# Micro-Mobility, E-Scooters and Implications for Higher Education

James Fong Chief Research Officer, UPCEA Director, UPCEA Center for Research and Strategy

Paul McDermott Research Assistant, UPCEA

Maria Lucchi Research Assistant, UPCEA

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# Introduction to the Micro-Mobility Landscape

Generation Z and Millennials, coupled with favorable trends regarding renewable energy and resource sharing, are quickly fueling a change within the transportation landscape. Some have labeled the phenomenon "micro-mobility." This term originally referred to personal vehicles for one or two passengers with the most common example being a standard pedal bike. Now, however, it describes new forms of transportation that include docked bikes, e-bikes, e-scooters, and even skateboards or e-skateboards often used in an urban setting.

E-bikes and e-scooters have emerged as primary options for riders looking for micro-mobility in large city markets. The first semblance of modern bikeshare was seen in Copenhagen in 1995.<sup>1</sup> However, it took 15 years for large-scale adoption of the bikesharing practice in the U.S., with Washington D.C. launching Capital Bikeshare as a commitment to the bikeshare model, replacing the pilot program launched two years earlier.<sup>2</sup> In 2013, New York city launched its corporate sponsorship funding bikeshare program, a unique model using no public funds.<sup>3</sup> That year, Chicago and San Francisco also launched their bikesharing programs.<sup>4</sup> The key features of these bikesharing systems were dock stations and monthly membership fees.

It was not until 2017 that the defining feature of micro-mobility began to emerge: a dockless system. Private companies like LimeBikes and Vbikes launched their dockless bikes in cities including San Francisco. However, in just a year, the dockless micro-mobility model has all but shifted to e-scooters. A pilot program in Washington D.C. originally had five companies offering dockless bikes, with promises of expanding the bike-sharing market. By Spring 2018, the program had almost completely shifted to e-scooters, with two of the biggest dockless bike operators, Mobike and Ofo, leaving the pilot that summer, citing an over-regulated market.<sup>5</sup> At the same time, dockless e-scooters became popular, with all but the Uber-owned company Jump choosing to fill its government-given allocation of micro-mobility vehicles exclusively with scooters.<sup>6</sup> Many other U.S. cities are following this trend. Shared pedal bikes are quickly disappearing in cities including Seattle, Washington D.C., Dallas, Camden, Chicago, and Boston in 2018.

Micro-mobility companies report that electric vehicles are much more popular for ridesharing, indicating that dockless e-bikes are twice as popular as standard bikes. Even more popular than dockless e-bikes are dockless e-scooters, with micro-mobility companies reporting that dockless e-scooters are two and a half times as popular among riders.<sup>7</sup> These companies are responding accordingly. One of the biggest e-scooter companies, Lime, was originally called LimeBikes, but rebranded in May 2018, transitioning from dockless e-bikes to dockless e-scooters in May 2018.<sup>8</sup>

<sup>&</sup>lt;sup>1</sup> https://www.citylab.com/city-makers-connections/bike-share/

<sup>&</sup>lt;sup>2</sup> Ibid

<sup>&</sup>lt;sup>3</sup> Ibid

<sup>&</sup>lt;sup>4</sup> Ibid

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<sup>&</sup>lt;sup>6</sup> Ibid

<sup>&</sup>lt;sup>7</sup> https://usa.streetsblog.org/2018/10/10/is-pedal-dockless-bike-share-going-extinct/

<sup>&</sup>lt;sup>8</sup> https://www.prnewswire.com/news-releases/lime-rebrands-and-announces-a-partnership-with-segway-300650581.html

Among micro-mobility companies, e-scooters are seeing the highest rates of adoption in U.S. metropolitan areas. In under one year, e-scooters saw 3.6% growth, similar to the growth seen by ridesharing giants like Uber and Lyft.<sup>9</sup> Bikesharing companies like Motivate have seen positive growth in the past eight years, but the future is uncertain. The adoption of bikesharing will see a healthy bump due to the advent of the e-bike; however, bikesharing will also have a very large segment of its market taken by the more popular e-scooter option. It is clear that e-scooters are the dominant option in the micro-mobility market. Ridesharing options have all seen logarithmic growth, meaning that in eight years, the e-scooter market can expect to see much greater linear growth than 28.8%. Given these forecasts, the main focus of this paper will be on dockless e-scooters.



