A comprehensive guide to electric scooter regulation practices

by

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A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF REGIONAL AND COMMUNITY PLANNING

Department of Landscape Architecture and Regional & Community Planning
College of Architecture, Planning and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2019

Approved by:

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Abstract

Electric scooters ("scooters") are an exciting new member of the urban trend of micro-mobility, having appeared in cities as recently as 2018. Micro-mobility is an urban transportation solution that covers 5 miles or less; micro-mobility options previously included dockless bicycles, pedestrian-only areas, and autonomous vehicles (self-driving cars that do not require a human driver) until scooters burst on the scene in 2018. Micro-mobility options are meant to provide a convenient and cheap last mile option. Scooters provide just that. Scooters have been deployed by companies - more often than not - without any communication between cities on their implementation. By not communicating a plan for regulation with cities, many scooter programs failed or were rolled back due to temporary bans. While scooters may be a viable part of the micro-mobility solution, they conversely present as many issues as they do solutions. The issues that scooters unintentionally brought with them to cities included safety, liability, operational questions, and infrastructure questions. A lack of data and scholarly research on scooters compounded these issues.

The purpose of this research is to help cities mitigate these issues and answer any questions related to scooter implementation with a thorough understanding of scooter regulations. This research is designed to provide cities a range of practices for scooter regulations without elevating any regulatory practice as best. Ultimately, this research can be used as a guide for cities when signing an agreement with a scooter company. To determine the range of regulatory practices for cities, a process of documentation review of scooter program precedent across 50 cities in the United States was undertaken. The programs that were reviewed in this study were exclusive relationships between cities and companies. From this documentation review emerged three core requirements for scooter operations; legal, operational,

and financial. Each requirement is comprised of specific components. With this range of practices for the legal, operational, and financial requirements for successful scooter operations, a city should be more than prepared to properly regulate and allow scooters in their city.

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Acknowledgments

I would like to acknowledge my committee as well as my peers in the planning program for the support and input over the last 5 years and ultimately in preparing this research.

Dedication

To my brother Brodie.

Chapter 1 - Introduction

Electric Scooters

Micro-mobility, an affordable, urban transportation solution that covers 5 miles or less (Runnerstrom, 2018) is a new, urban trend in transportation that revolves around dockless bicycles, pedestrian-only areas, autonomous vehicles (self-driving cars that do not require a human driver), and now, dockless electric scooters (Runnerstrom, 2018). Dockless systems are systems that do not have specified parking stations. Dockless electric scooters (hereby referred to as "scooters"), an integral part of the new micro-mobility trend, are two-wheeled vehicles, fitted with an electric motor that can reach speeds relative to cars – typically, 15 to 30 mph. Scooters are meant to be accessible and easy to use and are being manufactured and deployed by companies worldwide (Frangoul, 2018). Scooters allow users to travel short distances, thus saving time and reducing their carbon footprint (Frangoul, 2018). The potential for scooters to reduce the carbon footprint of users even prompted Ford Motors to invest in scooters, citing a desire to help reduce pollution, ease traffic congestion in cities, and reduce parking constraints (Doubek, 2018).

To use a scooter, users can purchase a ride via their smartphone after downloading the app of the applicable scooter company. Users are then charged set rates - either per hour or per miles traveled – while in operation. As they are dockless, users can park scooters wherever they please. Where users operate and park scooters, however, has become one of the most prevalent of the list of issues that accompanies scooters.

Issues began to surface almost immediately with scooters, beginning with their initial wave of deployment during the spring and summer of 2018 (Ryan, 2018). At the time of writing, scooters have been deployed in over 100 cities across the United States. More often than not,

scooters have been dropped off without any communication between the city and the company on their implementation (Ryan, 2018). Scooters presented many issues for cities, as mentioned above, and cities often found themselves caught off guard without plans for implementation. Prevalent issues included safety (for both users and non-users), congestion of sidewalks and the right-of-way, and legal and permissible operations (Sweeney, 2018). Ultimately, there was a lack of understanding and data in regards to the safe, legal, and permissible usage of scooters. While scooters are seen as a viable transportation option for many, and companies had good intentions with dropping off scooters, the lack of communication between companies and cities unintentionally created issues with unclear solutions.

Safety and Liability

The first and most pressing issue for cities to consider is the safety of users and non-users alike. This is the most pressing issue for cities as it is tied to the other sections of this chapter (liability, legality of operations, infrastructure, and lack of data). Depending on the motor fitted on the scooter, scooters can reach a top speed of 15 to 30 miles an hour. At that speed, scooters become an issue of public health (Stein, 2018). The American Public Health Association works to promote and protect the health of people and communities where they live, work, and play (American Public Health Association, 2019). At high speeds, scooters threaten the health of users, non-users, and overall safety of communities. Thus, they are not simply just a new technology – they are an issue of public health (Stein, 2018). Injuries can easily occur to users and non-users alike and threaten the public health of a city. Due to threats to safety, cities with uncontrolled scooter operations began to act against scooter companies.

In the short time that scooters had been implemented in Kansas City, Missouri, there was a sharp uptick in injuries. During the initial month of deployment in Kansas City at the HCA

Midwest Health System (Kansas City's largest hospital system) alone, over a dozen injuries due to rider negligence had been treated. Without any warning that scooters were being deployed, cities were unable to educate users on proper usage, and Kansas City was no different. Non-users were also at fault as well in these accidents, however. Just as users were not educated on usage, neither were non-users. And at speeds relative to automobiles, scooters easily caused injuries to users and non-users alike and threatened both the safety and the public health of Kansas City. The litany of injuries and issues to safety and public health eventually prompted a ban of scooters for a short period in Kansas City (Ryan, 2018).

Lack of infrastructure, just like scooter speeds, can bring issues of safety as well as the question of liability. A lack of infrastructure for scooters in much of Kansas City led to driver collisions with users due to confusion on where scooters should operate (Gutierrez, 2018). Similar injuries began to occur in Washington, D.C. and Dallas, Texas. During one week, two fatalities occurred in these two cities within days of each other. In Washington, D.C., a fatality occurred on a scooter due to a driver collision. Earlier in that same week, a rider in Dallas fell off of a scooter and died due to blunt force injuries to his head (Loizos, 2018). Lastly, when injuries such as the above occur, who is held liable? This question, like the issue of safety, confounded cities upon scooter deployment. In the cases seen in Kansas City, Washington, D.C., and Dallas, it was unclear who was liable; was it the user, the driver, the company, or the city? Without regulations, cities had a difficult time answering the question.

Operations

The operations of scooters that cause major issues for cities include parking and the infrastructure on which scooters are operated. A major criticism of scooter programs has been that users leave scooters parked wherever they please, prompting a popular hashtag,

#ScootersBehavingBadly (Ryan, 2018). In fact, scooters had behaved "badly" enough in some cities in California to prompt riot tactics against the scooters. Bird, Lime, and Spin scooters that were abandoned on sidewalks and streets had been lit on fire, hung in trees, had brake lines cut, and smeared with feces - all in an effort to drive away users. "They throw them everywhere: in the ocean, in the sand, in the trash can," a maintenance worker on Venice Beach told the Los Angeles Times (Ryan, 2018). As examined above, scooter companies have been deploying their scooters without proper agreements from cities, leaving a lack of education for users on proper parking practices.

Just as scooters have the potential to cause issues with their parking, they can cause issues related to operations on city-owned infrastructure. Scooters utilize the public right of way and city infrastructure (sidewalks, alleys, and roads alike). BikeWalkKC, an advocacy group for mobility options other than driving in Kansas City, made suggestions to the City of Kansas City regarding safe operations. BikeWalkKC is a non-profit organization that is supportive of modes of transportation that give people options beyond driving. Despite the support for scooters, they were discouraged by Bird dropping scooters off in the City prior to BikeWalkKC and the City establishing any rules or regulations on operations (Ryan, 2018). Before Bird signed an agreement with the City of Kansas City (with the help of BikeWalkKC), scooters quickly become a nuisance; they were being ridden on the sidewalk, the street, and in the Kansas City Streetcar lane; their unregulated usage even prompted a ban on the Country Club Plaza district (a high-density shopping district), citing safety of users, due to a lack of infrastructure, as the reasoning behind the ban.

BikeWalkKC's Executive Director Eric Rogers was discouraged with the implementation of scooters in Kansas City due to the lack of communication between the company and the City

(Ryan, 2018). BikeWalkKC suggestions cleared up questions with operations the city had upon deployment; scooters should seek to keep the right of ways clear, keep sidewalks clear, and keep those in wheelchairs safe (Ryan, 2018). These suggestions were implemented into a new agreement between the City and another scooter company (Ryan, 2018). If these suggestions were implemented before scooter deployment, then Kansas City could have avoided many of the issues and backlash that occurred with initial scooter deployment.

Infrastructure

The three issues discussed above (safety, liability, and operations) are compounded by infrastructure, or the lack thereof in many cases (as seen in Kansas City, Washington, D.C., and Dallas). Scooter companies recommend that users wear helmets (at the onset of purchasing a ride) which is ultimately just a recommendation; it is difficult to enforce. Recommending that users wear a helmet is aimed at mitigating the safety issues regarding scooters. Should a user be forced to ride on the sidewalk, then the helmet will protect the user – but not other pedestrians. On the other hand, should a user be forced to ride in the street (without a protected bike lane), then the user is put in danger by vehicles, despite the presence of a helmet. In both scenarios, there are issues no matter the level of infrastructure present for users to operate scooters.

Kansas City sought to mitigate these issues in the short term with the creation of a temporary "scooter" lane (the only one of its kind in the United State). Oak Street, a major thoroughfare between 17th and 19th streets was reduced to one lane throughout the month of October in 2018 by the organization Better Block KC (Betts, 2018). The lane provided scooter users a safe lane to operate on a street that "…has been plagued with car crashes for people that are driving excessive speeds." Rogers with BikeWalkKC stated (Betts, 2018). While only temporary, the initiative taken to install such a lane - the first of its kind in the United States

(Netsell, 2018) - illustrated a major point with safe scooter operations; infrastructure is lacking across cities in the United States for scooter operations and should be made a priority, just as it was in Kansas City.

Lack of Data and Scholarly Research

The issues above are all compounded by a lack of data and scholarly research on scooters. As they are a new mode of transportation, there is not a plethora of data or precedent on usage, safe operations, liability, operations, or proper infrastructure. Thus, for the purpose of this research, I looked into parallels with bike share, another mode of micro-mobility that is similar to scooter share programs.

