of the City of San Juan otherwise known as: *An ordinance prohibiting more than one (1) passenger riding in motorcycles and scooters and providing penalties thereof.* This local ordinance stipulates that there should only be a maximum of two (2) people riding a motorcycle or scooter, or any two-wheeled motorized vehicle to ensure the safety of the riders and the public from any form of misfortune. The penalties for violating the ordinance may range from PHP300.00 up to a maximum of PHP1000.00.

C. Ordinance No. 550, Series of 2014 of the City of Mandaluyong otherwise known as: *An ordinance regulating motorcycle riding-in-tandem in Mandaluyong City*. This ordinance prohibits the riding-in-tandem on motorcycles of a pair of male passengers. However, a female back rider, a spouse, a relative within the first degree of consanguinity, and a child between 7 to 10 years old is exempted from the ordinance. This ordinance was enacted in order to reduce crimes which involves motorcycle riding-in-tandem.

- Ordinance No. 595, Series of 2015 of the City of Mandaluyong otherwise known as: *An ordinance amending Ordinance No. 550, S-2014 otherwise known as "Motorcycle Riding-In-Tandem Ordinance"*. This local ordinance amends the exemption originally stated in the overlying ordinance. To which, male relatives with first degree

consanguinity and all members of the Philippine National Police Tactical and Mobile Unit assigned in Mandaluyong City are now exempted.

D. Ordinance No. 2017-135 of the City of Makati otherwise known as: *An ordinance on children's safety in tricycles and motorcycles.* This local ordinance reflects R.A. 10666 or the *Children's Safety on Motorcycle Act of 2015*. The same prohibition on children boarding motorcycles applies in this ordinance. However, the prohibition is extended to Tricycles as well.

2.4 Chapter Summary

From related literatures reviewed above, it is apparent that motorcycle taxi services are widely considered as a response to inadequate, or lack thereof, formal transportation systems. In some cases, motorcycle taxis have emerged as the primary means of transporting goods and people. It is evident that the immediate mobility required by any person willing to travel can be served by motorcycle operations. Moreover, operators enjoy a significant amount of economic benefits and regulatory autonomy as this type of industry is still widely informal. Any person with a motorcycle, regardless of their capacities or skills to maneuver and operate the vehicle, could offer taxi services to those in need of it. Although these forms of transport have long been existing in many cities of the developing world, most of the studies reviewed in this chapter primarily focuses on motorcycle taxi operations outside of the Philippines, and more importantly, majority are for rural settings. Furthermore, detailed observations on urban of operations of motorcycle taxis (or habal-habal) in Metro Manila are rare or has just emerged recently due to the proliferation of technology-based transport services. The challenge for this study is to effectively characterize and recommend a definite role that habal-habal plays in the wider context of Metro Manila's public transportation scene, considering the innovations and hindrances attached with it. The next chapter will discuss the methodologies on effectively gathering, processing, and interpreting vital information coming from relevant participants considered in this study in order to address the challenge of defining the role habal-habal plays and how it affects the city's overall public transportation system.

CHAPTER III
METHODOLOGY

3.1 Overview of Methodology

This chapter outlines the methods and approaches that will be employed in order to effectively accomplish this study. The methodology begins with a comprehensive review of literatures related to motorcycle taxi operations in international and local settings, and in urban and rural contexts. This will be followed by identifying and examining existing regulations (i.e., national laws or local ordinances) on motorcycle operations (i.e., private operation) in the country. Survey questionnaires and interview discussions will be the primary means of collecting data. Data regarding operational characteristics of habal-habal operations and socio-economic and trip characteristics of users will be intricately gathered. Statistical analysis tools and software will be used in order to analyze and process collected data, this process will be critical in identifying the factors that will characterize habal-habal operations. The final approach of this study is to formulate proposals that could assist in amending existing regulations that prohibits habal-habal operations in the country. The proposals made in this study will be carefully formulated based on the factors that strongly define the role of habal-habal services in the urban transportation context of Metropolitan Manila. Figure 9 summarizes the methodology that will be employed in this study.

3.2 Research Method

The study will employ descriptive and analytical methods of research as it aims to characterize the trips made using habal-habal services in Metro Manila and to relate describing factors involved for its significance in the region's public transportation system. Socio-economic profiles of both users and operators will be collected in a descriptive and disaggregate manner; examples of which are age, gender, occupation, income, and marital status. Trip characteristics from relevant stakeholders (i.e., habal-habal users) will also be gathered in a descriptive and disaggregated manner. Analytical methods (correlation analysis for example) will be applied to some of the quantitative variables mentioned above in order to provide explanatory parameters in identifying the significance or role habal-habal services play in the urban transportation scene of the metropolis.

3.3 Study Area

The cities comprising Metropolitan Manila would be the main study area of this research (see Figure 7). Although some habal-habal trips have been known to originate or end outside of the metropolis (to adjacent provinces such as Bulacan, Cavite, Laguna, and Rizal), the study will consider it as an urban trip for the study region. As mentioned before, the nature of habal-habal operations in Metro Manila is illicit and is therefore deemed to operate discreetly. It would be a challenge to locate explicit operational habal-habal stations within the study area. However, the level of discreetness of such services is not entirely uniform throughout the metropolis. Some areas within the cities, especially outside business districts, have physical habal-habal stations on collector and local roads. Predetermined habal-habal stations will be used

to initially collect the sufficient number of respondents for the study. Predetermined stations of habal-habal services are located primarily on the Cities of Makati and Parañaque (see Figure 7), which could be considered as commercial and suburban districts of the metropolis respectively. The data collection phase will commence with the respondents coming from the predetermined habal-habal stations mentioned before for the printed survey. In a case wherein respondent size is deemed insufficient for the study, site visits and probe interviews on other business and residential areas of the metropolis will be conducted to further identify locations of operational habal-habal stations.

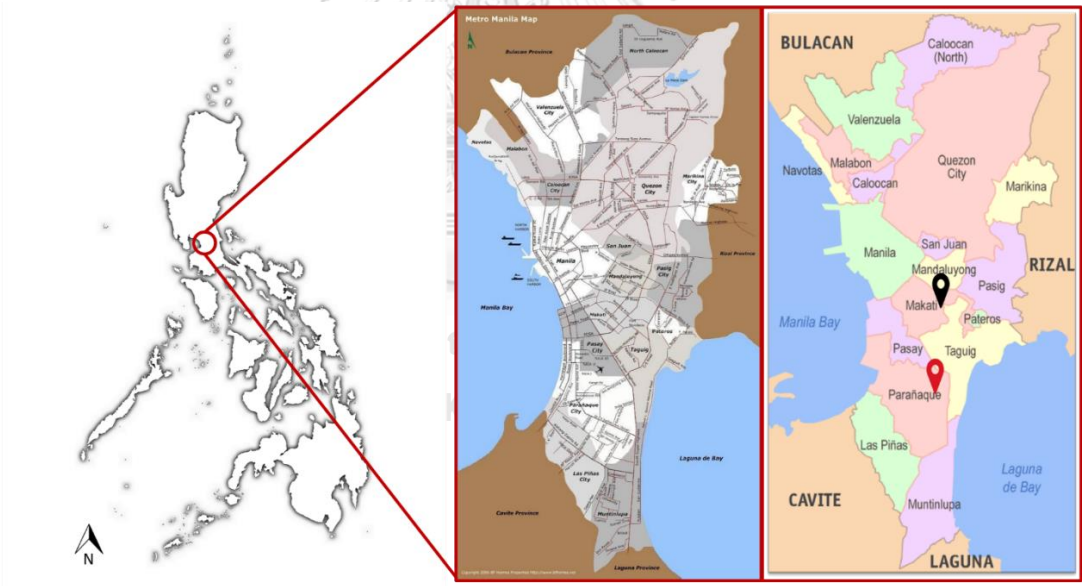


Figure 7. Location of Metropolitan Manila, and the cities that comprise it, in the Philippine Archipelago

Source: BF Homes Properties (https://bfhomes.net) and Wikipedia (https://en.wikipedia.org)

3.4 Subjects of the Study

The primary subjects of this study are the participants involved in the thriving operation of habal-habal services in Metro Manila. To be specific, the target subjects

of this study are the habal-habal operators, service users, and transport regulators. Coincidentally, the target research subjects would also be those comprising the target research respondents. However, the primary research respondent for data collection would be the service users (or commuters). Service users (or commuters) are individuals capable of generating trips from an origin to a destination with the use of habal-habal services, either as an alternative or primary mode of transport, within the study area. Habal-habal operators on the other hand are individuals capable of providing illicit transportation services with the use of privately-owned (and registered) motorcycles within the study region. Transport regulators are government officials in-charge of implementing and regulating policies that involve public modes of conveyances within the study region. Legislators will also be considered as transport regulators since these government officials are capable of revising or amending national legislations pertaining to public transportation.

Survey questionnaires will be given to operators and users in order to assess the characteristics of the trips made using habal-habal services. The survey questionnaires will be disseminated in two forms: (i) printed form and (ii) online form, both types of survey will be discussed in detail on the latter part of this chapter. In addition, the operators and users can be further sorted into two groups: (i) Group A – those that conduct habal-habal services with the use of a digital platform and (ii) Group B – those that conduct on-the-spot (*on-street*) habal-habal services. On-the-spot habal-habal services, in essence, are habal-habal services that can be seen explicitly on streets as compared to online-based services. Group B respondents will be sourced from the predetermined locations discussed on the previous section. Group

A respondents on the other hand will be sourced from the online platform in which habal-habal transactions are made (i.e., Multiple Facebook Groups).

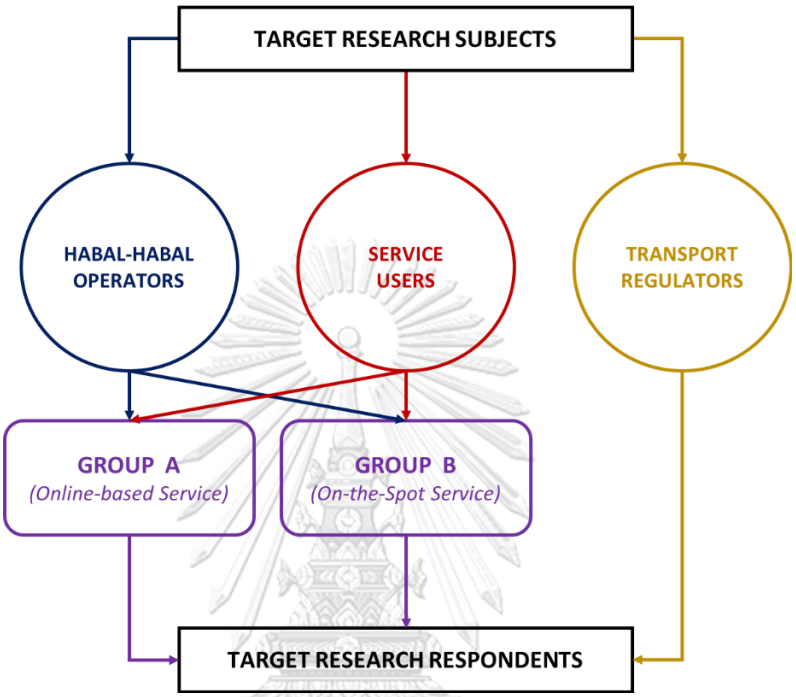


Figure 8. Research Subjects and Respondents

3.5 Sampling Method

The study will utilize simple random sampling of respondents for both operator and user groups; any willing participant will be considered as a research respondent. Simple random sampling is appropriate for this study since habal-habal operations are illicit and such services are deemed to operate discreetly within the metropolis. Because of the discreet nature of habal-habal operations and the limited resources (i.e. time and money) available, the number of sufficient respondents cannot be explicitly specified. However, using Cochran's equation (see Equation 1), a minimum representative sample size for large populations can be estimated. Three factors for determining a representative sample size will be assumed for this study: (i)

the level of precision will be at ±5% (5% statistical error), (ii) the confidence level will be at 95% and (iii) maximum variability of 50% will be used. The resulting representative sample from Cochran's equation will be used as a target sample size for users and operators in either respondent groups. In other words, a minimum sample size of 400 habal-habal service users and/or operators from either respondent groups will be collected.

$$n_o = \frac{Z^2 pq}{e^2} = \frac{(1.96^2)(0.5)(1-0.5)}{0.05^2} = 384.16 \approx 400 \qquad \text{(Equation 1)}$$

Wherein n_0 is the sample size;

Z is the abscissa of the normal curve that cuts off an area α at the tails,

e is the desired level of precision;

p is the estimated proportion of an attribute present in the population;

and q is $1 - p$

3.6 Survey Method and Instruments

The primary instrument that will be employed to collect data is through survey questionnaires. Interview surveys of transport regulators will also be considered in order to collect information regarding the government's perceptions on illicit habal-habal services. As mentioned before, two groups of users and operators will be considered. For Group A, an online survey questionnaire will be utilized and distributed in the online platform to which habal-habal transactions are conducted. Consent from the online platform administrators will be requested first before dispersion of said questionnaire. An incentive mechanism will be applied, to either users and operators, in order to encourage maximum participation among the target respondents. For Group B respondents, intercept surveys using printed questionnaires

will be conducted at predetermined service areas around the metropolis to which habal-habal services are present. The discreet nature of habal-habal operations will pose as a challenge in identifying and acquiring potential respondents for the study. In this case, predetermined locations of habal-habal services will require high response rates from target respondents. In order to collect an acceptable amount of data, similar incentive mechanisms will be adopted for Group B respondents. Operating costs and expenses, service frequency and duration, and service coverage will be some of the factors required from the habal-habal operators. Trip factors such as travel time or duration, trip distance, and level of service will be required from habal-habal users. It is also worth mentioning that fare setting conducts from both users and operators will be queried.

Structured personal interview will be conducted for transport regulators and legislators. The government's insights regarding illicit operations of habal-habal services and its significance to the overall transportation system of Metro Manila will be documented in order to determine the government's stance on such services. The prospects of legalizing and incorporating habal-habal services into the country's public transportation system will be the main subject of the interview.

3.7 Statistical Treatment of Data

Data processing and analysis will be executed using statistical analysis tools such as the Statistical Package for the Social Sciences (SPSS) software or other tools that conduct similar and advanced statistical procedures (e.g., R Statistics Software). Differences in responses between the two group respondents (i.e., Group A and B) would be evaluated using Welch's t-test in order to measure significant variances

between grouped responses. Quantitative variables such as trip or travel profiles of habal-habal operators and users will be analyzed using regression analysis (i.e., logistic regression) in order to correlate and identify significant factors that would describe the role of habal-habal services in Metro Manila. Other statistical functions that describes operational, trip, and socio-economic characteristics in percentage, arithmetic mean, and deviations will also be employed.

The choice of commuters (also referred as service users) on which transportation mode to use can be modelled by logistic regression under the utility framework. Two modes will primarily be considered: habal-habal (motorcycle taxi) and conventional modes of transport. Conventional modes of transport are any form of urban conveyance (public, private, semi-private) that is not a motorcycle taxi service. The utility of the modes is presented in Equation 2. Since only two modes will be considered, the logit model can take a binary form wherein the dependent variable is the probability of an individual choosing alternative 1 over alternative 2 (see Equation 3.2). The independent variable on the other hand are the inherent factors that describe the amount of utility gained by using mode *i*. The independent variables may come from the socio-economic characteristics of the commuter, the trip characteristics, and the characteristics of mode *i* itself.

As seen from Equation 2, the observable utility is a function of the alternative mode and individual characteristics. However, the nature of this utility function is still unknown. In order to address this complication, it will be assumed that the observable utility is in a linear form. If the function is linear, the relationship between independent and dependent variables could be initially defined. That is, the

probability of mode 1 (i.e., habal-habal) being chosen is directly proportional to its utility function and is inversely proportional to the sum of both utility functions of mode 1 and mode 2 (i.e., conventional transport). Lastly, in order to support the research hypothesis, it will be assumed that the probability of choosing habal-habal will be greater than the probability of choosing conventional modes of transport, $P(U_1>U_2)$, primarily due to the higher utility offered by habal-habal services.

$$U(X_j, S_i) = U'(X'_j, S_i) + \epsilon_{ji} \qquad \text{(Equation 2)}$$

Wherein $U(X_j, S_i)$ *is the utility of mode* j *for individual* i, *it is a function of the mode characteristics* (X_j) *and of the individual characteristic* (S_i);
$U'(X'_j, S_i)$ *is the observable utility of mode* j *for individual* i;
and ϵ_{ji} *is the unobservable utility or error*

$$P_j^i = \frac{e^{[U'(X'_j, S_i)]}}{\sum_k e^{[U'(X'_k, S_i)]}} \qquad \text{(Equation 3.1)}$$

Wherein P_j^i *is the probability that individual* i *chooses alternative mode* j;
and k *is a subscript identifying any alterntive mode from set* K

$$P_1 = \frac{e^{U_1}}{e^{U_1}+e^{U_2}} \text{ and } P_2 = \frac{e^{U_2}}{e^{U_1}+e^{U_2}} \qquad \text{(Equation 3.2)}$$

Wherein P_1 *is the probability of using habal − habal over conventional modes*;
P_2 *is the probability of using conventional modes over habal − habal*;
and U_1 *and* U_2 *are the utilities of alternatives* 1 *and* 2 *respectively*

3.8 Research Framework and Timeline

Figure 9 summarizes the methodology that will be undertaken in this research. Take note that this framework provides an overview of the methodology only. The following chapters would describe in detail the procedures conducted in order to properly execute the study.

