

Moving Bogotá:  
Passengers' Perception of El Sistema TransMilenio

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### **Abstract**

In Bogotá, Colombia, the main mass public transit is a bus rapid transit (BRT) system known as the TransMilenio. Since beginning operations on December 18, 2000 it has gained attention on the global level for its innovation and success as a solution to the city's public transit and mobility issues. However, it is unclear if the passengers of the TransMilenio agree. This research asked, "What is passengers' perception of the Sistema TransMilenio?" The study's main findings were that most passengers have a negative perception of the system. This is supported by the majority of respondents expressing dissatisfaction with the system in addition to having a low opinion of its quality. Yet, what influences the negative perception of the TransMilenio by its passengers remains unclear and requires further research.

## SECTION 1: INTRODUCTION

### Background

An expansive and well-developed public transit system is necessary in order to advance a country's economy. Moreover, in developing countries, like Colombia, transit systems are often designed with increased, and sustainable, mobility as the main goal (Keeling, 2008; Suzuki, Cervero & Iuchi, 2013). On December 18, 2000, a new mass public transit system called the Sistema TransMilenio (TransMilenio) began operations in Bogotá, the capital of Colombia. Since the opening of the TransMilenio it has received widespread attention and acclaim. Furthermore, the TransMilenio has radically changed Bogotá, providing new means of mobility to the city's population of over 7 million people. By 2015, the system's main bus routes, also referred to as truck lines, covered 113 kilometers and the system's feeder services (*Alimentadores*) covered over 663 kilometers. The TransMilenio has given the people of Bogotá a reliable transportation system, which did not previously exist. However, over time numerous problems have surfaced and satisfaction of the TransMilenio has continued to decline since 2007 (Bogotá ¿Como Vamos?, 2013c, 2014; Hidalgo, Pereira, Estupiñán, Jiménez, 2013).

The TransMilenio is a bus rapid transit (BRT) system. A BRT system is a bus-based public transit system that is similar to a metro-rail system in that it has high-capacity ridership, designated travel lanes, and express and local routes, but it is significantly less expensive to develop, implement and maintain. BRT systems differ from traditional bus systems in that there are designated bus lanes on the existing streets marked by a physical separation from other traffic lanes. In addition, BRT systems have elevated boarding/exiting platforms; payment is made prior to entry to the station/bus; and there is electronic signage that indicates arrival time of the next bus (See Appendix A for complete definition of BRT). For comparison, traditional bus systems

use the same lanes as other transport; bus stops are street-level bus often requiring users to step up into the bus; and payment is given upon entry, slowing the boarding process.

Today many cities are turning to BRTs as the solution to public transport and mobility issues. Traditional bus systems are often seen as a way of the past and BRTs are the future. Suzuki et al. (2013) explained that, “BRT is faster, safer, more efficient, and more user-friendly than traditional bus systems” (p. 26). Moreover, the TransMilenio has shown that BRT systems are comparable to rail-based mass transit (Hidalgo, Lleras & Hernández, 2013). The average operating speed of the TransMilenio is 26 kilometers per hour (km/h) and comparable to metro/subway systems such as New York’s, which operates at an average speed of 30 km/h (Lindau, Hidalgo & de Almeida Lobo, 2014).

The TransMilenio’s advancements in BRT development are most notably its speed and carrying capacity. Prior to the TransMilenio, BRT average carrying capacity of passengers per hour per direction (pphpd) was 12,000, and now the TransMilenio operates with between 45,000 and 48,000 pphpd (Peña, Jiménez & Mateos, 2013). A contributing factor to the increase in carrying capacity is the development of passing lanes. Passing lanes are when there are two designated bus lanes next to each other, going in the same direction. The TransMilenio’s design and implementation of passing lanes allow for a continuous flow of traffic. For example, when a bus is stopped at a station, a second bus is not forced to stop as well; it can move into the passing lane and continue on its route. Also, as the TransMilenio stations consist of more than one platform for boarding, buses that have already had passengers board can exit the station even if there is a bus stopped for passengers at the next platform.

The TransMilenio has pioneered technology revolutionizing BRT systems, making the TransMilenio the blueprint for systems worldwide. Turner, Kooshian and Winkelman (2012)

described the innovative technology in a case study of the TransMilenio: a logic unit (computer) in each bus that sends GPS updates every six (6) seconds to the TransMilenio's control center; schedule compliance verification software that provides real-time information enabling controllers to accommodate and adjust for demands; and advanced fare collection system with electronic smart cards where payment is deducted upon touching a sensor on turnstiles. The type of ticket used for the TransMilenio have also been incorporated into transit systems in the United States, such as the Metro in Washington, DC's "SmartCard" as well as systems in the Bay Area of San Francisco and Chicago.

The TransMilenio inspired a surge in BRT development worldwide (Mejía-Dugand, Hjelm, Baas, & Ríos, 2013; Heres, Jack, Salon, 2014; Hidalgo & Gutiérrez, 2013). Moreover, it continues to be seen as the most important BRT system worldwide (Peña et al., 2013) and referred to as the gold standard for BRT systems (Suzuki et al., 2013; Cervero, 2013). The system's importance can be understood by its dominant position as the reference point for development of BRT systems globally by countries such as China, Mexico, India, South Africa and the United States (Gutiérrez, 2010). In the TransMilenio's inaugural year only 40 BRT systems existed worldwide, since that time over 149 BRT systems have been implemented and began operations (BRT Data, 2014b).

The TransMilenio's positive and supportive reputation among the global BRT community is unquestionable. However, the *Bogotanos* (people from Bogotá) and other users have a considerably less glowing opinion of the system (Bogotá ¿Cómo Vamos?, 2014; Hidalgo, Pereira, Estupiñán, Jiménez, 2013; Suzuki et al., 2013). The events in March 2014 aptly show users' growing skepticism and negativity toward the system. Following a series of political debates and discussions focused on the TransMilenio, many students and residents of Bogotá

began protesting in opposition of *Administración Distral* (District Administration) and the TransMilenio. The protests were the result of anger and dissatisfaction at the lack of explanations or reasoning for the conditions of the TransMilenio. The protestors wanted explanations for the presence of “sexual harassment, large lines, congestion at ticket booths, insecurity, use of a single ticket, construction delays of stations and the system’s budget deficit” (Bogotá ¿Cómo Vamos? Concejo, 2014, p. 16).

The perception of the TransMilenio appears to be significantly polarized. In turn, there is a need for further research into passengers’ perception of TransMilenio and why there is a decline in satisfaction since its inauguration in 2000 (Bogotá ¿Cómo Vamos? 2013b, 2014; Cámara de Comercio de Bogotá, 2011; Hidalgo, Pereira, et al., 2013; Hidalgo & King, 2014; Suzuki et al., 2013) The aim of the TransMilenio BRT was to improve the city’s quality of life and increase productivity (Lee & Myung-Kyoon, 2003). On paper, the TransMilenio is a great success. It has excelled in its financial self-sustainability and revolutionary advancements for BRT systems as a whole. However, it is unclear if the system has improved the quality of life for those in Bogotá as well as passengers’ opinions are of the TransMilenio in general.

### **Rationale for Implementation**

The decision to develop and implement a BRT system (the TransMilenio) as the main form of mass transit in Bogotá was logical. BRT systems are a relatively low-cost solution to public transit. Peña et al. (2013) cited an average cost per kilometer, for a BRT, as ranging between US\$500,000 to US\$1.5 million. The cost of a BRT is significantly less than the average cost for a light rail system, elevated train system, or an underground metro, which respectively cost per kilometer between US\$1.3-40 million, US\$40-100 million and US\$45-350 million, respectively. However, Carrigan, King, Velásquez, Duduta, and Raifman (2013) reported that



BRT capital costs (infrastructure, stations, vehicles, technology etc.) per kilometer range from US\$1-14 million depending on the amount of construction and/or roadway work needed.

Although the numbers that Carrigan et al. (2013) reported are significantly higher than those from Peña et al. (2013), they too explained that the cost for BRT systems is still less than other rail transportation systems, specifically one third to one fifth of the cost.

In addition, BRTs are known for quick and easy implementation, along with documented environmental benefits. As the need for a well-organized public transit system was growing, along with its population, pollution and traffic-related fatalities and injuries, the city of Bogotá appeared to have no choice but to opt for a transit system that could be implemented quickly.

### **Curitiba, Brazil and Bogotá, Colombia's Bus Rapid Transit (BRT) Systems**

The TransMilenio was modeled after the Rede Integrada de Transporte in Curitiba, Brazil, one of the first BRT systems in the world established in 1974. The segregated bus lanes, station placement in the middle of roadways (allows for buses moving in different directions to use the station), use of articulated and double-articulated buses, paying drivers by distance travelled not by passengers, and lastly, environmentally responsible behavior, were all aspects of the Rede Integrada de Transporte that the TransMilenio included in its own development plan. (See Appendix B for Curitiba's BRT plan). However, as Suzuki et al. (2013) pointed out, there are some key aspects about Curitiba that should be noted in a comparison to the TransMilenio: Curitiba is one of the wealthiest cities in Brazil; the city was designed around the BRT, contrary to Bogotá's implementation of a BRT after the city's development; and third, the system continually had both political commitment and "harmonization of transit and land use" (p. 84). The last element has been a challenge for the TransMilenio. Bogotá is known for its politicians who are more concerned with their own legacy and agenda than continuing the projects of those

who came before. Nevertheless, it was the TransMilenio that stimulated BRT systems' popularity and viability as a public transit system.

As a whole the TransMilenio system was established with positive ideology. The TransMilenio S.A., the overseers of the TransMilenio, was founded on a four-pillar theory (see Appendix C) that is now echoed in its mission statement. The mission is to satisfy the public's need for quality, efficient, sustainable, organized (internally and physically) public transportation while improving the city and the people's quality of life (TransMilenio S.A., 2013). It remains unclear the extent to which this positive ideology/mission has been achieved during the almost 15 years of operation.

### **The History of Bogotá, Colombia's Public Transportation System and the Development of the TransMilenio**

Prior to the TransMilenio, the traffic in Bogotá, Colombia was a congested mess of vehicles, highly polluted air, numerous accidents accompanied with injuries and death, and lastly, very unfriendly to pedestrians. Moreover, public perception of Bogotá's public transit system was less than ideal. The World Bank (2013) called it "inefficient, unsafe and polluting," while Turner et al. (2012, p. 7) described it as "dangerous, underused, inefficient, and offer[ing] poor quality service." As a country, Colombia has had a bus-based transit history; yet, it suffered from what Turner et al. (2012, p. 5) claimed was an "over-saturation of independent bus operators, underinvestment in infrastructure and inefficient operations."

The TransMilenio was a much-needed addition to the fabric of Bogotá. It offered a new alternative to the chaos of the *busetas*, the privately owned and operated minibuses of several small companies. Despite their reputation of unsafe driving, rude drivers, and overall discomfort, *busetas* served as the primary form of public transportation. One woman went as far to say,

“You risk your life when you ride the *busettas*” (O. Stegenta, personal communication, October 13, 2014). Nonetheless, as prior public transit was bus-based, those past conditions are likely to have influenced the city’s ability to embrace the TransMilenio.

Under the leadership of Senor Peñalosa as mayor, the TransMilenio began to take shape. The system’s development was broken into eight phases to occur between 1998 and 2032. In 1999, a new government agency, the TransMilenio S.A., was established. It would serve as the new transit authority, responsible for planning, developing and controlling the TransMilenio, along with awarding contracts through a bidding process to private companies of which would be responsible for such areas of operations, fare collection and supply of vehicles (Hidalgo & Sandoval, 2002). Now, almost 15 years later, Phases I, II and III have been completed and Phase IV and V have been underway. Upon completion, the system is planned to cover 400 kilometers. The first five phases were scheduled for completion by 2016 and cover 388 kilometers, yet as of May 2015, the system only covered 113 kilometers.

### **Current State**

The TransMilenio has grown significantly since opening on December of 2000. Initially the system was one route that ran from 80<sup>th</sup> Street to 6<sup>th</sup> Street along a major avenue, Avenida Caracas and was serviced by 14 buses (TransMilenio S.A., 2014). As of 2015, the TransMilenio covers approximately 113 kilometers, consists of 137 stations and 9 *portales* (portals/terminals) along 11 *troncles* (trunk routes/corridors – the main segregated bus ways) served by over 1990 buses. In addition, the TransMilenio’s infrastructure has grown to include 9 garages for buses, public restrooms located in 9 stations/portals, and 13 *cicloparqueaderos* (free bicycle parking) with over 2,220 spaces for bicycles. The system also includes a feeder system (*Alimentadores*) serviced by over 850 buses and covering 663 kilometers as well as an extensive *cicloruta*

(bicycles paths). The system is operational Monday through Saturday from 5am to 11pm and on Sunday and holidays from 6am to 10pm. Each route of the *Alimentadores* operates on a different schedule, on average Monday through Friday is from 4:30am to 12:30am, Saturday is 4:30/5am to 12:30am and Sunday and holidays is from 6am to 11:30pm. In 2015, the TransMilenio had an average of over 2 million passengers per day, accounting for approximately 30% of Bogotá's public transportation demand.

The cost of the TransMilenio is significant when considering the country's minimum wage. Currently, the TransMilenio costs 1,900 COP during *pico* (peak) hours and 1,500 COP during *valle* (off-peak) hours, approximately 0.70-0.80 USD and 0.55-0.65 USD respectively depending on the currency exchange (see Appendix D for description of peak and non-peak hours). This is a significant cost, especially since the *Ministerio del Trabajo* (Ministry of Labor) (2015) determined that Colombia's minimum wage for 2015 as \$644,350 COP with a \$73,944 COP transport subsidy, totaling to \$718,280 COP per month. In a newscast produced by Noticias Caracol, (Rodrigues, 2014) it was reported that approximately 13% of employed Colombians earn this minimum salary. Nonetheless, taking the TransMilenio to and from work 5 days a week would be \$76,000 per month, 12% of monthly salary. On the other hand, according to Carrigan et al. (2013, p. 44), the TransMilenio's implementation "resulted in a net gain of 1,900 to 2,900 permanent jobs in operations, plus 1,400 to 1,800 temporary jobs per month during construction." Still, it is unknown the salaries and/or if transportation on the TransMilenio is compensated as a courtesy of employment.