Bike sharing began much as scooter sharing programs did; the first bike share program located in the Netherlands, termed "Witte Fietsen (White Bikes)", was not even remotely a success (DeMaio, 2009). Many bikes were found thrown in canals, abandoned, or cluttered on streets. The program lasted mere days because of a lack of education, and mostly, due to the newness of the program. This initial program relates to how scooters were first perceived in many cities; in cities across California, scooters were thrown in the ocean, abandoned in piles, and vandalized. Initially, both scooter and bike share programs were met with disdain from non-users; Witte Fietsen collapsed within days (DeMaio, 2009), while many scooter programs were banned almost within weeks in the United States.

Over the next half-century, bike share programs across Europe integrated new technology on the bikes to prevent safety issues, track customer usage, and provide ample communication between users and companies. Over the course of the latter half of the 20th century, bike share grew from a public nuisance to a worldwide phenomenon; by 2008, bike share programs existed in France, the Netherlands, Brazil, Chile, China, New Zealand, South Korea, Taiwan, and the

U.S. (DeMaio, 2009). Scooter programs are not yet as commonplace as bike share programs, however, they are worldwide, with locations outside of the United States in major cities such as Paris and Tel Aviv ("Bird," 2019).

Scooter share programs have the potential to have great, positive impacts on cities. Bike share programs, like scooter programs, share the same potential for great, positive impacts. These include increased transit usage (by offering a way to complete the last mile to transit) and potential to decrease greenhouse gases (DeMaio, 2009). Velib, a bike share service in Paris, reported that over 28% of its users chose to begin and end multi-leg transit trips in 2009 using bike share. During the previous year, 25% used the service on their return trip from transit, while 21% used the service to reach the transit options. Velib reported over 50 million trips in 2008; this incredible number of users has the potential to reduce millions of pounds of greenhouse gas from entering the environment. In Montreal, Canada, a similar service reported that it had saved over 3,000,000 pounds of carbon since its inception in 2009 (DeMaio, 2009). Like bike share, scooters offer a unique opportunity to further increase transit trips and reduce greenhouse gases from entering the environment. The positive impacts of scooters have yet to be recorded in great number, however, similar benefits and issues can clearly be seen in a bike share services across the world.

Chapter 2 - Methodology and Results

Research Question

Upon being initially deployed in cities, scooters have clearly presented a list of issues regarding safety, liability, operations, and infrastructure. A lack of data and scholarly research on scooters has only compounded these issues. Since they are such a new form of transportation, cities have often found themselves without solutions to these problems. The first step in finding solutions to the issues above is to regulate scooter usage. This is no small task; to regulate scooters properly, there are many factors that go into proper regulation. Precedent exists across the United States of cities attempting and either failing or succeeding to regulate scooter usage. The purpose of this research is to provide cities a range of regulatory practices, without elevating one as best, based on this precedent. These ranges of practices, and ensuing components, will provide cities the information and background they need to know when seeking to allow and regulate scooters in their city. This leads us to the central research question of, what are the components that cities should know when seeking to regulate electric scooters?

Methodology and Reasoning

To answer the above research question, a study of cities across the United States and their approach to regulating scooters was undertaken. Both a quantitative and qualitative approach was taken in this research. There were three phases within this methodology: establishing the sample size, conducting documentation review, and an organization of data. First, a large sample size was established, as there is a wide variation in precedents and factors across the United States regarding scooter regulations. As this research aims to present a wide menu of practices, the large sample size was necessary. Next, the variation in practices was analyzed with a documentation review in cities within the sample size. Lastly, these practices were analyzed for

their components, the components of which were subsequently organized into three master requirement categories for scooter regulations.

Study Sample

The study sample was chosen via a random sample. A random sample was chosen to present scooter regulation scenarios across a wide array of cities of all sizes across the United States. To take the random sample, a list of all cities in the United States that have currently or in the past had electric scooter programs was compiled. The list of cities was gathered from the websites of the following electric scooter companies; Uber (JUMP), Lyft, Skip, Spin, Lime, and Bird. The list of cities totaled 101. Each city was then assigned a number 1 through 101. All cities with an even number were chosen for this study so as to compile an even list of 50 cities. The random sample ultimately produced a list of cities in various stages of scooter implementation. It should be noted that I specifically looked at cities with exclusive relationships with companies and not situations where cities opened themselves up to bids for services. Figure 1 below displays the cities that were a part of this study.

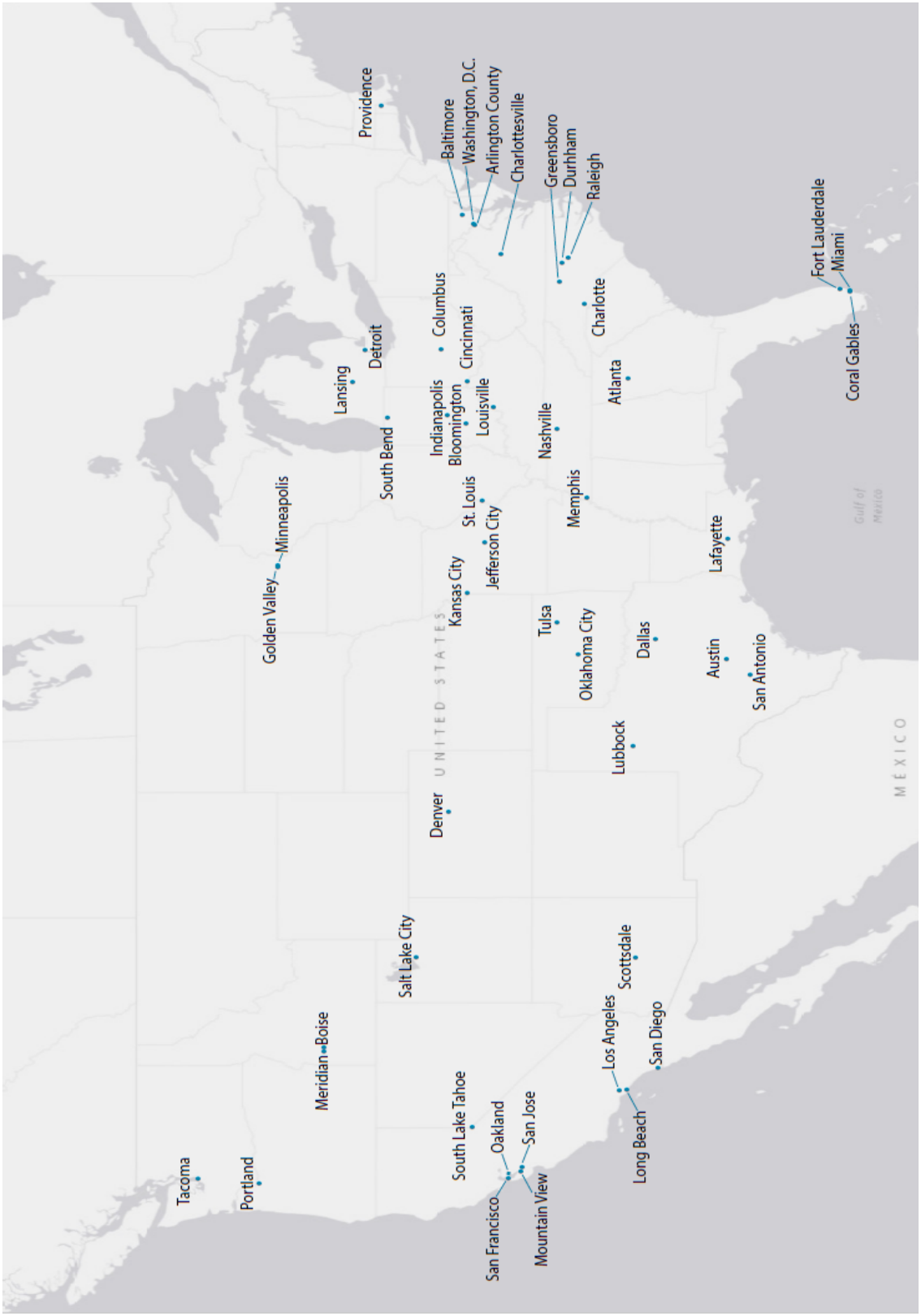

Figure 1: Study sample.

Document Review

For each city that was chosen as a part of this study, all available documentation relating to scooters and their regulations, up to and including local newspaper articles, ordinances, agreements, and blog posts were read and analyzed. Each document was read to determine the components that cities should be aware of when seeking to allow scooters in their city.

Organization of Data

Each component determined from the documentation review was organized based upon where it fell in an organized system. This system designated the components as part of one of three following master requirements for scooter programs: a legal requirement, an operational requirement, or a financial requirement. There was a wide variation in components per each of these requirements determined through this process. The purpose of this research is again to present this variation of practices and subsequent components to cities so they may be aware of scooter regulation precedents across the United States, and then, be knowledgeable in signing agreements with scooter companies. As such, each component of these requirements will be examined in the following chapters.

Chapter 3 - Legal Requirements

Legal Requirements

Legal requirements are those processes that cities must undertake to ensure that scooters operate within a legal framework within their city. These requirements are the first step in establishing scooter operations in cities. The four components that were used in the study sample to establish a legal framework for scooter programs were the mechanism of regulation, the definition of the scooter, legal protections, and financial protections. The mechanism of regulation was the document type that cities utilized when regulating scooters. The definition of scooters is how cities chose to define scooters, which subsequently led to where scooters were legally allowed to operate. Lastly, legal and financial protections provided cities protection for any legal and financial issues that may arise.

Mechanism of Regulation

The mechanism of regulation is the legislative document that regulates scooters in cities. When choosing a mechanism of regulation, cities should ultimately be cognizant of desired amount of control, as well as the time required to establish a scooter program with a given mechanism. Four common mechanisms of regulation were identified in the study sample; ordinances, pilot programs, agreements, and permits. These four mechanisms were utilized in 86% of the cities in the study sample. The other 14% of cities utilized other atypical mechanisms (referred to as “Other” in Figure 2 below) that were not similar to any of these four core mechanisms of regulation, and thus are not discussed as a typical option for the purpose of this research. In 14% of the cities, a combination of mechanisms was utilized, a tactic that offered cities greater stringency in control of scooters. Lastly, 6% of the cities in the study sample utilized no mechanism of regulation. Rather, they chose to take no action to regulate scooters;

this option will not be examined in this subsection, however, it is certainly a viable option for cities to choose should they be confident in regulating scooters without legislation – this laissez faire approach was used in Salt Lake City, where scooters were used and met with open arms (The Salt Lake Scene, 2018).

These different mechanisms of regulation types, combinations, or choice of no action provided cities varied levels of stringency in scooter control, as each mechanism differs in its purpose. Each mechanism type also varies in the time it takes to establish. Figure 2 below displays the frequency of choice for the mechanism of regulation types across the study sample. Figure 2 includes any combinations of mechanisms, thus, the total frequency for mechanism choices exceeded the study sample size of 50.