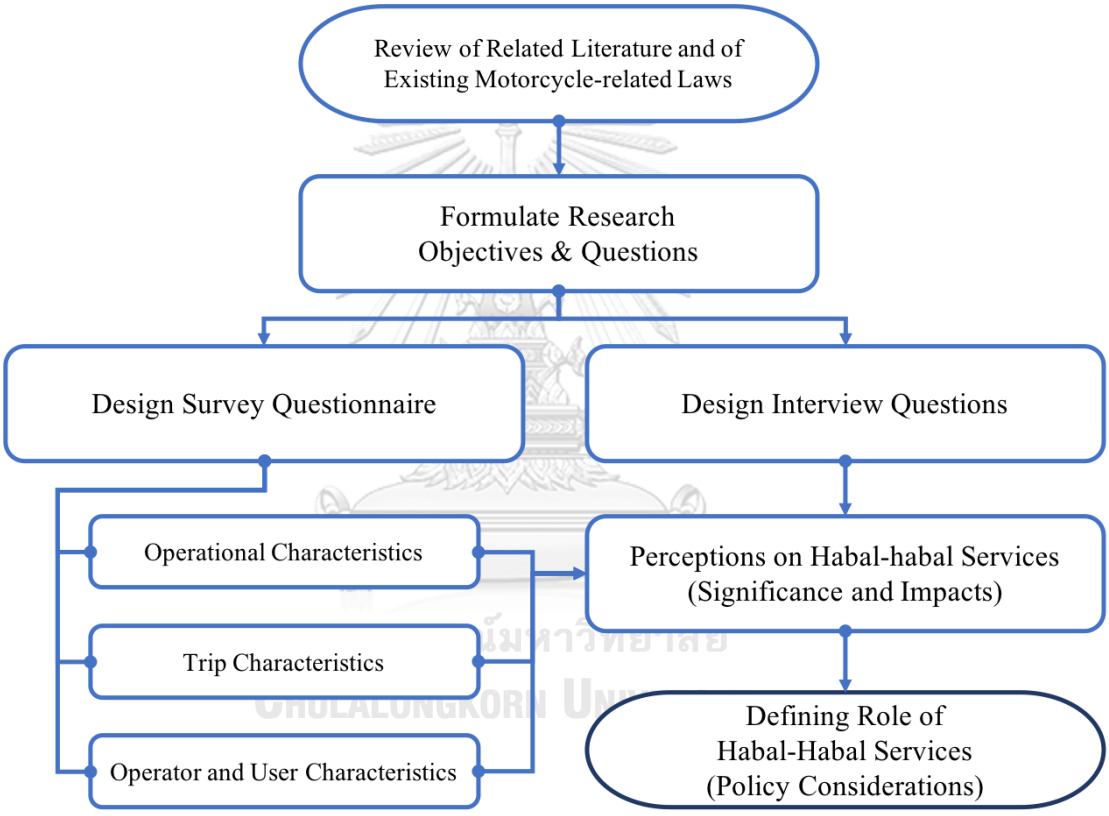


Figure 9. Research Methodology

CHAPTER IV
DATA COLLECTION AND DESCRIPTIVE STATISTICS

4.1 Data Collection Method

This section begins with the discussion of the actual procedures undertaken in order to collect sufficient data from the target respondents. It will also describe in detail the actual locations within the study area wherein intercept surveys were conducted. Clarifications regarding discrepancies between proposed and actual methodologies (for data collection) will also be provided on the latter part of each sub-section.

4.1.1 Research Subjects

The research proposal originally considered three research subjects: the habal-habal users (or customers), the operators (or riders), and the transport regulators. Furthermore, habal-habal users and riders were initially clustered into two groups: Group A – target research respondents that conduct motorcycle taxi services with the use of online platforms, and Group B – those that conduct on-street habal-habal transactions. Transport regulators on the other hand, are those capable of regulating, amending or implementing legislations related to public transport. In actuality, only Group B respondents were interviewed since it was a lot easier to request for consent directly from them. Group A respondents and transport regulators were dropped as research subjects for a variety of reasons, but primarily due to timeframe restrictions.

An initial interview was conducted for Group A respondents in order to gauge their participation rates; the result was pessimistic and unpromising. Group A

respondents had a significantly low participation rate during the initial interview phase primarily citing concerns for their privacy and the study's legitimacy. One rider respondent from this group remarked that the study's (online) interview methods were skeptically similar to a previous survey (allegedly government-initiated) in which only a few days after it was conducted, their habal-habal operation was apprehended. As such, it was decided that interview consent will be requested directly since it made the respondents feel more confident and assured in providing information pertinent to habal-habal operations. The interview with transport regulators was omitted in the study primarily because of two reasons. Firstly, the timeframe for data collection was not sufficient enough to schedule an interview with government officials. Secondly, the bureaucracy involved in order to request an interview with these individuals was excessive that it would further strain the limited timeframe for data collection.

4.1.2 Survey Method and Instrument

Much of the proposed survey method and the instruments to be used for data collection were actually realized in the study, except for the reduction in the research subjects. Nonetheless, intercept surveys were conducted for both habal-habal users (or customers) and riders (or operators) in predetermined locations around the metropolis. Additional locations were further identified and will be discussed in detail in the succeeding section. In order to effectively conduct the intercept survey, qualified surveyors were hired. These surveyors are highly skilled and have years of experience in undertaking transport-related studies. A total of five surveyors were involved in collecting important information from target respondents.

It took a total of six days to collect the required number of user and rider respondents; specifically during the 3rd to the 8th of January 2019. These dates were chosen randomly, and sequentially, in order to reflect regular weekdays and weekend operating scenarios. In all six days, not all five surveyors were utilized; the first three days only had four and the remaining three had all five surveyors. The reason for this is because the participation rates and output were significantly discouraging in the beginning. It was decided that some key locations that were visited on the first three days would again be surveyed until the required number of respondents is met by each surveyor. Lastly, a minimum number of respondents that must be interviewed per day was initially set in order to effectively collect information. The daily quota was typically proportional to the number of surveyors on that day (Richardson et al., 1995). Unfortunately there is no tally on the daily figures of each surveyor. Nevertheless, the number of user and rider respondents for each survey location is presented, and will be discussed, in the following section (please refer to Table 2).

4.1.3 Habal-habal Survey Locations

As mentioned in the study's methodology, predetermined habal-habal locations will be used to survey or interview respondents; these locations initially included the cities of Parañaque (suburban) and Makati (commercial). In actuality, both locations were surveyed in order to interview habal-habal users and operators (riders). However due to the discreet operations of habal-habal in commercial areas, only a limited number of respondents were interviewed in one of Makati's survey area. Table 2 provides a brief description of actual survey locations in the metropolis wherein habal-habal operations are conducted. The corresponding number of

respondents (either user or rider) is also presented in the table. Consider the case of the EDSA-Ayala MRT Station in Makati City, several habal-habal users were hesitant to participate as the survey was conducted during the peak of the morning rush hour period. As for the case of the riders in the same survey location, reluctance to participate in the survey was due to previous experiences of government-initiated apprehensions and clampdowns of illicit motorcycle taxi services.

Table 2. Surveyed Locations for Habal-habal Operations

No.	Survey Location	Nearest Landmark	Landmark Type	No. of Respondents	
				Users	*Riders*
	Parañaque City				
1	Sucat	Sucat Interchange	Intersection	6	18
2	Bicutan	Walter Mart Bicutan	Supermarket	5	5
3	Bicutan	SM Bicutan	Shopping Mall	61	22
4	Sun Valley	Amaia Steps Bicutan	Residential	7	2
5	Merville	Robinsons Supermarket - Merville	Supermarket	9	1
6	Merville	Merville Access Road	Local Road	11	2
	Taguig City				
7	South Daang Hari	Sitio Sto. Niño	Residential	7	6
8	Upper Bicutan	Dept. of Science & Technology	Government	21	21
9	Upper Bicutan	A. Bonifacio Avenue	Local Road	18	2
10	Lower Bicutan	Taguig People's Market	Public Market	41	16
11	Western Bicutan	Gate 3 Plaza	Shopping Mall	92	20
	Makati City				
12	Pembo	SM Aura Premier	Shopping Mall	121	4
13	Forbes Park	EDSA-Ayala MRT Station	Transit Station	7	0
	Pasig City				
14	San Nicolas	Pasig Public Market	Public Market	4	1
			Total (Actual)	*410*	*120*
			Total (Target)	*430*	*120*

Figure 10 shows the pinpoint location of identified places in Metro Manila wherein habal-habal operations are conducted. Due to the limitations in time and resources, majority of these places are located in the southern portion of Metro Manila

only. A characteristic that is common between these locations is that habal-habal operations tend to operate nearby (or along) major thoroughfares with existing public modes of transportation (e.g. jeepneys). Take for example the habal-habal station near SM Bicutan in Bicutan, Parañaque City. The landmark, being a shopping mall, is served by a transport hub with various options for public transportation (i.e., jeepneys, shuttle vans, and tricycles – as feeder modes) that caters to commuters that live in the residential areas adjacent to it. The terminal itself doesn't offer habal-habal services, but operators have made their presence permanent and ubiquitous enough to be seen as an alternative to conventional modes of transport.

Figure 10. Surveyed Locations in Metro Manila for Habal-habal Operations

Another common characteristic of these identified locations is that they are mostly located in, or at the extremities of, suburban (residential) areas. Consider the case of the habal-habal station nearby the SM Aura Premier. The landmark itself, being a shopping mall, is located in the commercial district of Taguig City. It doesn't

host habal-habal operations within its premises; but instead, the habal-habal station is someplace adjacent to it. The customers (or users) nearby this landmark mostly originate from the adjacent residential area of Pembo, Makati city; these customers generate trips going to the commercial district of Taguig city. With this example, it can be implied that identified habal-habal stations in this study mostly serve customers that generate home-based work (HBW) trips.

As mentioned above, Table 2 provides the number of respondents for each identified habal-habal locations. It is expected that participation levels will not be high and will vary per survey location. However, the goal of the survey remained the same for each location; to inquire about and acquire the characteristics of habal-habal users (and riders) with the use of a standardized questionnaire. The results and findings of this investigation are discussed in the following sections.

4.2 Descriptive Statistics of Habal-habal Riders (*operators*)

This section begins with the descriptive discussion of habal-habal operations and the rider characteristics. The term '*habal-habal rider*' is used frequently in this paper to correspond to individuals that *provide* habal-habal services rather than the individuals that *utilize* or employ its services. Despite it not being the main focus of this study, it is important to discuss fundamental habal-habal characteristics from the perspective of its operators.

4.2.1 Socioeconomic Characteristics

To begin with, Figure 11-a provides the graphical distribution of the riders' age and their corresponding civil status. This figure reveals that majority of habal-

habal riders are in their early 40's and are married or with a spouse. Figure 11-b on the other hand illustrates the rider's distribution according to their income group and their corresponding educational background. It is evident that majority of habal-habal riders are high school graduates and a significant number of them obtained higher educational degrees (i.e., Bachelor's Degree).

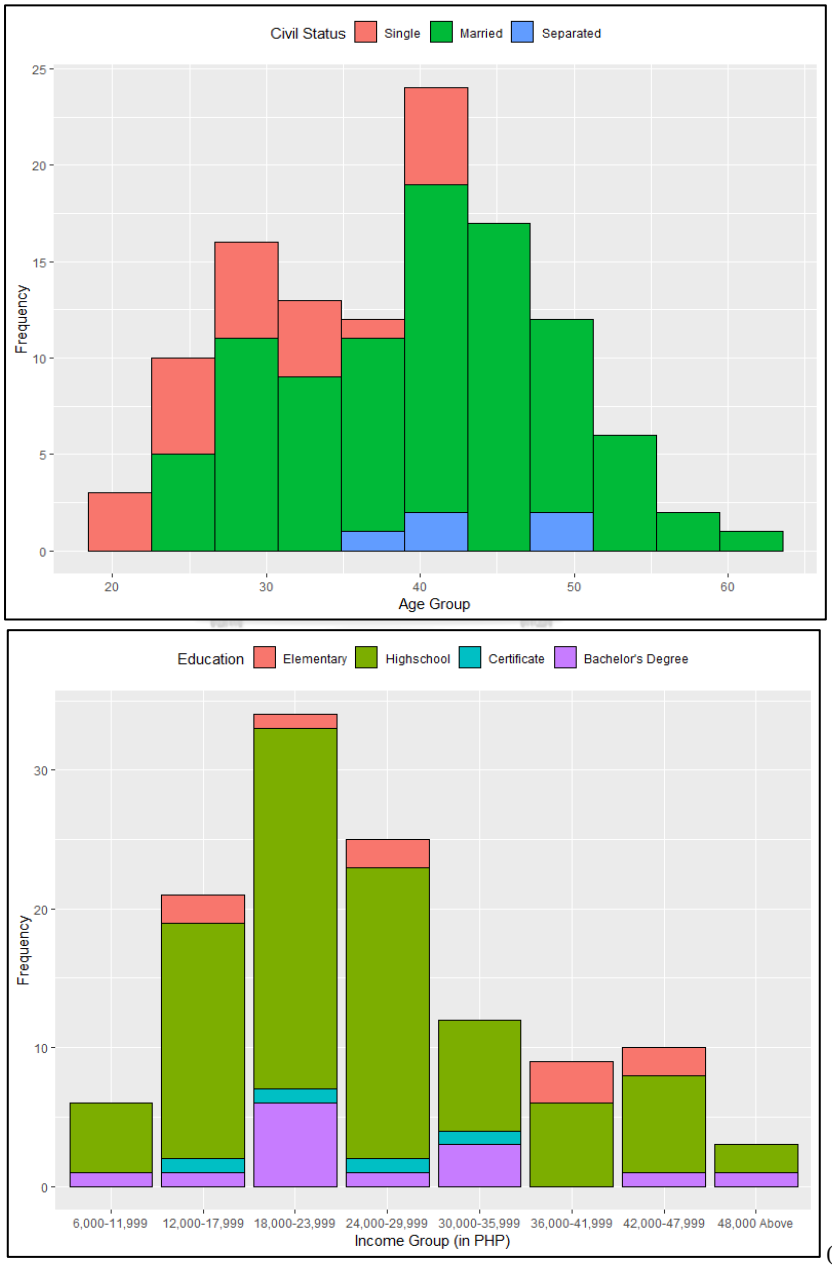
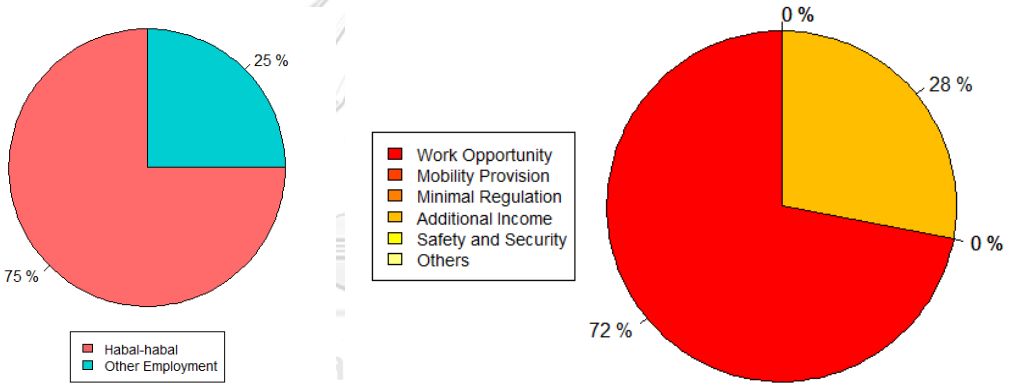


Figure 11. Socioeconomic profile of habal-habal operators:
(a) by age and civil status and (b) by income and educational background

Despite the variation in educational background, the income of habal-habal riders is normally distributed with a central tendency towards the third income bracket (i.e., PHP 18,000 – 23,999). This finding suggests that habal-habal operations can provide a decent income and employment opportunities, albeit informal, for individuals that cannot obtain formal employment due to educational restrictions and limitations in marketable skills. Perhaps this reasoning is supported by Figure 12 which illustrates the riders' primary motivations in providing illicit motorcycle taxi services.



(a) (b)

Figure 12. (a) Rider's source of employment and (b) reason for doing habal-habal

It was found that 75% of the interviewed riders consider habal-habal as their primary source of employment and that the primary reason for doing habal-habal services is for work or employment opportunity (see Figure 12). This finding further supports the argument that habal-habal provides informal employment. Furthermore, Figure 12 also shows that 28% of interviewed individuals conduct habal-habal in order to have an additional source of income. A finding that could imply that habal-habal could be an alternative source of income for any individual with a motorcycle.

4.2.2 Operational characteristics

The survey conducted for habal-habal riders did not only inquire about their socioeconomic profiles and motivations, but it also investigated the fundamental trip and operational characteristics of habal-habal services. Table 3 provides the descriptive statistics of some variables significant to habal-habal trips. For example, the average fare for a habal-habal trip as charged by the rider is given in this table. It is evident that trip fare is proportional to trip distance; the longer the destination, the higher the trip fare becomes. Another variable to take note of is the average waiting time; this variable denotes the idle time spent by riders in between revenue trips. Referring from the same table, habal-habal trips could occur frequently (2 minutes between trips) or intermittently (240 minutes between trips).

Table 3 also presents significant variables pertinent to habal-habal operations; examples of which are the daily average income, costs, and profit of habal-habal operators. On a single day, an average of PHP 984.79 (≈USD 18.00) can be earned by a rider; factoring in costs (such as fuel, repair and maintenance), a rider could still earn a decent wage of PHP 791.82 per day (≈USD 15.00). This amount is substantially more than the daily minimum wage rate in Metro Manila for 2018, which stood at PHP 500.00 to PHP 537.00 (≈USD 9.00 – USD 10.00). It was also found that 4% of interviewed riders are renting the motorcycles used for habal-habal, with an average daily rent price of PHP 144.13 (≈USD 3.00). But because of the small quantity of riders that rent a motorcycle, rent price was excluded from the daily net income computation. This finding indicates that majority of riders own their motorcycles and have complete control of their income. This could support the argument stated earlier that anyone with a motorcycle could seek alternative sources

of income through habal-habal operations. Take note that association charges, which varied per habal-habal groups, were also recorded during the investigation. However as requested by interviewed riders, such information will not be disclosed in this paper and were not included in the daily net income computation.

Table 3. Descriptive Statistics of Habal-habal Operators

Variables	Unit	Mean	SD*	Min.	Max	Count
Rider Characteristics						
Age		38.58	9.26	19.00	60.00	116
Trip Characteristics						
Average Distance	*km.*	5.87	4.59	0.50	25.50	119
Average Fare	*PHP***	114.40	126.56	22.50	1000.00	120
Average Travel Time	*minutes*	18.43	13.87	3.00	61.50	120
Average Idle Time[1]	*minutes*	37.38	35.50	2.00	240.00	120
Operational Characteristics						
No. of Trips	*per day*	14.40	6.63	3.50	40.00	119
No. of Passengers	*per day*	14.40	6.63	3.50	40.00	119
Average Income	*PHP/day*	984.79	360.91	400.00	2000.00	120
Average Fuel Cost	*PHP/day*	167.19	49.72	50.00	300.00	120
Average R&M[2] Cost	*PHP/day*	33.26	27.47	4.00	150.00	93
Daily Net Income	*PHP/day*	791.82	349.89	186.00	1840.00	120
Motorcycle Rent Price[3]	*PHP/day*	144.13	58.36	70.67	200.00	5

[1] Denotes the idle time between trips (since *n = 5* only)
[2] Repair and Maintenance (R&M) Cost *SD = Standard Deviation
[3] Not included in the daily net income **PHP = Philippine Peso

In terms of service frequency, Figure 13 illustrates the rider's frequency distribution for habal-habal operations within a day's period. At least 75% of interviewed riders conduct habal-habal operations during morning peak period (6AM–9AM), which then gradually decreases on the early hours of the afternoon. The peak service period in the evening, wherein at least 65% of riders conduct operations, happens between 3PM–6PM; service frequency also gradually decreases until midnight. Frequency of habal-habal operations also vary depending on the day of the week. From the same figure, it is evident that habal-habal operations are more

frequent on weekdays as compared on a Sunday. It can be observed that less than half of interviewed riders do not conduct habal-habal services on a Sunday. Moreover, the service frequency on a Sunday has a steeper decline after 6PM as compared on an average weekday. An implication that Sunday evenings are utilized by riders for rest and relaxation, or perhaps for repair and maintenance of their motorcycles.