The TransMilenio has continued to develop, yet, at times it appears that it cannot keep up with the city's population growth and demand for the system. During peak hours stations are densely crowded, theft has increased, aggressive pushing has become normal, accidents resulting

in injuries are growing in prevalence, especially in portals, and lines to enter stations are getting longer earlier. The TransMilenio's demand and popularity is likely related to its expansion, yet it is not just about expanding the system, it is also necessary to maintain the existing parts. The design of the system can be argued, but many users have agreed with one user's quote, "Y el principal, la falta de de orden en el sistema" ("and the principal problem is the lack of order in the system") (Leticia, personal communication, March 31, 2015).

One example of the growing power and volume of people voicing opinions of the TransMilenio's current state is a YouTube.com video posted on September 7, 2014 by a university professor, Guillermo Ramirez, and his students titled *¿Por qué no funciona TransMilenio?* (Why Doesn't the TransMilenio Work?). Since the video's posting it has over 784,501 views and over 1,687 "likes" on Facebook. The video explained that the TransMilenio has not been well integrated into the city; in addition, the system, especially concerning its route network, is overly complicated causing a lack of coordination of buses when stopping at stations, which in turn causes congestion and slows down the speed of transit. Moreover, the video makes a number of points regarding existing problems. These include: multiple empty buses passing stations without stopping; too many different types of routes and express routes are in turn becoming more local (because of congestion at stations), length of time for local routes, private bus operators have no influence on scheduling, (route) design, or any assorted conflicts; fare prices (Vélez, Scorcia & Rubiano, 2014, October 6).

### **Statement of the Problem**

Passengers' perception of public transportation systems is vital in order to develop transit that meets the needs of the people. Without knowledge of passengers' perception of a system, public transit may not be developed in a way that serves the public, and could result in an

inefficient use of funds if the system goes unused. In the case of the TransMilenio, it is critical that there is an understanding of passengers' perception, including their perceived problems of the system, as it has continued to be replicated throughout the world. There is ample information on the TransMilenio; however there is only a limited amount of information about passengers' perception of the system. The literature that exists on the topic is mostly written by students in university, news outlets, and by those who express harsh criticism of the system through social media networks.

Almost 15 years after its inaugural ride, the TransMilenio continues to be seen in a positive light, considered a prime example of a BRT system and a fantastic solution to public transit problems in Bogotá. This, however, is according to academia and the reviewed literature. What has not been determined is if the users of the system, the people of Bogotá, experience the four pillars theory and/or view the system in the same positive light in which academia presents the TransMilenio. What do the passengers think of the system? What is the passengers' perception of the TransMilenio?

### **Research Question**

*Question:* What is passengers' perception of Sistema TransMilenio (TransMilenio)?

### **Purpose of the Study**

This research looks to investigate the passengers' perception of the TransMilenio. More specifically, it aims to understand passengers' perception of the system in terms of characteristics that the system has, areas of problems and what characteristics passengers see as important for the system to provide. In addition, this study will use passengers' level of satisfaction as a quantitative means of understanding perception(s).

### **Significance of the Study**

Understanding passengers' perception(s) of the TransMilenio has numerous benefits. It provides insight into facilitating better conception, construction, development, implementation and maintenance of BRT systems on the local level (Bogotá), national level (Colombia) and global level. On the local level, information from this study presents the Bogotá TransMilenio passengers' perception. If passenger perception is negative then efforts to improve the system can be either increased and/or continued. In addition, this information can prove valuable from an economic standpoint for the system. If perception is so bad that it deters passengers from using the TransMilenio, this financially self-sustaining public transit may require subsidies and/or fall into disrepair. On a larger scale, the TransMilenio served as the basis for development of Colombia's Integrated Mass Transit Systems (IMTS) through the National Urban Transport Program (NUTP). Thus, insight into the original BRT system would be beneficial as IMTS and NUTP include the building of BRT systems throughout the country. To replicate a system that has problems would be like spreading a virus throughout the country, detrimental to the economy and society.

Although this study is smaller than most transit studies, it has practical implications for the global BRT community as it is beginning a conversation about passengers' perception of the TransMilenio. By studying passengers' perception(s) of the BRT system used as the blueprint for BRT systems internationally, the 150 BRT systems that have developed since the TransMilenio will be able to foresee what their own passengers think and/or will think of the respective BRT. It is important to recognize, and understand, long-term effects of the TransMilenio in order to better manage and develop BRT systems. As in the case of impacts of this study on the national level in Colombia, without information on the TransMilenio's current state, there is a greater

chance that the same problems/mistakes will be replicated and continue to be had by BRT systems internationally. The TransMilenio has had a profound influence on countries BRT development, as by the end of 2012, countries such China, India, Vietnam, South Africa, Kenya, Finland and the United States had visited Colombia specifically to study the TransMilenio (World Bank, 2013).

### **Organization of the Study**

This research is organized into six chapters. The first chapter provides the introduction to this study. Chapter Two reviews the relevant literature. It is broken into three sections beginning with general aspects of BRT systems and problems. Next, studies focused on passenger perception and satisfaction of modes of transportation, which is used to provide context for the development of this study's methodology. Chapter Two concludes with presenting literature specific to the TransMilenio. Chapter Three explains the study's methodology and research design: including – but not limited to – population sample, survey development, administering the survey, measuring the dependent variable, strengths and weaknesses and limitations. Chapter Four presents the study's results. Chapter Five offers further discussion on the study's findings. Lastly, Section Six provides a conclusion to the study.



## **CHAPTER 2: REVIEW OF RELATED LITERATURE**

### **Introduction**

The literature review conducted for this study presents information in three areas, the first addresses the problems and challenges facing BRT systems. Those issues range from political environments to societal perceptions to faulty communication. The focus in the second section of this chapter is on passengers' perception and their satisfaction of various forms of transportation, such as buses and BRT systems, types of rail transit and airplanes. This section was included as there was no prior study after which the researcher could model the methodology. There has been government research done on the topic of passengers' perception of the TransMilenio, but the researcher did not have access to methodologies, instruments used or the raw data to interpret. Since this research has been cited throughout the literature (Hidalgo, Lleras, et al., 2013; Hidalgo, Pereira, et al., 2013; Hidalgo & King, 2014; Suzuki et al., 2013; Zuluaga & Franco, 2014) the information from these studies provides valuable insight into passengers' perception of the TransMilenio. In turn, the last section of this chapter presents not only the limited literature, but also the government research on the TransMilenio as it relates to passenger perception and satisfaction. In this section, it becomes evident the need for further study on passenger perception (and satisfaction) of the TransMilenio.

### **Bus Rapid Transit (BRT) Systems' Problems and Challenges**

Within the BRT community, there is a general understanding of the problems and challenges that exist with BRT systems. Problems for BRT systems cover the various issues such as but not limited to: economics and finances, environment, land usage, policy, politics and government, schedules, social perception of buses, sustainability and traffic concerns. As difficulty and cost of implementation of BRTs is relatively low compared to other forms of

public transit and they have a high capacity, many developing cities are moving towards establishing BRT systems. Hidalgo and Gutiérrez (2013) explained some cities are using BRT system as “part of multimodal transport systems or plans” (p. 9). However, aside from ease of implementation and low costs, BRT systems do require planning before implementation, a step some cities do not spend enough time on (Filipe & Macário, 2014; Lindau et al., 2014; Mejía-Dugand et al., 2013).

In a series of case studies derived from their work, Lindau et al. (2014) compiled a list of 17 barriers to BRT systems that are found during the planning and implementation processes and in general. Barriers in the planning process addressed issues related to politics and institutional complexities; opposition of BRT from existing bus operators, business and land owners, and those who see BRT as a lesser quality mode of transit, and lastly a lack of community participation. During the implementation process barriers also include politics, along with limited policy development; an underestimation of requirements for implementation; and rushing implementation. General barriers Lindau et al. (2014) identified were again politics, yet here it refers to legislation; failing to see the benefits of BRT systems, such as decline in traffic accidents and fatalities and environmental benefits; and funding for infrastructure.

Based on the barriers identified in Lindau et al.'s (2014) study, the need for better communication becomes apparent. Communication is not only necessary among the experts in the field, but within government, between parties of public and private partnerships, in the community at large, and between community members and government and those involved with overseeing the BRT in every phase, from planning to management. Lindau et al.'s (2014) identification of areas that could prove problematic or challenging for BRT systems is an essential component in the development of current and future BRT systems.

A BRT system's success and by extension sustainability is dependent on identifying problem areas and circumstances as well as factors that predicated the success of a BRT system. Buluran, Fillone, Fukuda and Jaensirisak (2013) ascertained the importance of identifying the factors predicating a BRT system's success. Buluran et al. (2013) acquired data through surveying 30 transportation experts in the East Asian Region. Like Lindau et al. (2014), this study's conclusions confirm the importance of communication for a successful BRT system. However, the study also revealed the importance of a local knowledge bank on BRT systems and continual support from national leaders, government, decision makers in addition to the existing public transport providers (Buluran et al, 2013).

Despite the critical role communication has in successful BRT systems, there is little attention directed to communication with the passenger, or as Lindau et al. (2014) pointed out, with the community in general. There is a growing trend towards focusing on passenger perception of transit systems, but BRT focused literature does not yet delve deeply into this topic. However, there is mentioning of the role of passengers' perception, though it is limited. For example, Hidalgo and Gutiérrez (2013) stated that, "Most systems have showed better performance than the bus operations they replaced, regarding passenger demand, user satisfaction..." (pp. 10-11).

Other studies have cited that attention should be given to passenger perception if a city aims to improve a BRT system. One example was Hidalgo, Pereira et al. (2013) who observed key areas in need of attention, "[T]o improve quality of and user perception [of the TransMilenio] it is necessary to improve essential aspects, such as occupancy levels, frequency, reliability, and personal safety. Operational improvements for feeder services are especially important" (p. 134). Although passenger perception was not the direct focus of this study, the

inclusion of this statement alludes to the researchers' believing that passengers need to be considered in BRT development. This is significant because in the context of reality, there is little, if any, communication or interaction between the passengers and those deal with the physical BRT system (Lindau et al, 2014; Hidalgo & King, 2014; Morales, 2010). Despite the statement in Hidalgo, Pereira, et al. (2013), there continues to be a disconnect between passengers' wants and needs and what a BRT system delivers. This is especially true in the case of the TransMilenio.

### **Passenger Perception and Satisfaction**

Since 2001 there has been an increase in researching passengers' perception of transportation systems. Friman, Edvardsson, and Gärling (2001) wrote that there had been "little published research has investigated public transport users' satisfaction with the services they are provided" (p.95). Throughout the reviewed literature, there is a common assertion that satisfaction is composed of a variety of factors such as: comfort, cost, experience (Olsson, Friman, Pareigis & Edvardsson, 2012; Mokonyama & Venter, 2013), experience of (perceived) negative critical incidents (Friman et al, 2001; Friman & Gärling, 2001), frequency of service, reliability, speed and travel time (Friman et al, 2001; Diab & El-Geneidy, 2012). However, while each study addressed its own set of characteristics, they noted the presence of numerous variables affecting perception and satisfaction. Furthermore, most of the studies examined used surveys as the main form of data collection, yet approaches to analysis varied.

A study by Friman et al. (2001, p. 95) sought to identify the type of relationship between a public transit user's level of satisfaction and the experience of critical incidents, defined as "an encounter that is particularly satisfying or dissatisfying." In addition, the study looked at overall satisfaction in relationship to attribute-specific satisfaction and the effect of negative critical

incidents (NCIs) on attribute-specific satisfaction. A random sample of 2,000 people was mailed a questionnaire that aimed to gather information about cumulative overall and attribute-specific satisfaction, judgments and descriptions of NCIs, and socio-demographics. With a 49.9% response rate, the researchers analyzed the data from 997 questionnaires. Data was analyzed through correlational analyses regarding attribute-specific satisfaction (ATTSAT), frequency of negative critical incidents (FNCI) and overall satisfaction (SAT). The tests addressed the measurement of identified attribute-specific satisfactions (treatment from employees, service reliability, simplicity of information and recovery), experience and judgment of negative critical incidents (NCIs), and satisfaction (two questions) respectively (Friman et al., 2001).

The data revealed an inverse relationship between satisfaction and the frequency of remembered NCIs. A user with a high satisfaction level toward the public transit service, did not likely either experience or remember experiencing a large number of NCIs. In addition, the study showed a positive relationship between overall satisfaction and attribute-specific satisfaction. The attributes (independent variables) accounted for in the study were treatment by an employee (customer service), reliability of service (punctuality), simplicity of information (information is easy to understand and ease in buying tickets at retailers), and lastly, design (comfort, security and cleanliness of the service). Of these four attributes, reliability of service and simplicity of information had the largest effect on satisfaction.

The conclusions of this study establish a basic theory for the research: that it may provide insight into the reason(s) for the decline in passengers' satisfaction of the TransMilenio. Based on Friman et al. (2001), TransMilenio passengers either frequently remember experiences of NCIs or remember NCIs associated with specific attributes of the system. However, what is not determined in Friman et al. (2001) is the number of NCIs a passenger can experience and

remember before level of satisfaction is affected. The information of threshold for NCIs would need to consider the personal value a passenger denotes to a given attribute, as seen in Tyrinopoulos and Antoniou's (2008) survey.

For five types of transportation systems in Athens and Thessaloniki, Greece, Tyrinopoulos and Antoniou (2008) identified that service frequency, followed by vehicle cleanliness, waiting conditions, transfer distance and network coverage are the main attributes influencing user satisfaction. The transit systems included in the study were: an underground rail, (urban) thermal bus service, an electric bus network (trolley), an electric rail line, and a bus system operated by the Thessaloniki Ministry of Transport that carries 150,000,000 passengers per year. The inclusion of the bus system enables this research to gain insight into developing the methodology for analyzing passengers' perception and satisfaction of the TransMilenio.

The main instrument in used in Tyrinopoulos and Antoniou's (2008) study was a customer satisfaction survey that addressed 23 attributes of a transit system, selected from the Transportation Research Board's (TRB's) 1999 Handbook for Measuring Customer Satisfaction and Service Quality. These attributes were used as ways to measure passengers' satisfaction; they were sorted into four categories as follows: General characteristics of the public transit system (service frequency, on-time performance, service provision hours, network coverage, general information provision, types of tickets and passes, prices of tickets and passes, ticket selling network, personnel behavior, existence of bus lanes, measures for environmentally friendly public transit), Terminals and stops (walking distance to terminals and stops, information provision at terminals and stops, conditions at terminals and stops, safety at terminals and stops), Vehicles (onboard conditions, vehicle cleanliness, driving behavior, onboard information provision, accessibility to disabled and mobility impaired people), and

Transfer points (distance between transfer points, waiting time at transfer points, information provision at transfer points).