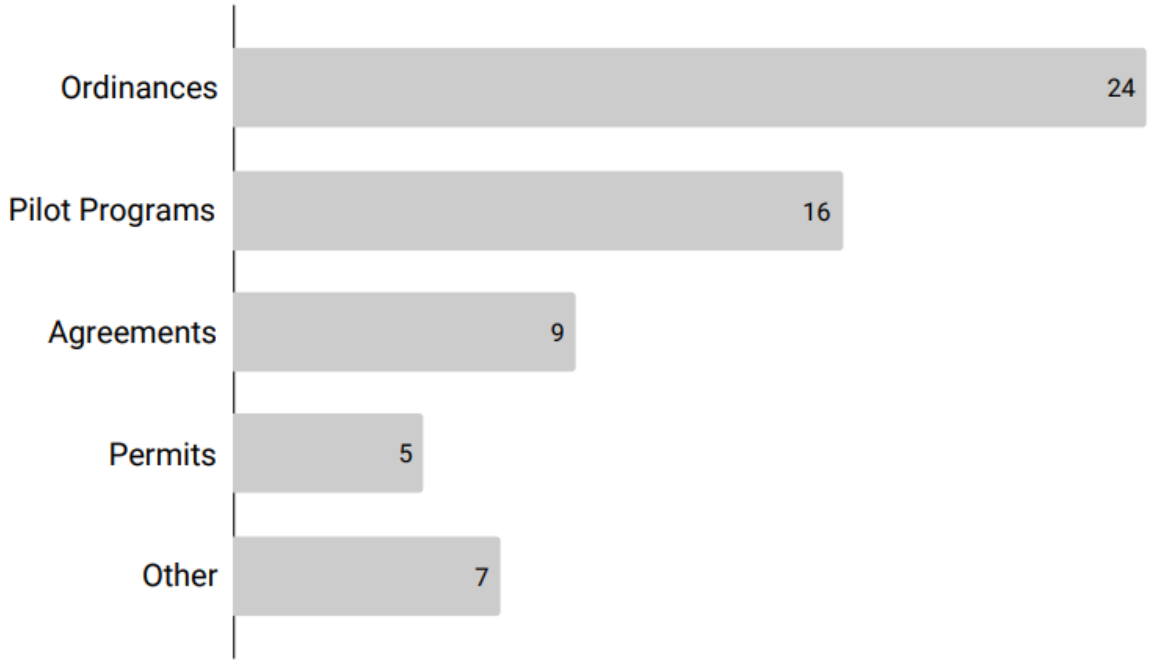

Figure 2: Frequency of choice per each mechanism of regulation type for the study sample. **Other: this category includes 3 instances of cities adding scooters as part of in place bike share, 3 instances of cities doing nothing, and 1 instance of a city requiring the company to sign*

an indemnification agreement. As referenced above, these mechanisms were not typical across the study sample and are thusly not considered a core mechanism of regulation type for the purpose of this research.

The most common mechanism choice for cities in the sample study was the ordinance, with 48% of cities utilizing this option to regulate scooters. Ordinances are legislative documents or laws that are passed by a municipal government and substitute the subject matter of law (Hill & Hill, 2005). As ordinances act as law, they can aptly guide principles and procedures for scooter operations. Ordinances present the highest level of stringency in scooter control for cities that chose this mechanism. As a written law, ordinances offer great control: however, as a written law, they are not easily changed and take considerable time to establish. The only way for an ordinance to be reversed, changed, or repealed is if the legislative body that passed it takes such an action. Both Dallas and Oakland, California (City of Dallas, Texas, 2018; Kapland, Gallo, 2018) utilized the ordinance as their regulatory mechanism.

The second most commonly chosen mechanism was the pilot programs, with 20% of cities utilizing this mechanism. Pilot programs are small-scale, short-term experiments that help cities learn how a large scale project might work in practice (Rouse, 2013). Pilot programs provide cities a way to properly explore future parameters of operation. These programs typically led to the passing of ordinances, an agreement, or a permit. Pilot programs, as experiments, are much easier to repeal than ordinances. However, as they are merely experiments and not law like ordinances, they do not offer the same control over scooter programs as ordinances - as referenced above ordinances are written law, and the violation of an ordinance substitutes fines or legal action more severe than a violation of a pilot program (Hill & Hill, 2005). Secondly, pilot programs take considerable time to establish just as ordinances, thus cities are not able to

quickly establish scooter programs with the pilot program option. Cities in the study sample that chose the pilot program mechanism did so to experiment with scooter operations and establish future parameters of operations. Two cities that chose to utilize the pilot program were Denver, Colorado, and Baltimore, Maryland (City of Baltimore, Maryland, 2018; Denver Public Works, 2018). Denver chose to implement a 1-year pilot program to properly explore how electric scooters could provide accessible multi-modal transportation to users of all levels of income. While exploring the parameters of operation, Denver also sought to encourage scooter usage (Denver Public Works, 2018). As a pilot program's purpose is to be an exploratory program, and Denver desired to explore the newness of scooter programs, a pilot program was the ideal choice. (Denver Public Works, 2018).

The third and fourth mechanism of regulation options utilized by cities were agreements and permits. These two mechanisms are very similar. Agreements are simply legal contracts between the city and the company that give the authorization to operate scooters in the city, and typically include the details of an exchange of money, the time period, and a delineated exchange of services. Permits are more administrative, in that they typically manage the details of operation without the legal obligation of an agreement. They are similar to agreements in that they provide the same details. Both agreements and permits can easily be rescinded or canceled should the need arise (City of Kansas City, Missouri, 2018) and take significantly less time to establish than an ordinance or pilot program. Should a city desire scooters quickly, then an agreement or permit is the best option. However, they do not offer the stringent control that an ordinance does (as they are not written law), nor do they allow cities to be as exploratory in their operations with scooters as pilot programs do. These two mechanisms were chosen by 18% and 10% of cities respectively in the study sample. Memphis, Tennessee and Raleigh, Carolina chose to utilize

agreements (City of Memphis, 2018; Raleigh City Attorney's Office, 2018). Washington, D.C, and San Francisco, California chose to utilize the permit option. (Government of the District of Columbia Department of Transportation, 2018; SFMTA, 2018).

Definitions of Scooters

What a scooter is must be defined before being deployed. The definition of a scooter prompted the operation zone for scooters across the study sample, thus, cities should define scooters based upon where they desire to allow scooters to operate (if they are not constrained by state laws, as explained below). There was a wide variation in what a scooter was defined as across the study sample. Definitions across this study are seen below in Figure 3. Only 10 states in the United States define what scooters are; for the cities in this study, Washington, Virginia, California, Minnesota, Texas, Indiana, Colorado, Arizona, Michigan, and state law applied (Bergal, 2018). Otherwise, the other cities not in these states were able to use their own definition for scooters.

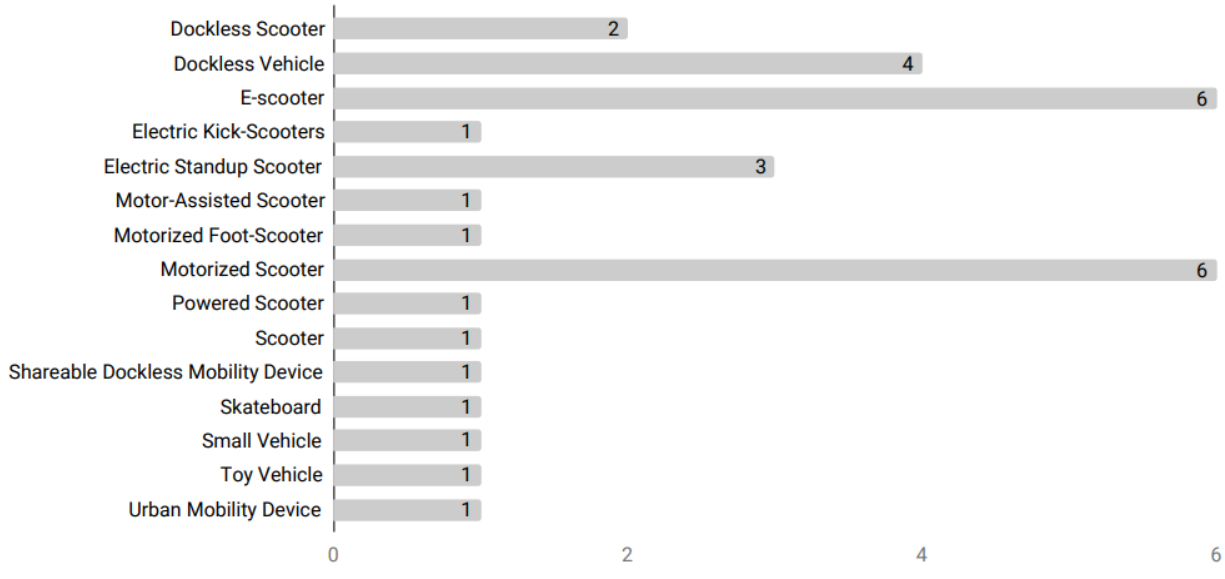

Figure 3: All definitions and their frequency across the study sample.

Both Detroit, Michigan and Denver, Colorado were constrained by state law for their definition of a scooter, thus they were already defined for them. Detroit (and thus Michigan's) definition for a scooter ("small vehicle") prompted Detroit to prohibit the use of scooters on sidewalks. Detroit went further in specifying that when being operated on the roadway, users are required to utilize the most far right lane that is possible (Brundidge, 2018). The City of Detroit also prohibited scooters in the Central Business District as did a host of other cities including Dallas (Brundidge, 2018; City of Dallas, Texas, 2018). Denver (and thus Colorado) chose to define scooters as "toy vehicles" (Denver Public Works, 2018), prompting scooters to only be allowed to operate on sidewalk; they were not fully defined as vehicles. If cities are not constrained by state law for scooters, then the definition should be crafted to determine the operation zone.

Legal and Financial Protection

Both protections are necessary in the event of injury to users and non-users alike or in the event of damage to city property. First, to protect the city from legal issues, liability must be established. Second, to protect the city from financial issues, there must be insurance, taken out by the company, to cover damage to city property and to cover injuries of users and non-users alike. Legal and financial protection was provided by indemnification agreements and insurance policies, respectively, across the study sample.

Liability

Liability is the state of being responsible for an action; establishing who is liable in the event of a scooter accident is important for cities. Liability should be, and was, established as the company's prior to deployment by cities across the study sample. As referenced above, the establishment of liability protects the city in the event of legal issues. Agreement of the

establishment of liability (between the city and company), and thus protection from legal action on behalf of the city, was provided by indemnification agreements. Indemnification is security against legal liability for one's actions. Indemnification agreements are both security against legal liability for the scooter company's actions as well as an agreement that compensates the city for any losses that may occur during scooter operations – they are ultimately about legal and financial protection for cities (Kraus, n.d.). These agreements protected cities from legal action on the behalf of users, while also providing them protection in the event of a financial issue.