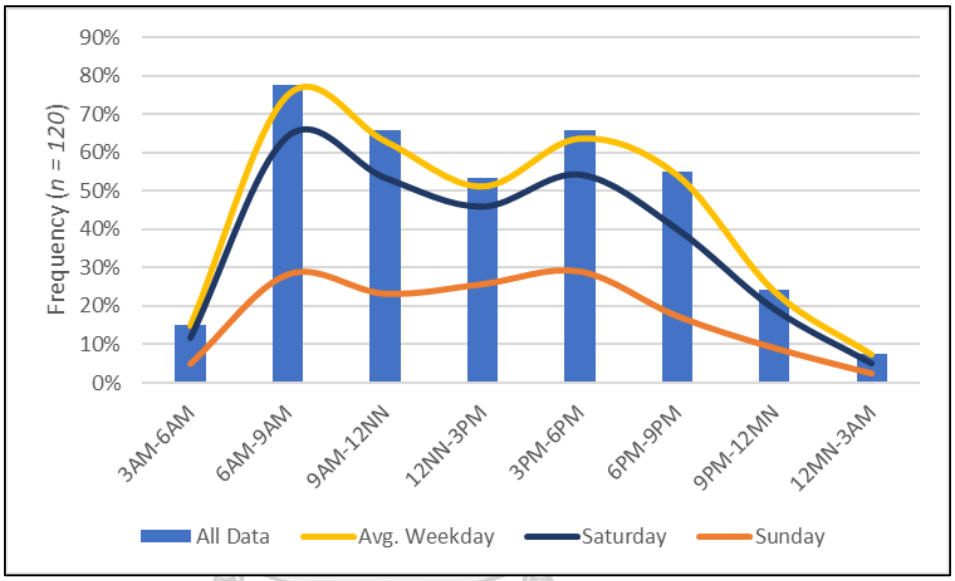


Figure 13. Service Frequency of Interviewed Habal-habal Riders

It was found that 92% of the interviewed riders are active members of (or is affiliated with) habal-habal associations; 14 habal-habal associations were identified in this study. Most of these associations have their own rules, regulations, and operating protocols. A common denominator between these groups is their membership fee. Similar to Bangkok's *quota rent*, wherein the number of motorcycle taxi operators are limited by setting a membership fee (Chalermpong and Ratanawaraha, 2017), prospective members of a habal-habal association must also pay a membership fee in order to become a part of it. Although the implication and

significance of this fee is not clearly disclosed, it was suggested that this fee is used as a form of insurance or protection against apprehension from local traffic authorities.

Some habal-habal associations also impose a daily boundary fee for its members in order to sustain membership privileges. As an example, one habal-habal association imposes a *uniform trip fee* for its members. In order to meet daily boundaries, a member must pay PHP 5.00 for every habal-habal trip conducted, then the member gets to keep the rest of the fare; again, this is not the case for all identified associations. One characteristic of this group is their convenient operating location which sits between a transit-deficient residential area and a sprawling, yet somehow transit-deficient, commercial district. Residents that work in the commercial district often rely, sometimes exclusively, on the association's services to bring them to their destinations within the commercial district or to transit stations adjacent to it. If not, residents typically prefer to walk to their destinations, especially if it is only nearby.

Lastly, a handful of interviewed habal-habal operators have asked for discretion in sharing their organization's information and activities, partly due to its illicit nature and from worries of a government-initiated crackdown. Which could mean the loss of their livelihood (as mentioned, majority of respondents consider habal-habal as the primary source of employment).

4.2.3 Internet-based Ride-hailing Motorcycle Taxi Service

Motorcycle taxi services has been existing in the country for a long time, but it was mostly believed to operate only in rural areas as a response to transit deficiency. The opposite can be observed in urban areas like Metro Manila wherein

habal-habal operations is a response, not entirely to transit-deficiency, but to the worsening congestion levels. A local start-up company (DBDOYC Inc.) launched a motorcycle taxi ride-hailing service in January 2017 called *Angkas* (which is a Filipino word meaning *to hop on*) in order to address the growing demand for habal-habal services (Lopez, 2018). Take note that prior to Angkas, habal-habal transactions have mostly been demand-driven. Demand-driven in a sense that a customer has to go to the desired service as opposed to demand-responsive wherein the desired service goes to the customer. Angkas was aimed to be a demand-responsive motorcycle taxi service similar to other online-based ride-hailing services (e.g., Uber and Grab). A handful of the interviewed riders are, or were previously, affiliated with the motorcycle ride-hailing company. This implies that their service coverage is not just limited or fixed to a specific area, but also extends to online ride-hailing customers.

On November 2017 the Land Transportation and Franchising Regulatory Board (LTFRB) issued a memorandum that bans the operations of Angkas citing that the country's laws do not recognize motorcycles as a form of public conveyance (De Jesus, 2017). According to Republic Act 4136, otherwise known as the *Land Transportation and Traffic Code of 1964*, motorcycles are authorized to be used indicatively for private trips or purposes only. The LTFRB, together with its parent agency, the Department of Transportation (DOTr), claims that the abovementioned law must be amended in order to allow motorcycle taxi operations. In order for Angkas to survive, the company changed its operating protocol from transporting passengers to transporting parcel and goods. This was done in order to retain and support its approximately 20,000 driver-partners (or riders) nationwide while it struggled to legally bypass LTFRB's memorandum. Although passenger bookings

ceased to operate on the company's mobile application, online habal-habal transactions continued to flourish elsewhere.

The cessation of the Angkas ride-hailing application prompted the driver-partners and their customers to conduct passenger transport elsewhere. As such, multiple Facebook group pages that handle motorcycle taxi transactions between riders (or driver-partners) and customers began to flourish. During the course of this study, more than a dozen Facebook group pages for the Metro Manila area alone were identified that actively conducts online habal-habal transactions. A customer books a habal-habal trip by posting certain information (e.g., pick-up and drop-off locations, phone number, etc.) on the page's wall, any online rider that sees the post and is nearby can bid for the customer's preference by simply posting a comment or by directly messaging the customer (either on Messenger or through the phone number provided). The selection of a rider depends on the customer's discretion, but it typically follows a *first-come, first-served* basis. A distinct difference between Angkas and the online group operation is that the rider gets to keep the day's revenue all to himself, these habal-habal groups do not impose any sort of membership or company fees. Affiliation is open for anyone that is interested, either rider or customer, and membership to more than one Facebook group is possible as well. With this condition, it can be stated that these online groups exclusively operate on the premise of providing an organized and convenient way of conducting habal-habal transactions, which is similar to Angkas but without the bureaucratic regulations and corporate charges.

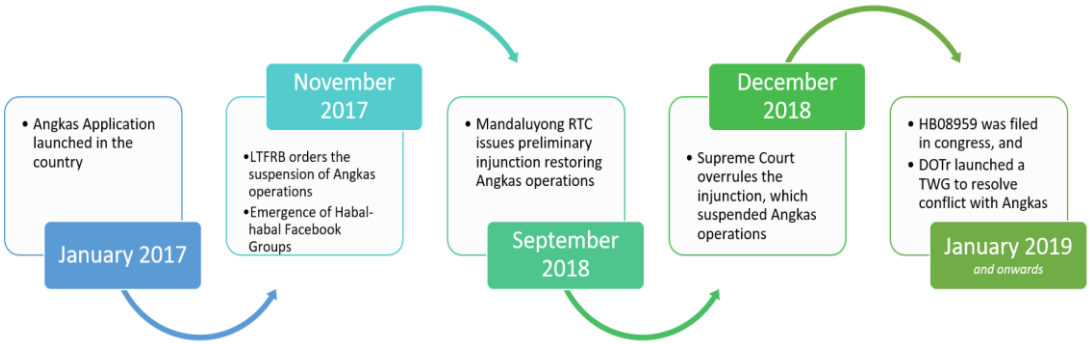


Figure 14. Timeline of Angkas Operations

Continuing on with the Angkas timeline, 10 months after its shutdown or in September 2018, the Mandaluyong City Regional Trial Court (RTC) granted the request of Angkas for a preliminary injunction in order to counter the government-initiated memorandum thus effectively allowing it to resume its motorcycle taxi operations again (Esguerra, 2018). Certainly, both transport regulatory agencies (i.e., DOTr and LTFRB) were dismayed because of the court's decision citing that motorcycle taxi operations (or habal-habal) are unsafe and illegal, and will remain so unless amendments are done to national laws. However, just before 2018 ended, the Supreme Court issued a temporary restraining order (TRO) which overruled the Mandaluyong RTC's preliminary injunction which restored the ban on Angkas operations. It would seem that the executive (transport regulators) and judicial (trial courts) branches of the government have reached an impasse regarding the Angkas situation and would continue to be so unless the legislative branch amends the existing laws pertinent to public modes of transportation.

At the beginning of 2019, a house bill (House Bill No. HB08959) was filed in congress as a *response* to the growing conflict between transport regulators and Angkas. Similar to other house bills that have been filed earlier but have not progressed significantly, this house bill aims to amend Republic Act No. 4136 in

order to include motorcycles-for-hire in the list of legally identified public modes of transportation. At the moment of writing this paper, the house bill has already passed its final reading in congress (lower house) and is now for review and approval of the senate (upper house). In addition, the Department of Transportation (DOTr) also created a technical working group (TWG) as a response to the situation. The technical working group aims to study all aspects of Angkas' operations, particularly its efficiency, viability, and safety characteristics (Ilagan, 2019). The initial plan for this technical group is to eventually conduct trial runs of Angkas operations in different parts of the country.

It is obvious that the embroilment between the government and Angkas made a significant impact on the livelihoods of its riders (or driver-partners), which is why most of the interviewed riders were no longer associated with the company and are operating independently from it. A strong concern against Angkas occurred among the interviewed riders citing that: "[the company] as it gains more favor and foothold from the government and the general public, will become more bureaucratic and monopolistic with its corporate operations". Perhaps this is an implication that these riders would want a more inclusive regulation for motorcycle taxi operations wherein access for a habal-habal franchise would be equitable for all, be it an individual or a corporation. Finally, this regulation is relevant and needed now as similar foreign ride-hailing services are trying to enter the Philippine market (e.g., Indonesia's Go-Jek). The competition between independent, local, and foreign entities might produce further complications and imbalances if policies and regulations are not set in place accordingly and swiftly.

4.3 Descriptive Statistics of Habal-habal Users (*customers*)

This section discusses the characteristics of habal-habal users in a descriptive manner, such characteristics include: socioeconomic, trip, and mode characteristics. A summary of the descriptive statistics of these characteristics is presented in Table 4.

4.3.1 Socioeconomic Characteristics

Variation in socioeconomic characteristics exist for the interviewed respondents. Figure 15-a illustrates the variation in the preferred mode of transport of interviewed commuters. Of the 410 commuter respondents, a total of 294 individuals chose habal-habal as their primary means of transport, while the remaining 116 preferred to use conventional modes of transport. Recall that conventional modes of transport in this study are defined as any form of public transportation that is not a motorcycle taxi service. Upon observation, majority of the respondents, either a user of habal-habal or not, are within their late 20's and early 30's, a finding that could suggest that habal-habal users in Metro Manila are established professionals.

Figures 15-b and 15-c provides the age distribution of individuals with respect to their gender. It can be observed that habal-habal services in Metro Manila are fairly utilized by both genders. The same figure (Figure 15-b) illustrates that approximately 60% percent of habal-habal users are males and 40% are females. Although habal-habal is significantly used more by males, this result could suggest that access and mobility is equitably provided by habal-habal services for both genders. In addition, the decline on habal-habal patronage as age increases should also be noted. Unlike conventional mode users, habal-habal usage steadily declines as an individual gets older.

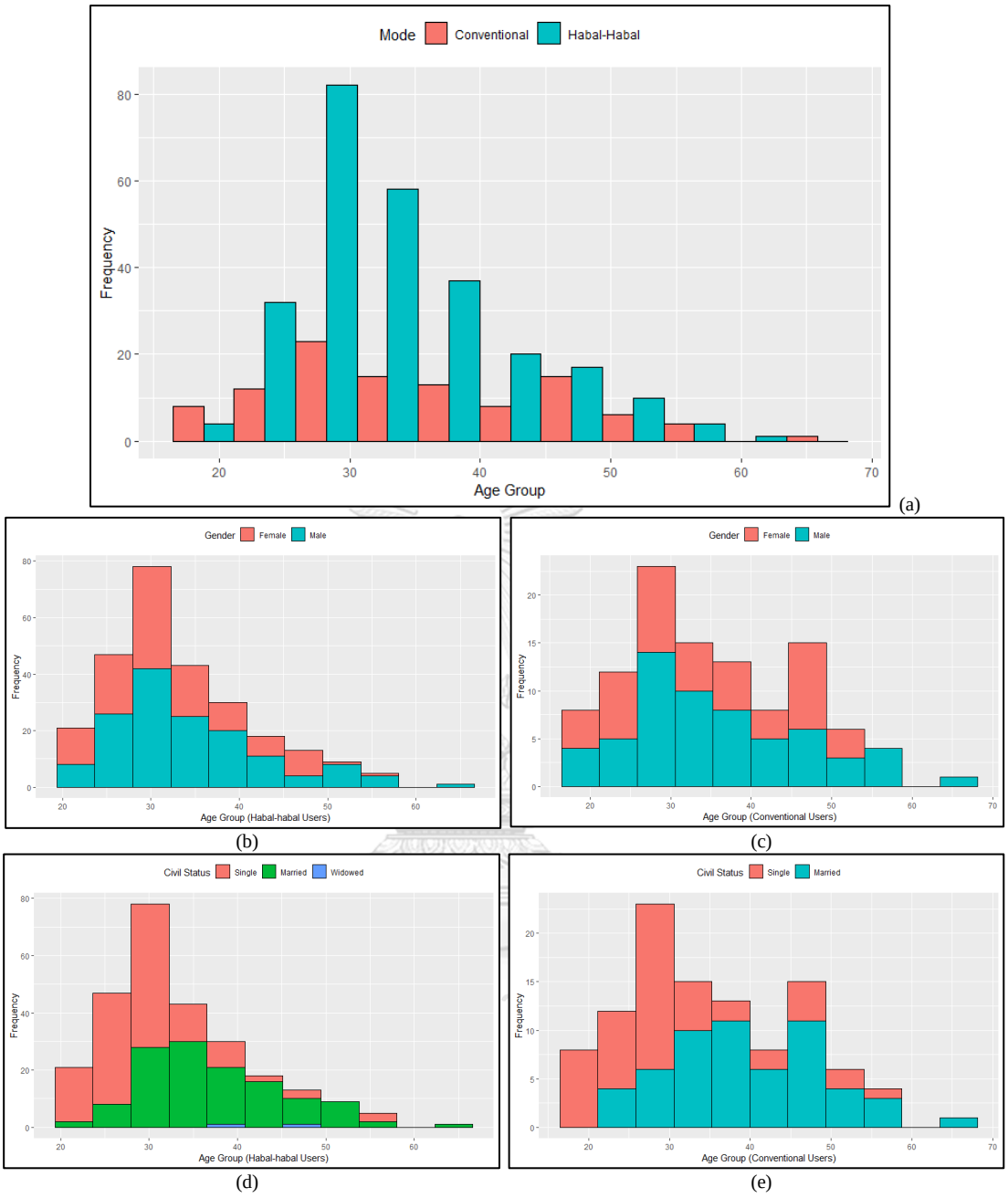


Figure 15. Age Distributions of Interviewed Individuals based on their: (a) preferred mode of transport, (b)(c) gender, and (d)(e) civil status

Furthermore, Figures 15-d and 15-e provides the same age distribution but with consideration to their civil status. A trend can be observed on both graphs wherein users that are single increase in number throughout their early 20's and would significantly reduce beyond their late 30's. The same behavior or trend can be

observed for married users, with the exception in the shape of its spread or distribution which is wider (high variance) than the former user group.

On average, habal-habal users earn a fair amount of income, majority of which are above the poverty threshold to live adequately in Metropolitan Manila (Sy et al., 2018). Figure 16-a provides the income distribution of user respondents with respect to their preferred mode of transport. It is apparent that interviewed habal-habal users earn larger amounts of income as compared to conventional mode users. Moreover, Figures 15-b and 15-c provides the same income distribution but with consideration with the respondent's employment status. It is apparent that majority of interviewed individuals are decently employed (whether regularly, part-time, or contractually) and receive a sufficient amount of income. A minute, but still notable, amount of self-employed habal-habal users earn a fairly decent amount of income as well. Upon inquiry, most of these self-employed users are micro-entrepreneurs or small business owners (e.g., convenience stores or cake shops).

In addition, Figures 16-d and 16-e presents the same income distribution of respondents but with consideration for their educational degree. Approximately 60% of habal-habal users has a bachelor's degree while 28% holds a high school diploma. Majority of users in the 12,000 to 17,999 income group, regardless of transport mode, are high school diploma holders, the opposite is true for higher income groups. An implication is that bachelor degree holders receive higher income as compared to other users that were able to obtain lower degrees. The 'NA' in Figures 16-d and 16-e are users that have not disclosed their educational background but has provided data for their monthly income.