Many of the attributes included in Tyrinopoulos and Antoniou's (2008) survey have been used to measure passenger perception and/or satisfaction – as well as the identified challenge areas for BRT systems. The 23 attributes chosen by Tyrinopoulos and Antoniou (2008) have applicability for research on the TransMilenio. In turn, the researcher referenced Tyrinopoulos and Antoniou's (2008) survey in the development of the survey used in this study on passengers' perception of the TransMilenio.

In analyzing the data from the customer satisfaction survey, Tyrinopoulos and Antoniou (2008) used a factor analysis test to make the data more manageable and identify latent variables easier. The test identified service frequency and on-time performance as key factors for each transit systems. In addition, timetable information, transfer distance and transfer waiting time were found to be key factors in four of the five systems. While service hours, price, existence of bus lanes, distance/time to access stop and accessibility for disabled were not seen as significant latent variables or factors influencing satisfaction. Tyrinopoulos and Antoniou (2008) had included questions using a Likert scale in their survey, which led them to conduct a second analysis of their data using an ordered logit. Results of this analysis identified service frequency, followed by vehicle cleanliness, waiting conditions, transfer distance and network coverage as the attributes with the most influence on satisfaction levels (Tyrinopoulos & Antoniou, 2008).

Much of the research reviewed that studied passenger perspective or satisfaction, identified reliability or some related attribute, such as frequency of service or punctuality, as having a high-level of importance for passengers (Friman et al., 2001; Friman & Gärling, 2001; Chen, 2008; Eboli & Mazzulla, 2011; Lai & Chen, 2011; Mokonyama & Venter, 2013; Sheth,

Triantis & Teodorović, 2007; Tyrinopoulos & Antoniou, 2008). By extension, reliability is associated with satisfaction.

Reliability was also observed as a key characteristic of a public transit system that influenced satisfaction in a South African case study conducted by Mokonyama and Venter (2013). This study focused on car owners who choose to use public transit for commuting purpose. One of Mokonyama and Venter's (2013) questions was, "What constitutes customer satisfaction in public transport?" There were two other questions posed in the research; however, they are not germane to the current research's question.

Using the Kano model of customer satisfaction, Mokonyama and Venter (2013) determined that unreliability and poor security were unacceptable by both users of the system and non-users of the system. In addition, they found that as poor reliability and insecurity become worse, non-users become even more dissatisfied with the transit system. Mokonyama and Venter's (2013) comment, "A slight compromise in security will result in an immediate mode [of transportation] switch," is extremely valuable in connection to this research on the TransMilenio. Since reports on the TransMilenio show increasing rates of crime (Cámara de Comercio de Bogotá, 2011; Bogotá ¿Como Vamos?, 2013b, 2014), the results of Mokonyama and Venter's (2013) study influenced this study including questions of crime in its survey.

The studies addressed in the literature thus far look at passengers' perception and satisfaction in the case of bus- and rail-based public transportation. However, the Chen (2008) study is on airline passengers, it is still relevant for this study as it helped to develop methodology and the survey. Chen (2008) investigated the relationships between service quality, perceived value, satisfaction and behavioral intentions for air passengers. A convenient sampling including 300 questionnaires was done in Taiwan's Koashiung International Airport, which had



a response rate of 81.6%. Like Tyrinopoulos and Antoniou (2008), Chen (2008) conducted a factor analysis; however, Chen (2008) divided the aspects of the airline into four categories: Factor 1: Employees/facilities, Factor 2: Product, Factor 3: Transaction and Factor 4: Reliability.

The conclusions of Chen's (2008) analysis appeared to echo some of the findings from the previously mentioned studies. For example, provisions of information, frequency/reliability (measured through Factor 4's characteristics of punctuality and convenience of schedule), safety and efficiency (particularly with respect to waiting in line) were all aspects that showed a variance of customers' perceived value and satisfaction of the service. In addition, Chen (2008) found that satisfaction was indirectly affected by the perceived performance of the airline moderated by perceived value. Also, a high perceived value and satisfaction of the airline had a positive impact on a passenger's behavior, which is defined as repeated use and/or recommendation of the service. One of Chen's (2008) main findings of consequence, in relation to this study, is that "service quality is not guaranteed to lead to a customer's overall satisfaction" (p. 716). In a later study, Chen also examined passengers' perception, but in the context of public transit and an emphasis on the need to view public transportation from a more market oriented perspective (Lai & Chen, 2011).

Lai and Chen (2011) studied the relationships between a passenger's satisfaction, perception of service quality, perceived value and involvement with the Kaohsiung Mass Rapid Transit (KMRT) public transit system in Taiwan. As in Chen's (2008) study, Lai and Chen (2011) collected data using a questionnaire administered through a convenience sampling. The questionnaire asked about passenger's involvement (characteristics relating to: use of the system and interaction with passenger's lifestyle), opinion of general service quality aspects (characteristics relating to: information provisions, network coverage, service provision hours,

tickets, frequency, customer service) and psychical environment related to service quality (characteristics relating to: cleanliness, safety, conditions of vehicles and stations). Lai and Chen (2011) used the data on these characteristics to conduct a factor analysis. The data from the factor analysis provided the basis for testing the relationships of involvement, service quality, perceived value, satisfaction and behavioral intentions (loyalty and/or recommending the service) using a structural equation model (SEM). From the analyses, Lai and Chen (2011) concluded that satisfaction is central to achieving positive behavioral intentions, meaning continued use of the system. Furthermore, satisfaction is affected by changes in service quality and perceived value. However, Lai and Chen (2011) supplemented this result by stating that, “Passenger satisfaction is not guaranteed if the quality of the service that public transit delivers do not result in increased passenger perceptions of value in relation to the fares paid” (p. 324). In turn, satisfaction is predicated first on the cost of using the system being seen as fair and then provision of quality service (Lai & Chen, 2011).

### **Passenger Perception and Satisfaction in Relation to the TransMilenio**

In general, there is limited research on the TransMilenio, and much is focused on operational, technical and economic aspects (Echeverry, Ibáñez, Moya, Hillón, Cárdenas & Gómez-Lobo, 2005; Gilbert, 2008; Hidalgo & Sandoval, 2002; Hidalgo, Lleras et al., 2013; Hidalgo, Pereira, et al., 2013; Montezuma, 2003). As far as the author knows, studies on passengers’ perception of the TransMilenio are predominantly by government agencies and organizations, these include: Bogotá ¿Cómo Vamos?’s annual studies *Encuesta de Percepción Ciudadana* (Public Perception Survey), *Cómo Vamos en Movilidad* (How We Are in Mobility), and *Informe de Calidad de Vida* (Information on Quality of Life); TransMilenio S.A.’s *Encuesta de Satisfacción de Usuarios*, conducted annually by research companies contracted by

TransMilenio S.A.; and an annual survey *Cámara de Comercio de Bogotá* (The Chamber of Commerce for Bogotá) conducts that is presented as *Encuesta de Percepción sobre las Condiciones y Calidad del Servicio de Transporte Público Colectivo y TransMilenio* (Survey of Perceptions about the Conditions and Quality of Service of Collective Public Transit and the TransMilenio). With the exception of the TransMilenio S.A.'s *Encuesta de Satisfacción de Usuarios*, the research shows a decline in passengers' satisfaction and perceived quality of service along with a rise in number of passengers and expansion of the system.

These themes in the government research are similar to ideas Suzuki et al. (2013) expressed in their case study on the TransMilenio. Suzuki et al.'s (2013) provided insight into the reason for the results of the government's research, "Deteriorated main routes and worsening traffic congestion have overshadowed the TransMilenio's success. The decline in service quality reflects both the system's popularity and lack of attention to user needs" (p. 113). Suzuki et al.'s (2013) focused their case study of the TransMilenio on the development of the system in conjunction with land development and usage. In general, Suzuki et al. (2013) showed that land integration has been considered in the TransMilenio's development. However, they explained that because of the political, institutional and public-private partnership constructs that lead to breakdowns in communication and inefficient policy-making; financial/budgetary deficiencies; and microdesign shortcoming, the TransMilenio could be better integrated into the city and address land density concerns.

Like Suzuki et al. (2013), Hidalgo and King (2014) include aspects concerning passengers' perception of the TransMilenio although it is not the focus of the study. However, passenger satisfaction, or lack thereof, is acknowledged and addressed in Hidalgo and King's (2014) study as well as in their literature review. Hidalgo and King (2014) studied public

transport integration in Bogotá and Cali, Colombia. Although the TransMilenio is well-regarded and has been extolled all over the world (Gutiérrez, 2010), Hidalgo and King (2014) depict the TransMilenio as inferior to Cali's BRT system, MIO-SIT, despite low user satisfaction. The low satisfaction is attributed to an "insufficient supply of buses...bus delay and high occupancy, and insufficient coverage" (Hidalgo & King, 2014, p. 168). Still, it was suggested that passenger perspective might change as a result of an 8% increase in the headway threshold between January 2013 and August 2013 along with an increase of 1.8 kilometers per hour (km/h) between 2012 and 2013. MIO-SIT's users' satisfaction rate in 2013 was 52% (Hidalgo & King, 2014) while the TransMilenio's users' satisfaction rate in 2013 was 15% (Bogotá ¿Cómo Vamos?, 2014).

Statistics on passengers' satisfaction differ among the literature. Yet, the documentation of the decline in passengers' satisfaction of the TransMilenio is unquestionable. The information is not sufficient as a singular datum; there needs to be an understanding of the why. Thus, further research is required on the TransMilenio and passenger perception and/or satisfaction.

### **Summary**

The literature reviewed presents a picture of BRT systems having numerous problems and challenges; however, passengers' perception is not seen as a pertinent issue. This suggests the need for further research that looks satisfaction declines; service use is also likely to decline. This has already been seen in the case of the TransMilenio as private vehicle usage has been increasing steadily since 2012 (Bogotá ¿Cómo Vamos?, 2014). Furthermore, the literature reviewed illustrates the importance of considering an assortment of variables in assessing passenger satisfaction with public transit ranging from cleanliness to wait time to environments within systems (in-vehicle, station, transfers). However, in the case of this research concerning

the questions, “What is passengers’ perception of the Sistema TransMilenio?” the most important observation from the literature is the gap in the published research on and the inaccessibility of government data on user satisfaction. This study aims to fill that gap by providing information on passengers’ perception of the TransMilenio that has no governmental association.

## **CHAPTER 3: Methodology**

### **Introduction**

The research was conducted as a mixed study with aspects of both qualitative and quantitative elements. As the study was in the form of a case study on the TransMilenio with both exploratory and explanatory principles, it truly mixes qualitative and quantitative research methods. The question, “what is passengers’ perception of the TransMilenio,” is exploratory in nature, a common identifying characteristic of a qualitative explanatory research. Also, the study’s main instrument was a survey that allowed participants to include comments; moreover, many participants started informal conversations with the researcher following their completion of the survey. However, during the analysis of the research’s data, regression and correlation tests were ran in order to account for potential bias of the researcher in terms of her interpretations of data.

This study did not have a previous research methodology for passengers’ perception of the TransMilenio to which this study could be modeled after. In turn, the study’s survey, processes and means for analysis were modeled after existing studies on passenger perception and satisfaction, and general information on BRT systems.

### **The Population Sample**

The study’s population comprised of people who reside in Bogotá above the age of 18, meaning parental consent is not needed according to the standards in both the United States and Colombia. Furthermore, as the study’s instrument was a survey written in Spanish, subjects could either read or understand Spanish. There were a few participants that were unable to read, so it was read to them and they verbally gave their answers. It should be noted that the researcher observed this, but to respect the participants’ privacy stood out of earshot. Literacy, or use of the

TransMilenio was not a requirement in order to complete the survey. However, use of the TransMilenio was a factor in determining the usability of a survey in the study's analysis.

The surveys included in the research were those that either used the TransMilenio and/or the *Alimentadors* (feeder buses, but in this paper the term *Alimentador(s)* will be used). The reason that surveys that did not use the TransMilenio, but did use the *Alimentador* were included is because these two buses are extremely related; the *Alimentadors* are directly connected to the TransMilenio because their terminals are the same as the various *portales* (portals/terminals) of the TransMilenio.

A total of 174 surveys administered, 130 of those completed were useable for analysis. There were 44 surveys excluded from analysis, 27 respondents did not use the system, and 17 surveys were unusable.

### **Survey Development**

The survey used in this research was given in Spanish and asked 20 questions. The first questions were to gain information regarding demographics, such as gender, age, which *localidad* (an area of Bogotá that is within a zone of the city, but still has smaller neighborhoods within it), profession and type of cellphone plan, or lack thereof. The questions of which *localidad*, profession and type of cellphone plan also served to provide information of socio-economic status (salary). The remaining 10 questions asked about passenger's modes of transportation, frequency of use of the TransMilenio, satisfaction, service quality, characteristics the system has, characteristics that are important for the TransMilenio to have according to the user, crime, and the final survey question asked about characteristics that are problem areas for the TransMilenio along with an opportunity to write additional comments.

Questions aimed at measuring passengers' satisfaction and gain deeper insight into

passengers' perception were developed based on information from studies on passenger perception and satisfaction from the literature review in Chapter 2 and information gained through preliminary conversations with residents of Bogotá. The studies most referenced were: Friman et al. (2001), Friman and Gärling (2001), Eboli and Mazzulla (2011), Hidalgo and King (2014), Lai and Chen (2011), Mokonyama and Venter (2013) and Tyrinopoulos and Antonious (2008). In order to measure satisfaction, 14 characteristics of transportation system were used in questions 13, 14 and 20. These questions asked respondents to identify which of the characteristics the TransMilenio has, what are most important as a passenger and what are problem areas for the TransMilenio.

There was no specific order for presenting the 14 characteristics in the survey. The first characteristic included in the survey was wide [network] coverage, included in the studies by Lai and Chen (2011), Hidalgo and King (2014) and Tyrinopoulos and Antonious (2008). The most influential factor including this characteristic came from Tyrinopoulos and Antonious' (2008, p. 266) assertion that wide coverage is "[one of] the most important satisfaction attribute" for the studies types of transit; and Hidalgo and King's (2014) statement that bus delays, high occupancy, insufficient bus supply and coverage were factors influencing passenger perception of the TransMilenio.