Figure 1: Ridesharing Service Adoption by Years Since Launch<sup>10</sup>

Source: Micro-Mobility Revolution, 2018

<sup>&</sup>lt;sup>9</sup> https://medium.com/populus-ai/the-micro-mobility-revolution-95e396db3754 <sup>10</sup> lbid

## Trends in Micro-Mobility

#### Decreased Demand for Traditional Vehicles

With fewer cars on the road, there will be significantly less demand for parking spaces in urban areas. This is especially important now considering young people are entering their adult lives in a time where housing prices are at an all-time high.<sup>11</sup> The existing land supply crunch has driven real estate prices up; developers are able to hoard land and add a premium to property purchases and rentals. One of the most common uses of city land is for parking. Micro-mobility will ease this demand and therefore open up land supply. In a competitive market, this will drive land prices down, followed by a decrease in housing prices.

Local governments across the world have already begun banning certain vehicles from their city centers. For example, Madrid, Spain bars all non-resident private transportation from its city centers.<sup>12</sup> Oslo, Norway plans to permanently ban all vehicles from the city center this year.<sup>13</sup> Governments are doing this to reduce carbon emissions and congestion within their already heavily populated urban regions. These cities could begin to take advantage of the micro-mobility trend in lieu of traditional vehicles for their citizens. This would further solidify the spread of micro-mobility globally.

#### A Greener Way of Transportation

Now more than ever, people, especially Gen Z'ers and Young Millennials, are becoming conscious of the impacts that their actions have on the environment. These young people are prepared to make a commitment to sustainability and will make the sustainable choice more often than not. Micro-mobility provides them with the opportunity to reduce the carbon footprint. This aspect of the e-scooter and e-bike business model could be a driving force for its success, especially among young people.

#### The Expansion of Micro-Mobility Market Share

Expansion of the micro-mobility market has been rapid. Three of the four major e-scooter players were launched from February to May 2018, illustrating the boom. Both rideshare giants, Uber and Lyft, have made efforts to join the market, and Ford acquired Spin, an e-scooter company. Additionally, e-bike companies are seeing dramatic growth. According to the National Association of City Transportation Officials, consumers took 84 million trips on shared micro-mobility vehicles in the United States in 2018, twice the number of trips taken in 2017.<sup>14</sup> While increased regulation poses a significant hurdle to micro-mobility, the continued growth of the industry is undeniable.

<sup>&</sup>lt;sup>11</sup> https://www.marketwatch.com/story/existing-home-sales-roar-back-in-march-even-as-supply-crunch-worsens-2018-04-23

<sup>&</sup>lt;sup>12</sup> https://www.businessinsider.com/cities-going-car-free-ban-2017-8

 $<sup>^{13}\,</sup>https://www.weforum.org/agenda/2018/03/13-cities-that-are-starting-to-ban-cars$ 

<sup>14</sup> https://nacto.org/shared-micromobility-2018/

#### The Unbundling of Short to Medium Distance Transportation

Scooter companies like Bird have claimed that their main purpose is for "last-mile" transportation. Micro-mobility has essentially unbundled the first and the last few miles of a trip, or the entire trip, depending on the length. For city dwellers, specifically in cities with subpar public transportation, rideshare e-scooters represent a viable and affordable way to travel, even if it is only the first or the last mile. For businesses, last mile logistics can often make up 28% of total shipping costs.<sup>15</sup> Because the micro-mobility market offers solutions in last-mile transportation, there is potential for businesses and small delivery firms to take advantage of e-scooters, further perpetuating their popularity. Not only would this reduce costs for both the firm and the consumer, but it would reduce carbon emissions and city congestion as well.