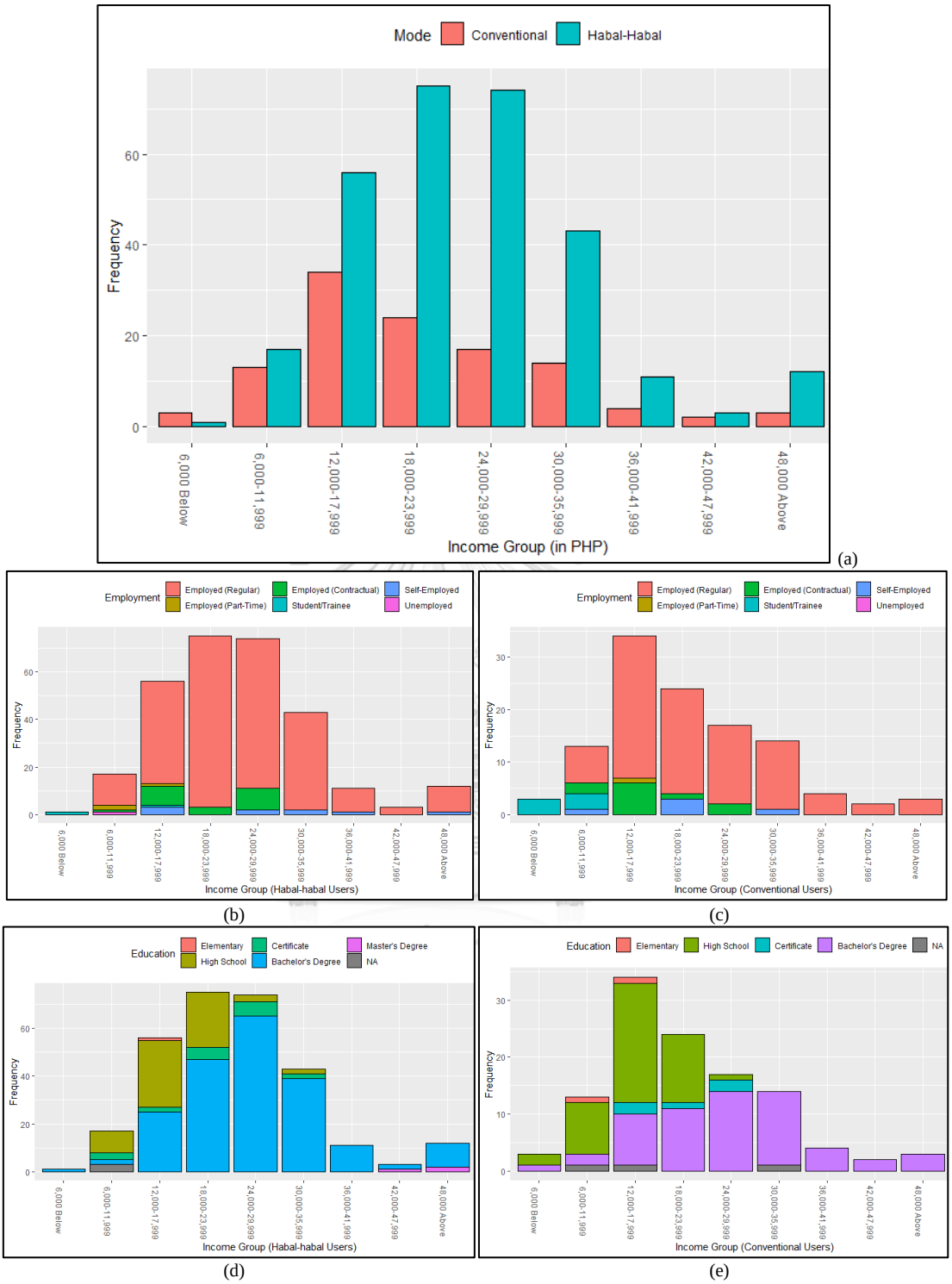


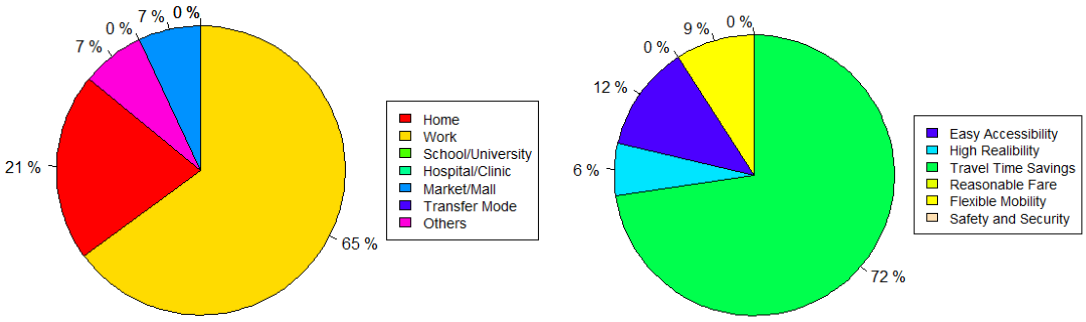
Figure 16. Income Distributions of Interviewed Individuals based on their: (a) preferred mode of transport, (b)(c) employment status, and (d)(e) educational background

An implication regarding user's motivation to employ motorcycle taxi services can be made from their income distributions. Basing alone on habal-habal user's typical income group, which is the PHP 18,000 to PHP 23, 999 income range, it is apparent that majority of these users are capable of spending a significant amount of their income for habal-habal services; which are, as it will be discussed in the succeeding section, are more expensive than a typical trip on conventional modes of transport. It is not clear yet if income alone affects the decision of users to employ habal-habal services. However, as portrayed in Figure 16-a, majority of habal-habal users earn significantly more income as compared to individuals that prefer conventional modes of transport. Moreover, since more than 80% of the user respondents are employed (either regularly, part-time, or contractually), it is possible that work-related issues, such as being at work on-time, could contribute to their trip-making decision. Information regarding automobile ownership (and motorcycles) were also recorded, but it was found that only a handful of respondents actually have their own vehicles (i.e., automobile and/or motorcycle). Moreover, only 13% of the respondents has a license to operate personal mobility vehicles, and majority of these licensed individuals opted to use public transportation instead.

4.3.2 Trip Characteristics

As mentioned before, intercept surveys were conducted in order to gather information from habal-habal users. These surveys were conducted throughout a number of weekdays and weekends; although majority of it were completed during the weekdays. Given this condition, it was apparent that 65% of the habal-habal trips made by users are for work purposes (see Figure 17-a); 21% are for home-bound

trips, and the remaining 14% are equally divided into market-bound trips and other trips, most of which were identified as ‘personal’ trips. Only six, general and common, trip purposes were predetermined in order to simplify categorical choices in the questionnaire.



(a) (b)

Figure 17. (a) Trip Purpose and (b) Reason for using of Habal-habal Services

User respondents were also asked to identify the primary reason for using or choosing habal-habal services (labelled as *influence setting* in the questionnaire). Figure 17-b illustrates that 72% of respondents chose ‘Travel Time Savings’ as their primary reason for choosing habal-habal. This finding points out the importance of travel time in choosing an appropriate mode for a generated trip. Other reasons or influences that are important for the users are: easy accessibility, flexible mobility, and high reliability. These influence factors were also predetermined in the questionnaire and are based on literatures pertinent to motorcycle taxi services.

The time period wherein habal-habal trips are conducted was also queried from individuals. Figure 18 provides the habal-habal user’s time period distribution with considerations to their trip purpose and their influence setting. It is evident from Figure 18-a that majority of habal-habal trips are conducted during the morning rush

hour period (i.e., 6AM - 9AM), it gradually decreases throughout the afternoon until it peaks again in the early evening (i.e., 3PM - 6PM). This observation is somewhat similar to the service frequency of habal-habal riders (please refer to Figure 13), which could suggest symmetry between habal-habal supply and demand. A key finding to take note of is the regularity of work-induced habal-habal trips in the morning periods as shown in Figure 18-b. Work-related trips are also present for conventional mode users. However, they are not as in-demand as habal-habal is in the morning period. Rather, usage of conventional modes of transport among interviewed individuals peaked only during early evening periods (see Figure 18-c). An implication from this result suggests that habal-habal is likely preferred for trips conducted in the morning.

It can be implied that habal-habal services are primarily utilized by employed and professional individuals. Regardless of an individual's preferred mode of transport, Figures 18-d and 18-e illustrates the importance of travel time for both respondent groups. It is vital for these professionals to reach and arrive at their destinations on time. Employing habal-habal services implicitly suggest that it is possible to reduce the travel time despite a trip conducted on either morning or evening rush hour periods. Observing the same pair of figures, travel time savings could be regarded as a significant factor in a commuter's trip making decision. Other influence factors, besides travel time savings, that were deemed relevant by the respondents are: easy accessibility, flexible mobility, and high reliability. Of the six predetermined influence factors, only four were recognized by users that seem to be analogous with their intentions to use habal-habal services.

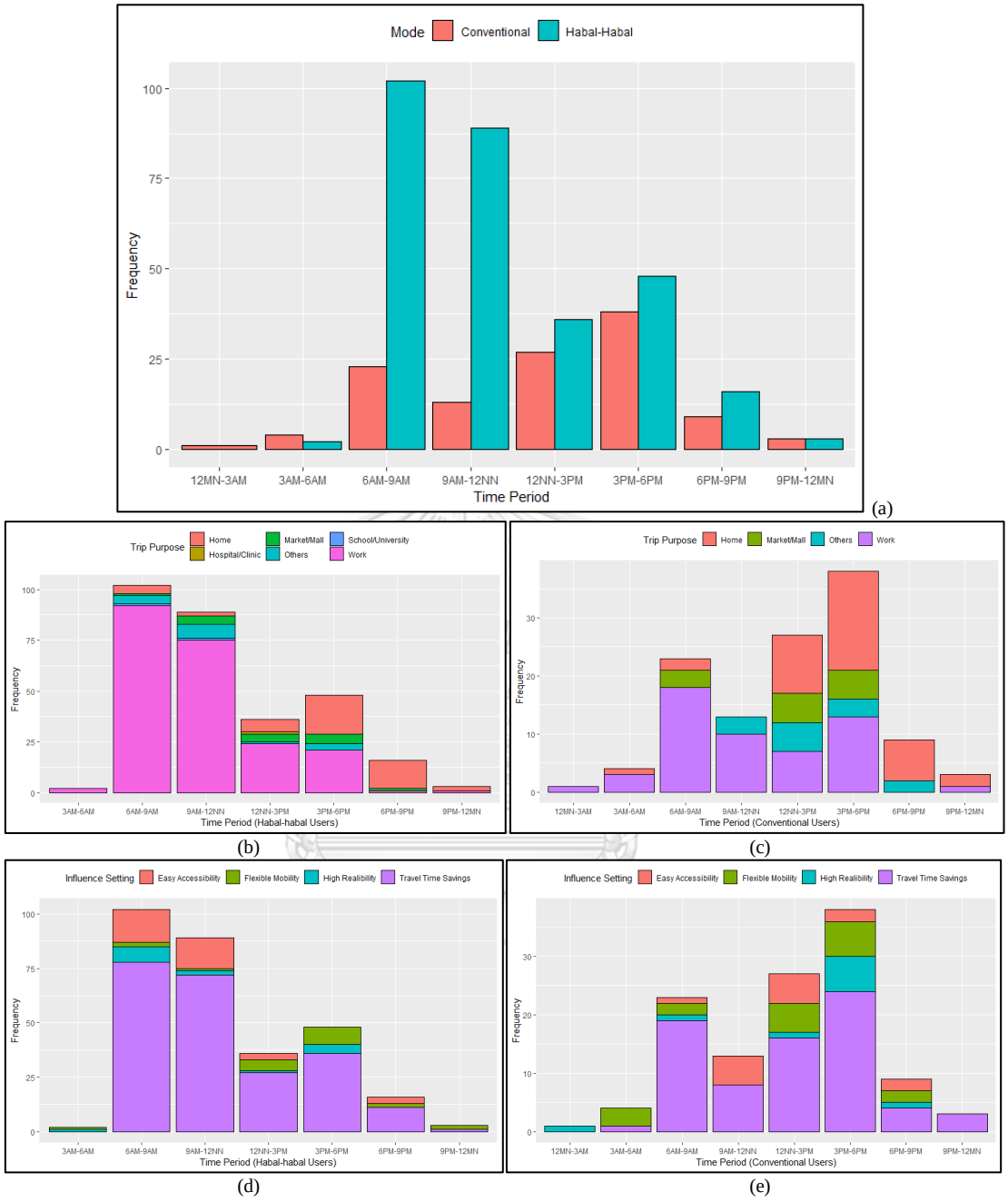


Figure 18. Time Period Distribution of Interviewed Individuals based on their: (a) preferred mode, (b)(c) trip purpose, and (d)(e) influence setting

Table 4 provides the descriptive statistics of other variables related to the trips made by habal-habal users. One variable to take note of is the average usage of habal-habal per week. Habal-habal users typically employ motorcycle taxi services at an

average of 3.52 times per week with a minimum usage of once (1) a week and a maximum usage of ten (10) times per week. The reason for this variation in usage frequency lies on the purpose of the trips made by the service users. As an example, a user that employs habal-habal services only once a week is more likely to go to a market than an office; the opposite might be true for a user that employs habal-habal services numerous times a week in order to reach his or her workplace.

Figure 19. Habal-habal Routes based on documented O-D pair

Another trip variable to consider is the average distance of the habal-habal trips. From the same table, the mean distance of a habal-habal trip is 5.19 kilometers, with a minimum of 450 meters to a maximum of 15 kilometers. In this statistic, only trip distances that are less than or equal to 15 kilometers were considered. The reason for this is because of a 40-kilometer trip that was recorded from a respondent. If this distance were to be considered in the descriptive statistics, the standard deviation for trip distance would increase to ±5 kilometers, which is too high or distant for a typical

habal-habal trip. The 40-kilometer trip was an isolated occurrence wherein the trip originated within the study area and ended outside of it. Recalling a statement in Chapter 3, habal-habal trips originating within the study area but terminating outside of it would still be considered for deeper analysis. Figure 19 provides the extent of habal-habal service coverage based on recorded origin-destination pairs from interviewed users. The red pins indicate the location of habal-habal stations wherein intercept surveys were conducted (recall Table 2 and Figure 10). Roads with darker shades of blue are more likely to be utilized for habal-habal operations. Despite the limited number of survey locations, the figure above suggest inter-city habal-habal trips as some of the recorded OD pairs originate and terminate in different cities and areas around Metro Manila.

4.3.3 Mode Characteristics

Apart from the socioeconomic and trip characteristics, mode characteristics as perceived by habal-habal users are also presented in Table 4 in a descriptive manner. The characteristics considered in this study are: waiting time – the time spent prior to making a trip with the desired mode, trip time – the duration of the trip with the desired mode, and trip cost – the total amount paid for the trip with the desired mode. Perceived mode characteristics from conventional mode users are also presented in Table 4. To clarify, conventional modes are any form of transportation (formal or informal) that is not a motorcycle taxi service. In terms of trip cost, it is evident that making a habal-habal trip is 3.57 times more expensive than making a trip with conventional modes of transport. From a habal-habal user's perspective, a typical habal-habal trip could cost PHP 90.74 as compared to PHP 25.42 for a trip using

conventional modes of transport. Despite this drawback, habal-habal services significantly outdoes conventional modes in terms of trip completion time and waiting time. As an example, a typical trip would take 47 minutes to complete at a cost of only PHP 25.00 if conventional modes are used. However if habal-habal is used, the trip time would significantly be reduced to only 15 minutes, but price would significantly be costlier at PHP 91.00.

Table 4. Descriptive Statistics of Interviewed Individuals

		Habal-habal Users					Conventional Mode Users				
Variables	Unit	Mean	SD*	Min.	Max.	Count	Mean	SD*	Min.	Max.	Count
User Characteristics											
Age		33.35	8.21	20.00	63.00	263	34.86	10.53	17.00	64.00	103
Trip Characteristics											
Trip Distance	*km.*	5.19	4.83	0.45	15.00	293	7.71	5.45	0.80	15.00	116
Usage Frequency	*weekly*	3.52	1.88	1.00	10.00	294	1.53	1.05	1.00	7.00	116
Time Period[1]		2.34	1.38	1.00	8.00	294	3.25	1.64	1.00	8.00	116
Mode Characteristics											
Habal-habal Perception											
Waiting Time	*mins.*	4.20	5.58	0.00	30.00	294	2.35	2.51	0.00	20.00	116
Trip Time	*mins.*	14.95	14.04	2.00	125.00	294	17.46	14.03	3.00	70.00	116
Trip Cost	*PHP*	90.74	116.80	15.00	1500.0	294	109.63	74.62	20.00	400.00	116
Conventional Modes Perception											
Waiting Time	*mins.*	12.07	11.64	0.00	90.00	294	10.13	7.27	0.00	45.00	116
Trip Time	*mins.*	46.69	32.31	2.00	180.00	294	57.11	37.84	5.00	180.00	116
Trip Cost	*PHP*	25.42	54.11	8.00	800.00	294	26.51	23.63	8.00	120.00	116

*SD = Standard Deviation

[1] Time period when the trip was made:
[1] 6AM-9AM [2] 9AM-12NN [3] 12NN-3PM [4] 3PM-6PM [5] 6PM-9PM [6] 9PM-12MN [7] 12MN-3AM [8] 3AM-6AM

On either user perspectives, the mean trip time and mean waiting time for habal-habal is significantly lesser as compared to conventional modes, but the opposite is true in terms of the mean trip cost. The expensive cost of a habal-habal trip is somewhat reasonable since the nature of its service is demand-responsive; meaning that it exists to serve a niche market (e.g., time-sensitive workers or transit-captive commuters) unlike conventional modes of transport that regularly provide transport services to the commuting public.

The table above presents the collective trip characteristics of conventional modes of transport as perceived by interviewed commuters. The reason for this arrangement can be traced back to the questionnaire's structure (see appendix section for reference), which only permits the comparison between characteristics of a one-way trip on habal-habal with an identical one-way trip on conventional modes, regardless of the number of conventional modes taken for the said trip. However, collected information from commuters suggests that more than 50% of these trips are actually *unimodal* or single-mode trips, with jeepneys being the dominant mode of conventional transport for either interviewed commuters. Table 5 provides the characteristics of these single-mode trips as perceived by habal-habal and conventional mode users.

Table 5. Descriptive Statistics of Conventional Modes of Transport

Perceptions on **Mode Characteristics** *(Unit)*	**Habal-habal Users**				**Conventional Mode Users**		
	Wait Time *(minutes)*	**Trip Time** *(minutes)*	**Trip Cost** *(PHP)*	**N**	**Wait Time** *(minutes)*	**Trip Time** *(minutes)*	**Trip Cost** *(PHP)*
Conventional Modes:							
o Jeepney	11.06	43.99	14.14	109	8.42	48.51	14.51
o UV Express/FX Vans	11.67	46.67	44.00	3	20.00	60.00	50.00
o Tricycle/Pedicab	8.24	32.02	14.62	42	7.22	38.33	18.11
o Bus	24.29	55.71	17.14	7	12.50	90.00	26.50
o LRT/MRT/PNR	15.00	30.00	30.00	1	-	-	-
o Taxi	28.75	60.00	342.50	4	10.00	30.00	120.00
o Personal Car	-	-	-	-	-	-	-
o Personal Motorcycle	-	-	-	-	-	-	-
o Grab/Uber	-	-	-	-	-	-	-
Sum				166			

*mode characteristics shown above are averaged values

As shown on the table above, it is apparent that jeepneys are the primary means of conventional travel for either users. As an example, 109 of the 294 habal-habal users utilize jeepneys as their primary means of conventional transport. Waiting

time for jeepneys are perceived to be significantly lesser by conventional mode users. The opposite is true however in terms of travel time, as jeepney trip duration is perceived to be relatively shorter by habal-habal users. In terms of trip cost, both user groups had identical perceptions with costs averaging at PHP 14.00 to PHP 15.00 per trip. Other than jeepneys, other conventional modes were also identified to be involved as single-mode trips. However, the number of observations for these modes are significantly low to be able to produce generalized statements about it. In addition, some conventional modes (e.g., car or motorcycle) does not show any values at all. The reason for this incident could be explained by the fact that none of the interviewed commuters actually used personal cars, motorcycles, or ride-hailing services for their trips. In the case of rail-based transport (i.e., LRT/MRT/PNR), single-mode trips for conventional users are non-existent as it is mostly part of multimodal trips. Figure 20 provides the frequency of conventional mode usage among interviewed individuals in the study. Take note however that the figure considers the collective trip information from all respondents, regardless of their user group.