34% of cities across the study sample required that companies sign indemnification agreements prior to beginning operations. There were two typical indemnification agreements found in the study sample. The first was a "general indemnification agreement" that required that the company defend, hold harmless, and indemnify the city and all related agencies from and against all claims, damages, liability, losses, costs, and expenses resulting from any and all acts related to scooter operations (City of Kansas City, Missouri, 2018). The second typical indemnification agreement, also found in 34% of cities, was an "indemnification for professional negligence" agreement. This agreement required that the company defend, hold harmless, and indemnify the city and all related agencies from and against all claims, damages, liability, losses, costs, and expenses should the company choose to hire an outside architecture, engineering, or other professional firm to design and manufacture scooters (City of Kansas City, Missouri, 2018).

Insurance

Scooters are a considerable risk to cities; as such, cities should be insured against potential losses financially, in the event of liability, or in the event of a data breach. To insure themselves in such events, 46% of cities across the study sample required that insurance be taken

out by the scooter company. Of these cities, 15 provided specifications for said coverage; the remaining 8 cities merely stated that the company provide proof of insurance, or, that insurance in some form be taken out by the company (City of Durham, 2018; City of Fort Lauderdale, Florida, 2018; Gindling, 2018; Kapland, Gallo, 2018; Spillar, 2018). A typical insurance policy for cities began with the requirement that the insurance company is authorized to operate in the given state that a city is located, is acceptable to the city, and does not violate ownership or operational control. Operational control is the authority to perform functions of command over scooter operations by the company (City of Dallas, Texas, 2018).

Table 1 below was derived to show the specific policies and their required coverage found in those 15 cities that provided specifications. These policies include Worker's Compensation, Commercial General Liability, Automobile Liability, and Employer's Liability Insurance. The final category, City Officials, was not a specific policy, however of these cities, it was typically a requirement to include City Officials as an additional insured.

Table 1: Insurance policy requirements and coverage required.

City	Worker's Compensation	Commercial General Liability	Automobile Liability	City Officials	Employer's Liability
Arlington County, VA	State required coverage	$1,000,000 per occurrence, $2,000,000 aggregate	$1,000,000 combined single limit	--	--
Baltimore, MD	State required coverage	$1,000,000 per occurrence, $3,000,000 aggregate	$1,000,000 per occurrence	Listed as additional insured	--

Charlottesville, VA	State required coverage	$1,000,000 per occurrence	$1,000,000 per occurrence	Listed as additional insured	$100,000
Dallas, TX	State required coverage	$1,000,000 per occurrence, $2,000,000 aggregate	--	--	$500,000 for each accident, $500,000 for disease policy limit, $500,000 per each employee with diseases
Indianapolis, IN	--	$1,000,000 per occurrence	--	Listed as additional insured	--
Kansas City, MO	State required coverage	$2,000,000 per occurrence, $2,000,000 aggregate	$2,000,000 per occurrence	--	$100,000 for each accident, $500,000 for disease policy limit, $100,000 per each employee with diseases
Louisville, KY	--	$1,000,000 per occurrence, $2,000,000 aggregate	$1,000,000 per occurrence	--	$100,000 for each accident, $500,000 for disease policy limit, $100,000 per each employee with diseases
Meridian, ID	--	$1,000,000 per occurrence	--	Listed as additional insured	--
Nashville, TN	--	$2,000,000 per occurrence	$1,000,000 per occurrence	--	--
Providence, RI	--	$1,000,000 per occurrence	--	Listed as additional insured	--
San Antonio, TX	State required coverage	$1,000,000 per occurrence,	$500,000 per occurrence	--	$500,000 for each accident, $500,000 for disease policy limit,

		$2,000,000 aggregate			$500,000 per each employee with diseases
San Francisco, CA	State required coverage	$2,000,000 per occurrence, $4,000,000 aggregate	$2,000,000 per occurrence	Listed as additional insured	Not less than $1,000,000 for each accident, injury, or illness
Washington, D.C.	District required coverage	$1,000,000 per occurrence	--	Listed as additional insured	--

(City of Baltimore, Maryland, 2018; City of Charlottesville, Virginia, 2018; City of Dallas, Texas, 2018; City of Kansas City, Missouri, 2018; City of Meridian, Idaho, 2018; City of Nashville, Tennessee, 2019; City of San Antonio, Texas, 2018; City-County Council of the City of Indianapolis and of Marion County, Indiana, 2018; County Board of Arlington County, Virginia, 2018; Fischer, 2018; Government of the District of Columbia Department of Transportation, 2018; Morabito III, 2018; SFMTA, 2018).

If a city required that the company take out Worker's Compensation, it was to provide wage replacement and medical benefits to employees of the company who are injured in the course of employment. The coverage required by cities was typically based upon state limits for Worker's Compensation. Next, each city required that the company take out Commercial General Liability insurance. This insurance covers bodily injury, personal injury, and property damage – all of which are likely to occur with scooter operations. Automobile Liability insurance is financial protection for a driver of a scooter who harms someone else, city property, or scooters themselves. Lastly, Employer's Liability insurance was required to be taken out by companies to pay compensation for costs and legal fees should an employee or ex-employee sue the company in the future. All of these insurance policies serve a different purpose, but each

serves an important function for cities in protecting cities from injuries, damages to vehicles and city property. The policies that provide these protections are essential to protecting cities during scooter operations. These insurance policies also provide wages and benefits to employees of companies, or protection in the event that a lawsuit is pursued against the company. All of these insurance policies ultimately prove that the company is fit to operate in the city.

Aside from these typical core insurance policies required by cities, Cyber Liability and Information Technology insurance was required to be taken out by both Charlottesville, Virginia and San Francisco, California. This insurance policy type protected these cities for up to $1,000,000 per claim, including coverage for costs for 3rd party notification, credit monitoring, and fraud protection (County Board of Arlington County, Virginia, 2018; SFMTA, 2018). This insurance is vital as protection in the event of a data breach involving sensitive customer information.

Chapter 4 - Operational Requirements

Operational Requirements

Operational requirements regulate the routine functions and activities of scooters through fleet regulations, safety measures, strong communication, user education, and data sharing and privacy. The regulation of routine functions of scooters ensures that they do not become a public nuisance, are safe for consumers, and meet an expected level of service. Fleet regulations include the fleet size (both initial and subsequent expansion) and rebalancing deployed scooters to avoid overconcentration. The safety measures that cities used in this study included parking requirements, preventing attachment to fixed and moving objects, and requiring equipment on scooters be held to a strict standard. These safety measures helped to prevent injuries from occurring to users and non-users alike. Cities across the study sample required strong communication between the city and company as well as the company and users. Strong communication helped to remove unsafe scooters, prevent scooters from becoming over-concentrated, and keep scooter companies transparent in their operations. User education refers to the education of users on safe and legal scooter usage. User education was an emphasis for cities in this study that had successful programs. Lastly, data on vehicles, users, usage, and community perceptions on scooters were used to enhance or reduce scooter operations.

Fleet Regulations

The establishment of fleet regulations begins with establishing the fleet size. There are two steps to establishing a fleet size – one, setting the number of scooters for the initial fleet size, and two, establishing parameters for subsequent expansion of the fleet size. The initial fleet size is the set number of scooters that a scooter company can deploy at the onset of a scooter program. Subsequent expansion refers to an increase of the fleet size should it be deemed necessary.

During both processes, cities should be cognizant of the potential for over-concentration, over-crowding, and meeting expected levels of service (City of Dallas, Texas, 2018).

There were two options found in the study sample when beginning the process of setting an initial fleet size: specify a size or not specify a size. These options refer to the city setting a limit on scooters deployed in their city or not. 44% of cities in the study sample chose to specify size and thus were proactive in preventing over-concentration or overcrowding of scooters. 56% chose to not specify a scooter limit to a company, and thus did not have as much control over the potential for scooters to become over-concentrated or overcrowd the city as those cities that did specify a fleet size. However, those 54% of cities had better potential to meet expected levels of service than those who played it safe and specified a smaller fleet size. It was not clear if the cities that chose to specify an exact number of scooters truly had more successful programs than those who did not, however, there is certainly a relationship to be inferred between control over the number of scooters and a lesser chance of over-concentration or over-crowding (per the total number of scooters in operation). There is also an inferred relationship between having a larger fleet size and meeting or exceeding expected levels of service. The frequency of choices when choosing one of these two options can be seen below in Figure 4.

Figure 4: Frequency of choices for cities in the study sample when choosing to specify or not specify an initial fleet size.

There appeared to be a strong relationship between the population and initial fleet size across the study sample. Figure 5 below was charted to further derive this strong relationship between population and initial fleet size. The cities that were used for Figure 5 are those that specified an initial fleet size. The equation that accompanies Figure 5 can be used to formulate a fleet size based upon the rates seen in cities that specified an initial fleet size.

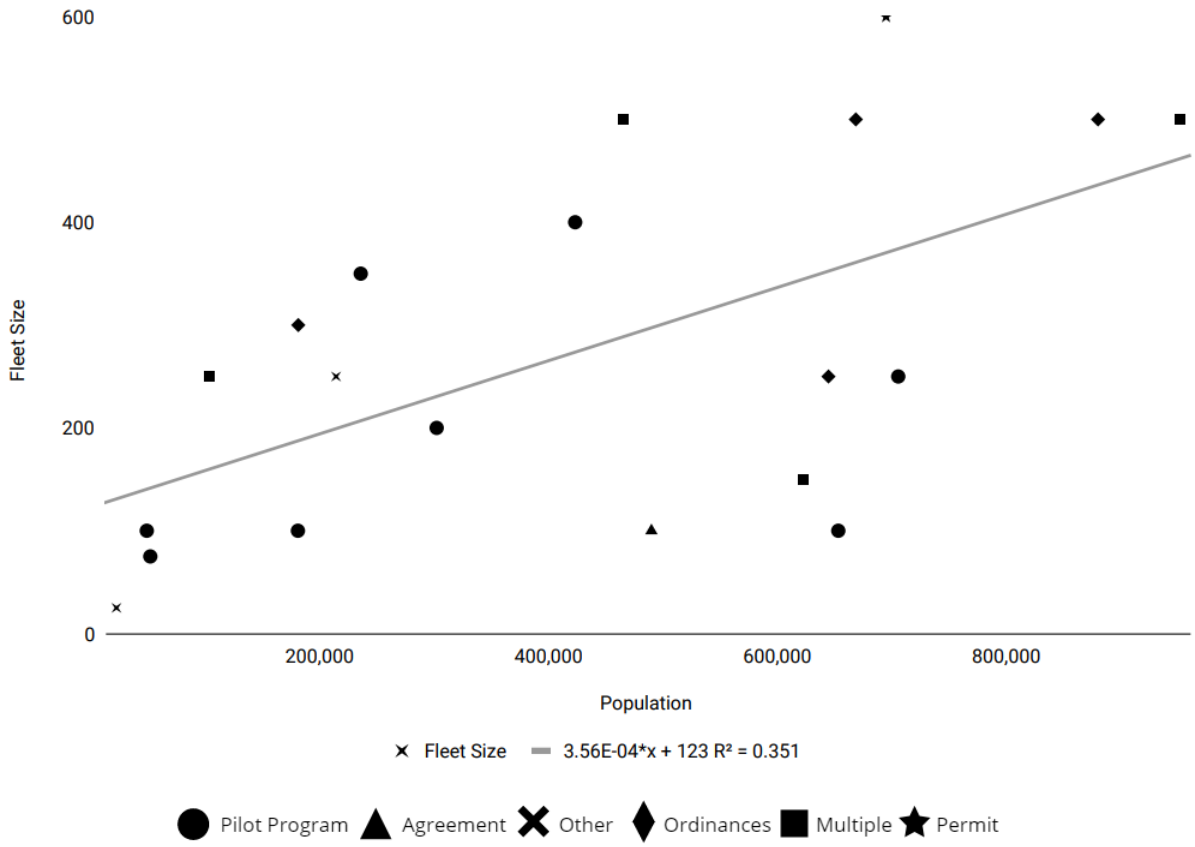

Figure 5: Population versus initial fleet size.