The second characteristic listed was reliability, referenced by Friman et al. (2001), Friman and Gärling (2001), and Mokonyama and Venter (2013). These three studies all identified service reliability as influencing satisfaction. Yet, what really drove the inclusion of this characteristic in the survey was Mokonyama and Venter's (2013) observation that unreliable service was not tolerated and the more unreliable the service the more passengers were dissatisfied with the transit system.



The next three characteristics derived from studies and information concerning the TransMilenio. Easy-to-use tickets (Diab & El-Geneidy, 2012; Friman et al., 2001; Mokonyama & Venter, 2013; Tyrinopoulos and Antonious, 2008) was included not only because it was used in previous studies, but also a complaint in the March 2014 protests against the TransMilenio (Bogotá ¿Cómo Vamos? Concejo, 2014) and there are three different tickets for the TransMilenio. The workday in Bogotá begins as early at 5:30/6am, yet the TransMilenio does not open until 5am and express routes do not begin operating until approximately 5:30. Based on this information, the characteristic of long hours of operation was included to see if TransMilenio users felt hours of operation 5am-11pm (Monday-Saturday) were sufficient. Moreover, hours of operation was also included in studies by Friman et al. (2001), Eboli and Mazzulla (2011), Lai and Chen (2011) and Tyrinopoulos and Antonious (2008). The characteristic of being environmentally responsible was included primarily because of the environmental efforts made (building *cicloruta*, a network of bicycle lanes; the Green Corridor, aimed at reducing pollution on a major avenue in the city), being one of the World Bank's "Eco2 Cities: Ecological Countries as Economic Cities" (Suzuki et al., 2013), and the TransMilenio was the first mass transit system registered to sell its Certified Emission Reduction (CER) credits (Turner et al., 2012). In turn, the researcher wanted to see if passengers saw the TransMilenio as being environmentally responsible and not just international organizations.

The following characteristics concerned comfort; station/portal comfort was differentiated from in buses. Friman et al. (2001) also differentiated comfort in stations from buses; and found comfort had a significant influenced on satisfaction. Furthermore, Hidalgo and King (2014) cited high occupancy (crowding) as influencing perception. Crowding was part of the definition of comfort used in multiple studies when measuring perception and satisfaction

(Eboli & Mazzulla, 2011; Friman et al., 2001; Friman and Gärling, 2001). In addition, Eboli and Mazzulla (2011) and Friman and Gärling (2001) inclusion of comfort as a means to measure satisfaction and passenger perception. Moreover, what solidified the importance of including comfort in the survey was the reports by Cámara de Comercio de Bogotá (2011) and Bogotá ¿Cómo Vamos? (as cited by Hidalgo et al., 2013) that high occupancy/over-crowding is a main reason passengers perceive quality of service as declining.

Availability of information also was specified to be for stations/portals and buses. Studies that included characteristic(s) for information provisions that distinguished the different places for receiving information were Friman and Gärling (2001), Chen (2008), Eboli and Mazzulla (2011), Lai and Chen (2011) and Tyrinopoulos and Antonious (2008); while Friman et al. (2001) and Mokonyama and Venter (2013) had a single information provision characteristic.

Other characteristics, in no specific order were frequency (Chen, 2008; Eboli & Mazzulla, 2011; Friman & Gärling, 2001; Lai & Chen, 2011; Mokonyama & Venter, 2013; Tyrinopoulos & Antonious, 2008); affordability as well as safety in buses, though the previous studies used overall safety (Eboli & Mazzulla, 2011; Friman et al., 2001; Lai & Chen, 2011; Mokonyama & Venter, 2013; Tyrinopoulos & Antonious, 2008; Zuluaga & Franco, 2014); and accessibility for the disabled and mobility impaired (Tyrinopoulos & Antonious, 2008).

A final characteristic was included but not found in the literature reviewed, the system is easy to use. This was included because the researcher believed this would be influential in the case of passengers' perception and satisfaction of the TransMilenio. Developing the survey based on previous related studies' surveys and conclusions is a strength of this study. By doing this, the survey is more likely to yield results, and results can be contextualized, and compared, with existing studies on passenger perception.

### **Procedure: Administering the Survey**

A survey of convenience was conducted in Bogotá, Colombia from March 28<sup>th</sup> to April 1<sup>st</sup> and April 6<sup>th</sup> to April 10<sup>th</sup>, 2015. Surveys could not be administered between April 2<sup>nd</sup> and April 5<sup>th</sup>, 2015 out of respect for the country's national holiday *Semana Santa*. This research used a convenient sampling method due to constraints of time and manpower, the same rational was used by Chen (2008).

Surveys were administered in various businesses, a language school, a foundation, spas/salons, parks and a hospital. The researcher administered the surveys; however there were two exceptions. A doctor administered the surveys in the hospital. This was only after the researcher trained the doctor on how to administer the survey and answer any questions a respondent may have during survey completion. The second exception was in the case of the foundation where a woman who volunteers at the foundation accompanied the researcher. This was because the foundation is for children with various disabilities (physical and mental) and the accompaniment of the woman would enable the foundation's employees and other volunteers to feel the children's safety was not being compromised by the researcher's presence.

The researcher quickly learned that Colombians in Bogotá were not very open to surveys. However, those who took part in the survey were receptive. Upon putting the completed survey in the designated envelope, approximately 2 to 3 out of every 10 participants wanted to verbally share their opinions of the TransMilenio that were not addressed in the survey. These conversations were noted by the researcher and proved extremely valuable. The researcher did not plan for this type of follow-up conversation, but it was very welcomed.

### **Measuring the Dependent Variable**

Measuring passengers' perception, the dependent variable, was difficult as it is

subjective. The study utilized two methods explained in the literature reviewed to measure passengers' perception, which were level of satisfaction and perceived quality of service. These were calculated with the results from questions 10 and 12. (See Appendices F and G for complete survey in English and Spanish). In addition, an analysis was done of the data from questions 13, 14 and 20, which inquired about 14 characteristics in terms of their presence in the TransMilenio, importance for the TransMilenio to have and lastly problem areas of the TransMilenio.

After data was collected a series of regression tests were run to identify existing relationships in the data. The majority of regression tests used level of satisfaction as the y-variable/dependent variable, which stayed constant, while changing the x-variable/independent variable to be of demographics, average number of days per week one uses the TransMilenio, perceived quality of service, how the service compares to the year before, being a victim of a crime, and number of problems identified the system as having.

### **Strengths**

There are other strengths of this study in addition to those in relation to the survey development. Another strength was that the researcher was familiar with the system, the culture, the language and the city, which enabled her to use her time wisely and be better able to convince subjects to take part in the study. Secondly, by conducting a mixed-methods study the results are easier to use in a practical sense. The type of information gained through this research is valuable for public sector purposes, as well as for BRT systems. Since the TransMilenio has frequently been used as the blue print for BRT systems worldwide, the information from this study has the potential to help improve BRT system development.

### **Weaknesses and Limitations**

The most glaring limitation for this study is that the government in Colombia prohibits this research topic. This fact was learned after having begun administering the surveys. The researcher learned that she could continue conducting the study, but to be careful, especially since the study is on passenger perception of the TransMilenio (A. Díaz, personal communication, March 30, 2014; Cristian, personal communication, April 1, 2014). Depending on how well-known this prohibition is, prospective respondents could have deterred from participating and/or given answers not truly reflexive of how s/he feels towards to system.

There were other limitations that were known prior to conducting the research, such as time, inability to have a random and large sample, and that the study's design had potential for the data gathered to be too limited and/or abstract and thus results would not be applicable to general perceptions of the TransMilenio. Furthermore, Spanish is not the researcher's first language and the survey had some grammatical and phrasing errors. However most respondents were very accepting of errors after the researcher introduced herself. Lastly, the researcher knew cultural etiquette in Colombia, but was not familiar with protocols around surveying or asking about opinions of public services.

The inability to access the raw data from surveys organized through the TransMilenio S.A. and governmental organizations and agencies was another limitation of this study. Studies by Bogotá ¿Cómo Vamos?, an agency associated to the government; Datexco Company S.A., a company contracted by the TransMilenio S.A. to conduct a survey on user satisfaction; and Cámara de Comercio de Bogotá, the city's Chamber of Commerce conducted surveys addressing passengers' satisfaction of the TransMilenio. Each agency presented their findings online, but it is necessary to review more information than what is made available, especially the raw data.

Despite the fact that the findings from the 2013 survey on user satisfaction conducted by Datexco Company S.A. are presented on the website for the TransMilenio, the scaling used is not explained making the information undecipherable.

### **Summary**

The methodology of this mix-methods study was developed using prior transit studies on passenger perception and satisfaction. Measures were taken to increase the reliability and validity of the study's results in this methodology. However, as there are numerous limitations, this will very likely have implications on the results.

## Section 4: Results

### Introduction

This section will present the findings pertaining to passengers' perception(s) of the Sistema TransMilenio (TransMilenio) in Bogotá, Colombia. The TransMilenio has rave reviews according to the literature reviewed in Section Two; while information on passengers' reviews of the system are not fully clear. The results from this study are based on 130 survey-respondents, 129 use the TransMilenio while 1 uses only the *Alimentadores* of the system. Due to the fact *Alimentadores* are very connected to the TransMilenio that respondent's survey was included in all calculations. As this is a mixed-methods study, the data will be presented in both a quantitative form, findings from multiple correlation and regression tests, and qualitative form, findings from observation, written comments from surveys and the researcher's own assessment based on logic.

Some of the main findings of the study are that the passengers of the TransMilenio have much to be desired from the system. With 57% of respondents to this study's survey stating they were dissatisfied with the TransMilenio leads one to think that there is a gap between the literature and reality. Moreover, only 19% of respondents thought the TransMilenio's service is between good and excellent while 48% said the service was bad to horrible. In addition, it was found that crime does affect passengers' usage of the TransMilenio, and being a victim of crime is not a requirement.

### Demographic and Descriptive Statistics

The population of this study was 37.7% male (49), 61.5% female (80), and 0.8% no answer (1). The mode age range was 18 to 24 years with 30% of the respondents, followed by 19.2% of respondents in the range of 30 to 34 years. In order to account for income variation in

the survey, respondents were asked what type of cellular phone plan s/he had, which can be seen in Table 4.1. Based on this information it was determined that the study's population may be skewed towards the higher income levels. This is because in order to have a post-pay cellular phone plan one must need to show proof of credit; in Colombia it is much harder to get a credit card than in the United States in addition, it is not uncommon to go without having a bank account. Respondents were also asked to write their profession in a blank provided to have further information to account for income variation. Professions included, but not limited to: accountants, administrators, business executives, doctors, engineers, housewives, lawyers, manicurists, nurses and nurses assistants, physiotherapists and physical therapists, security guards, students, stylists, teachers.

**Table 4.1** Descriptive Statistics for Survey Question: What Type of Cellular Phone Plan Do You Have?

Type of plan	Number of people	Percentage
Prepay	59	45.38%
Post-pay	64	49.23%
No phone/plan	8	6.15%
No answer	1	Less than 1% (.769%)

Bogotá, Colombia is divided into six zones: *Norte* (North), *Sur Oriente* (Southeast), *Sur Occidente* (Southwest), *Occidente* (West), *Centro* (Center of the city), and *Chapinero*, which is in the East of the city. Within each zone there are *localidades*, (these are similar to municipalities, they are not neighborhoods). The *Secretaría Distrital de Planeación* (Secretary of District Planning) in the office of the *Alcaldía Mayor de Bogotá D.C.* (the mayor of Bogotá) (2011) reported the population distribution based on the *localidades*, and by extension zones in 21 *Monografías de las Localidades: Distrito Capital 2011*. For this study, the respondents to the survey indicated where they live according to *localidad*, this information was tabulated to get the population distribution based on zones. With the exception of *Sur Oriente* (Southeast), the



survey results do not replicate the mayor's office's report. In Table 4.2 this survey's population distribution percentages are shown along with the percentages from 21 Monografías de las Localidades: Distrito Capital 2011. The significance of this distribution is to account for socio-economics among respondents; however, there was no significant correlation between cellular phone plan and *localidad* or zone.

**Table 4. 2 Population Distributions by Zone**

<b>Zone (English/Spanish)</b>	<b>Percentage of Population Distribution According to: Respondents from Study's Survey (2015)*</b>	<b>Percentage of Population Distribution According to: Secretary of District Planning's Report (2011)</b>	<b>Difference in Percentages</b>
North/Norte	27.73	20.69%	+7.04
Southeast/Sur Oriente	17.65	17.14%	+0.51
Southwest/Sur Occidente	12.61	19.10%	-6.49
West/Occidente	22.69	29.61%	-6.92
Center of City/Centro	10.08	6.57%	+3.51
Chapinero	9.24	6.89%	+2.35
Total	100%	100%	

\*Percentages are based on sample of 119, which excludes survey respondents who did not answer the question or who live outside of Bogotá proper.

Additional information pertaining to this study's population was collected regarding transportation. Only 31% of respondents did not use the TransMilenio as their principle mode of transit, while 69% of respondents did identify the TransMilenio as their principle mode of transit. It should be noted that of the 69%, 65% identified the TransMilenio as their sole principle mode of transit while 35% considered the TransMilenio as principle, but in conjunction with another/other form(s) of transit. Furthermore, most respondents, 37%, use the system, on average, between 6-7 days per week, while the other respondents' average use per week was: 28% use it 1 to 2 days, 14% for 3 to 4 days, 19% for 5 days and 2% do use the system but not every week. Also, the majority of respondents, 72.3%, use the system for work, which is likely explained by 56% use the system five or more days on average per week.