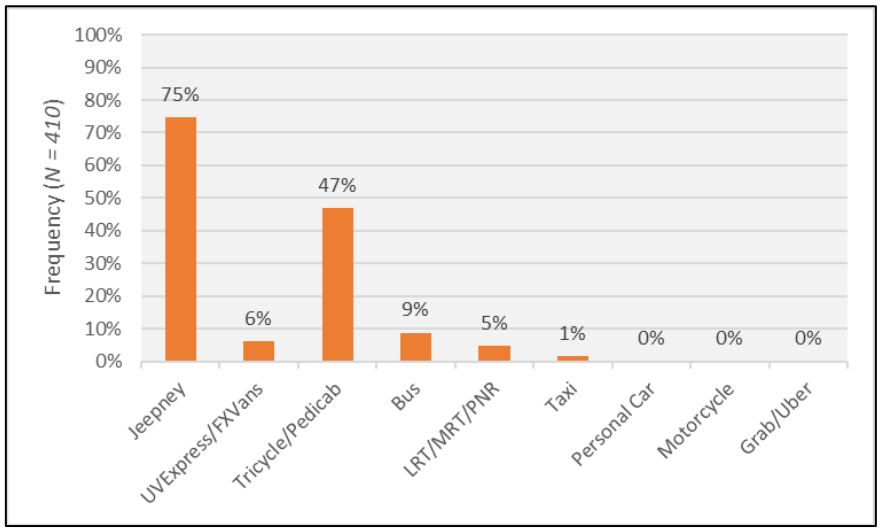


Figure 20. Usage Frequency of Conventional Modes of Transport

In addition to the tables presented above, Figure 21 further demonstrates the discrepancy between the mean trip cost of habal-habal and conventional modes. It is evident that trip cost is proportional with trip distance; however, this linear relationship is more profound for habal-habal services. By observation, it can be stated that changes in conventional trip costs are nominal, even invariable in certain cases, as trip distance increases; the opposite can be said for changes in habal-habal trip costs. It follows the proportional relationship between variables, but at a more heightened state; the farther the trip distance is, the larger the marginal habal-habal trip cost becomes.

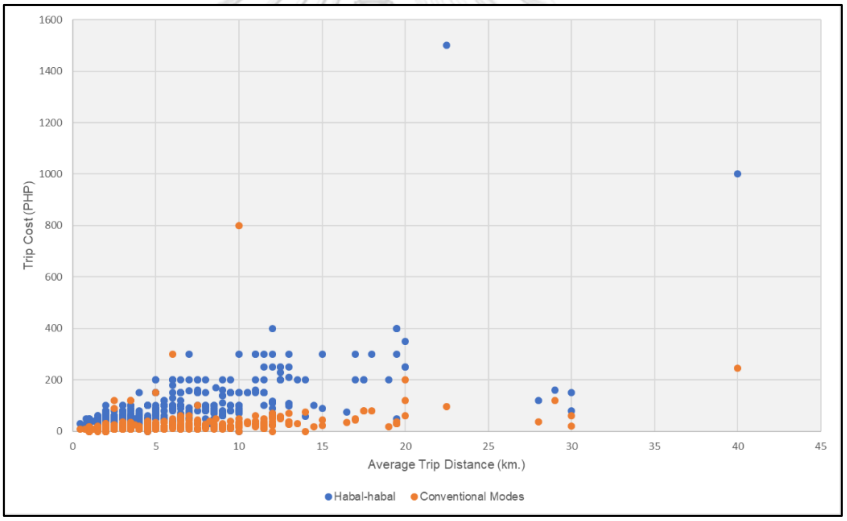


Figure 21. Trip Cost versus Trip Distance Scatterplot

Given the rough analysis regarding the marginal trip cost of habal-habal services, it can't be helped to ask: what it is that makes it an attractive alternative to conventional modes of transport? The succeeding chapter will help in answering this question by delving further into the decision-making process of commuters. By utilizing a powerful mathematical tool, *discrete choice modeling*, commuter characteristics that significantly affect trip-making decisions could be determined.

CHAPTER V
DISCRETE CHOICE ANALYSIS AND BINARY LOGIT MODEL

5.1 Preliminary Findings and Discussion

In order to test the premise that modal characteristics, particularly travel time savings, are the primary motivators for habal-habal patronage, logistic regression was utilized in order to model the choice probabilities of respondents between two alternatives. The dependent variable is the probability of an individual choosing an alternative over a set of alternatives, k (see Equation 4.1). $U(X_j, S_i)$ is the utility of mode j for individual i; it is a function of the mode characteristics (X_j) and of the individual's characteristic (S_i). Among the choices available, the alternative with the highest probability is likely to be chosen by an individual.

$$P_j^i = \frac{e^{\left[U(X_j, S_i)\right]}}{\sum_k e^{\left[U(X_j, S_i)\right]}} \quad \text{(Equation 4.1)}$$

Recall that in this study, two modes were primarily considered for analysis: habal-habal (Equation 4.2) and conventional modes of transport (Equation 4.3). In essence, conventional modes of transport are any form of urban conveyance (public, private, semi-private) that is not a motorcycle taxi service. Since only two modes will be considered, the logit model can take a binary form as shown below:

$$P_1 = \frac{e^{U_1}}{e^{U_1} + e^{U_2}} \quad \text{(Equation 4.2)}$$

$$P_2 = \frac{e^{U_2}}{e^{U_1} + e^{U_2}} \quad \text{(Equation 4.3)}$$

Table 6. Explanatory Variables in the Regression Model

Variables	Variable Description	Unit
Independent (Quantitative) Variables		
WTH	Waiting time for habal-habal	*minutes*
WTC	Waiting time for conventional modes	*minutes*
TTH	Travel time for habal-habal	*minutes*
TTC	Travel time for conventional modes	*minutes*
TCH	Travel cost for habal-habal	*PHP*
TCC	Travel cost for conventional modes	*PHP*
WT	WTH – WTC	*minutes*
TT	TTH – TTC	*minutes*
TC	TCH – TCC	*PHP*
Distance	Distance perceived by the commuter	*kilometers*
Age	Respondent's age	
Independent (Qualitative) Variables		
Gender	Gender dummy variable	*= 1 if Male* *= 0 if Female*
CivilStat	Civil status dummy variable	*= 1 if Married* *= 0 if Unmarried*
Education	Educational background dummy variable	*= 1 with higher educational degree* *= 0 without higher educational degree*
Employed	Employment status dummy variable	*= 1 if employed* *= 0 if unemployed*
Income	Middle-income cluster	*= 1 if PHP18,000.00 ≤ Income < PHP36,000.00* *= 0 otherwise*
	High-income cluster	*= 1 if Income ≥ PHP36,000.00* *= 0 otherwise*
Purpose	Work-induced trip	*= 1 for work trips* *= 0 otherwise*
	Others-induced trip	*= 1 for other trips* *= 0 otherwise*
Time	Time period dummy variable	*= 1 for daytime* *= 0 for nighttime*
HabalOnly	Mode availability dummy variable	*= 1 only habal-habal* *= 0 other modes available*

Table 6 provides the list of variables that were used for the regression model. As shown on the table above, three modal attributes were primarily considered, namely: waiting time, travel time, and trip cost. The differences between the mode attributes of habal-habal and conventional modes (i.e., WT, TT, and TC) were also

utilized in the regression analysis. Intuitively, ‘WT’ and ‘TT’ should be negative as habal-habal is presumed to provide quicker mobility than conventional modes of transport. ‘TC’ (difference in trip costs) on the other hand, should be positive as habal-habal fares, as discussed previously, are more expensive than conventional modes of transport. In addition to mode attributes, six socioeconomic variables were also included in the regression model. Majority of these variables can be considered as dummy variables, or those with binary responses only. The ‘Education’ variable corresponds to respondents that were able to attain at least a bachelor’s degree. Furthermore, the ‘Income’ variable was grouped into three classifications: low income (< PHP 18,000), middle income (PHP 18,000 to PHP 35, 999), and high income (> PHP 36,000). These classifications were broadly based from the income tax brackets of the Philippine’s Bureau of Internal Revenue (BIR). There were originally six trip purposes (variable labeled as ‘Purpose’) that can be chosen by the respondents; but for the sake of simplicity in the regression model, it was reduced to only three. Lastly, the ‘Time’ variable describes the period wherein the trip is made; it was simply classified into two 12-hour periods (daytime and nighttime).

Table 7 provides a brief descriptive summary of the variables used in the regression analysis. The mean values provides empirical evidence on the disparity between habal-habal services and conventional modes of transport. The presumptions for the differences in modal attributes are confirmed as shown in the mean values of ‘WT’ (- 7.85), ‘TT’ (- 33.97), and ‘TC’ (70.35). However, it is also noteworthy to examine the standard deviation for ‘WT’ and ‘TC’. The resulting standard deviation for these two variables are larger than their means, which could indicate that some data points from these variables had results which are counterintuitive. For example,

considering the estimated mean and standard deviation for 'TC', an observation from the data set might have resulted to a negative difference in trip cost, implying that an individual actually spent less on a habal-habal trip than a trip on conventional modes of transport. The degree of variation in regression variables, as represented by the standard deviation, could affect, either positive or negatively, the mode choice probabilities of individuals and the estimated coefficients in the logistic regression models. Another result to look at is the mean of the 'HabalOnly' variable, which is 0.06. This value implies that for majority of the interviewed individuals, other modes of transportation is available. However, this variable will not be considered in the succeeding regression models in order to avoid biasedness towards habal-habal services.

Table 7. Summary Statistics of Explanatory Variables

Variables	Unit	Mean	SD*	Min.	Max.	Count
Independent (Quantitative) Variables						
WTH	*minutes*	3.67	4.97	0.00	30.00	410
WTC	*minutes*	11.52	10.62	0.00	90.00	410
TTH	*minutes*	15.66	14.07	2.00	125.00	410
TTC	*minutes*	49.64	34.24	2.00	180.00	410
TCH	*PHP*	96.08	106.83	15.00	1500.00	410
TCC	*PHP*	25.73	47.48	8.00	800.00	410
WT	*minutes*	-7.85	8.72	-85.00	15.00	410
TT	*minutes*	-33.97	25.47	-170.00	10.00	410
TC	*PHP*	70.35	98.88	-500.00	1403.00	410
Distance	*km.*	5.90	5.13	0.45	40.00	409
Age		33.78	8.93	17.00	64.00	366
HabalOnly		*0.06*	*0.23*	*0.00*	*1.00*	*410*

Figure 22 provides the Pearson correlation among these regression variables. As shown in this figure, the variables 'TCH' and 'TC' are the most positively

correlated variables. It implies that an increase in 'TCH' would also result to an increase in 'TC'. This makes sense as the difference in trip cost is presumed to be positive thus implying costlier habal-habal trips. Negatively correlated variables are also shown in this figure. Two of the most negatively correlated variable pairs are *TTC-TT* and *WTC-WT*. The negative correlation between these pairs indicate that a unit decrease in one variable would correspond to an equivalent unit decrease to the other variable. The resulting Pearson correlation coefficient for these variable pairs are reasonable since the differences in waiting time (WT) and travel time (TT) are presumed to be negative, thus implying shorter access and trip times, respectively, for habal-habal services. Other implications of the Pearson correlation coefficients among the variables would be useful in explaining the ensuing results of the subsequent logistic regression models.

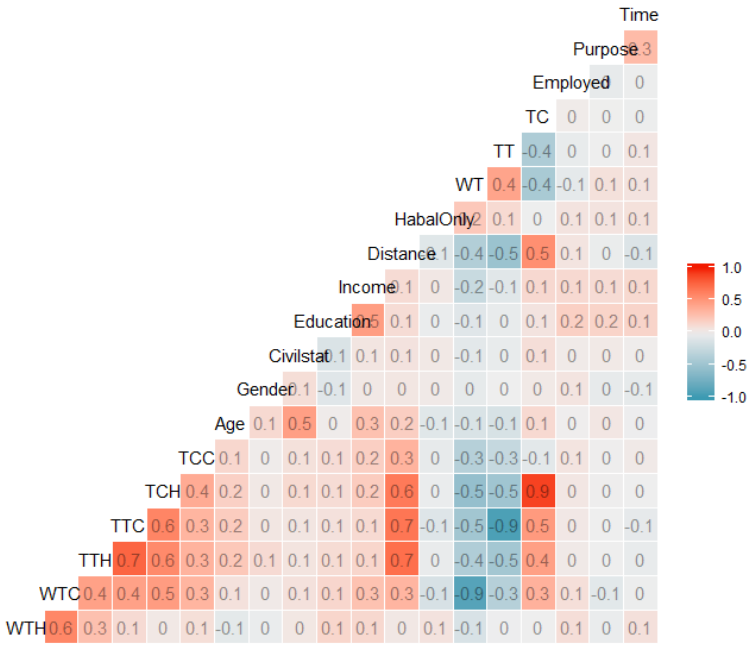


Figure 22. Pearson Correlation Coefficients of Explanatory Variables

5.2 Logistic Regression Analysis

5.2.1 ASV Model

Analysis of commuter data by logistic regression begins with a model that considers alternative-specific variables (ASV). In this regression model, mode attributes, specifically waiting time, travel time, and trip cost variables, are specified individually and independently for each mode alternative. The results of the first logistic regression model is presented in Table 8. Based on the estimated results of its coefficients, mode characteristics do not entirely affect the probability of an individual to choose habal-habal; the reasons being that its estimated coefficients are not statistically significant, and some of it yielded unrealistic signs.

Table 8. Logistic Regression Results: *ASV Model*

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	0.055325	0.856452	0.065	0.948494
WTH	0.060475	0.047136	1.283	0.199494
WTC	0.013584	0.023764	0.572	0.567583
TTH	0.024607	0.015950	1.543	0.122899
TTC	-0.004426	0.006095	-0.726	0.467741
TCH	0.002442	0.002401	1.017	0.309133
TCC	0.001425	0.004923	0.290	0.772177
Distance	-**0.175647**	0.045441	-3.865	0.000111
Time: Daytime	-0.017779	0.455315	-0.039	0.968853
Age	-0.014249	0.018048	-0.790	0.429809
Gender: Male	-0.022358	0.278565	-0.080	0.936031
CivilStat: Married	-0.106588	0.311851	-0.342	0.732508
Education: With HEd	**0.579732**	0.334239	1.734	0.082833
Employed: Yes	0.807070	0.566390	1.425	0.154175
Income: Middle	0.346333	0.336444	1.029	0.303295
Income: High	0.254612	0.595626	0.427	0.669038
Purpose: Work	**0.743767**	0.361104	2.060	0.039427
Purpose: Others	-0.087953	0.430039	-0.205	0.837945

N = 352; Null Deviance: 414.46; Residual Deviance: 349.02; AIC: 358.02; ρ^2: 0.157892; $\rho^2_{adj.}$: 0.075858

Take for example the estimated coefficients for habal-habal mode attributes (i.e., 0.060475, 0.024607, and 0.002442 for WTH, TTH, and TCH, respectively). A unit increase in either one of these variables should result to a decrease in the probability of choosing habal-habal. However, the regression results are counterintuitive and has yielded to a positive estimate. These results could imply an inexplainable biasedness towards habal-habal among the interviewed respondents. The same irregularity can also be observed for the estimated coefficient of *TTC* (-0.004426). A unit increase in the conventional travel time should result to an increase in the habal-habal's probability, therefore the estimate should be positive. However, the regression model yielded a negative estimate. This result is peculiar and perhaps could only be justified if the travel time is caused by a trip with a distance of considerable length, and the corresponding cost for this particular trip would make habal-habal the least desirable alternative.

The estimated coefficient for trip distance is -0.175647, which is negative and statistically significant; this result indicate that distance has a significant effect on habal-habal's probability to be chosen. In terms of elasticity, a unit increase in trip distance would decrease the habal-habal's probability by as much as 4.52%. This result may help explain the irregularity of the estimated coefficient for *TTC*. A long-distance trip on habal-habal would take less time to complete as compared to taking it with conventional modes of transport. However, the cost incurred for this trip on habal-habal would make it a less desirable alternative. Moreover, safety and convenience issues might be an underlying factor that commuters consider when travelling for long distances. The 'Time' variable yielded a coefficient that is not

statistically significant. This result could imply that the time period wherein a trip is conducted does not directly affect a commuter's choice probability on habal-habal.

The socioeconomic variables in the regression model also provide some influence on habal-habal's probability. The estimated coefficient for 'Age' (-0.014249) indicate that an older individual is less likely to take habal-habal as compared to a younger person. The same behavior is portrayed based on an individual's civil status. A married person is less likely to take habal-habal, perhaps due to safety and health concerns. Despite aptness on these estimated coefficients, they are not statistically significant; which implies that these variables weakly influence an individual's trip making decision. Furthermore, the coefficient estimate for the 'Education' variable (0.579732) indicate that an individual with higher education is likely to choose habal-habal more than conventional modes. The same conduct is exuded for the estimated coefficients for the 'Employed' and 'Income' variables. The resulting sign of these estimates are reasonable, especially for the income variable. It is likely that individuals that earn more income would choose habal-habal since they are capable of spending more for it. As discussed earlier, a typical habal-habal trip costs more than a typical conventional trip. However, these two socioeconomic variables (i.e., Employed and Income variables) are not statistically significant, which indicate that it does not strongly affect an individual's trip-making decision. Lastly, for the 'Purpose' variable, habal-habal is more likely to be chosen if an individual is on a work-induced trip. The estimated coefficient for this variable is 0.7438, which is positive and statistically significant. From this result, it is indicative that individuals whose trip agenda is to go to work, value the importance of getting to their workplace on-time. As such, it can also be implied that an individual is

likely to choose habal-habal in order to save a substantial amount of time in his/her work-induced trip.

5.2.2 AGV Model

A second regression model was created in order to assess the differences between previously-specified alternative-specific variables. In the second model, alternative-generic variables (AGV) were used to define mode characteristics; specifically, the differences between waiting time (WT), travel time (TT), and trip cost (TC) of habal-habal and conventional modes. It is intuitive that the differences in waiting time and travel time is negative, while the difference in trip cost should be positive. Socioeconomic variables were also applied in the new model, the same way it was utilized in the first regression model. Table 9 provides the results for the second logistic regression model.