This chart shows this clear relationship between population and initial fleet size; as populations increase, so too does the initial fleet size. The relatively low r-squared for this model does not tell the whole story on the relationship between population and initial fleet size, however, it does provide an estimate for the strength of the relationship between population and initial fleet size.

The second step in establishing the fleet size, subsequent expansion, was typically based upon data on usage across the study sample. When allowing fleet expansions, cities kept the same factors in mind as they did when establishing an initial fleet size; being mindful of preventing over-concentration, over-crowding, and meeting an expected level of service. To

prevent these factors from occurring, cities required that the scooter company provide proof from data on usage that expansion was warranted. Two cities, Arlington County, Virginia and Austin, Texas required that in order for a fleet expansion to occur (by 50 devices), the company must demonstrate at least 3 trips per device per day over a full month (County Board of Arlington County, Virginia, 2018; Spillar, 2018). Louisville, Kentucky, required that should the company desire to increase fleet size (by an ungiven amount), that they be able to demonstrate at least 4 trips per device per day over a full month (Fischer, 2018). The rate of 4 trips per day per device was the typical rate for expansion provided by over two thirds of the study sample.

Upon being deployed, scooters, no matter the fleet size, can quickly become over-saturated in high traffic areas for scooter usage. To combat this issue, 20% of cities in the study sample created rebalancing standards and plans. Rebalancing refers to moving over-concentrated scooters, or, moving scooters to preferred or designated locations. Rebalancing helps scooters meet their expected level of service (Denver Public Works, 2018), and is often used to remove scooters parked in prohibited zones. To prevent users from even entering prohibited zones (a non-preferred area), the city of Detroit utilized geo-fencing, a technology that warns users that they are entering a prohibited zone (geo-fencing is utilized via an application programming interface). Typical preferred areas for scooters across the study were high traffic pedestrian areas, low-income areas of the city, and transit stops (Denver Public Works, 2018). Rebalancing typically occurs at all times of the day or in the event of severe weather. Cities typically required that companies have a plan to remove scooters from circulation in the event of severe weather (City of Fort Lauderdale, Florida, 2018). Where the scooters are to be stored was unclear, however – this issue should be decided between the company and the city. Rebalancing is already standard practice for Bird and Lime, two scooter companies, which was helpful for cities

when seeking to implement rebalancing standards. These two companies offered a paid job to those who wished to pick up and charge scooters overnight, and then, rebalance scooters to preferred locations ("Bird," 2019; Lime, 2018). The rebalancing job offered by these companies answered the issue of charging for scooters; those who offer to rebalance charge them overnight at their place of residence or business.

Rebalancing scooters first prevents scooters from becoming a public nuisance should scooters be over-concentrated. Rebalancing them to a new location such as a high demand area or an opportunity area also helps to meet expected levels of service and more users. A typical rebalancing plan required that scooters be moved to an area of high demand or an opportunity area within 2 hours of receiving notice on an issue such as parking illegally from a customer or within 12 hours of receiving notice from a city official. High demand areas are those areas that are expected to generate the greatest number of users (City of Dallas, Texas, 2018). Along with rebalancing scooters to high demand areas, rebalancing scooters to opportunity areas for equitable access was a requirement for 10% of cities in the study sample. These "opportunity areas" included the city core, designated opportunity areas, and high priority opportunity areas where the greatest number of vulnerable populations are located (Denver Public Works, 2018). Vulnerable populations include racial or ethnic minorities, socioeconomically disadvantaged, or those with inadequate access to transit (Denver Public Works, 2018). Denver offered incentives (the extent of which was unclear) for companies to stay committed to opportunity areas (Denver Public Works, 2018).

Safety Measures

The following measures comprise the safety measures component. These measures including parking regulations, attachment of scooters to vehicles and fixed objects, and

equipment standards for scooters. These measures work to both enhance and maintain safe operations for scooter users, keep non-users safe, and work to keep scooters from becoming a public nuisance.

Parking

The parking component refers to parking regulations found across the study sample. Parking regulations include both the manner that scooters are parked in as well as where they are allowed to be parked. Should scooters not be regulated on parking, they pose considerable risks to non-users safety and have the potential to becoming over-crowded or over-concentrated. Typical parking regulations mandated that the scooters be parked in an upright position, on a hard surface, in a manner that does not block access to utilities, crosswalks, ADA access, pedestrian or vehicular paths, or obscure the sight triangle. Doing so prevents scooters from becoming a public nuisance, becoming over-crowded or over-concentrated, and keeps pedestrians and vehicles safe.

Where scooters were allowed to be parked had more variation than the manner across the study sample. Figure 6 below shows the variation in where scooters were allowed to be parked, by percentage, across the study sample. The locations found in the study sample were the sidewalk, street, against buildings, against street furniture, in designated parking spots, and against an unmarked curb. Street furniture refers to signs, benches, transit stops, and posts. Designated parking spots are both temporary and permanent parking spots that were created for scooter parking with paint or another mechanism. Should a scooter be parked outside of these zones or in a manner that is illegal, both the user and the company faced fines across the study sample (as examined later in the Fines section, only 10% of cities had available information on fine amounts). The manner in which cities obtained this money was unclear.

36% of cities that did not specify where they could be parked did mandate that they should be parked upright, on a hard surface, in a manner that does not cause issues (City of Tulsa, Oklahoma, 2018). 64% of cities in the study sample chose to specify where scooters could be parked, which is where the locations for Figure 5's purpose were derived. Of those cities, 44% allowed that scooters be parked in multiple locations.

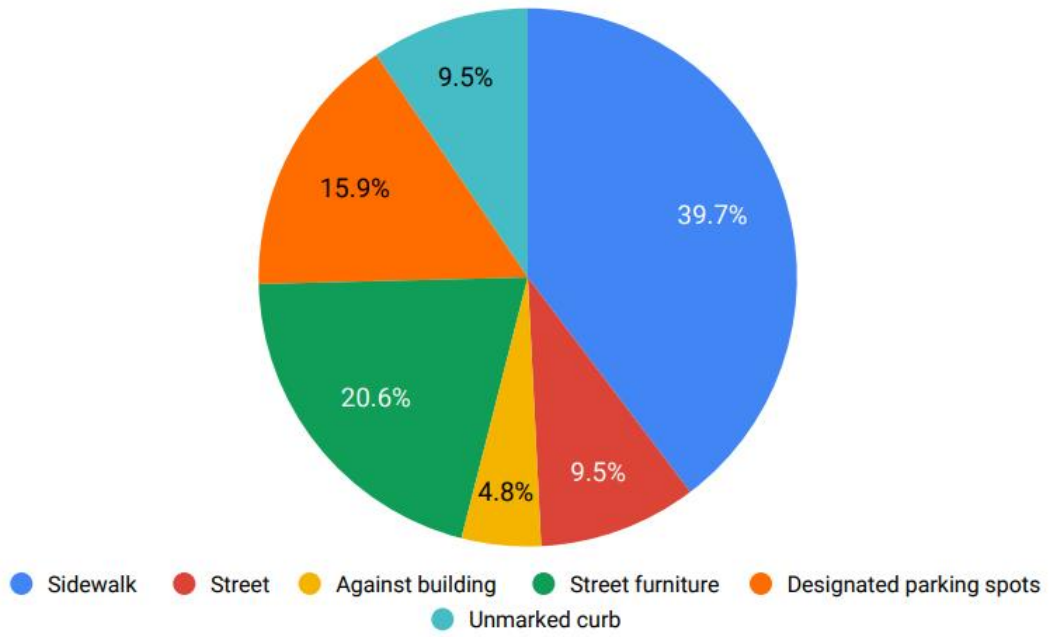

Figure 6: Frequency of choice for scooter parking locations.

As can be seen, the majority of cities allowed parking on sidewalks (39%) and against street furniture. Allowing parking against buildings was the least typical option, as cities often cited concern over scooters cluttering entrances to buildings (City of Tulsa, Oklahoma, 2018). The 64% of cities that chose to specify where scooters could be parked exhibited greater control over scooter parking than those cities did not. However, it was not clear that those that did not specify a given location had less successful programs. Specifying at the very least that scooters

must be parked upright, on a hard surface, and in a manner that does not cause issues is crucial to keeping scooter parking from becoming a public nuisance. Further specifying a location helps to provide greater control over scooter parking, however, and should be considered if there are infrastructure or safety concerns in a city. If no regulations are given, then scooters are doomed to become a nuisance and cause issues with over-concentration, over-crowding, and safety.

Attachment

Attachment refers to the attachment of scooters to fixed or moving objects. Attachment of scooters to fixed objects, including trees, parking meter posts, street light posts, traffic signal posts can lead to scooters becoming public nuisances and also impede the normal and reasonable movement of pedestrians or other traffic (Reich, 2018). The attachment of scooters to moving objects such as vehicles brings with it the question of user safety as well as liability. Attachment of scooters to vehicles was typically referred to as "clinging to motor vehicles" across the study sample. Moving objects typically were deemed automobiles or trailers. In Boise (City of Boise, Idaho, 2018), persons riding or operating scooters were prohibited from attaching themselves or such scooters to a moving motor vehicle. Prohibiting attachment of scooters to fixed or moving objects was only specified by 14% of cities in the study sample, however, the remaining cities merely stated that attachment in itself was prohibited. Table 2 below shows the cities which prohibited such actions of attachment, and if they prohibited attachment to fixed or moving objects.