#### A New Data-Driven Fold to City Planning

Micro-mobility has the potential to spur a revolution in city planning and the overall look of U.S. cities over the next 10 to 20 years. With built in GPS's, scooter and e-bike companies are able to track every trip. At the end of each ride, the user is shown a map of their ride, detailing length both in time and in distance. This data will be invaluable to city planners who are adapting cities due to the advent of micro-mobility. These planners will have tangible insight into the most common routes travelers take in their cities. The advent of cars caused city streets to widen and sidewalks to shrink, but micro-mobility options could lead to a reversal. In planning these modern-day cities, the data-provided by micro-mobility companies will dictate the new transportation grids. Micro-mobility is the beginning of a city planning revolution. The young people of today will likely live in cities with vastly different street and transportation makeups in the near future.

<sup>&</sup>lt;sup>15</sup> https://www.shipware.com/what-is-last-mile-logistics/

## E-Scooters: An Example of the Expansion of Micro-Mobility

Dockless scooters present an entirely new type of short-distance transportation. Riders are free to park their scooters anywhere. Starting a ride is just as easy. The rider scans the QR code located on the handlebar of the scooter, and the scooter activates. Riding off without scanning will result in a fairly jarring and unrelenting jingle to attack the rider's ears. This simple yet effective mechanism parallels the business model as a whole. There is almost no barrier to entry for any individual ride, no waiting at a curb and keeping your eyes peeled for a specific make or model. The only barrier is the availability of a scooter, which will prove to be less and less of a problem as more scooters are deployed.

#### How it works:

- Riders sign up on a smartphone app. Some require a driver's license; all require payment information.
- Using the app, riders can locate the scooters visually on the map provided on the app. Every scooter is equipped with GPS technology, allowing the app to keep tabs on all the scooters at all times. Riders can ring the scooter if they see it on the map but are having trouble finding it.
- To start a ride, the rider scans a QR code located on the handlebar from the phone app.
- Riders pay "\$1 to activate a scooter and then 20 cents per minute. Rides usually stretch from a half-mile to a bit more than a mile."<sup>16</sup>
- On a flat road, the scooters can reach speeds of about 16 mph, with a trigger on the handlebar allowing the rider to control how much "gas" they give the scooter.
- Upon completion, riders go to the app and touch "End Ride." Then the rider must take a picture of the scooter in case the next rider needs help locating it. Riders can also pause their rides. This avoids the \$1 activation charge when they come back to the scooter.
- To recharge the scooters, the rideshare companies hire contractors who drive around picking up the scooters to recharge in bulk, and later place the scooters back in popular locations.<sup>17</sup>

<sup>&</sup>lt;sup>16</sup> https://buffalonews.com/2019/02/11/transformative-or-headaches-e-scooters-may-be-coming-to-new-york/

<sup>&</sup>lt;sup>17</sup> https://www.stltoday.com/news/local/metro/inside-the-scooter-side-hustle-charging-for-lime-and-bird/article\_b2036edf-e54c-5ab7-bd1f-c668fc47ede4.html

## The Major Players

Electric scooter sharing companies are beginning to flood the market, trying to stake a claim on market share before saturation. Bird was first on the scene and was quickly followed by Lime, Spin, and Skip.



Figure 2: Major E-Scooter Companies<sup>18</sup>

Later bought by Ford for close to \$100 million.

launching in March 2018, founded by Sanjay Dastoor.

<sup>&</sup>lt;sup>18</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

## The Scooter Timeline

After Bird's initial September 2017 launch, companies started announcing its plans for electric scooter rideshare in quick succession. From February to May 2018, four separate companies announced their intention to enter the electric scooter rideshare market.<sup>19</sup> The established rideshare and automotive companies quickly took notice. In November 2018, Ford decided to buy Spin<sup>20</sup> in a deal worth almost \$100 million.<sup>21</sup> Uber has partnered with Lime<sup>22</sup>, in a deal that implemented Lime into Uber's app, allowing riders to find Lime scooters.<sup>23</sup> Uber is also reportedly interested in buying a scooter rideshare company outright; however, Bird has made it clear that it is not for sale, leaving Lime as the primary option.<sup>24</sup> Additionally, Uber recently acquired a bikesharing company, Jump.<sup>25</sup> The other rideshare giant, Lyft, is also looking to make a scooter play in an attempt to expand horizontally.<sup>26</sup> Neither has made their play yet, but their entrance into the market indicates that the first phase of market entry is likely coming to an end, and consolidation of market share is likely.