As shown on Table 9, majority of the estimated coefficients behaved similarly with the results from the previous regression model, with the exception of mode characteristic variables and the 'Time' variable. For mode characteristic variables, none of the estimated coefficients are statistically significant. However, the 'WT' estimate is negative which indicate that habal-habal is more likely to be chosen if the difference in waiting time between the alternatives (which should be negative) is greater. The estimate of 'TT' on the other hand is positive, which is unusual since the difference in travel time would also yield as negative. Furthermore, the estimated coefficient for 'TC' is positive, which specify that a unit increase in cost differences between alternatives (which should be positive), would also result to an increase in habal-habal's probability. This does not make sense since habal-habal fares were

found to be much pricier than conventional modes. Perhaps, cost differences, as proven insignificant in the regression model, does not completely affect an individual's mode choice.

Table 9. Logistic Regression Results: *AGV Model*

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	0.0066212	0.8561550	0.008	0.993830
WT	-0.0240678	0.0188920	-1.274	0.202676
TT	0.0031756	0.0058734	0.541	0.588730
TC	0.0009548	0.0017980	0.531	0.595401
Distance	**-0.1155453**	0.0324916	-3.556	0.000376
Time: Daytime	0.0849804	0.4545930	0.187	0.851710
Age	-0.0114931	0.0175045	-0.657	0.511451
Gender: Male	-0.0258194	0.2737969	-0.094	0.924870
CivilStat: Married	-0.1030647	0.3029831	-0.340	0.733731
Education: With HEd	**0.6189956**	0.3340557	1.853	0.063886
Employed: Yes	0.8231371	0.5610774	1.467	0.142358
Income: Middle	0.3777609	0.3327969	1.135	0.256330
Income: High	0.2991631	0.5982597	0.500	0.617036
Purpose: Work	**0.8242504**	0.3560276	2.315	0.020606
Purpose: Others	-0.1104007	0.4293479	-0.257	0.797074

N = 352; Null Deviance: 414.46; Residual Deviance: 358.84; AIC: 388.84; ρ^2: 0.134199; $\rho^2_{adj.}$: 0.066641

For the 'Time' variable, its estimated coefficient yielded a positive sign. It is indicative that for this model, individuals are likely to take habal-habal trips conducted during daytime. However, this coefficient is not statistically-significant as well. As such, similar to the previous regression model, the time period weakly affects a commuter's mode choice. Statistically-significant estimates in this model are identical with the previous model. In particular, distance (-0.1155453), with higher education (0.6189956), and work-induced trips (0.8242504) still accounts as the variables that significantly affect an individual's trip-making decision. The estimated

coefficients for other socioeconomic variables also behaved similarly with the estimates from the previous model; however, none of which are statistically significant.

5.2.3 Likelihood Ratio Test (LRT)

In order to compare and identify which of the two regression models best fit the collected data from interviewed commuters, a likelihood ratio test (LRT) was conducted. Equation 5a provides the test statistic to prove that the AGV model is better (H_0: null hypothesis) than the ASV model. The resulting LRT value is chi-squared distributed with k degrees of freedom; k is equal to the number of parameter restrictions ($k = \rho_{AGV} - \rho_{ASV}$).

$$LRT = -2[LL(\beta_{AGV}) - LL(\beta_{ASV})] \sim \chi^2{}_{\alpha,k} \quad \text{(Equation 5a)}$$

$$\chi^2{}_{\alpha=0.05,k=3} = 7.82 \quad \text{(Equation 5b)}$$

The resulting LRT value from the regression models is 9.82, which is more than the critical $\chi 2$ value of 7.82 (see Equation 5b). The result indicate that the null hypothesis, H_0 (AGV is true), must be rejected. As such, the ASV regression model should be used as it fits the commuter data better and predicts choice probabilities more accurately.

5.3 Composite Regression Model

A third regression model was created in order to identify the effects of combining alternative-specific (ASV) and alternative-generic variables (AGV) of mode attributes from the two previous models in the commuter's choice probability. In particular, the waiting time and travel time variables (e.g., WTC, WTH) of habal-habal and conventional modes are specified as alternative-specific variables. While the difference in trip cost between modes (i.e., TC) is specified as an alternative-generic variable. This composite model also utilized socioeconomic variables, the same way it was specified in the previous regression models. Table 10 provides the results for the third logistic regression model.

Table 10. Logistic Regression Results: *Composite Model*

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	-0.0005269	0.8524521	-0.001	0.999507
WTH	0.0575421	0.0468046	1.229	0.218917
WTC	0.0200014	0.0224042	0.893	0.371989
TTH	0.0250332	0.0157227	1.592	0.111346
TTC	-0.0037916	0.0060532	-0.626	0.531066
TC	0.0014868	0.0020179	0.737	0.461247
Distance	**-0.1643302**	0.0426696	-3.851	0.000118
Time: Daytime	0.0132591	0.4516918	0.029	0.976582
Age	-0.0143351	0.0180106	-0.796	0.426075
Gender: Male	-0.0274743	0.2781924	-0.099	0.921329
CivilStat: Married	-0.0836129	0.3101556	-0.270	0.787481
Education: With HEd	**0.5940141**	0.3339498	1.779	0.075280
Employed: Yes	0.8238919	0.5641061	1.461	0.144145
Income: Middle	0.3204834	0.3347169	0.957	0.338327
Income: High	0.3177219	0.5972697	0.532	0.594756
Purpose: Work	**0.7413010**	0.3612653	2.052	0.040174
Purpose: Others	-0.0677596	0.4304063	-0.157	0.874905

N = 352; Null Deviance: 414.46; Residual Deviance: 349.85; AIC: 383.85; ρ^2: 0.155890; $\rho^2_{adj.}$: 0.078681

As shown in Table 10, it would seem that the estimated coefficients of the composite model are identical in behavior with the ASV model. Firstly, the coefficient estimates for mode attributes were found to be non-significant and some of which obtained unrealistic signs. Take for example the alternative-specific variables for habal-habal's waiting time and travel time (i.e., WTH and TTH). These variables yielded a positive estimate, which would imply that a unit increase in either one of these variables, would also increase habal-habal's probability to be chosen. This result is unsound unless the marginal differences between these mode attributes are large enough to augment an individual's likelihood to choose habal-habal. Furthermore, the coefficient estimate for *TTC* is negative and significant (-0.0037916). Similar to the ASV model, this result is peculiar and perhaps could only be justified if the travel time, caused by a trip with a distance of considerable length, and the corresponding cost for this particular trip would make habal-habal the least desirable alternative. The estimate for the generically-specified trip cost difference variable (TC) was also found to be odd. The cost differences between alternatives should be positive since it was found that typical habal-habal trips are costlier. However, the coefficient of *TC* also yielded a positive estimate (0.0014868), which would also result to an increase in habal-habal's probability. This does not make sense since habal-habal fares are much pricier than conventional modes. Perhaps, cost differences, as proven insignificant in the regression model, does not completely affect an individual's mode choice. Of all the mode attributes specified in this regression model, the coefficient estimate for *WTC* (0.0200014) is the most rational. However, it is insignificant and is therefore less likely to influence a commuter's choice probabilities.

The composite regression model also yielded statistically-significant estimates. Similar to the previous models, estimates of trip distance, education (with higher education), and trip purpose (work-induced) were found to expressively affect the commuter's choice probabilities. In terms of elasticity, a unit increase in trip distance can reduce habal-habal's probability by as much as 4.07%, which constitutes a lesser effect from the ASV model. In addition, the estimated trip period coefficient was positive (0.0132591), implying a preference to travel by habal-habal during daylight; but the estimated coefficient is still insignificant. Lastly, the remaining socioeconomic variables (e.g., Age, Gender, Employment, and Income) also behaved identically with the previous models. However, the estimates of these variables were also found to be non-statistically significant and are therefore less likely to affect an individual's trip-making decision. The composite regression model yielded coefficient estimates that are similar with the ASV model, it is ideal to test the accuracy of this regression model in order to know if it represents the commuter's data better.

Table 11. Comparative Summary of Logistic Regression Models

Model	Null Deviance	Residual Deviance	Estimated Parameters (*p*)	McFadden's R^2 (ρ^2)	Adjusted McFadden's R^2 (Adj. ρ^2)
ASV	414.46	349.02	17	0.157892	0.075858
AGV	414.46	358.84	14	0.134199	0.066641
Composite	414.46	349.85	16	0.155890	0.078681

It was previously discussed that between the ASV and AGV models, the regression model with alternative-specific variables (ASV) is better in representing the commuter data. In order to check the accuracy of the composite model to characterize the commuter data, a likelihood ratio test was conducted between the

ASV and composite regression models. Table 11 provides a comparative summary of the three logistic regression models based on their null and residual deviances, number of parameters to be estimated, McFadden R^2, and adjusted McFadden R^2 .

The test for model accuracy involves conducting a likelihood ratio test (LRT) between the ASV and composite regression models. In this test, the null hypothesis situates that the composite model is better in representing the commuter data than the ASV model (H_0: composite model is true). Equation 6a provides the test statistic to evaluate the null hypothesis (H_0). The resulting LRT value is chi-squared distributed with k degrees of freedom; wherein k is equal to the number of parameter restrictions ($k = \rho_{composite} - \rho_{ASV}$).

$$LRT = -2[LL(\beta_{Composite}) - LL(\beta_{ASV})] \sim \chi^2{}_{\alpha,k} \quad \text{(Equation 6a)}$$

$$\chi^2{}_{\alpha=0.05,k=1} = 3.84 \quad \text{(Equation 6b)}$$

The resulting LRT value from this model pair is 0.83, which is less than the critical $\chi 2$ value of 3.84 (see Equation 6b). The result indicate that the null hypothesis, H_0 (composite model is true), must not be rejected. With this finding, it can be stipulated that between the logistic regression models generated in this study, the composite model should be selected as it fits the commuter data better and predicts choice probabilities more accurately. Other combinations of explanatory variables that would refine the regression model to better represent the commuter data is provided in the appendix section, please see Appendix A.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

6.1 Research Summary

Metropolitan Manila, being the conurbation that it is today, experiences severe traffic congestions in its road networks that makes commuting a burden for an ordinary citizen, more so for the people that solely rely on its public transportation. The current structure of public transportation in the region encourages financially-capable individuals to travel by private (or semi-private) modes of transportation. In addition, it also encourages an open and overly-competitive market for road-based services (e.g., buses and jeepneys). The competition between privately-operated road-based services has led to a commuting culture that undermines passenger safety and service quality in exchange for maximized profits. This competitive behavior is often imputed for the reckless and undisciplined behavior of public transport drivers, which in turn causes accidents and horrendous traffic congestions. The inefficient public transportation and traffic congestions in Metro Manila has led the attention of its commuters to alternative modes of transport that is fast, reliable, and congestion-free.

Motorcycle taxi services (or habal-habal) in Metro Manila has increased in popularity among time-weary commuters, especially after the onset of ride-hailing mobile applications, as it rids them of the complications brought by severe congestions. However, transport regulators have continuously reiterated that operations of habal-habal services, especially in urban areas, are illicit and unsafe. Habal-habal is largely unregulated and will continue to be so unless amendments are done on laws governing public transportation. The problem that this study aimed to

address is the lack of understanding on habal-habal services, especially on the perspective of its users and from the urban context, which is necessary for public transport policy formulation or emendation. It is imperative for authorities to understand the fundamentals of habal-habal operations before formulating policies in order to appropriately gauge its characteristics and function in the country's public transportation scene. Without sufficient information, habal-habal could end up as a redundant service in the existing public transportation structure.

The primary objective of this study was to characterize habal-habal services based on the perspective of its users and on from the urban context. In order to do so, field intercept surveys around several cities in Metro Manila were conducted during weekdays and weekends to simulate typical travelling patterns of commuters. A survey questionnaire was distributed among randomly-selected individuals in order to collect information regarding their commuting behavior. The sampling frame is strictly limited for individuals that have used habal-habal and conventional modes of transport on a same particular trip. Data collected from commuters contained information regarding their socioeconomic traits, trip characteristics, and mode perceptions. The collected data was subjected to descriptive and logistic regression analyses in order to determine commuter characteristics, their choice probabilities, and the underlying factors that significantly affect their decision-making procedures. It was initially expected that mode attributes, specifically travel time savings, are the primary motivator of an individual to choose habal-habal. However, empirical results from ensuing logistic regression models suggest differently.

6.2 Interpretation of Results

Characterizing motorcycle taxi users in Metropolitan Manila requires a series of investigation on the observable and latent qualities of the subjects. Descriptive results have found that majority of the interviewed commuters are relatively young and are employed professionals. It was also found that these individuals earn a sufficient amount of income, which perhaps enables them to spend a portion of it for motorcycle taxi services. Descriptive results have also found that a typical habal-habal trip is 3.57 times more expensive than a trip made on conventional mode of transport. Several implications can be made from this finding. One of which is the inherent necessity to save time on their travel. Any trip-making individual would definitely choose an alternative that would get them to their destination at a shorter period of time. But for those that perceive time as an invaluable commodity, especially if something critical is at stake, the alternative that guarantees quicker mobility would be the most viable option. Adding to the list of findings from the descriptive analysis, 65% of interviewed commuters have stated that their intentions to initiate a habal-habal trip was work-induced. This finding could further be supported by the logistic regression models that consistently identified work-related trips as a significant factor in an individual's choice probabilities. It would seem that individuals whose trip is work-induced do not necessarily mind the inflated costs associated with habal-habal as long as they get to their workplaces on-time. More importantly however, the results of this study reaffirms the commuter's value-of-time as an important factor in trip-making decision. Perhaps, commuters would rather spend their time in more productive means than being stuck in traffic congestions.

The inflated cost of a habal-habal trip is also indicative of the nature of its service. Similar to other demand-responsive modes of transport (e.g., Grab, Uber, or taxis), it serves to provide on-demand mobility among time-sensitive commuters; unlike conventional modes of transport that regularly provide transit services to the commuting public. However, habal-habal operates with two-wheeled vehicles (i.e., motorcycles), this makes it more flexible and adaptive to traffic situations. This condition provides habal-habal services a competitive edge against existing modes of transportation. The question however is: will this edge be enough to attract commuters in order to sustain habal-habal operations? In addition to work-induced trips, regression results also indicate that trip distance negatively affect a commuter's choice probabilities. In other words, commuters conducting trips of considerable lengths are less likely to choose habal-habal services. Moreover, average habal-habal trip distances are considerably shorter than typical trips taken on conventional modes of transport. It would seem that these findings might infer a delimiting role for habal-habal services. In the urban public transportation scene, habal-habal services might be suitable to provide mobility for short- to mid-range trips only. A prolonged trip on habal-habal would make it a less desirable option as safety, convenience, and cost would highly influence a commuter's trip-making decision.

In extending the significance of trip distance as an indicator of habal-habal usage among commuters, the location of operational habal-habal stations should come to mind as well. Majority of the surveyed locations are well within the fringes of commercial and residential areas, or in rare cases, aptly situated between these areas. Moreover, a common characteristic among these locations is that habal-habal operations tend to operate nearby (or along) major thoroughfares with existing public

modes of transportation (e.g. jeepneys). It would seem that these findings indicate that for the majority of interviewed individuals, public transportation is sufficiently available. In one of the survey locations for example, majority of commuters from a nearby residential area generate work-induced trips towards an adjacent commercial district either by walking, taking public transport, or by taking habal-habal. The probability of using habal-habal coarsely depends on the distance of the individual's destination inside the commercial district. One thing is certain however; the presence and location of this habal-habal station provides a quicker mobility option for the trip-generating and working residents living nearby it. Another question might come to mind: if these people could easily afford and access habal-habal services, then why don't they purchase and operate their own motorcycles instead? The answer to this question may actually lie on the characteristics of the interviewed individuals. In addition to aforementioned findings of interviewed commuters, only 13% of them are actually licensed to operate vehicles and only a handful of them actually own a vehicle of their own. These findings could be indicative of the low motorization, or car dependency, of areas nearby habal-habal stations, especially for the case example mentioned earlier. It is not that these people are not capable of buying their own vehicles, but given their locational condition, it would seem that these people are more likely to choose public modes of transportation rather than owning and operating their own vehicles. Perhaps, densities of the surrounding areas in habal-habal stations could covertly affect the trip-making process of commuters, as highly-dense areas make it inherently difficult for its residents to own and maintain personal vehicles.

6.3 Policy Recommendations

The lack of government regulation on the persistent and increasing operations of motorcycle taxis in urban areas could render it as a risk rather than a service to the public. One issue that needs to be addressed immediately is accountability whenever an incident involving habal-habal occurs. Majority of interviewed habal-habal operators are licensed to operate a motorcycle. This driving regulation indicate that they and their vehicle are substantially insured. However, habal-habal customers are not part of this coverage; more so if they are not related to the operator. Although majority of interviewed commuters in this study perceived the current habal-habal service as adequately safe, because of the consistent abidance on the motorcycle safety law (wherein it is imperative for the motorcycle driver and passenger to wear safety helmet), there are cases wherein the operated motorcycle is loaned to a different operator. In such cases, it would take a lengthy amount of time to reach a verdict on accountability, and possibly at the expense of the customer. The government could start habal-habal regulation by clearly defining its role and purpose in the public transportation scene. This role should, at most, prioritize the safety and welfare of its end users.

Provided that trip purpose (i.e., work-induced trips) was found to be one of the most significant indicator for an individual's probability to choose habal-habal, it would make sense to demarcate first habal-habal's service coverage within substantial areas of an urban region, perhaps in high-density commercial or business districts. However, the question of inter-city trips might come to mind. Collected trip information from commuters suggests that inter-city habal-habal trips does occur, yet they are defined by the trip distance. In this case, habal-habal's role should not be

limited by service area alone, but perhaps by the distance it could cover as well. This arrangement would make its service a lot similar to existing demand-responsive transport services (e.g., taxis, Grab, or Uber), but for two-wheeled vehicles.

A typical individual's work trip could be redefined if a habal-habal is to bring him or her from residence to workplace directly, with little effort and at a considerably lesser amount of time. Of course, this wouldn't solve the grander problem of congestion in the metropolis, it would only encourage a quick-fix solution. However, the idea is to be able to provide the consumers (or commuters) a variety of mobility options at their own expense, but at a level of service wherein their safety and welfare are of paramount importance.

6.4 Research Limitations

The binary logit model was primarily utilized in this study in order to identify significant characteristics of habal-habal users that influence their mode choice decisions. However, the analytical model itself may have been a restrictive factor due to the limited number of evaluated alternatives. In this study, the alternative modes were limited into two options only: habal-habal and the collective non habal-habal services (i.e., conventional modes of transport). As defined in this study, conventional modes of transport are any form of transportation (private, semi-private, or public) that is not a motorcycle taxi service. In addition, mode attributes, as perceived by commuters, were collected in the same manner specified above. In cases wherein an individual takes multiple conventional modes for a one-way trip, the sum for each mode attributes were utilized and compared against an equivalent one-way trip on

habal-habal only. This condition has restricted the sampling frame of commuters to only those that have exclusively used habal-habal in exchange for conventional modes of transport, irrespective of the number of modes taken in the trip. Perhaps, this kind of analysis and sampling arrangement has limited the capacity of logistic regression analysis to evaluate explanatory variables that would further help in defining the characteristics of habal-habal users. And to a certain extent, it has also limited the accuracy of the regression models to predict choice probabilities of individuals.