Table 2: Attachment of scooters to fixed or moving objects across study sample.

City	Fixed objects	Moving objects
San Antonio, TX	X	--
Minneapolis, MN	X	--
Boise, ID	--	X

Charlotte, NC	--	X
Scottsdale, AZ	--	X
St. Louis, MO	--	X
San Diego, CA	--	X

(C*ity of Boise, Idaho, 2018; City of Charlotte, North Carolina, 2018; City of San Antonio, Texas, 2018; City of San Diego, California, 2018; City of Scottsdale, Arizona, 2018, 2018; Reich, 2018; Werner, 2018).*

As seen in Table 2, attachment to moving objects was a greater concern than attachment to fixed objects for cities. Attachment of scooters to moving objects raises concerns over safety more so than attachment to fixed objects, which is a reasonable explanation for this trend. Cities at the very least should prohibit scooter attachment to moving objects to protect users, and then further specify which fixed objects scooters cannot be attached to.

Equipment

Equipment refers to the set of articles and materials that comprise the physical scooter device. Safe and functional equipment is paramount to providing a safe product for the user, a product that does not create parking issues, and issue free operations. All scooters in operation should be 100% maintained and 100% functional at all times – if not, they should be removed from circulation until all parts are repaired and replaced (Brundidge, 2018). Scooters should lastly be equipped to handle the rigor of being outdoors. If the product is safe and functional, then the chance of serious injury is lessened, and, a scooter program has a greater chance to succeed and prosper into the future.

To provide the best product possible, scooter companies should be required to meet a given industry grade standard for equipment – such as the Code of Federal Regulations (City of

Durham, 2018) or the United States Consumer Product Safety Commission (City of Boise, Idaho, 2018). This industry grade standard refers to equipment that has higher quality and durability than consumer grade equipment and materials (Goodyear & Dickerson, 2019). Consumer grade equipment and materials used for commercially available scooters typically have shelf lives less than 30 days, with 7" diameter wheels, a 20-mile maximum range, and single wheel brakes. Consumer grade equipment like this is not acceptable for industry use (Goodyear & Dickerson, 2019). Consumer grade equipment, in particular the small wheels and single wheel brakes, is not suitable for scooters in operation, especially when seeking to have the safest and most efficient product possible in use (Goodyear & Dickerson, 2019). Specifying the equipment be held to a certain standard on scooters is vital to providing the best product possible.

34% of cities in the study sample specified that the equipment on scooters be held to a given industry standard. The other 66% did not have specifications or descriptions for the equipment and merely stated that either all or specific equipment must meet a given industry standard or definition that a city has for a scooter. It was not clear that cities without equipment specifications had less success than those cities that did have equipment specifications, however, those that did had greater control over the standard in which scooters were held.

Table 3 below displays said equipment found across the study sample, its purpose, the issue that the equipment addresses (safety, parking, or operations), and an example standard specification required by cities. The set standard that the equipment and materials for these cities met was unclear (be it the Code of Federal Regulations or the United States Consumer Product Safety Commission).

Table 3: Equipment purpose, issue it addresses, and an example specification.

Equipment	Purpose	Safety	Parking	Operations	Example Spec.
Lamps/reflective headlights	Front and rear lights that are visible from a given distance	**X**	--	--	Visible from at least 500 feet at night and stays illuminated for 90 seconds after scooter has stopped – St. Louis, MO
Horn/bell	Sound mechanism to alert users and non-users alike	**X**	--	--	Scooters may not be operated without a working bell, horn, or another sound mechanism – San Antonio, TX
GPS	Used to track scooter locations	**X**	**X**	**X**	GPS pings scooter company's mobile platform no less than every 90 seconds – Durham, NC
Sticker	Identify scooters or company contact	**X**	**X**	**X**	Include companies contact information, unique VIN, and logo – Kansas City, MO
Motor/governor	To provide assisted power/prevents scooters from exceeding a maximum speed	**X**	--	**X**	A motor cannot allow for speed to top 15 mph – Detroit, MI

Front and rear brakes	Stop or slow scooters	**X**	--	--	Must be able to perform a braked wheel skid(s) on pavement – Scottsdale, AZ
Front and rear wheels	Provide stable riding capability	**X**	--	--	In alignment and spokes, hubs, and axles are tightened and free of damage or wear – Detroit, MI
Front and rear fenders	Prevent road spray from being thrown into the air by tire rotation	**X**	--	**X**	Clean and free of damage or wear - Detroit, MI
Handlebar	Used to hold onto and grasp when operating scooter	**X**	--	--	Bearings are tightened, handlebars turn through a full range of motion, and handlebar covers are free of damage or wear; any attachments to the handlebar are tightly affixed – Detroit, MI
Lockdown capability	To stop scooters that are operating outside of a set operation zone	**X**	--	**X**	Capable of lock remote lockdown by the company or city – Detroit, MI

Platform	Used to stand upon when operating a scooter	**X**	--	--	Structurally sound and free of damage or wear – Detroit, MI
Kickstand	Used when parking scooter to keep scooter upright	--	**X**	--	Stable, structurally sound, and free of damage or wear – Detroit, MI

(Brundidge, 2018; City of Kansas City, Missouri, 2018; City of San Antonio, Texas, 2018; City of Scottsdale, Arizona, 2018; Werner, 2018).

As can be seen, Detroit had the most extensive standards for equipment. Table 3 shows that the kickstand, platform, handlebar, horn, lamps, fenders, wheels, and brakes, are all equipment that were typically required to be stable, sound, and free of damage or wear. The table further shows that the wheels were typically required to be free of damage and a diameter that is greater than the consumer grade (7" in diameter) standard. Lock-down capability and GPS help were required to regulate where scooters operate. The motor speeds varied across these cities, however, it should be noted that motor speed allowed is tied to the definition of the scooter (as a scooter is defined, it may be operated on the sidewalk or street, thus leading to the speed the scooter may operate at). Lastly, a sticker with a VIN (vehicle identification number) and contact information was typically required to be present on every scooter so as to provide users and non-users alike a means to report issues with scooters such as parking or a handlebar issue. The equipment specifications above in Table 3 were ultimately set with the intent to create a safe, functional (in regards to parking) product for users, and, a product that does not hinder scooter operations. Table 4 below was derived to expand upon these equipment specifications on a city by city basis. Table 4 displays specifications for all equipment that was required by cities to be

on scooters (excluding the obvious equipment of kickstand, platform, handlebar, horn, lamps, fenders, wheels, and brakes). A "yes" denotes that these cities required this equipment item on the scooter.

Table 4: Standards for equipment present on scooters on city by city basis.

City	Lamps (visibility)	Bell	GPS	Sticker	Motor speed	Remote lockdown capability
Detroit, MI	500 ft. (front)	Yes	Yes	Yes	15 mph	Yes
Nashville, TN	--	Yes	--	Yes	20 mph	--
San Antonio, TX	500 ft. (rear) 50-300 ft. (front)	Yes	--	--	20 mph	--
San Diego, CA	--	Yes	--	Yes	25 mph	
Baltimore, MD	Unclear, but lamps required	--	--	Yes	N/A	--
Boise, ID	500 ft. (front) 50-300 ft. (rear)	Yes	--	--	20 mph	--
Arlington County, VA	--	Yes	--	Yes	10 mph	--
Charlottesville, VA	300 ft. (front and rear)	--	Yes	--	15 mph	--
Scottsdale, AZ	500 ft. (front) 500 ft. (rear)	--	--	--	20 mph	--
Fort Lauderdale, FL	--	--	Yes	Yes	15 mph	--
Austin, TX	500 ft. (front) 500 ft. (rear)	--	Yes	Yes	20 mph	--

Louisville, KY	300 ft. (front) 300 ft. (rear)	--	--	Yes	15 mph	Yes
Indianapolis, IN	500 ft. (front) 500 ft. (rear)	Yes	--	Yes	20 mph	--

(Brundidge, 2018; City of Baltimore, Maryland, 2018; City of Boise, Idaho, 2018; City of Charlottesville, Virginia, 2018; City of Fort Lauderdale, Florida, 2018; City of Nashville, Tennessee, 2019; City of San Antonio, Texas, 2018; City of San Diego, California, 2018; City of Scottsdale, Arizona, 2018; City-County Council of the City of Indianapolis and of Marion County, Indiana, 2018; County Board of Arlington County, Virginia, 2018; Fischer, 2018; Spillar, 2018).

As can be seen, both lamp visibility distance and motor speed varied across the sample of cities. Lamp visibility distance was typically required to be no less than 300 feet for the front of the scooter and no less than 50 feet for the rear lamp. It was typical to require a visibility distance of 300 feet or more for front lamps. Cities did not typically allow scooters to exceed 25 mph, as otherwise they begin to threaten both users and non-users alike. Cities also did not typically require horns/bells, GPS, or lockdown capability. While these three are not necessary, they should certainly be considered necessary by cities, as they provide great value to scooter operations in terms of safety and data.

Education

Education refers to the education of users on safe and legal operations of scooters. Education is essential to the operations of scooters, as an educated population is one that knows how to use scooters safely and legally. If users are not educated on safe and legal operations, then scooter operations were more often than not set up for failure, and, users and non-users alike are put in

considerably more danger. Components that cities typically required users to be educated on included existing city rules and regulations, safe (wearing a helmet, operating at a safe speed) and courteous riding (yielding to a pedestrian), legal parking, terms of service, privacy, penalties, and age limitations. Users are typically provided this information at the onset of purchasing a scooter ride on an interface attached to the scooter. Flyers and pamphlets were also typical means of providing education across the study sample. To properly educate users, Portland, Oregon used both public outreach events - a non-typical approach to educating users across the study sample - as well as the two typical approaches mentioned previously (The City of Portland, 2018).

Portland first required the company present a robust set of educational tools to the user at the onset of purchasing a ride. As their pilot program progressed, Portland enhanced these initial educational tools by hosting their own public outreach events in the form of safety lectures, helmet giveaways, and public meetings. Users were engaged during the pilot program and were amply educated on safe and legal usage (The City of Portland, 2018). Upon the conclusion of their pilot program, Portland analyzed the data from the usage of scooters and surveyed users; their findings showed that users viewed scooters positively, used them more than expected, and reported very little to no issues (The City of Portland, 2018). Through the robust educational tools, helmet giveaways, and extensive public meetings, Portland's program prospered. The education component, while not the only major component involved in establishing Portland's scooter program, helped the pilot program in Portland considerably (The City of Portland, 2018).