Figure 3: The Scooter Timeline

<sup>&</sup>lt;sup>19</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

<sup>&</sup>lt;sup>20</sup> https://techcrunch.com/2018/02/08/bike-sharing-startup-spin-is-getting-into-scooter-sharing/

<sup>&</sup>lt;sup>21</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

<sup>&</sup>lt;sup>22</sup> https://www.prnewswire.com/news-releases/lime-rebrands-and-announces-a-partnership-with-segway-300650581.html

<sup>&</sup>lt;sup>23</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

<sup>&</sup>lt;sup>24</sup> Ibid

<sup>&</sup>lt;sup>25</sup> https://money.cnn.com/2018/04/09/technology/uber-jump-bikes-bikeshare/index.html

<sup>&</sup>lt;sup>26</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

## Why Does It Matter?

To understand micro-mobility's leap onto the ridesharing scene, some of the key benefits that come with the business model must be examined.

- "Short, single-occupancy car trips represent 80 to 90 percent of all automobile travel."<sup>27</sup> Electric scooters are well suited for these types of trips.
- Scooters can contribute to greener cities because they have the ability to take cars off the road and provide a much greener alternative. According to Medium.com "producing electricity for five million scooters around the world would emit 370 metric tons, which is less than 2% of CO<sup>2</sup> produced by the same number of cars. Let's reduce this number by 20% for people who would have walked and for chargers picking up scooters in their cars. Now we're looking at a total amount of 13,700 metric tons of CO<sup>2</sup> mitigated by not driving a car. That's the equivalent of taking 105,000 cars off the roads around the world, each day."<sup>28</sup>
- By taking cars off the road, scooters also have the potential to decongest city roads, replacing cars for short single occupancy rides.<sup>29</sup>
- The scooter industry calls its offerings "last mile" transportation. Potential riders utilize major public transportation methods such as a subway or bus and then scooter to their final destination, or vice versa.<sup>30</sup> In this way, scooters can be seen as an extension of public transportation.
- These scooters are suited for areas with limited parking due to their dockless nature, eliminating the need to drive around looking for parking.
- They are well suited for areas not meant for heavy car-traffic, or in populated areas where traffic is congested, such as college campuses, bike trails, and busy city streets.

<sup>&</sup>lt;sup>27</sup> https://www.inc.com/magazine/201902/will-yakowicz/bird-electric-scooter-travis-vanderzanden-2018-company-of-the-year.html

<sup>&</sup>lt;sup>28</sup> https://medium.com/cleantech-rising/the-environmental-impact-of-electric-scooters-8da806939a32

<sup>&</sup>lt;sup>29</sup> https://www.inc.com/magazine/201902/will-yakowicz/bird-electric-scooter-travis-vanderzanden-2018-company-of-the-year.html

<sup>&</sup>lt;sup>30</sup> https://buffalonews.com/2019/02/11/transformative-or-headaches-e-scooters-may-be-coming-to-new-york/

Scaled up to 500 cities with electric scooter ridesharing, and taking into account the energy needed to recharge, scooters mitigate about 13,700 metric tons of CO<sup>2</sup> a day.



Figure 4: Scooter Sustainability<sup>31</sup>

Source: The Environmental Impact of Electric Scooters, 2018

## Obstacles to the Future of Micro-Mobility

Despite the advantages that dockless scooters can bring to a city, there are also considerable disadvantages including a lack of regulation, increased congestion, and limited liability. Local governments have been fighting them and their parent companies for the various issues that they create.

## Lack of Regulation & Notice

Many of the start-ups mentioned, developed their technology without consulting the governments that the business would be affecting. There was no opportunity for regulations to be created, reviewed, and passed in order to control the use of the dockless scooters. Therefore, cities became inundated with the scooters being left haphazardly with little concern for daily government functions such as trash collection and street cleaning. Additionally, local governments were concerned that without proper regulation, there would be no way for them to collect taxes or fees from the start-up companies to help maintain the city infrastructure and road quality.