6.5 Recommendations for Future Research

The regression models in this study were able to identify significant characteristics of habal-habal users that influence their mode choice decisions. However, it was trip characteristics that influenced most of these choices and, unexpectedly, less from mode attributes. A detailed approach to choice modelling requires a comprehensive inquiry on commuter's travel behavior, especially on mode attributes. As such, it is recommended to structure a questionnaire that focuses more on exclusively gathering mode characteristics such as waiting time, travel time, and trip cost.

In addition, the analysis could also be approached from the multinomial logit model in order to consider other alternatives that may compete with habal-habal services. However, it could further restrict the conditions for the sampling frame thereby reducing the number of qualified respondents. The multinomial logit model arrangement would perhaps yield better regression models, which could significantly help in habal-habal regulation and policy formulation or emendation. Furthermore, the

issue regarding emerging motorcycle taxi ride-hailing services should also be taken into consideration as competition between independent (*habal-habal)*, local (*Angkas*), and foreign (*e.g., Indonesia's Go-Jek*) entities is inevitable and might further cause complications and inequity if policies and regulations are not set in place swiftly and accordingly.

Lastly, this research has focused primarily on the perspective of habal-habal users in the urban context. An inquiry on the socioeconomic and operational characteristics of habal-habal operators is briefly provided in Chapter 4. However, in order for the government to provide an impartial and comprehensive regulation on habal-habal services, a detailed investigation from the perspective of its operators should also be conducted.

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APPENDICES

Appendix A

Refined Logistic Regression Model

Refined Logistic Regression Model

The logistic regression models presented and discussed in Chapter 5 primarily characterized the commuter's choice probabilities based on their perception of the trip they conducted, the alternative mode they used, and their own inherent personalities. Results from these regression models indicate that an individual's trip-making decision is largely influenced by trip characteristics, which was counterintuitive with the premise on mode characteristics. Recall that Tables 8 and 9 illustrate the results of the logistic regression models with mode characteristic variables arranged in a specific (ASV) and generic (AGV) manner, respectively. None of the estimated coefficients for mode characteristics in these tables are statistically significant and some of which yielded unrealistic signs. This appendix section will attempt to construct another regression model that would better predict the choice probabilities of the interviewed commuters.

Table C-1. Regression Model Results - Iteration 1

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	0.5887740	0.2105504	2.796	0.005168
TCC	0.0005305	0.0027892	0.190	0.849165
TCH	-0.0021897	0.0012289	-1.782	0.074790
Income: Middle	0.8413407	0.2400927	3.504	0.000458
Income: High	1.0040843	0.4951051	2.028	0.042558

N = 402; Null Deviance: 475.67; Residual Deviance: 459.45;
AIC: 469.45; ρ^2*: 0.034099;* $\rho^2_{adj.}$*: 0.017281*

To begin with, the first iteration of the regression model considers the mode variables TCC and TCH (travel cost by mode), which was paired with the income variable. It would be reasonable to pair these variables first in order to investigate the

relationship between an individual's income and his or her capacity to avail habal-habal services. Results for this regression model are presented in Table C-1. The results for this model iteration are satisfactory as the estimates yielded favorable signs. As an example, the estimated coefficient for TCH yielded negative and is statistically-significant. This result indicate that a unit increase in habal-habal's cost would result to a decrease in its probability to be chosen. Moreover, middle- and high-income variables were also found to be statistically-significant. An indication of a habal-habal user's financial capacity to avail of such transport services.

Table C-2. Regression Model Results - Iteration 2

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	1.011417	0.249594	4.052	5.07e-05
TTC	-0.007802	0.005279	-1.478	0.139401
TTH	0.026970	0.013613	1.981	0.047572
TCC	0.004369	0.005461	0.800	0.423683
TCH	0.001903	0.001915	0.994	0.320201
Income: Middle	0.920563	0.251252	3.664	0.000248
Income: High	0.832569	0.486464	1.711	0.086994
Distance	-0.157649	0.039650	-3.976	7.01e-05

N = 401; Null Deviance: 475.02; Residual Deviance: 432.40; AIC: 448.40; ρ^2*: 0.089723;* $\rho^2_{adj.}$*: 0.060250*

The second iteration for the regression model considers the addition of another mode characteristic, travel time (i.e., TTC and TTH); the distance variable was also included in the model. Correlation analysis suggests that travel time variables are highly correlated with distance. It would be interesting to investigate the effects of these variables, and their latent relationships with one another. Table C-2 provides the results for this regression model. The travel time variables yielded counterintuitive signs. For example, the estimated coefficient for TTH suggest that a unit increase in

habal-habal's travel time would also result to an increase in its probability to be chosen. This finding is strange, however it was found to be statistically-significant. Perhaps, the marginal increase in habal-habal's travel time would still make it a more viable option as compared to conventional modes of transport. In addition, the trip distance variable was also found to be negative and statistically-significant. An implication that habal-habal is not favorable for long-distance trips as travel for such cases require convenience and security. The estimated coefficient for TCH in this model is now positive, which is odd as it suggests likelihood for habal-habal despite an increase in trip cost. Perhaps, the high correlation between TCH and distance has something to do with this result.

Table C-3. Regression Model Results - Iteration 3

Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	1.887957	0.511980	3.688	0.000226
WT	-0.018584	0.020091	-0.925	0.354984
TTC	-0.007837	0.005743	-1.365	0.172363
TTH	0.033777	0.014468	2.335	0.019569
TCC	0.003553	0.005651	0.629	0.529525
TCH	0.002122	0.002303	0.921	0.356824
Income: Middle	0.906618	0.277493	3.267	0.001086
Income: High	0.970396	0.523516	1.854	0.063794
Distance	-0.170668	0.043225	-3.948	7.87e-05
Age	-0.031315	0.014518	-2.157	0.031011

N = 358; Null Deviance: 424.10; Residual Deviance: 380.62;
AIC: 400.62; ρ^2*: 0.102523;* $\rho^2_{adj.}$*: 0.060080*

The third iteration on the regression model considers the difference in waiting time between habal-habal and conventional modes of transport (WT). The generic specification of waiting time was used instead for this iteration since alternative-specific variables were found to be highly correlated with one another. Oversaturation

of individually-specified variables in a model could lead to problems related with multicollinearity. In addition to waiting time, the age variable was also added in order to consider an additional socioeconomic characteristic. Age is believed to negatively affect habal-habal's probability as older commuters are less likely to choose it. The result for this model iteration is presented in Table C-3. The coefficient for WT is rational as it yielded a negative estimate. This result is indicative of its positive effect on habal-habal's probability to be chosen (recall that WT should be negative as well). The problem however is that it is not statistically-significant. As such, it can be stipulated that the difference in waiting time between the alternatives weakly affect an individual's choice probabilities. Another item to take note of is the decrease in the number of observations involved for this model iteration (i.e., *N = 358*). The decrease in quantity was caused by incomplete values for the age variable.

Table C-4. Regression Model Results - Iteration 4

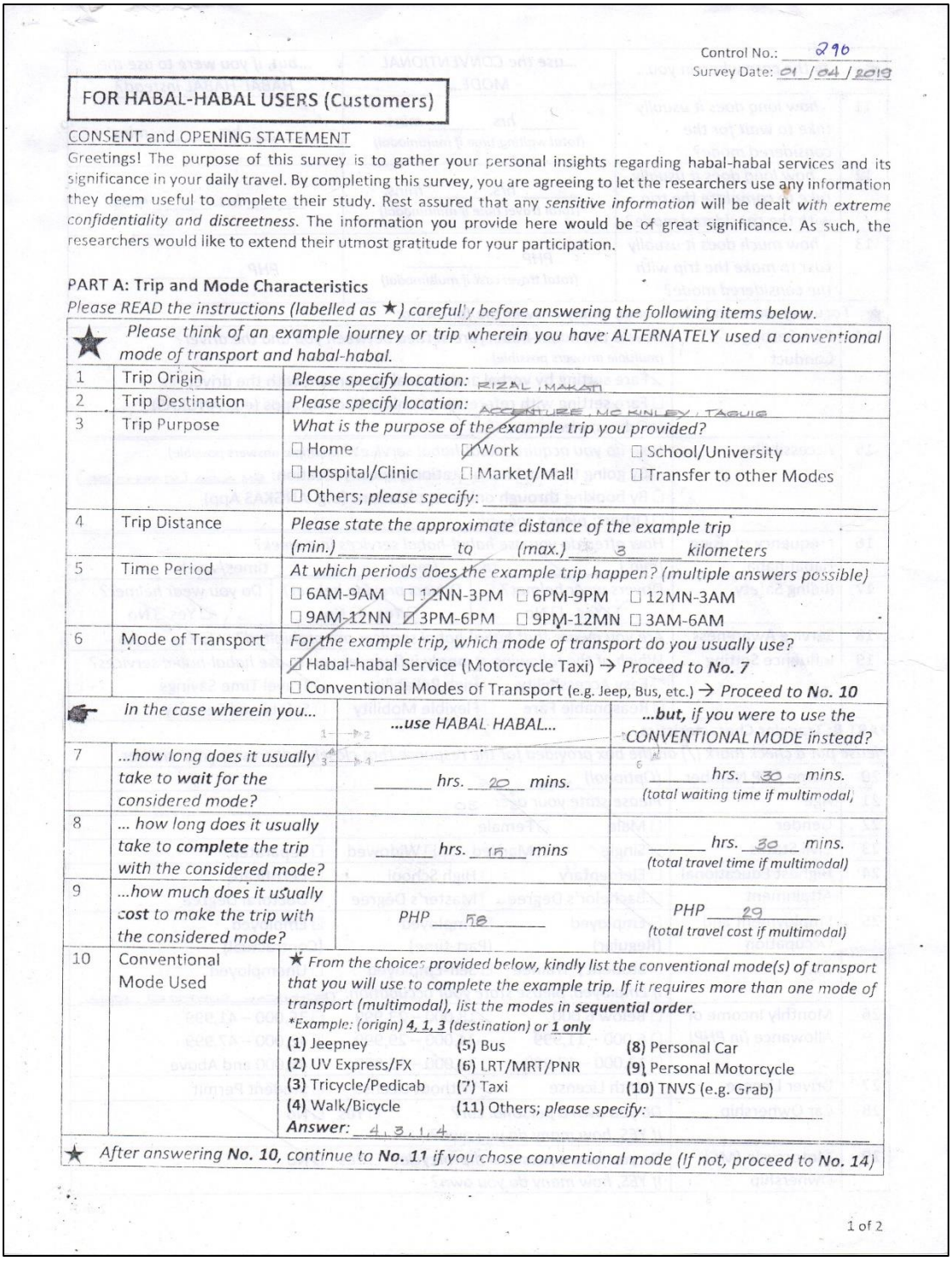
Variable	Coefficient	Std. Error	*t*-Statistic	*p*-Value
Intercept	0.439220	0.736102	0.597	0.5507
WT	-0.016980	0.020816	-0.816	0.4147
TTC	-0.006981	0.005891	-1.185	0.2360
TTH	0.034298	0.014954	2.294	0.0218
TCC	0.002481	0.005200	0.477	0.6333
TCH	0.002076	0.002328	0.892	0.3725
Income: Middle	0.621451	0.323385	1.922	0.0546
Income: High	0.542492	0.581916	0.932	0.3512
Distance	-0.180964	0.044192	-4.095	4.22e-05
Age	-0.026473	0.015619	-1.695	0.0901
Gender: Male	0.032983	0.270615	0.122	0.9030
Education: With HEd	0.573028	0.321987	1.780	0.0751
Employed: Yes	1.218278	0.546486	2.229	0.0258

N = 352; Null Deviance: 414.46; Residual Deviance: 362.61; AIC: 388.61; ρ^2: 0.125103; $\rho^2_{adj.}$: 0.067196

In the fourth and last iteration of the regression model, additional socioeconomic variables were added. The gender, educational background, and employment status variables can be considered as dummy variables. The reason for considering these explanatory variables is to be able to further characterize habal-habal users based on their socioeconomic profiles. Table C-4 provides the results for this regression model. As shown in the said table, majority of the explanatory variables behaved similarly with the results of the previous iteration. Of the added socioeconomic variables in this model, only gender was not statistically-significant, although its estimates makes sense. The estimated coefficients for educational background and employment status in this iteration reaffirms the premise that habal-habal is primarily utilized by employed professionals. In this model iteration, there are considerably more statistically-significant variables, these include: TTH (travel time by habal-habal), trip distance, middle-range income, respondent age, educational background, and employment status. Although it cannot be certain that this iteration is better than the composite model, or the other way around, the results have definitely provided supplementary insights on the characteristics of habal-habal users in Metro Manila. Lastly, trip purpose was no longer added as an additional variable to describe trip characteristics since it could be understood that the employment variable could also indicate that an individual is generating a habal-habal trip that is work-induced.

Appendix B

Accomplished Survey Questionnaire for Interviewed Commuters



Control No.: 290
Survey Date: 01 / 04 / 2019

FOR HABAL-HABAL USERS (Customers)

CONSENT and OPENING STATEMENT

Greetings! The purpose of this survey is to gather your personal insights regarding habal-habal services and its significance in your daily travel. By completing this survey, you are agreeing to let the researchers use any information they deem useful to complete their study. Rest assured that any *sensitive information* will be dealt *with extreme confidentiality and discreetness*. The information you provide here would be of great significance. As such, the researchers would like to extend their utmost gratitude for your participation.

PART A: Trip and Mode Characteristics

Please READ the instructions (labelled as ★) carefully before answering the following items below.

★	*Please think of an example journey or trip wherein you have ALTERNATELY used a conventional mode of transport and habal-habal.*	
1	Trip Origin	*Please specify location:* RIZAL, MAKATI
2	Trip Destination	*Please specify location:* ACCENTURE, MC KINLEY, TAGUIG
3	Trip Purpose	*What is the purpose of the example trip you provided?* ☐ Home ☑ Work ☐ School/University ☐ Hospital/Clinic ☐ Market/Mall ☐ Transfer to other Modes ☐ Others; *please specify*: _____
4	Trip Distance	*Please state the approximate distance of the example trip* *(min.)* _____ *to* *(max.)* 3 *kilometers*
5	Time Period	*At which periods does the example trip happen? (multiple answers possible)* ☐ 6AM-9AM ☐ 12NN-3PM ☐ 6PM-9PM ☐ 12MN-3AM ☐ 9AM-12NN ☑ 3PM-6PM ☐ 9PM-12MN ☐ 3AM-6AM
6	Mode of Transport	*For the example trip, which mode of transport do you usually use?* ☑ Habal-habal Service (Motorcycle Taxi) → *Proceed to* ***No. 7*** ☐ Conventional Modes of Transport (e.g. Jeep, Bus, etc.) → *Proceed to* ***No. 10***

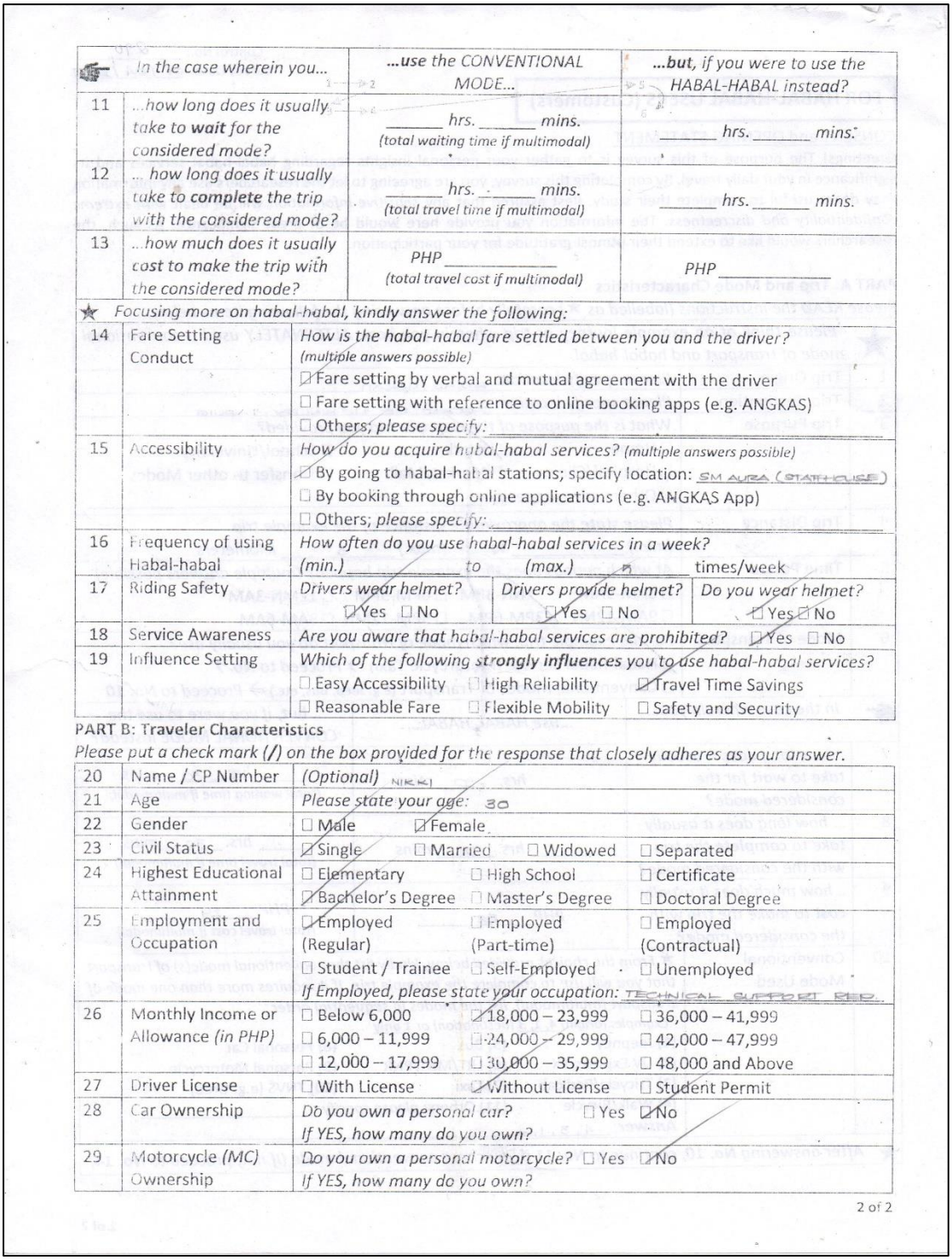
	In the case wherein you...	***...use*** *HABAL HABAL...*	***...but,*** *if you were to use the CONVENTIONAL MODE instead?*
7	*...how long does it usually take to* ***wait*** *for the considered mode?*	_____ *hrs.* 20 *mins.*	_____ *hrs.* 30 *mins.* *(total waiting time if multimodal)*
8	*... how long does it usually take to* ***complete*** *the trip with the considered mode?*	_____ *hrs.* 15 *mins*	_____ *hrs.* 30 *mins.* *(total travel time if multimodal)*
9	*...how much does it usually* ***cost*** *to make the trip with the considered mode?*	*PHP* 58	*PHP* 29 *(total travel cost if multimodal)*