In comparison to Portland, the city of Meridian, Idaho did not have a robust education program, did not host helmet giveaways, and, no educational events were hosted (City of Meridian, Idaho, 2018). Their program failed for a list of reasons; users parked wherever they

pleased, there were complaints of non-users being impacted negatively by user negligence on scooters, and there was an ultimate dislike of scooters in the city (City of Meridian, Idaho, 2018). Should the users have been educated on usage, then perhaps, the program would have had more success.

Portland and Meridian provide two scenarios where education of users on the above components - existing city rules and regulations, safe (wearing a helmet, speeds) and courteous riding (yielding to a pedestrian), proper parking, terms of service, privacy, instructions on usage, fees and penalties, and age limitations – either helped scooter operations or hindered them. It should again be noted that education was not the complete decider of success or failure in either city, but, the alternative to not educating users on safe and legal scooter operations is a greater chance of failure and issues as seen in Meridian. Cities should seek to act as Portland did, and require robust educational tools to users, host helmet giveaways, and host robust educational events.

Communication

Communication was carried out across the study sample in the form of one, the company providing contact information for the city and users alike and two, in having around the clock availability to respond to any reported issues or questions from the city or user. This component was typical to all cities in the study sample. Having strong communication between user and company allows users the opportunity to report unsafe scooters, maintenance issues with scooters, illegally parked scooters, or to ask general questions on operations. Having strong communication between cities and the company allows transparency by the company in their operations, the city to ask questions on operations, and the city to request data at any given point. A typical aspect to this component was that the company have a fully staffed operations center,

staffed around the clock, in the city to provide efficient response to notices of violation and to customer complaints within (City of Kansas City, Missouri, 2018).

Data

Data refers to the data collected by cities on behalf of the company regarding scooter operations. Data privacy was an aspect of data in the study sample as well; protecting user data is important in preventing financial information be stolen. These data collected by over half of the cities in the study sample included usage, vehicles, users, and survey data from users. Data sharing on utilization rates is necessary when cities or companies wish to increase or decrease a scooter fleet size, rebalance scooters to a new location in the city, or change scooter functions on behalf of survey data. Data sharing on behalf of the company was required by over half of the cities in the study sample, while it was unclear if the other cities required this or not. Data types other than survey data were typically shared via an application programming interface (Denver Public Works, 2018), which simply allows two applications to communicate with each other. Survey data is typically gathered by public outreach events (The City of Portland, 2018). Table 5 below was derived to displays the different data types found in the study sample, which categories they fall into, and an example location of where this data was required to be gathered.

Table 5: Data types, category, and an example location.

Data Type	Usage	Vehicle	User	Survey	Example
Trip starts and ends	X	X	X	--	Kansas City, MO
Crashes	--	X	--	--	Kansas City, MO
Trip distance	X	X	X	--	Denver, CO
Map of route	X	X	X	--	Boise, ID
Vehicle counts	X	X	X	--	Kansas City, MO

Location of towed vehicles	--	X	--	--	Austin, TX
Number of daily, weekly, and monthly riders	X	X	X	--	Denver, CO
Demographics (age, gender)	X	--	X	--	Kansas City, MO
Low-income users number	X	--	X	--	Denver, CO
Active customers	X	--	--	--	Kansas City, MO
Injuries	X	--	--	--	Denver, CO
Device theft	--	X	--	--	Austin, TX
Vandalism and losses	--	X	--	--	Denver, CO
Parking compliance	--	X	--	--	Dallas, TX
Maintenance reports	--	X	--	--	Oakland, CA
Battery level	--	X	--	--	Providence, RI
Customer complaints	--	--	--	X	Portland, OR
Community outreach	--	--	--	X	Portland, OR

Rider surveys	--	--	--	X	Portland, OR

(City of Boise, Idaho, 2018; City of Dallas, Texas, 2018; Denver Public Works, 2018; Morabito III, 2018; Spillar, 2018; The City of Portland, 2018).

Usage data can be utilized on behalf of the city to recommend an increase in fleet size if the number of daily, monthly, or weekly riders show that rides exceed the expected level of service. Usage data can also help cities decide if scooter deployment locations should be altered or moved based upon their trip origin or destinations. User data can help show cities if scooters are being utilized enough by low-income users, by certain demographics, or are causing more injuries than expected. Vehicle data can help show cities the movement, distribution, and compliance of scooters while in operation. Vehicle data can also help to improve city traffic management. These data can help cities know if scooters are being deployed to preferred locations, if they are being vandalized, or if scooters are in need of repairs. Lastly, survey data can be used to help cities know how their constituents wish to improve scooter operations. Portland utilized survey data in more instances than other cities in the study sample. Cities should utilize all types of data to enhance their scooter operations and ensure code compliance.

Chapter 5 - Financial Requirements

Financial Requirements

The financial requirements refer to revenue sources for cities that fund scooter operations. This revenue provided cities funding to cover scooter implementation and routine functions, a means to prohibit illegal or improper activity with scooters, and protection from damages to city property. Revenue yields from these three sources are important for cities, as even though scooters are an amenity, they do use public resources, and thus a city needs the revenue to allow them to do so. Three core financial requirements were found across the study sample. The three core financial requirements were fees, fines, and bonds. These three financial requirements can generate the desired or needed revenue given any combination or amounts charged. Fees and fines were the most typical source of revenue for cities, while bonds were used by merely 20% of cities. In terms of reliability, fees and bonds are reliable, while fines are not. However, fines provide an incentive to the users and the company to prevent scooters from becoming a nuisance or violating regulations. There were a variety of other financial requirements that were not typical across the study sample, thus they will not be discussed as a viable option for cities in this chapter. The revenue that cities collected typically went to improving infrastructure to accommodate scooters, such as creating bike lanes or improving street conditions (Fischer, 2018).

Fees

Fees were a reliable source of revenue for cities across the study sample. Fees are sums that cities require companies to pay in order to have the right to operate scooters within their city. Fees are an instant and upfront way to obtain payment for scooter operations; cities can obtain a lot of revenue quickly with fees. Typically, fees were incurred upon the company in order to

begin or continue operation. They are one of two reliable revenue sources for cities (along with bonds). Fees were found in five forms in this study, as displayed in Table 6 below. Three fee structures were typical across the study sample, however, two fee structures, technology and operating in the ROW, were found in Washington D.C. It was not clear what the technology fee was incurred for, however, this is certainly an option worth exploring.

Table 6: Fee types, ranges, structures, and example locations.

Fee Type	Description	Ranges	Structure	Examples
Permit/ Application	An instant form of revenue cities receive when companies apply for a permit	$23 - $15,000 (Middle ranges included $100, $500, $808, $5,000)	One time; semi-annual in San Antonio	$100 – Atlanta, GA; $500 – Memphis, TN; $808 – Dallas, TX; $5,000 – Oklahoma City, OK
Daily/Annual	Daily or annual form of revenue based upon scooters in operation	$1	Daily fee is per scooter; annual fee is periodic	$1 - Kansas City, MO, Baltimore, MD, Indianapolis, IN, Louisville, KY
Renewal	Annual form of revenue based upon permit or agreement renewals	$100 - $404	Periodic/Annual	$100 – Fort Lauderdale, FL, Washington, D.C.; $404 – Dallas, TX
Technology	Information not available	$25	Information not available	$25 - Only seen in Washington, D.C.
Operating in ROW	Annual form of revenue for the city to cover costs of operating in the ROW	$25	One-time	$25 – Only seen in Washington, D.C.

(City of Baltimore, Maryland, 2018; City of Dallas, Texas, 2018; City of Fort Lauderdale, Florida, 2018; City of Kansas City, Missouri, 2018; City of Memphis, 2018; City of Oklahoma City, Oklahoma, 2018; City-County Council of the City of Indianapolis and of Marion County, Indiana, 2018; Government of the District of Columbia Department of Transportation, 2018).

As seen above in Table 6, fees can be incurred for various purposes at various ranges. Fees offer daily, one time, annual, and periodic structures, giving cities a range in options given when revenue is needed most. Lastly, revenue can be obtained quickly should a higher permit fee be instituted, or, if there are large numbers of scooters in operation (with daily/annual per scooter fees).

Figure 7 below was derived to show the frequency of choices for fee types across the study sample. As can be seen, permit fees were the most popular option.

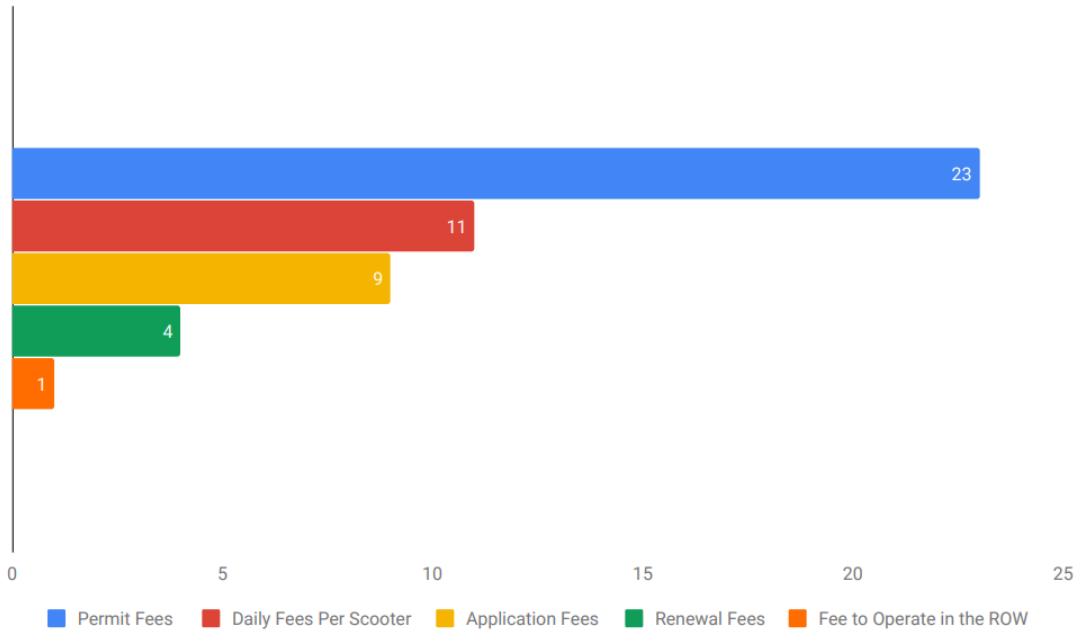

Figure 7: Frequency of choice per fees across study sample.

Figure 7 includes combinations of fees that cities used. For example, 2 cities used a daily fee and a permit fee, thus increasing the amount of revenue they received for scooter operations. Two of the most commonly utilized fees, permit and application fees, were chosen by half of cities in the study sample. If a city lacks excess funding that can be applied to scooter operations, the most common type of fees, permit and application fees, provided a quick solution. And, as there are many variables with scooter operations, the excess funds provided by permit fees can be crucial to funding operations.