## **Misuse Causing Congestion**

As the dockless scooters flooded cities across the nation without proper "stations" or "docks," they began to create the very problem that they were supposed to solve: congestion. As consumers left the scooters wherever they pleased, sidewalks and public spaces became cluttered with scooters, making the city even more congested.

<sup>&</sup>lt;sup>31</sup> https://medium.com/cleantech-rising/the-environmental-impact-of-electric-scooters-8da806939a32

#### Liability Concerns

Additionally, dockless scooters pose serious liability issues for both the local governments and those who use them. Although consumers sign a liability waiver when they use a dockless scooter, there is concern over whether or not there is any insurance coverage on these devices in case of accident or injury to the user or especially a bystander.<sup>32</sup> These scooters can reach speeds of 15-25mph, fast enough to cause life-changing injuries to any party involved in an accident. In cities where dockless scooters have been permitted, there has been an uptick in injuries and accidents related to this technology.<sup>33</sup>



Scenes such as this one led the city of Austin to suspended giving new licenses to micro-mobility companies in January.



Police officials in Austin have made a concerted effort to prevent scooters from operating on certain key streets.

Furthermore, the Center for Disease Control (CDC) released a report on May 2, 2019 detailing statistics related to e-scooters and injuries. The report found that injuries occur roughly 14.3 times per every 100,000 trips. The CDC found that head injuries were the most common type of injury (45%), followed by upper extremity fractures (27%) and lower extremity fractures (12%). The report suggested that many of the injuries could have been prevented if riders were wearing helmets and were more careful around cars.<sup>34</sup>

<sup>&</sup>lt;sup>32</sup> https://www.sutliffstout.com/grahams-blog/liability-dockless-scooters-austin/

<sup>&</sup>lt;sup>33</sup> https://www.theverge.com/2019/3/11/18260154/austin-scooters-bird-lime-uber-jump-sxsw-2019-dangerous-future-urban-transit

<sup>&</sup>lt;sup>34</sup> https://www.cnbc.com/2019/05/01/cdc-study-says-e-scooter-injuries-are-largely-preventable-with-helmets.html

# Micro-Mobility and its Implications for Generation Z and Young Millennials

People have a positive perception of dockless scooters. A study carried out by Populus Insights found that 70% of people in major cities with scooters available view them positively. The positive aspects highlighted in the survey are the scooter's ability to provide transportation without the hassle of owning a car, provide logical short transportation options, and complement public transportation.



Figure 5: Public Perception of Micro-Mobility in Major U.S. Cities

As one of the first cities to see e-scooters, San Francisco has experienced growing pains in regards to micro-mobility. Accordingly, the local government has implemented various regulations to hinder micro-mobility's growth. However, the public perception data shows that San Francisco could in fact be an outlier, likely due to the fact that it was a test market. San Francisco residents have by far the lowest opinion of e-scooters, with only 52% percent of survey respondents indicating a positive view towards the scooters.<sup>35</sup> This is a full 15% lower than the next lowest city (New York), which could mean that some of the growing pains have already started to be alleviated either by the companies themselves, or the various local governments.





<sup>35</sup> https://www.populus.ai/micro-mobility-2018-july

## The Unbundling of Transportation

Scooters appear to be more than a passing fad in transportation. Cities cannot ignore the growing influence of micro-mobility, and must find a way to work with the companies and to accommodate the scooters. Micro-mobility essentially unbundles the first or last few miles from the car, bus or train ride. The radius for parking a car is vastly expanded for drivers, as is the radius of realistic bus and train stations for riders to either hop on or hop off their choice of public transportation. Scooters provide an affordable way for people to greatly expand their radius of availability for travel, either with pure scooter rides, or a combination of modes. This at face value is a huge positive, but it also brings into play a lesser discussed benefit of micro-mobility: transportation equity. Purchasing a car is a pricey endeavor and one that is getting more and more difficult for recent college grads and people of lower income. And coinciding with this, Populus Insights found that there is an overall negative relationship between income and perception of e-scooters.<sup>36</sup>





#### Source: Populus Groundtruth, 2018

The explanation behind this perception is likely very simple: scooters are much less expensive to use than cars. This is only compounded by the ownership costs of cars. In addition to making the scooters appealing to new graduates, this factor will also heavily contribute to student adoption of micro-mobility options. College students will no longer be limited to a one- to two-mile radius of their dorm or apartment and will no longer have to settle for what can be an expensive Uber or Lyft trip across campus.