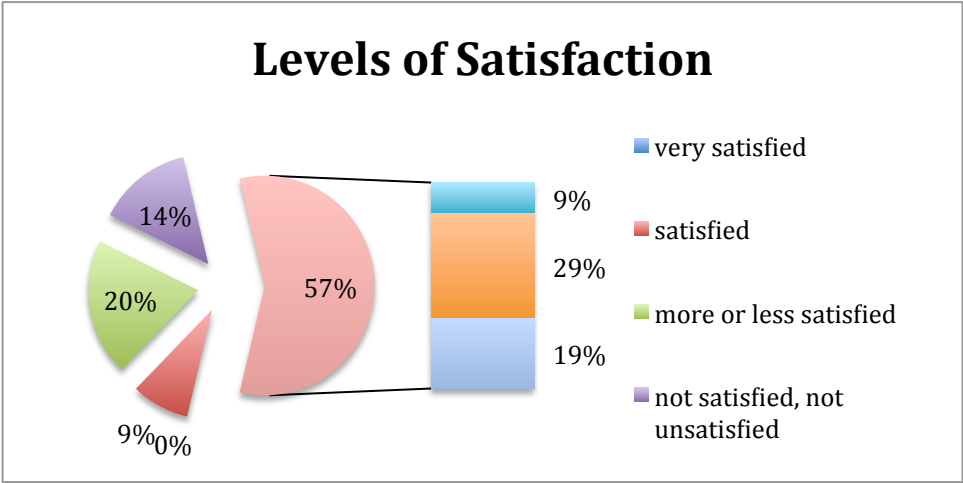
Quantitative Data

In order to answer the question “what is passengers’ perception(s) of the TransMilenio,” a quantitative analysis was done to supplement the qualitative analysis. The quantitative analysis will proceed the qualitative in an effort to give better context. Survey question 12 specifically asked how satisfied one was with the TransMilenio. The responses are presented in Table 4.3 and were used as the basis for the quantitative analysis; see Figure 4.1 for the graphical representation. The responses showed that 57% were dissatisfied with the TransMilenio, while 29% were satisfied and 14% were neutral.

Table 4. 3 Data on Passengers' Satisfaction Levels

Level of Satisfaction (Spanish/English)	Responses	Percentage
Muy satisfecho (very satisfied)	0	0%
Satisfecho (satisfied)	11	8.5%
Más o menos satisfecho (more or less satisfied)	26	20%
Ni satisfecho, ni insatisfecho (not satisfied, not unsatisfied)	18	14%
Más o menos insatisfecho (more or less unsatisfied)	11	8.5%
Insatisfecho (unsatisfied)	38	29%
Muy insatisfecho (very unsatisfied)	25	19%
No response	1	1% (0.8%)

Figure 4. 1 Passenger Satisfaction with the TransMilenio



As this study asks about perception, and not solely satisfaction, further analysis was

required. In turn multiple regression tests were run in order to see if any relationships existed between satisfaction and other variables. It was determined that there were no significant relationships between satisfaction and the following variables: gender, age, *zone/localidad* of residence, type of cellular plan, average number of days per week one uses the system, if the TransMilenio was the principle mode of transit, and being a victim of crime while in the TransMilenio. The results from these regression tests are in Table 4.4.

**Table 4. 4 Regression Statistics**

Y Variable (Dependent Variable)	X Variable (Independent Variable)	R <sup>2</sup> Value	Absolute Value of Pearson's coefficient of correlation  r	Standard of Error	Interpretation
Satisfaction	Gender	0.0177295	0.1331521	1.7110481	No significant relationship
Satisfaction	Age	0.0227335	0.1507764	1.7066842	No significant relationship
Satisfaction	Zone of Residence	0.0009479	0.030788	1.7242797	No significant relationship
Satisfaction	<i>Localidad</i> of Residence	0.010012	0.10006	1.71644	No significant relationship
Satisfaction	Type of Cellular Plan	5.336E-05	0.0073046	1.7250515	No significant relationship
Satisfaction	Average Number of Days Per Week Uses the TransMilenio	0.02841851	0.16857789	1.70040853	No significant relationship
Satisfaction	TransMilenio as Principle Mode of Transit	0.0035372	0.059474	1.7233648	No significant relationship
Satisfaction	Being a Victim of Crime while in the TransMilenio	0.0990334	0.3146958	1.6374498	There is a moderate relationship with regards to Pearson's r, but only a 9.9% that having been a victim of a crime in the TransMilenio would be related to the change in the y-variable (satisfaction)

In addition to asking about satisfaction, the survey asked participants about service quality (question 10) and to compare the service to the previous year (question 11). Question 10

addressed the quality of the TransMilenio by asking, “How is the TransMilenio’s service.” The majority of respondents, 48%, defined the TransMilenio’s service quality in negative terms, responses were as follows: bad 21%, very bad 14% and horrible 13%. However, a neutral response for the TransMilenio’s service was given by 33% of participants, while 19% saw the TransMilenio’s service in positive terms, responses were as follows: good 15%, very good 2% and excellent 2%. Refer to Table 4.5 for further details. Question 11 asked respondent to complete the sentence “Would you say that the service is \_\_\_\_\_ from last year (2014)” with better, worse or the same (with 3 degrees of better and of worse). Overall, the study found that 29% of respondents saw no change in service from 2014 to April 2015; while 14% responded that the service had improved since 2014, but 56% said the service to has declined since 2014. The data from this question can be found in Table 4.6.

**Table 4. 5 Data from Question 10 "How is the TransMilenio's service?"**

Level of Service	Number of People	Percentage
Excelente (Excellent)	3	2%
Muy Bueno (Very Good)	3	2%
Bueno (Good)	19	15%
Ni Bueno, Ni Malo (Not Good, Not Bad)	43	33%
Malo (Bad)	27	21%
Muy Malo (Very Bad)	18	14%
Horrible (Horrible)	17	13%

**Table 4. 6 Data from Survey Question 11 - How the TransMilenio's Service Compares to Last Year (2014)**

The service is ____ from last year	Number of people	Percentage
Mejóro mucho (much better)	0	0%
Mejóro (better)	5	4% (3.9%)
Mejóro algo (a little better)	13	10%
Sigue igual (the same)	38	29% (29.3%)
Empeoró algo (a little worse)	21	16% (16.2%)
Empeoró (worse)	39	30%
Empeoró mucho (much worse)	13	10%
No answer	1	1% (.8%)

Based on the information from questions 10 and 11, additional regression tests were run

using satisfaction as the dependent variable. The regression with satisfaction as the y-variable and perceived quality of the TransMilenio as the x-variable yielded an  $R^2$  of 0.47539715. This is significant because it means that 47% of the change in satisfaction can be explained by variation in passengers' opinion of the quality of the TransMilenio. This does not reflect causality, it only states there is a moderate to strong relationship between satisfaction and quality with respect to the TransMilenio and the respondents of this study. A relationship between satisfaction (y-variable) and passengers' perception of the TransMilenio's service compared to the year before (2014) (x-variable) was found as well. This relationship is less than that between satisfaction and quality; however, with an  $R^2$  of 0.3515045 there is a relationship, results for the regression test are presented in Table 4.7.

**Table 4. 7 Regression Test Results for Satisfaction and Comparison to the TransMilenio Last Year**

<b>Likert Scale Used</b>	<b><math>R^2</math> Value</b>	<b>Absolute Value of Pearson's coefficient of correlation <math> r </math></b>	<b>Standard of Error</b>	<b>Interpretation</b>
1= much better; 2= better; 3= a little better; 4= same; 5= a little worse; 6= worse; 7= much worse; 0= no response	0.3515045	0.5928781	1.3902732	Based on the $ r $ value, there is a moderately strong correlation, which the $R^2$ value further explains that the changes of a person's opinion of how the TransMilenio compares to last year accounts for 35% of the change in level of satisfaction.

The next set of results comes from the responses from questions 13, 14 and 20 of the study's survey. These questions asked about what characteristics the TransMilenio has, what characteristics are important for the TransMilenio to have, and what characteristics are problems for the TransMilenio. In addition, question 20 enabled participants to write additional problems of the TransMilenio and/or general comments. The data from these questions is presented in

Table 4.8. After tabulating the top five responses for each question, it became apparent that there was a need for further analysis.

**Table 4. 8 Percentages for the Top 5 Responses for Questions 13, 14 and 20**

Characteristic	Characteristics the TransMilenio has	Characteristics that are important	Characteristics that are problems	Interpretation
Wide coverage (accesible a la ciudad)	52%	62%	12%	This is may not influence satisfaction, since 52% observe characteristic and 62% think it is important. In addition, only 12% think this is a problem. It appears to be a non-issue for TransMilenio passengers, yet their satisfaction still is low. In turn this may be an important characteristic for a transportation system, but it is not a characteristic that makes-or-breaks satisfaction.
Reliable service (el servicio confiable)	6%	28%	48%	This may or may not influence perception/satisfaction. It is a problem area, but the percentage of respondents who considered reliability important is not great.
Easy-to-use Tickets (tarjetas son fácil para usar)	40%	48%	21%	This appeared not to have much discrepancy with the importance, and the presence of this characteristic, which means it is not likely what influenced satisfaction.
Long hours of operation (horas de operación son largos)	47%	42%	23%	Based on comments and informal conversations following submission of a completed survey, it is likely that the 23% either: 1. Have to take <i>Alimentadores</i> 2. Have work/school that ends very late or starts very early. 3. Want to use the system on weekends when going out at night.
Comfortable environment in stations and portals (el ambiente en las estaciones y portales están cómoda)	7%	19%	55%	This is low in importance according to respondents. However, it is believed that this is lower in priority because there are numerous other problems that may have more immediate importance.
Comfortable environment inside buses (el ambiente en las buses están cómoda)	5%	18%	48%	This is low in importance according to respondents. However, it is believed that this is lower in priority because there are numerous other problems that may have more immediate importance. Moreover, the buses prior to the TransMilenio are old, narrow seats and

				aisle, and pack many people (at times over capacity) as drivers were paid based on the number of passengers they picked up during their shift. In turn, many are not use to a comfortable bus environment, so it is not that much of an issue; however it is recognized that this does not exist.
Frequent service (el servicio frecuente)	14%	44%	35%	This seems contradictory as 35% think frequency is a problem, but 86% did not see it as a characteristic of the TransMilenio.
The system is easy to use (el sistema es fácil para usar)	32%	51%	17%	Most respondents identified this as an important characteristic for the TransMilenio. However, this data raises questions for the researcher as only 32% say the system is easy to use, and 17% (even less) say this is a problem are for the TransMilenio. Is the system's ease of use not noted by the passengers or is it taken for granted? If 83% of respondents did not see it as a problem, then maybe it is not important enough to impact satisfaction or perception of the system. At the same time, the data shows that 68% do not see the system as easy to use, which questions the validity that 83% think the system's ease of use is not a problem. On-site observations push the researcher to conclude that it is not a problem because it is easy to use, and many passengers see it as their entitlement.
Safe environment inside buses (el ambiente seguro en las buses)	3%	24%	60%	For this characteristic as well as the three that follow (comfortable environment in stations and portals as well as buses, and reliable service) have significantly low percentages of respondents who felt these characteristics to be important. Also, almost no respondents identified a safe bus environment as a characteristic of the TransMilenio, yet only 24% thought it was important. With the growing crime on the system it was surprising that not more people saw this characteristic as important. However, 8 of 15 comments identified <i>inseguridad</i> ( as an issue of the TransMilenio. By including the comment it is believed that these respondents see this as an important characteristic, despite only 3 of the 8 including safe bus environment in their list of important characteristics.

Accessibility to disabled and mobility impaired people (la accesibilidad para discapacitados y personas con movilidad reducida)	30%	45%	43%	The percentages of respondents who identified this characteristic as something the TransMilenio has is only slightly lower to the percentage of those who think it is a problem area. However, it is noteworthy that 45% think it is important and 43% think it is a problem. This leads the researcher to infer that this characteristic is important in passengers' perception and satisfaction of the TransMilenio
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The majority of respondents identified the TransMilenio as having the following characteristics, in order according to the survey: wide coverage (52%), easy-to-use tickets (40%), long hours of operation (47%), system is easy to use (32%), accessibility to disabled and mobility impaired people (30%). Of these five characteristics, respondents identified four as important: wide coverage (62%), easy-to-use tickets (48%), system is easy to use (51%) and accessibility to disabled and mobility impaired people (45%). The fifth characteristic respondents gave importance to was frequent service (44%). However, the percentage of respondents who identified wide coverage, easy-to-use tickets, frequent service, system is easy to use, and accessibility to disabled and mobility impaired people, as important, were all higher than the percentage of respondents who identified the TransMilenio as having those characteristics. This information has been interpreted to mean that there are significant percentages of passengers who feel that the system does not provide services that s/he feels to be important, which could be problematic. In turn, each respondent's perceived important characteristics (response to question 14) was cross-referenced with the characteristics s/he identified the TransMilenio to having (response to question 13). From here, the number of a respondent's perceived important characteristics that were not included in the TransMilenio's had characteristics was recorded. A regression was run using the number of a respondent's important characteristics that s/he did not



identify the TransMilenio (the independent/x-variable) and satisfaction (dependent/y-variable). Since the  $R^2$  value was 0.0078732, there was no significant relationship, thus the number of important characteristics not provided by TransMilenio is not related to their satisfaction of the system.

As the average number of problems a respondent identified the TransMilenio as having was 4.5, the researcher was inclined to see if this had any bearing on satisfaction. Two additional regressions were ran to analyze factors that influence passengers’ perception of the TransMilenio in terms of satisfaction two regressions were ran. The first was to see if a relationship exists between passengers’ satisfaction and the number of problems a respondent perceives the TransMilenio has. These results are found in Table 4.9. The second test was run for each of the characteristics included in question 20 of the survey. This was to identify any existing relationship between satisfaction and selection of a characteristic being a problem for the TransMilenio. These results are found in Table 4.10.