One city that utilized both permit and application fees was Portland. In Portland, permit fees (set at $250 for the permit application and $5,000 for the permit itself) provided the city an instant source of revenue for scooter operations. These funds provided an upfront source of revenue to cover project startup and program administration costs for the e-scooter pilot program, as well as educational and public outreach (The City of Portland, 2018). In collecting this large source of revenue upfront, Portland was able to cover costs associated with scooter operations that otherwise would not have existed. In this instance, permit fees were the perfect solution in coming up with funds instantly; should a city not have the funding to implement scooters, like in Portland, large permit and application fees are the perfect solution.

Fees incurred per scooters in operation offer a constant source of revenue for cities (however, this source of money is dependent on the fleet size). Louisville, Kentucky took two approaches to these fees per scooters in operations: “Daily Dockless Vehicle Fees” and “Annual Per Dockless Vehicle Fees”. The daily fees (typically set at $1, as noted above) offered a daily stream of revenue per each scooter in operation, and were typically used to improve shared mobility infrastructure (Fischer, 2018). The process of acquiring fees was not clear. Louisville

established its initial fleet size as 150 scooters, thus, they received approximately $150 per day. To accrue more funding on top of the daily fees, Louisville, as mentioned above, also utilized an annual fee of $50 for every dockless vehicle in circulation. This extra set of revenue was used to remedy a variety of issues in Louisville, such as moving illegally parked vehicles, recouping the loss of public ROW space, and for purchases of new bike racks (Fischer, 2018). The extra set of fees gave Louisville another instant source of revenue.

Fees offered Portland and Louisville (Fischer, 2018; The City of Portland, 2018) an instant and often sizable amount of revenue. Low permit and application fees, as well as a smaller fleet size in Louisville, were counteracted with an annual dockless vehicle fee of $50 per scooter. A city can also incur higher fees to reduce the number of scooters in operation, thus using fees as a means of control. Ultimately, the accruement of revenue can be increased quickly with higher fees or combinations of fee types, as fees offer the promise of reliable, instant, and often, large sums of revenue.

Fines

Fines refer to a sum that a city imposes upon users and companies alike as punishment for violating scooter regulations. Fines are an unreliable revenue source; cities should not rely upon fines, however, if enough violations occur, revenue can pile up quickly for cities. The collection method for fines was unclear across the study sample. Fines are important as a punishment mechanism to keep users and companies from violating regulations. 6 different fines on various regulations being broken were found across 10% of cities across the study sample; illegal parking, parking outside operation zones, not properly rebalancing, DUI's, reckless operation, and damaging the scooter's VIN sticker. It was unclear if other cities did not have fines, however, it can certainly be inferred that these fines did exist, as these punishment

mechanisms are important in regulating scooter operations. Fines should be incurred by cities and should be high enough to both accrue revenue and control operations.

For illegal parking, parking outside operation zones, and not properly rebalancing, the company is the responsible party. For DUI's, reckless operation, and parking outside operation zones, as users are the responsible party. The highest fine imposed on companies were $500 in Louisville for parking illegally, while parking outside the operation zone was a $100 fine in Louisville. Not properly rebalancing scooters was worth $500 in Louisville (Fischer, 2018). Users were fined $1,000 for a DUI, $250 for reckless operation, and $1,000 in San Diego, California for damaging or removing a VIN sticker (City of San Diego, California, 2018). Again, fines are important as a control mechanism, and should be high enough to reflect this importance.

Bonds

Bonds, typically referred to as performance bonds, are issued by a bank or another insured financial institution and constitute a promise of repayment to the city in the event that the city needs funding for repairs, towing, storage, or removal of vehicles (SFMTA, 2018). Bonds are typically returned at the end of operations back to the company or rolled over for another year (SFMTA, 2018). 20% of cities in the study sample required performance bonds as a source of revenue for their scooter programs. Two types of performance bonds were typical in the study sample; a fixed fee or per scooter. Given that they have a range of acceptable uses, performance bonds are beneficial to cities in that they are a reliable revenue source that is readily available should scooter operations cause an issue that requires immediate funding to repair. Bonds typically must be replenished should they fall below a certain level (SFMTA, 2018); that money

will always be available to cities. However, not all cities in the study sample required they be replenished.

Table 7 below displays the variation in bonds found across the study sample. The location, the type (if it is per scooter or a fixed fee), and their acceptable use are listed below in Table 7.

Table 7: Bond types, replenishment rules, and acceptable uses.

Location	Fixed Fee	Per Scooter	Acceptable Uses
Arlington County, VA	$5,000	--	Removing and storing improperly parked vehicles
Austin, TX	--	$100	Public property repair and maintenance; auditing, storing, or removing improperly parked vehicles; costs incurred if the company is not present to fix an issue
Dallas, TX	$10,000		An irrevocable letter of credit; used to recover damages, fees, or fines, paid for by the company
Denver, CO	--	$30	Public property repair and maintenance; auditing, storing, or removing improperly parked vehicles; costs incurred if the company is not present to fix an issue
Fort Lauderdale, FL	--	$80	Information not available
Memphis, TN	--	$50	Public property repair and maintenance; auditing, storing, or removing improperly parked vehicles; costs incurred if the company is not present to fix an issue

Nashville, TN	--	$80/scooter	Public property repair and maintenance; auditing, storing, or removing improperly parked vehicles; costs incurred if the company is not present to fix an issue
Providence, RI	N/A	$50/scooter	Public property repair and maintenance
San Francisco, CA	$10,000	--	Public property repair and maintenance
Washington, D.C.	$10,000	--	Removing improperly parked or unsafe scooters

(City of Dallas, Texas, 2018; City of Fort Lauderdale, Florida, 2018; City of Memphis, 2018; City of Nashville, Tennessee, 2019; County Board of Arlington County, Virginia, 2018; Denver Public Works, 2018; Government of the District of Columbia Department of Transportation, 2018; Morabito III, 2018; SFMTA, 2018; Spillar, 2018).

The revenue generated from performance bonds can vary based on the type; a fixed fee has the potential to provide more funding should fewer scooters be allowed in the city, while a fee per scooter could accrue more revenue should the number of scooters allow so. The acceptable uses focused primarily upon public property repair and maintenance, removing improperly parked scooters, and auditing or storing scooters.

Performance bonds ultimately provided cities a large sum of money that can be relied upon to cover large expenses related to routine functions of scooters. If a city needs a large amount of funding for operations, then performance bonds are a viable and intriguing option to utilize.

Conclusion

To return to the research question, what are the components that cities should know when are seeking to regulate electric scooters, the answer is those components that fulfill legal, operational, and financial requirements. These components are revisited below in Table 8. The requirement that they fulfill, the common options for cities in regards to the components, and the major consideration when establishing these components can be seen below. Table 8 is thus a consolidation of the answer to the research question, and cities can use this table to easily understand basic information for each component. A reference page number is included in the table for cities to return to the examination of said component.

Table 8: Components, the requirement they fulfill, options for cities, major consideration, and reference page number.

Component	Legal	Operational	Financial	Options for Cities	Major Consideration	Page
Mechanism of Regulation	X	--	--	Ordinances, Pilot Programs, Agreements, Permits	Control, exploration of parameters, and time to establish	12
Definitions of Scooters	X	--	--	E-Scooter, Motorized Scooter, Dockless Vehicle, Dockless Scooter, and Electric Standup Scooter (most common)	Operation zones, state laws on scooter definitions (if applicable)	16
Liability	X	--	--	Establishing liability with "General Indemnification" and "Professional Indemnification" Agreements	Establishing liability and holding city harmless in the event of liability	17
Insurance	X	--	--	Worker's Compensation, Commercial General Liability, Business Automobile Liability, Employer's Liability, and insuring City Officials	Scooters are a considerable risk; cities should be protected as such both financially and legally	18
Fleet Regulations	--	X	--	Setting an initial fleet size, expanding the fleet size, and rebalancing	Over-concentration, over-crowding, and meeting expected levels of service	23
Parking	--	X	--	Sidewalk, Street, Against Buildings, Against Street	Preventing injuries and over-crowding or over-concentration	29

				Furniture, Designated Parking Spots, and Unmarked Curbs		
Attachment	--	X	--	Fixed or Moving Objects	Preventing scooters from becoming a public nuisance, protecting user and non-user safety	31
Equipment	--	X	--	Headlights, Horns, GPS, VIN Stickers, Motors, Brakes, Wheels, Fenders, Handlebar, Lockdown Capability, Kickstands, and Platforms	If the product is safe and functional, then the chance of serious injury is lessened, and, the operations have a greater chance to succeed and prosper into the future	32
Education	--	X	--	Educating users on existing city regulations, safe riding, parking, terms of service, privacy, penalties, and age limitations	If users are not educated on safe and legal operations, then scooter operations were more often than not set up for failure, and, users and non-users alike are put in considerably more danger	38
Communication	--	X	--	Communication between company and city, communication between user and company	Strong communication leads to transparency in operations from companies to users and cities	40
Data	--	X	--	Gathering Usage, Vehicle, User, and Survey Data	Data is necessary when making decisions to expand or decrease scooter operations	41
Fees	--	--	X	Permit/Application, Daily/Annual (per scooter), Renewal, Technology, and Operating in the ROW	Instant and upfront way to obtain payment for scooter operations	44
Fines	--	--	X	Illegal Parking, Parking Outside Operation Zone, Not Properly Rebalancing, DUI's, Reckless Operation, Damaging the Scooter's VIN Sticker	Fines act as a punishment mechanism to deter illegal operations	48
Bonds	--	--	X	Fixed Fee or Per Scooter	Large sums of money, backed by a bank or financial institution, that pay interest and constitute a promise of repayment to the	49

					city in the event that the city needs funding	

The purpose of this research was to provide cities a comprehensive guide to scooter regulation practices. However, this report could not be as extensive as desired at times, as there were instances where information and data were not available in the documents reviewed. It was often difficult to obtain the context behind why a city chose to use an ordinance as a mechanism of regulation, for example, without speaking to those who wrote said articles. While blogs or reports did provide context, many times it was impossible to find the reasoning or context behind regulations. Interviewing or discussing the ordinances with the authors would have been beneficial to this research. Lastly, the newness of scooters, and thus a lack of scholarly work on the subject made this research difficult.

This research can lead to more detailed reports on the context behind scooter regulations in the future. The field of scooters and micro-mobility will be rapidly changing in the future and will surely have more research and data in the coming years. This guide was a comprehensive look at practices, but could be enhanced by said data or by a more contextual search for the reasoning behind some practice.

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