10	Conventional Mode Used	★ *From the choices provided below, kindly list the conventional mode(s) of transport that you will use to complete the example trip. If it requires more than one mode of transport (multimodal), list the modes in* ***sequential order.*** **Example: (origin)* ***4, 1, 3*** *(destination) or* ***1 only*** **(1)** Jeepney **(5)** Bus **(8)** Personal Car **(2)** UV Express/FX **(6)** LRT/MRT/PNR **(9)** Personal Motorcycle **(3)** Tricycle/Pedicab **(7)** Taxi **(10)** TNVS (e.g. Grab) **(4)** Walk/Bicycle **(11)** Others; *please specify:* _____ ***Answer:*** 4, 3, 1, 4

★ *After answering* ***No. 10****, continue to* ***No. 11*** *if you chose conventional mode (If not, proceed to* ***No. 14****)*

1 of 2

Figure B-1. Questionnaire Front Page



	In the case wherein you...	...use the CONVENTIONAL MODE...	...but, if you were to use the HABAL-HABAL instead?
11	...how long does it usually take to **wait** for the considered mode?	_____ hrs. _____ mins. (total waiting time if multimodal)	_____ hrs. _____ mins.
12	... how long does it usually take to **complete** the trip with the considered mode?	_____ hrs. _____ mins. (total travel time if multimodal)	_____ hrs. _____ mins.
13	...how much does it usually cost to make the trip with the considered mode?	PHP _____ (total travel cost if multimodal)	PHP _____

★ *Focusing more on habal-habal, kindly answer the following:*

14	Fare Setting Conduct	*How is the habal-habal fare settled between you and the driver?* *(multiple answers possible)* ☑ Fare setting by verbal and mutual agreement with the driver ☐ Fare setting with reference to online booking apps (e.g. ANGKAS) ☐ Others; *please specify:* _____
15	Accessibility	*How do you acquire habal-habal services? (multiple answers possible)* ☑ By going to habal-habal stations; specify location: SM AURA (STATEHOUSE) ☐ By booking through online applications (e.g. ANGKAS App) ☐ Others; *please specify:* _____
16	Frequency of using Habal-habal	*How often do you use habal-habal services in a week?* *(min.)* _____ *to* *(max.)* 7 times/week
17	Riding Safety	*Drivers wear helmet?* ☑ Yes ☐ No; *Drivers provide helmet?* ☑ Yes ☐ No; *Do you wear helmet?* ☑ Yes ☐ No
18	Service Awareness	*Are you aware that habal-habal services are prohibited?* ☑ Yes ☐ No
19	Influence Setting	*Which of the following **strongly influences** you to use habal-habal services?* ☐ Easy Accessibility ☐ High Reliability ☑ Travel Time Savings ☐ Reasonable Fare ☐ Flexible Mobility ☐ Safety and Security

PART B: Traveler Characteristics

Please put a check mark (/) on the box provided for the response that closely adheres as your answer.

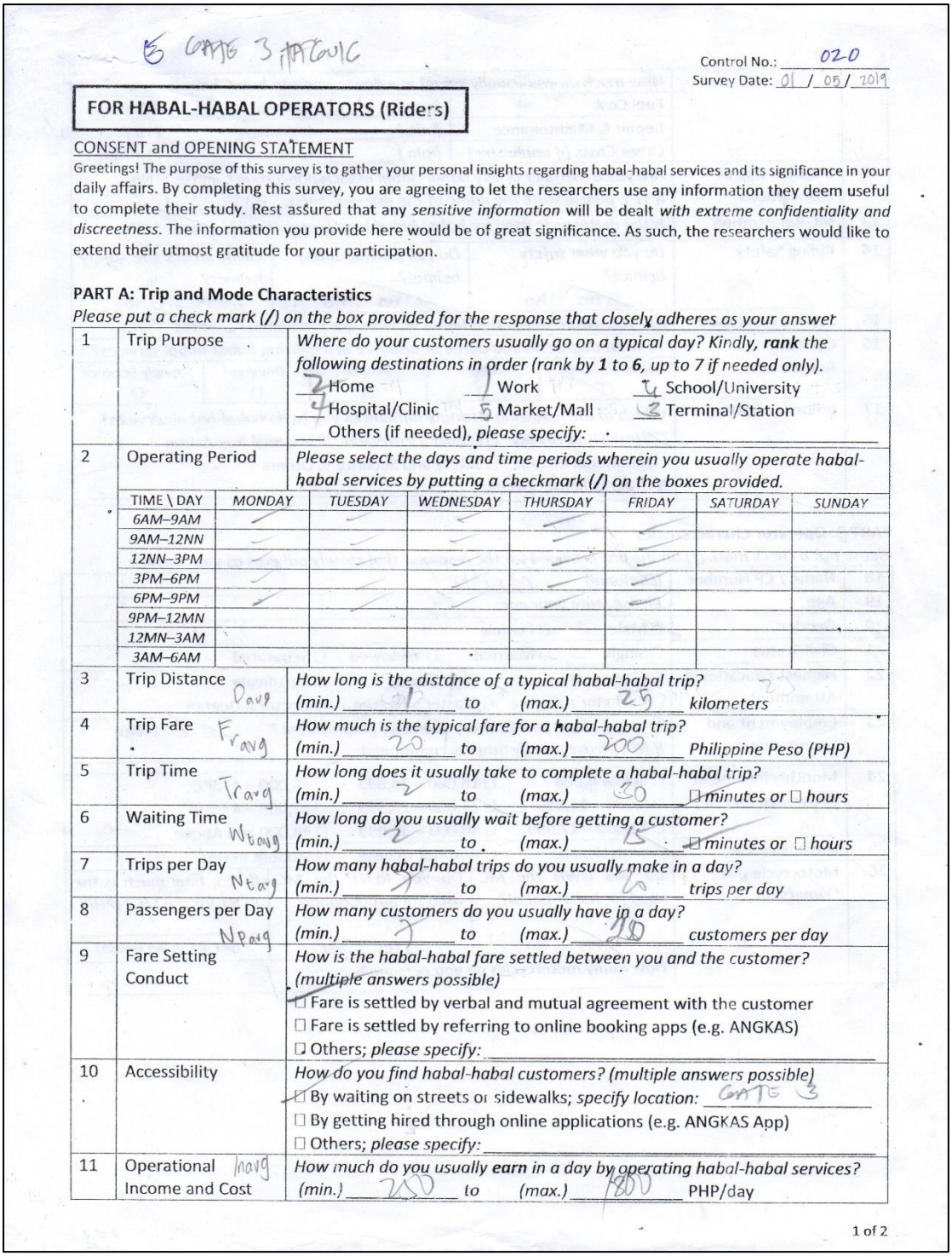
20	Name / CP Number	*(Optional)* NIKKI		
21	Age	*Please state your age:* 30		
22	Gender	☐ Male	☑ Female	
23	Civil Status	☑ Single	☐ Married ☐ Widowed	☐ Separated
24	Highest Educational Attainment	☐ Elementary	☐ High School	☐ Certificate
		☑ Bachelor's Degree	☐ Master's Degree	☐ Doctoral Degree
25	Employment and Occupation	☑ Employed (Regular)	☐ Employed (Part-time)	☐ Employed (Contractual)
		☐ Student / Trainee	☐ Self-Employed	☐ Unemployed
		If Employed, please state your occupation: TECHNICAL SUPPORT REP.		
26	Monthly Income or Allowance *(in PHP)*	☐ Below 6,000	☑ 18,000 – 23,999	☐ 36,000 – 41,999
		☐ 6,000 – 11,999	☐ 24,000 – 29,999	☐ 42,000 – 47,999
		☐ 12,000 – 17,999	☐ 30,000 – 35,999	☐ 48,000 and Above
27	Driver License	☐ With License	☑ Without License	☐ Student Permit
28	Car Ownership	*Do you own a personal car?* ☐ Yes ☑ No *If YES, how many do you own?*		
29	Motorcycle *(MC)* Ownership	*Do you own a personal motorcycle?* ☐ Yes ☑ No *If YES, how many do you own?*		

2 of 2

Figure B-2. Questionnaire Rear Page

Appendix C

Accomplished Survey Questionnaire for Interviewed Operators



(5) GATE 3 TAFCOLC

Control No.: 020
Survey Date: 01 / 05 / 2019

FOR HABAL-HABAL OPERATORS (Riders)

CONSENT and OPENING STATEMENT

Greetings! The purpose of this survey is to gather your personal insights regarding habal-habal services and its significance in your daily affairs. By completing this survey, you are agreeing to let the researchers use any information they deem useful to complete their study. Rest assured that any *sensitive information* will be dealt *with extreme confidentiality and discreetness*. The information you provide here would be of great significance. As such, the researchers would like to extend their utmost gratitude for your participation.

PART A: Trip and Mode Characteristics

Please put a check mark (/) on the box provided for the response that closely adheres as your answer

1	Trip Purpose	*Where do your customers usually go on a typical day? Kindly, **rank** the following destinations in order (rank by **1** to **6**, up to 7 if needed only).* 2 Home 1 Work 4 School/University 6 Hospital/Clinic 5 Market/Mall 3 Terminal/Station ___ Others (if needed), *please specify:* ___
2	Operating Period	*Please select the days and time periods wherein you usually operate habal-habal services by putting a checkmark (/) on the boxes provided.*

TIME \ DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6AM–9AM	/	/	/	/	/		
9AM–12NN	/	/	/	/	/		
12NN–3PM	/	/	/	/	/		
3PM–6PM	/	/	/	/	/		
6PM–9PM	/	/	/	/	/		
9PM–12MN							
12MN–3AM							
3AM–6AM							

3	Trip Distance D_{avg}	*How long is the distance of a typical habal-habal trip?* *(min.)* 1 *to (max.)* 25 *kilometers*
4	Trip Fare F_{avg}	*How much is the typical fare for a habal-habal trip?* *(min.)* 20 *to (max.)* 200 *Philippine Peso (PHP)*
5	Trip Time T_{avg}	*How long does it usually take to complete a habal-habal trip?* *(min.)* 2 *to (max.)* 30 ☐ *minutes or* ☐ *hours*
6	Waiting Time W_{tavg}	*How long do you usually wait before getting a customer?* *(min.)* 2 *to (max.)* 15 ☐ *minutes or* ☐ *hours*
7	Trips per Day N_{tavg}	*How many habal-habal trips do you usually make in a day?* *(min.)* 1 *to (max.)* 6 *trips per day*
8	Passengers per Day N_{pavg}	*How many customers do you usually have in a day?* *(min.)* 1 *to (max.)* 20 *customers per day*
9	Fare Setting Conduct	*How is the habal-habal fare settled between you and the customer? (multiple answers possible)* ☐ Fare is settled by verbal and mutual agreement with the customer ☐ Fare is settled by referring to online booking apps (e.g. ANGKAS) ☐ Others; *please specify:* ___
10	Accessibility	*How do you find habal-habal customers? (multiple answers possible)* ☐ By waiting on streets or sidewalks; *specify location:* GATE 3 ☐ By getting hired through online applications (e.g. ANGKAS App) ☐ Others; *please specify:* ___
11	Operational Income and Cost I_{navg}	*How much do you usually **earn** in a day by operating habal-habal services?* *(min.)* 200 *to (max.)* 800 PHP/day

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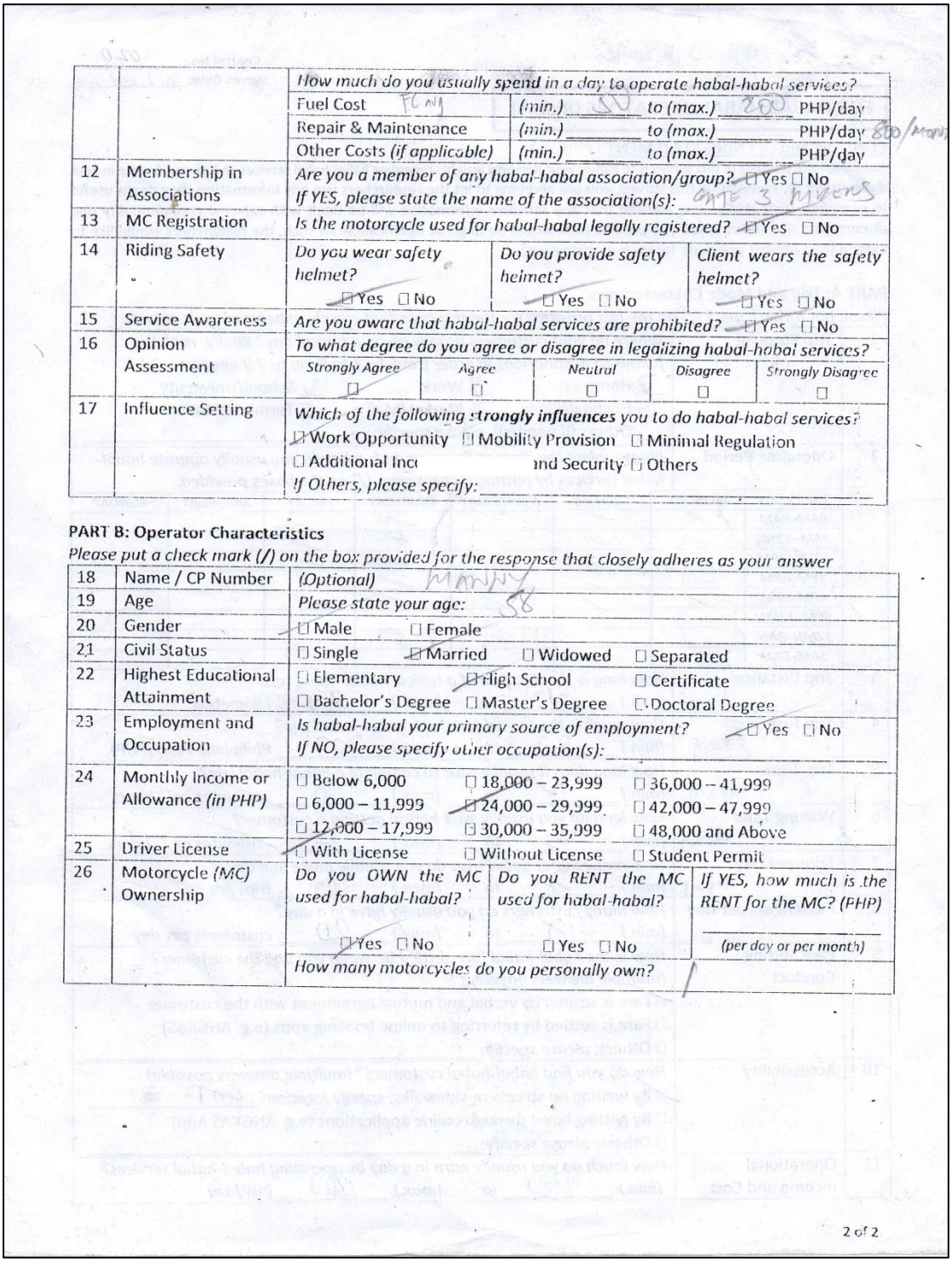
Figure C-1. Questionnaire Front Page



		How much do you usually spend in a day to operate habal-habal services?			
		Fuel Cost	*(min.)* 50 *to (max.)* 200		PHP/day
		Repair & Maintenance	*(min.)* ____ *to (max.)* ____		PHP/day
		Other Costs *(if applicable)*	*(min.)* ____ *to (max.)* ____		PHP/day
12	Membership in Associations	*Are you a member of any habal-habal association/group?* ☐ Yes ☐ No *If YES, please state the name of the association(s):* GATE 3 MOVERS			
13	MC Registration	*Is the motorcycle used for habal-habal legally registered?* ☐ Yes ☐ No			
14	Riding Safety	*Do you wear safety helmet?* ☐ Yes ☐ No	*Do you provide safety helmet?* ☐ Yes ☐ No	*Client wears the safety helmet?* ☐ Yes ☐ No	
15	Service Awareness	*Are you aware that habal-habal services are prohibited?* ☐ Yes ☐ No			
16	Opinion Assessment	*To what degree do you agree or disagree in legalizing habal-habal services?*			
		Strongly Agree ☐	*Agree* ☐	*Neutral* ☐	*Disagree* ☐	*Strongly Disagree* ☐
17	Influence Setting	*Which of the following **strongly influences** you to do habal-habal services?* ☐ Work Opportunity ☐ Mobility Provision ☐ Minimal Regulation ☐ Additional Inc ind Security ☐ Others *If Others, please specify:* ____			

PART B: Operator Characteristics

Please put a check mark (/) on the box provided for the response that closely adheres as your answer

18	Name / CP Number	*(Optional)* MANNY			
19	Age	*Please state your age:* 58			
20	Gender	☐ Male ☐ Female			
21	Civil Status	☐ Single ☐ Married ☐ Widowed ☐ Separated			
22	Highest Educational Attainment	☐ Elementary ☐ High School ☐ Certificate ☐ Bachelor's Degree ☐ Master's Degree ☐ Doctoral Degree			
23	Employment and Occupation	*Is habal-habal your primary source of employment?* ☐ Yes ☐ No *If NO, please specify other occupation(s):* ____			
24	Monthly Income or Allowance *(in PHP)*	☐ Below 6,000 ☐ 18,000 – 23,999 ☐ 36,000 – 41,999 ☐ 6,000 – 11,999 ☐ 24,000 – 29,999 ☐ 42,000 – 47,999 ☐ 12,000 – 17,999 ☐ 30,000 – 35,999 ☐ 48,000 and Above			
25	Driver License	☐ With License ☐ Without License ☐ Student Permit			
26	Motorcycle *(MC)* Ownership	*Do you OWN the MC used for habal-habal?* ☐ Yes ☐ No	*Do you RENT the MC used for habal-habal?* ☐ Yes ☐ No	*If YES, how much is the RENT for the MC? (PHP)* ____ *(per day or per month)*	
		How many motorcycles do you personally own? 1			

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Figure C-2. Questionnaire Rear Page

VITA

NAME	Sebastian Mapili Cano
DATE OF BIRTH	14th July 1996
PLACE OF BIRTH	Pasay City, Republic of the Philippines
INSTITUTIONS ATTENDED	De La Salle University - Manila (BS in Civil Engineering)
HOME ADDRESS	Merville, Parañaque City, Metro Manila, Philippines 1709