Table 4. 9 Regression Test Results for Satisfaction and Number of Problems the TransMilenio Has

Y-Variable (Dependent Variable)	X-Variable (Independent Variable)	$R^2$ Value	Absolute Value of Pearson’s Coefficient of Correlation $ r $	Standard of Error	Percentage that X influences the change in Y
Satisfaction	Number of Problems a Respondent Identified the TransMilenio as having	0.0532525	0.2307649	1.6785364	5%

Table 4. 10 Regression Results for Satisfaction and Characteristics Perceived as a Problem for the TransMilenio

Y-Variable (Dependent Variable)	X-Variable (Independent Variable)	R <sup>2</sup> Value	Absolute Value of Pearson's Coefficient of Correlation  r	Standard of Error	Percentage that X influences the change in Y
Satisfaction	Wide coverage/accessibility	0.0476038	0.218183	1.6835363	5%
Satisfaction	Reliable service	0.022528	0.1500934	1.7055553	2%
Satisfaction	Easy-to-use tickets	3.378E-05	0.0058123	1.7250684	0%
Satisfaction	Long hours of operation	0.0016749	0.0409253	1.7236523	0%
Satisfaction	Environmentally responsible	0.0184848	0.1359588	1.7090791	2%
Satisfaction	Comfortable environment in stations and portals	0.030332	0.174161	1.6987332	3%
Satisfaction	Comfortable environment in buses	0.0313533	0.1770688	1.6978384	3%
Satisfaction	Frequent service	0.0177169	0.1331047	1.7097476	2%
Satisfaction	System is easy to use	0.0078328	0.0885029	1.7183281	1%
Satisfaction	Safe environment in buses	0.001964	0.0443167	1.7234037	0%
Satisfaction	Affordable (cost)	0.0101358	0.1006768	1.7163326	1%
Satisfaction	Information is available in stations and portals	0.0275846	0.166086	1.7011381	3%
Satisfaction	Information is available in buses	0.0067712	0.822875	1.7192471	1%
Satisfaction	Accessibility to disabled and mobility impaired people	0.0020999	0.0458246	1.7232853	0%

The survey also included three questions that addressed crime and the TransMilenio, questions 17, 18 and 19. As mentioned earlier in Table 4.4, there was a low relationship between satisfaction and being a victim of a crime. When asked about being a victim of crime while in the TransMilenio, 40% of the study's population answered yes. Of the respondents who were victims of crime, 73% experienced robbery/theft, 23% sexual harassment/assault, 15% violence, and a single respondent selected other and wrote "atropello a la dignidad humana," which means she felt that her human dignity had been squashed/assaulted. Yet, of all responses to, "Does crime on the TransMilenio affect your daily use of the system?" a total of 66% answered yes. Of those who were victims of crime, 79% felt crime affected their daily use of the TransMilenio,

while 17% did not and 4% provided no response. Moreover, of the 74 respondents who identified not being victims of crime, 58% answered yes, that crime did affect their daily use of the TransMilenio.

### Qualitative Results

In conjunction to understanding passengers' perception of the TransMilenio through quantitative means, it also needed to be understood through a qualitative analysis. Survey question 20 asked, "What of the characteristics listed below are problems for the TransMilenio has?" In addition to the 14 characteristics, there was a 15<sup>th</sup> characteristic denoted as "other." In this space respondents could either select the corresponding box and/or write in additional problems and/or comments. The chart below includes the comment as written in Spanish and the English translation.

Original Comment	Comment Translated to English
"hay pocos buses para la cantidad de gente en horas pico"	There few buses for the number of people there are in peak hours
"falta mantenimiento y falta información en las buses"	It needs maintenance and information in the buses
"la inseguridad y la cultura ciudadanos"	The insecurity/unsafe, and the culture of the city's population
"inseguridad, congestión, violencia, demora en servicios, incomodidad del servicio"	Insecurity/unsafe, congestion, violence, delays in services, uncomfortable service
"diría que los anteriores enunciados son todo lo contrario a lo que realmente es el sistema con excepción de la accesibilidad para los discapacitados"	I would say that the statements above are the opposite of the reality of the system with the exception of accessibility for the disabled
"robo y matoneo"	Theft and bullying
Inseguridad	Insecurity/unsafe
"vendedores"	The people who sell things inside the stations/portals and buses illegally.
"Atención al consumidor"	Consumer/Customer Service
"inseguridad"	Insecurity/unsafe

"inseguridad"	Insecurity/unsafe
"la información no es claro. Las estaciones no están estandarizadas y por ende, no se sabe con seguridad donde están las cosas. Faltan mas medios que obliguen a la gente a seguir normas de civismo en las estaciones y buses."	Information is not clear. The stations are not standardized and so no one knows for sure where things are. Missing (Needs more) people who follow the normal rules of civility in stations and buses.
"el sistema esta muy mal diseñado, lo cual con lleva la cantidad de problemas que tiene, incluida la inseguridad y el numero grande de personas que montar sin pagar."	The system is very badly designed, which causes the many problems it has, including insecurity and a large number of people who ride without paying.
"es un monopolio, dejo a muchos familias sin trabajo, medios pasaron de ganar 2.3 o mas millones a ganar un salario fijo de 1 million aproximadamente, no se como lo premiaron por ser ambiental o revolucionario, sus buses usan diesel!!! Se apropio de la vía <u>publica</u> y la usa como propiedad privada. La gente se siente violentada todos los días. No hagan lo mismo en E.E.U.U. Por favor!	It is a monopoly, it left many families without work, people went from earning 2.3 million or more to earning a fixed salary of approximately 1 million, I don't know how it gets rewards for being environmental[ly responsible] or revolutionary, the buses use diesel!!! It has appropriated public roads for private property use. The people feel violated every day. Do not do the same (system) in the United States, Please!
"los colados"	The people who enter without paying
"con mucha gente, control al acceder al transmilenio"	There are many people, control of access to the TransMilenio.

In addition to the above comments there were several participants who started informal conversations with the researcher following their completion of the survey. Many participants wanted to make sure the researcher knew the issues of theft and security on the system. When the researcher asked if the police presence at stations help ease their concerns, there was a unanimous response of no. "They are only there to stop children from jumping up into the station

from the street when doors are still open,” said one participant.<sup>1</sup> Another man, who used to ride the TransMilenio said, “It is just uncomfortable always checking your wallet and cellphone.”

One of the most interesting comments were about how the system is a good idea, and the system itself is not the problem; the people of the city are the problem as they have no respect or common courtesy. A woman who was of considerably more wealth than most respondents expressed this idea while at a luxury salon. What was of interest to the researcher was that the stylist who did the wealthy woman’s hair also expressed the same idea; the two offered this opinion separately as one’s opinion did not influence the other woman’s statement. Several women expressed this idea that it is more the people than the system that is a problem.

Other opinions and/or comments respondents gave in the informal conversations were as follows. Not all conversations are included, only those that stood out in the researcher’s mind.

#### *Conversation 1*

Researcher: “Do you think the system is expensive?”

Young woman working at a dry cleaners: “Well, yes, but no. The system takes me so far, and it saves me so much time in travel. Because of that I say it is not expensive, but it is expensive for many people.”

#### *Conversation 2*

The researcher was invited to lunch at a participant’s home. She began to have a conversation with the woman’s children who were not only opinionated and articulated, they had logical rational, and examples, to support their opinions.

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<sup>1</sup> Names have been excluded to protect subjects’ privacy and general protection. Numerous participants asked if their names would not be included, the research said yes. The research believes that this enabled the participants to speak more openly on the topic. However, two participants did give permission to use their names, as seen in Conversation 2 and 4.

Student of Veterinary Science (Gabriela Gómez): “I take the TransMilenio to school, and it is good but it is horrible. My friend was in Portal 80 in the morning, and some woman or man, I don’t remember, just pushed her and knocked out her front teeth. She had blood all over her face and fell to her shirt...”

Researcher: “Are you serious, Wednesday!”<sup>2</sup>

Student of Veterinary Science: “Yes! This is the worst part, no one stopped pushing to get into the bus or check to see if she was ok!”

### *Conversation 3*

Participant: “So, you are a foreigner, do you take the TransMilenio?”

Researcher: “Yes, all the time.”

Participant: “What do you think of the system?”

Researcher: “Well, what do you think, I will tell you after you tell me.”

Participant: “Ok. I think it is ugh, I don’t know. I hate it sometimes, but when I need to get somewhere quickly I have no other choice. It is not safe, but *busestas* aren’t either. In Colombia there are so many problems; but it is really advancing and changing. People are more open to things like homosexuality, which is good, but they are still so behind the world. I think the United States it so much better, it is so strange you choose to live here, for me.”

Researcher: “You have good points. I too have a love hate feeling of the TransMilenio. There seem so many problems, people are so aggressive pushing to get on and off, too many buses pass with “En Transisto” (in transit, meaning not in operation for passengers), routes are easy and complicated because not everything is always running. But for me, the most uncomfortable is

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<sup>2</sup> In Spanish “Wednesday” is “miércoles,” which is a common way to politely say “mierda,” which means shit.

that the bus lanes are not maintained so the ride is not smooth, and it is so crowded I feel like an animal not a person.”

Participant: “It is true. It is so bad, but there is nothing we can do. I just work so hard all the time, maybe I can buy a car one day.”

#### *Conversation 4*

Manicurist (Leticia Espinosa): The TransMilenio, Oh my!

Researcher: What do you mean?

Manicurist: The people are just so rude. There is not consideration.

Researcher: Can you give me an example?

Manicurist: You know how there are the red seats and there are blue seats for elderly, pregnant, handicapped, and women with baby in their arms?

Researcher: Yes.

Manicurist: So I go into the bus and the blue seats are all empty and there are no red seats. Se I stand. But there are old women sitting in the red seats, so I have to stand. They have special seats! Why do they not sit in them?! It is so frustrating, and I cannot say “hey go sit in your blue seat” and I cannot sit there so it is just so annoying. So rude.

Researcher: I know, I see that too. I just sit in the blue seat and when someone come on the bus who needs it I stand up.

Manicurist: Hahaha. Sometimes you are sooooo American!

Researcher: What do you mean?

Manicurist: Colombians don’t think like that. Hahaha.

#### **Summary**

The study found passenger perception of the TransMilenio is poor as satisfaction, perceived quality of service are low. Furthermore, no obvious relationship exists between satisfaction and other variables with the exception of quality. Qualitative data provides deeper insight into passengers' perception of the TransMilenio as well as the culture in Bogotá. Furthermore, as the government prohibits this type of research, the data from this study proves both informative and valuable.

Beyond that, and more importantly, what actually constitutes satisfaction when associated with a public transportation service is something that is difficult to arrive at. Notably, Lai and Chen (2011) and Chen (2008) found that a relationship exists between satisfaction and service quality but service quality is not a total antecedent to satisfaction. This study found the same result as there was only a 47% relationship between satisfaction and quality of service existed among the sample of respondents.



## **Chapter 5: Discussion**

### **Introduction**

Understanding passengers' perception of the TransMilenio was the main objective of this study. Based on this study's findings, passengers' perception of the TransMilenio is negative. In addition, the study found that there was a relationship between passengers' satisfaction and perceived quality of the system, a common claim in the literature reviewed (Chen, 2008; Lai & Chen, 2011). The results of this study support and add to claims in the literature reviewed. Moreover, as the findings regarding crime, comfort, safety and satisfaction stimulate further research.

### **Explanation and Discussion of Results**

Overall, the passengers of the TransMilenio, in the confines of this study, have a negative perception of the TransMilenio. With only 28.5% of respondents being satisfied with the system and 58% perceiving the quality of service as low, it is difficult to argue that the passengers see the TransMilenio in the same positive perspective as that expressed in the literature. However, one possibility is the TransMilenio is good, even the gold standard of BRT systems (Cervero, 2013; Suzuki et al., 2013), but the reason passengers have a negative perception of the system is because they have seen what transportation could be like and want something better. Prior to the TransMilenio public transit was just the *busetas* and taxis; now the people of Bogotá experience organized mass public transit and are holding it to higher standards than before. In turn, it is possible that the passengers' perception of the system is bad only because they want more. Speculation as to why passenger perception of the TransMilenio is negative is endless.

The study's results concerning satisfaction were not straightforward. Satisfaction not only had no relationship with demographic questions, not the presence of characteristics seen as important by a respondent, or with the number of problems a respondent identified the systems as having. Based on the qualitative data, including both conversations and comments included in the surveys, insecurity should have been included as one of the 14 characteristics. Yet, because being a victim of a crime had no relationship with level of satisfaction or perceived quality of service, the researcher is unsure of the population's definition of security.

Based on the study's results, it is unclear what drives this negative perception of the TransMilenio. Not one of the 14 characteristics of a transit system considered in this study proved to influence satisfaction. When identified as a problem, wide coverage of the system had only a 5% relationship to satisfaction. Wide coverage, along with easy-to-use tickets, the system being easy to use and accessibility to disabled and mobility impaired people were all identified as characteristics that are important and that the system has. This is significant because it shows that despite the system giving the passengers what they feel is important is not enough. Passengers either want more or something else that this study did not include in the characteristics used to measure satisfaction.

The 14 characteristics used in this study should have been different. Referring to government studies by Bogota ¿Cómo Vamos? (2013a, 2013b, 2013c, 2014) and Cámara de Comercio de Bogotá (2011), crowding was specifically an issue in the eyes of TransMilenio passengers. This study did not specifically ask about crowding in the TransMilenio but rather asked about comfort and safety inside the buses. Including crowding as well as comfort in the 14 characteristics may have yielded results more aligned with those of the prior studies. In addition, as the study's qualitative results showed issues of security, which was not stated specifically in

the 14 characteristics, should also be included in the survey if this study was to be replicated.

Different characteristics may have led to substantiate the low levels of satisfaction and perceived quality of service.

As satisfaction and perceived quality of service were so low when the system provides four out of the five characteristics respondents identified as important begs to question legitimacy of passengers' perception of the TransMilenio. However, it could also mean that the fifth characteristic, frequency, is more influential on perception and/or satisfaction than this study's analysis showed. Without finding any relationship between the measurements of perception and the characteristics of the TransMilenio, the researcher is led to conclude that this study did not touch on the characteristic and/or issue driving passengers' satisfaction with the TransMilenio.

Using the study's qualitative results, it is possible that the root of the dissatisfaction is more with the behavior of the other passengers. Both in informal conversations and in written comments on the survey, respondents described their dissatisfaction with people not paying for the TransMilenio and/or lack of civility and respect exhibited by passengers towards other passengers. During data collection the researcher observed the aggressiveness and lack of civility and respect reflected in Conversation 2 in the qualitative results. The researcher witnessed passengers pushing to get onto the bus without regard for anyone who might get hurt in the process. In addition, the qualitative results lead the researcher to believe that crime is a factor, despite the quantitative results of the study stating differently. It is possible that the results do not coincide because the wording used in the survey was not specific enough in addressing safety, security and/or crime.

On the topic of crime, the study found that being a victim of a crime did not dictate a passenger's usage of the TransMilenio being affected by general crime on the system. It is hypothesized that this stems from the conditions of public transportation prior to the TransMilenio, which consisted of only taxis and *busetas*, and both relatively dangerous in the case of crime. These results could also mean that passengers have an understanding and awareness that crime is an issue on the TransMilenio and just accept it and act appropriately. The researcher observed preventative behavior against theft, likely a result of experience(s) from the *busetta*-only period. Preventative behavior was seen with people wearing their backpacks on their chests instead of back; putting cellphones either inside one's brassiere or moved to the breast-pocket of shirts and/or jacket; and checking that wallets were secure and/or bags were closed. However, the vigilance to which passengers took for their cellphones appeared to have the most importance. Thus the researcher is led to believe that cellphone theft is one of, if not the, most common crime on the TransMilenio.

The survey used in this study specifically asked about the type of crime someone experienced. During the research process the researcher was a victim of crime, *acostó sexual* (sexual harassment/assault), which 23% of crime victims on the TransMilenio also experienced. However, due to the extreme crowding of the bus, the researcher questioned whether she was in fact harassed or if it was unavoidable as the bus was so crowded the maximum weight capacity indicator light was on. This reiterates how important it was to have included crowding as one of the 14 characteristics for measuring satisfaction in the survey.

### **Considerations For Interpretation of Results**

There were numerous aspects of this study that could have influenced the results. The most glaring was that the government prohibits research on the TransMilenio, especially on

passengers' perception. It is unknown the degree that this influenced participants responses and/or willingness to participate. The researcher did not know why such research is prohibited, but based on a comment written on a survey it may be related to the monopoly of organized public transportation. Also, the prohibition could be related to not wanting negative press about Colombia as it still is recovering from the country's stigma of drug trafficking.

Other factors that affected the study's results were time; an accurate representation of the population's geographical distribution, socioeconomics, professions and age; complexity of the survey, it was 20 questions and required people to think; data collection occurred days prior to and following a national holiday, which meant a large percentage of the population was outside the city; and the researcher was a foreigner and is not fluent in Spanish. However, the researcher did not feel her Spanish level was a major limitation as many of the participants were so glad that a "gringa puede hablar!" ("an American could speak [Spanish]). Many asked her, "Como aprendiste? Eres Latina?" (How did you learn? Are you Latina?). To which the researcher responded she learned in the streets of Colombia and is not Latina, which made many participants smile and laugh as they said to give them the survey. In turn, the researcher's Spanish may have been a strength of the study.

The sample size consisting of only 130 usable surveys, could have been expanded if the survey was administered online or through Facebook. However, the researcher was concerned that this would lead to data having bias with regards to socio-economics. Since the majority of TransMilenio user come from *estrato* 2 and 3 (poor and low-middle class) (*estrato* is a term used to denote the socioeconomics of a specific geographical location/neighborhood, see Appendix A for complete definition), administering the survey via the Internet may have skewed the data to reflect the perception(s) of higher social strata and wealth.

During data collection a variety of matters became apparent to the researcher that deserve noting in the study's Discussion. For example, by approaching perspective participants with a smile and using common expressions in Colombia that acknowledge that the survey is an imposition and expressing her appreciation that a person was helping her by completing the survey, the researcher noticed that people were more inclined to read questions thoroughly and complete them to the best of their ability. Also, people who the researcher approached to complete the survey were surprised that an American would care about the opinions of Colombians. This could have influenced willingness to participate as well as the initiating of conversations following completion of the survey.

Another observation by the researcher in terms of participation and survey completion was related to knowing the researcher. Since time was an issue and it was a survey of convenience, the researcher utilized connections she had in Bogotá. People who knew the researcher, the doctor administering surveys in the hospital or the woman who accompanied the researcher to the foundation, appeared to be more willing to participate and concerned about answering all questions in the appropriate manner. The researcher interprets this to be a result of familiarity and established trust with the researcher enabled respondents to feel safe in participating in the study. Also, as a result, participants may have felt they could be honest in their answers and speak candidly to the researcher; as well as by knowing the researcher and her Spanish level these participants modified the sophistication of their Spanish during the informal conversations about the TransMilenio.

### **Support and Refute for the Literature Reviewed**

The study's results on passengers' low levels of satisfaction and perception of service quality are supported by governmental agency's reports in Bogotá. The reports from Bogotá

¿Como Vamos? (2013a, 2013b) stated that the percentage of TransMilenio passengers satisfied with the service was 28% in 2012 and 29% in 2013. In this study 28.5% were satisfied with the TransMilenio, which echoes the data from 2012 and 2013. However, as this study was conducted in 2015 it is better to reference a more recent report from Bogotá ¿Como Vamos?'s (2014). Using the more recent data, this study's finding for satisfaction levels was significantly higher than the percentage Bogotá ¿Como Vamos? (2014) reported of only 15% satisfaction.

Findings from this study also confirm other Bogotá government research on passengers' perception of the TransMilenio. Numerous problems exist with the TransMilenio, some this study identified and others as of now have not been determined. However, the TransMilenio's growth of problems has been previously reported. In *Informe de Calidad de Vida 2013* (Information of Quality of Life 2013) it stated that, "Sin embargo, el sistema [de TransMilenio] ha sorteado muchos inconvenientes durante su implementación" ("However, the service has had many problems since implementation.") (Bogotá ¿Como Vamos?, 2013c, p. 144). Moreover, the same report explained that satisfaction can be improved if there is improvement to the quality of service during peak hours when there are the more riders on the TransMilenio (Bogotá ¿Como Vamos?, 2013, p. 146). These statements prove that not only did this study find a relationship between satisfaction and quality of service of the TransMilenio, so did the government in Bogotá. A relationship between satisfaction and perceived quality of service is also found throughout much of the reviewed literature on passenger perception and satisfaction for transit systems (Chen, 2008; Mokonyama & Venter, 2013; Lai & Chen, 2011; Sheth et al., 2007; Zuluaga & Franco, 2014).

Passengers' dissatisfaction and perception of quality of service as bad is contradictory of the literature on BRT systems. As much of the literature discussed in Chapter 2, the

TransMilenio has received well-documented praise from all over the world. However, there appears to be a contradiction between the transit experts' experiences and those of the passengers. Yet, as seen in the study's qualitative data, some TransMilenio passengers do not see the system as flawed, but the other passengers as the problem. For example, in Conversation 4 found in the qualitative results in Chapter 4, a manicurist described a story of how she was unable to sit as a passenger who had a designated seat due to age chose to sit in a seat for the average passenger. It is unknown the circumstances that drove the elderly woman to sit in the regular seats, but to speculate would be moot as it will never be known. Nonetheless, this is just one example of how passengers' behaviors could be contributing to general dissatisfaction with the TransMilenio. If this is the case, and TransMilenio users assert that the problem is not the system but rather the disrespect and a lack of civility among passengers, then passengers are in agreement with academia that the TransMilenio is great. As a consensus in this thinking was not reached among the respondents further research is required to determine if academia and passengers agree or disagree.

### **Practical Application of the Results**

The passenger has a great influence on a transit system's success and longevity. In the case of the TransMilenio, if passengers' perception of the system is low, their usage may decline and result in financial difficulties for the system. The TransMilenio is financially self-supported, and profits, primarily from passengers' ticket costs. In turn, a decline in ridership could prove financially perilous. This hypothetical situation is becoming a reality. Suzuki et al. (2013) cited that, "Declines in the quality of service have become so problematic that many people who are able to travel by alternative means, often by private vehicle, choose to do so" (p. 113).



The results from this study serve to reiterate the fact that the TransMilenio is not providing a satisfactory transit experience and its quality of service is declining. In turn, this study proves that something needs to be done regarding the TransMilenio. The system needs to adjust to the needs of the population if it wants to continue. Moreover, if the TransMilenio continues to be seen as unsatisfactory and of poor quality, it is unlikely that Bogotá will obtain funding for a metro, or any other public transit system. The rationale for this being, if the city cannot maintain a system that has been globally recognized for excellence, how can the city maintain a more complicated system like a metro.

### **Recommendations for Further Research**

The findings of this study provide valuable insight into the TransMilenio. However, this study will serve as a pilot study for future research. In order for the TransMilenio S.A. to consider this type of study's findings, a larger sample size that more accurately reflects the population of Bogotá is needed. Furthermore, additional demographic information would be required, such as: educational attainment and *estrato* one lives in (not just *localidad*). Questions Zuluaga and Franco (2014) included in their survey aimed to identify indicators for quantifying quality in the case of public transit in Bogota, such questions are: main issues that affect city's mobility, average travel time, public transport safety perception, perception of public transport cost.

## Chapter 6: Conclusion

Answering this study's research question, "What is passengers' perception of the Sistema TransMilenio?" proved challenging. The study did find that passengers' perception of the TransMilenio is negative, primarily because of low levels of satisfaction and perceived quality of service among respondents. Reaching this conclusion meant the researcher battling against not only the study's numerous limitations, most importantly the Colombian government prohibiting investigating the topic of this study, but also the cultural and linguistic differences that exist between Bogotá, Colombia and New York, New York, United States.

The evidence from this study causing the researcher to conclude that passengers' perception is negative of the TransMilenio, was insufficient. As expressed in Chapter 5, the confounding issues that required considerations for interpreting the results were not only multiple but held significant impact on the validity and reliability of this study's data. This study should be used as a pilot study for further research on passengers' perception of the TransMilenio. Key ideas on how to measure perception were discovered in this study, such as – but not limited to: the type of transit system characteristics used to measure satisfaction, vocabulary modification for written surveys, conditions for surveying in Bogotá, and the need for ample time when conducting research of a transit system.

In conclusion, this study was successful in providing information and beginning the conversation on passengers' perception of the TransMilenio. In addition, it has shown the researcher her own strengths, weaknesses and limitations as a researcher, which is vital for developing future research methodologies.

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## Appendices

### Appendix A: Definitions of Terms

**Alimentador:** green feeder buses part of the Sistema TransMilenio.

**Busetta:** Minibuses that were the main form of public transportation prior to the TransMilenio. They require pay upon entry and only accept cash, but do not accept 50,000pesos bills.

**Bus Rapid Transit (BRT) System:** “a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. It does this through the provision of dedicated lanes, with busways and iconic stations typically aligned to the center of the road, off-board fare collection, and fast and frequent operations.

Because BRT contains features similar to a light rail or metro system, it is much more reliable, convenient and faster than regular bus services. With the right features, BRT is able to avoid the causes of delay that typically slow regular bus services, like being stuck in traffic and queuing to pay on board.”

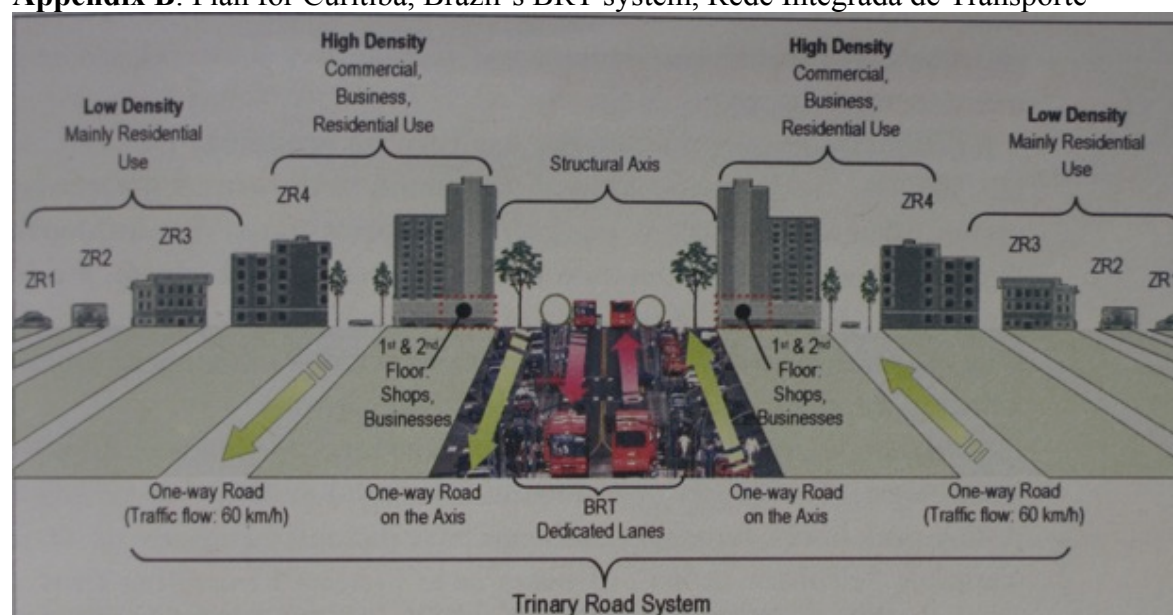
Source: <https://www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/what-is-brt/>

**Estrato:** The categorization of a location/area/neighborhood according to the amount of wealth present and signify the socioeconomic class. There are 6 *estatos*, 1 is the lowest with wealth described as low-low, the remaining *estatos* are explained as follows: 2 is lower class, 3 is low middle class, 4 is middle class, 5 is upper middle class and 6 is upper class.

**Integrated Mass Transit Systems (IMTS):** Colombia’s national plan to develop public transit systems modeled after the TransMilenio in Bogotá

**Tarjeta:** the ticket to enter a station of the Sistema TransMilenio.

### Appendix B: Plan for Curitiba, Brazil’s BRT system, Rede Integrada de Transporte



### Appendix C: Four Pillars Theory for the Development of the TransMilenio (English and Spanish)

1. Respect for life, represented by comfortable, safe and modern service
2. Respect for a person's time, with a transportation system that meets the minimum standards of quality regarding itineraries and travel time.
3. Respect for the city's diversity, and provide a transportation system that brings people of different social classes together, while no preference is given to one social class over another, all receive equal treatment.
4. Comply with international quality minimum requirements as outlined by transport engineering for providing a comfortable, safe and effective service."

1. Respeto a la vida, representado en un servicio cómodo, seguro y moderno.
2. Respeto al tiempo de la gente, con un sistema de transporte que cumpla estándares mínimos de calidad en cuanto a itinerarios y tiempo de desplazamiento.
3. Respeto a la diversidad ciudadana, pues se convertiría en un sistema de transporte en el que converjan las diferentes clases sociales sin preferencias de ninguna clase y, por el contrario, trato igualitario.
4. Calidad internacional, cumpliendo con los requisitos mínimos señalados por la ingeniería del transporte para la prestación de un servicio cómodo, seguro y efectivo.

Source: TransMilenio S.A. <http://www.transmilenio.gov.co/es/articulos/historia>

### Appendix D: Explanation and Costs for the Sistema TransMilenio During Peak (*Pico*) and Non-Peak (*Valle*) Times



Retrieved from <http://www.transmilenio.gov.co/es/articulos/ingreso-al-sistema-transmilenio>

\*\*Prices have since changed, as of April 2015, *valle* tickets were \$1,500 COP and *pico* \$1,900 COP

**Appendix E: Introductory Paragraph for Survey (English and Spanish)**

Hello! Good Day!

My name is Alix Hoechster and I am a student in the United States. I am getting my Master's of Urban Studies at the City University of New York (CUNY). Before I began my studies at the university, I lived in Bogotá. Currently, I am in my last semester and writing my thesis. I am conducting research on the topic of my thesis, the Sistema TransMilenio. I ask if you can help me and complete this survey on the TransMilenio. The information from the survey is only for my the purpose of my master's degree. No one will have access to the individual surveys or the results expect my professor, classmates, and myself. Once the surveys are completed and I will compile and analyze the data and summarize the information; this information will then be used to write my thesis and create, and give, a presentation to my professor.

If you are 18 or older, and decide to complete this survey, I will be very thankful. After you have completed the survey, please return it to the envelope at reception (or doorman).

Thank you in anticipation for your participation. Have a great day.

Hola! Buenos Días!

Me llamo Alix Hoechster y soy estudiante en Estados Unidos. Estoy haciendo mi maestría en estudios urbanos y desarrollo a la Universidad de la Ciudad de Nueva York (CUNY). Antes de asistir a mi universidad viví en Bogotá. Ahora, estoy en mi semestre ultimo y escribo mi tesis. Yo dirijo una investigación por mi tesis sobre el Sistema TransMilenio. Por favor, estoy preguntando si puede ayúdame y completar esta encuesta sobre el TransMilenio. La información es solo para mi clase de mi maestría. Nadie tendrá acceso a las encuestas individuales ni los resultados a fuera de mi profesor, compañeros de clase y yo. Una vez que las encuestas hayan sido completado y los resultados concentrados hayan sido generados, los resultados de las encuestas serán utilizar para escribir mi tesis y una presentación por mi profesor.

Si usted tiene más qué 18 años y decide que completará esta encuesta, seré muy agradecido. Después usted de haber completado la encuesta, por favor, poner en el sobre largo en la recepción (o con los poteros).

Gracias y agradezco anticipadamente por su participación. Tiene un buen día!

## Appendix F: Survey in English

## Survey (in English)

If you are not at least 18 years of age please do not continue

1. Select your gender? ☐ Male ☐ Female
2. Select your age range. ☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40-44 ☐ 70+  
☐ 45-49 ☐ 50-54 ☐ 55-59 ☐ 60-65 ☐ 66-69
3. In which *localidad* do you live?  
☐ Antonio Nariño ☐ Barrios Unidos ☐ Bosa ☐ Chapinero ☐ Ciudad Bolívar  
☐ Engativá ☐ Fontibón ☐ Kennedy ☐ La Candelaria ☐ Los Mártires  
☐ Puente Aranda ☐ Rafael Uribe Uribe ☐ San Cristóbal ☐ Santa Fe ☐ Suba  
☐ Teusaquillo ☐ Tunjuelito ☐ Usaquén ☐ USME ☐ Other \_\_\_\_\_
4. What is your profession? \_\_\_\_\_
5. What type of cell-phone service do you have? ☐ prepay ☐ post-pay ☐ no cellphone
6. What mode of transportation do you use most for daily activities?  
☐ TransMilenio ☐ SITP ☐ busetta ☐ taxi ☐ personal car ☐ moto (personal) ☐ bicycle ☐ walk
7. What forms of transportation do you use? Check all that apply.  
☐ TransMilenio ☐ Alimentador ☐ SITP Urbano ☐ SITP Complementario ☐ SITP Espacial
8. On average, how many days per week do you use the TransMilenio? ☐ 0 ☐ 1-2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-7
9. For what purpose do you use the TransMilenio? ☐ work ☐ school ☐ personal ☐ do not use ☐ other \_\_\_\_\_
10. How would you rate the service of the TransMilenio?  
☐ excellent ☐ very good ☐ good ☐ not good/not bad ☐ bad ☐ very bad ☐ horrible
11. Complete the sentence below about the TransMilenio using one of the options below. In your opinion, the TransMilenio is \_\_\_\_\_ than last year (2014).  
☐ much better ☐ better ☐ slightly better ☐ the same ☐ slightly worse ☐ worse ☐ much worse
12. How satisfied are you with the TransMilenio?  
☐ very satisfied ☐ satisfied ☐ somewhat satisfied ☐ neither satisfied nor dissatisfied  
☐ somewhat dissatisfied ☐ dissatisfied ☐ very dissatisfied
13. Which of the following characteristics listed below does the TransMilenio have?  
☐ wide network coverage ☐ frequent service  
☐ reliable service ☐ easy to use system  
☐ easy to use ticket(s) ☐ safe bus environment  
☐ long hours of operation ☐ affordable service  
☐ environmentally responsible/friendly ☐ information available in stations/portals  
☐ comfortable environment inside stations/portals ☐ information available in buses  
☐ comfortable environment inside buses ☐ accessibility for disabled and mobility impaired

14. In your opinion, what are the 5 most important characteristics for the TransMilenio to have? Please list in order of importance, with 1 as the most important and 5 as the lowest.

- |  |   |
|--|---|
| <input type="checkbox"/> wide network coverage                           | <input type="checkbox"/> frequent service                                 |
| <input type="checkbox"/> reliable service                                | <input type="checkbox"/> easy to use system                               |
| <input type="checkbox"/> easy to use ticket(s)                           | <input type="checkbox"/> safe bus environment                             |
| <input type="checkbox"/> long hours of operation                         | <input type="checkbox"/> affordable service                               |
| <input type="checkbox"/> environmentally responsible/friendly            | <input type="checkbox"/> information available in stations/portals        |
| <input type="checkbox"/> comfortable environment inside stations/portals | <input type="checkbox"/> information available in buses                   |
| <input type="checkbox"/> comfortable environment inside buses            | <input type="checkbox"/> accessibility for disabled and mobility impaired |

15. What of the phrases below would you use to complete the following sentence? The TransMilenio has \_\_\_\_\_. Choose all that apply.

- ☐ frequent service    ☐ reliable service    ☐ a safe bus environment

16. If you use, or have used, the feeder service (Alimentador), please answer the following question.

What of the phrases below would you use to complete the following sentence? The Alimentador has \_\_\_\_\_. Choose all that apply.

- ☐ frequent service    ☐ reliable service    ☐ a safe bus environment

17. Have you been a victim of a crime on the TransMilenio?    ☐ Yes    ☐ No

18. If you have been a victim of a crime on the TransMilenio, what was the type of crime?

- ☐ robbery    ☐ sexual harassment    ☐ violence    ☐ other \_\_\_\_\_

19. Has crime on the TransMilenio affected your use of the system?    ☐ Yes    ☐ No

20. What of the following characteristics are problems for the TransMilenio? Choose all that apply.

- |  |   |
|--|---|
| <input type="checkbox"/> wide network coverage                           | <input type="checkbox"/> frequent service                                 |
| <input type="checkbox"/> reliable service                                | <input type="checkbox"/> easy to use system                               |
| <input type="checkbox"/> easy to use ticket(s)                           | <input type="checkbox"/> safe bus environment                             |
| <input type="checkbox"/> long hours of operation                         | <input type="checkbox"/> affordable service                               |
| <input type="checkbox"/> environmentally responsible/friendly            | <input type="checkbox"/> information available in stations/portals        |
| <input type="checkbox"/> comfortable environment inside stations/portals | <input type="checkbox"/> information available in buses                   |
| <input type="checkbox"/> comfortable environment inside buses            | <input type="checkbox"/> accessibility for disabled and mobility impaired |
| <input type="checkbox"/> other _____                                     |   |

*Thank you for your help and completing the survey*

## Appendix G: Survey in Spanish

**Encuesta sobre el Sistema TransMilenio**

Si usted no tiene 18 años, por favor no continúe. Gracias.

1. Seleccione su género. ☐ Hombre ☐ Mujer
2. Escoja su categoría de edad. ☐ 18-24 ☐ 25-29 ☐ 30-34 ☐ 35-39 ☐ 40-44 ☐ 70+  
☐ 45-49 ☐ 50-54 ☐ 55-59 ☐ 60-65 ☐ 66-69
3. Escoja la localidad en la que usted vive.  
☐ Antonio Nariño ☐ Barrios Unidos ☐ Bosa ☐ Chapinero ☐ Ciudad Bolívar  
☐ Engativá ☐ Fontibón ☐ Kennedy ☐ La Candelaria ☐ Los Mártires  
☐ Puente Aranda ☐ Rafael Uribe Uribe ☐ San Cristóbal ☐ Santa Fe ☐ Suba  
☐ Teusaquillo ☐ Tunjuelito ☐ Usaquén ☐ USME ☐ Otro \_\_\_\_\_
4. ¿Cual es su profesión? \_\_\_\_\_
5. ¿Qué tipo de plan móvil tiene? ☐ prepago ☐ pospago ☐ no tiene un móvil
6. ¿Qué medio de transporte usa principalmente para sus actividades habituales?  
☐ TransMilenio ☐ SITP ☐ busetta ☐ taxi ☐ carro personal ☐ moto (personal) ☐ bicicleta ☐ camina
7. ¿Qué medio de transporta masivo usa? Escoja todos que aplican.  
☐ TransMilenio ☐ Alimentador ☐ SITP Urbano ☐ SITP Complementario ☐ SITP Espacial
8. ¿Cuantos días usted usa el TransMilenio en promedio por semana? ☐ 0 ☐ 1-2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-7
9. ¿Porque usa el TransMilenio? ☐ trabajo ☐ estudio académicos ☐ personal ☐ no usa ☐ otro \_\_\_\_\_
10. ¿Como es el servicio de TransMilenio?  
☐ excelente ☐ muy bueno ☐ bueno ☐ ni bueno, ni malo ☐ malo ☐ muy malo ☐ horrible
11. Complete la frase sobre TransMilenio con un opción a bajo, ¿A usted le parece que el servicio esta \_\_\_\_\_ que el año pasado (2014)?  
☐ mejoró mucho ☐ mejoró ☐ mejoró algo ☐ sigue igual ☐ empeoró algo ☐ empeoró ☐ empeoró mucho
12. ¿Cómo calificaría su satisfacción en general con el TransMilenio?  
☐ muy satisfecho ☐ satisfecho ☐ más o menos satisfecho ☐ ni satisfecho, ni insatisfecho  
☐ más o menos insatisfecho ☐ insatisfecho ☐ muy insatisfecho
13. ¿Cual cree usted que son las características de TransMilenio en la lista a bajo?  
☐ accesible a la ciudad ☐ el servicio frecuente  
☐ el servicio confiable ☐ el sistema es fácil para usar  
☐ tarjetas son fácil para usar ☐ el ambiente seguro en las buses  
☐ horas de operación son largos ☐ servicio accesible para pagar  
☐ ambientalmente responsable ☐ información disponible en las estaciones/portales  
☐ el ambiente en las estaciones y portales están cómoda ☐ información disponible en las buses  
☐ el ambiente en las buses están cómoda ☐ la accesibilidad para discapacitados y personas con movilidad reducida

14. ¿En su opinión, cuales son la 5 características más importantes de TransMilenio? Por favor, lista las características en orden de importancia, con 1 es la más importante y 5 es el mínimo.

- |  |   |
|--|---|
| <input type="checkbox"/> accesible a la ciudad                                 | <input type="checkbox"/> el servicio frecuente  |
| <input type="checkbox"/> el servicio confiable                                 | <input type="checkbox"/> el sistema es fácil para usar  |
| <input type="checkbox"/> tarjetas son fácil para usar                          | <input type="checkbox"/> el ambiente seguro en las buses  |
| <input type="checkbox"/> horas de operación son largos                         | <input type="checkbox"/> servicio accesible para pagar  |
| <input type="checkbox"/> ambientalmente responsable                            | <input type="checkbox"/> información disponible en las estaciones/portales                      |
| <input type="checkbox"/> el ambiente en las estaciones y portales están cómoda | <input type="checkbox"/> información disponible en las buses                                    |
| <input type="checkbox"/> el ambiente en las buses están cómoda                 | <input type="checkbox"/> la accesibilidad para discapacitados y personas con movilidad reducida |

15. ¿Cual de las siguientes frases se puede utilizar para completar la oración?: El TransMilenio tiene \_\_\_\_\_.  
Escoja todas que aplican.

- ☐ el servicio frecuente      ☐ el servicio confiable      ☐ el ambiente seguro en las buses

16. Si usted utiliza o ha utilizado Alimentador, por favor complete la pregunta siguiente.

¿Cual de las siguientes frases se puede utilizar para completar la oración?: El Alimentador tienen \_\_\_\_\_.  
Escoja todas que aplican.

- ☐ el servicio frecuente      ☐ el servicio confiable      ☐ el ambiente seguro en las buses

17. ¿Ha sido víctima de algún delito en el TransMilenio?      ☐ Sí      ☐ No

18. ¿Si ha sido una víctima de algún delito en el TransMilenio, de qué delito?

- ☐ robo      ☐ acostó sexual      ☐ violencia      ☐ otro \_\_\_\_\_

19. ¿El delito en TransMilenio afecta su uso diario?      ☐ Sí      ☐ No

20. ¿De las características siguientes, cuales son los problemas de TransMilenio? Escoja todas que aplican.

- |  |   |
|--|---|
| <input type="checkbox"/> accesible a la ciudad                                 | <input type="checkbox"/> el servicio frecuente  |
| <input type="checkbox"/> el servicio confiable                                 | <input type="checkbox"/> el sistema es fácil para usar  |
| <input type="checkbox"/> tarjetas son fácil para usar                          | <input type="checkbox"/> el ambiente seguro en las buses  |
| <input type="checkbox"/> horas de operación son largos                         | <input type="checkbox"/> servicio accesible para pagar  |
| <input type="checkbox"/> ambientalmente responsable                            | <input type="checkbox"/> información disponible en las estaciones/portales                      |
| <input type="checkbox"/> el ambiente en las estaciones y portales están cómoda | <input type="checkbox"/> información disponible en las buses                                    |
| <input type="checkbox"/> el ambiente en las buses están cómoda                 | <input type="checkbox"/> la accesibilidad para discapacitados y personas con movilidad reducida |
| <input type="checkbox"/> otro _____  |   |


*Gracias por su ayuda y completar la encuesta.*



Appendix H: Photos of the TransMilenio

		A lightly crowded TransMilenio bus
		Entry into the station during the beginning of evening peak hours

 A photograph showing a massive crowd of people, mostly men, entering a station. The crowd is dense and fills the foreground and middle ground. In the background, a red bus is visible, and a large, modern building with a glass facade is partially seen. The sky is overcast.	<p>Entry into the station at approximately 5:30pm</p>
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	<p>TransMilenio during evening peak hours</p>
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