## The Repurposing of City Space

With the student debt crisis, higher rents, uncertain employment prospects, and the tightened mortgage market, young people are buying homes at a much lower rate than older generations. According to the Urban Institute, the homeownership rate for millennials was 37 percent in 2015, eight percentage points lower than the two previous generations at the same age.<sup>37</sup> A land supply crunch has allowed property developers to purchase land to flip at a high margin for apartment rentals and business leasing. Similarly, housing prices are going up in part due to the tightened mortgage market. Using San Francisco as an example, the distribution of home sale prices from 2007 to 2017 shifted significantly towards the more expensive end of the cost spectrum.<sup>38</sup>

<sup>&</sup>lt;sup>36</sup> https://www.populus.ai/micro-mobility-2018-july

<sup>&</sup>lt;sup>37</sup> https://www.urban.org/research/publication/millennial-homeownership

<sup>&</sup>lt;sup>38</sup> https://www.urban.org/urban-wire/whats-preventing-millennials-buying-homes





This trend is not limited to only San Francisco, however. The U.S. Federal Housing Finance Agency keeps an index of housing prices. Figure 9 shows how indexed housing prices have been increasing since 2012 and are now at an all-time high. Again, a large driver of this is a land supply crunch.39



Figure 9: House Price Index for the United States, 2018<sup>40</sup>

<sup>&</sup>lt;sup>39</sup> https://www.marketwatch.com/story/existing-home-sales-roar-back-in-march-even-as-supply-crunch-worsens-2018-04-23

<sup>40</sup> https://fred.stlouisfed.org/series/USSTHPI

Two hundred square miles are dedicated to parking in Los Angeles.<sup>41</sup> This is in a city encompassing a total of 502.7 square miles, meaning that about 40% of Los Angeles is reserved for parking.<sup>42</sup> E-scooters provide cities with the opportunity to repurpose some of this land due to lower demand for parking. This increase in land supply will drive down land prices, which could carry over to lower housing costs in cities, something that young people need.





## Impact on the Job Market

Where does micro-mobility fit into the job market of today and the future?

Micro-mobility companies have seen heavy early investment from investment institutions as well as some of the established transportation companies like Ford. As of January 2019, four micro-mobility companies were able to raise over \$100 million in investments, with Bird and Lime seeing funding similar to giants like Lyft and Uber.





Source: The Electric Scooter Wars of 2018

<sup>&</sup>lt;sup>41</sup> https://www.pcmag.com/news/364492/how-scooters-and-the-data-they-collect-can-transform-citie

<sup>&</sup>lt;sup>42</sup> https://www2.census.gov/geo/docs/maps-data/data/gazetteer/2010\_place\_list\_06.txt

<sup>&</sup>lt;sup>43</sup> https://techcrunch.com/2018/12/23/the-electric-scooter-wars-of-2018/

By observing the occupational data on three e-scooter companies, Lime, Spin and Skip, valuable insight can be gained into what kind of jobs these newly established micro-mobility companies are creating. Figure 12 highlights the top occupations posted from March 2018 to March 2019 among these three organizations. The top occupations include computer user support specialists, general and operations managers, maintenance and repair workers, and business operations specialists, all other. It appears that these companies which are built on a mix of hardware and software are still focusing on user experience, but now have a need for business professionals as well as customer service professionals and those who are able to fix and maintain their product. As these companies scale, they appear to be looking for professionals with the business knowledge to bring efficiency to their supply chain and avoid the costly mistakes that are routinely made when companies rapidly expand. Public relations specialists and public relations and fundraising managers are also included in the top posted occupations, likely as micro-mobility companies now need to leverage a strong public perception into effective lobbying among consumers and city officials as well as to boost participation numbers.

Occupation (SOC)	Total/Unique (Mar 2018 - Mar 2019)	Posting Intensity	Median Posting Duration
Computer User Support Specialists	1,058 / 134	8:1	13 days
General and Operations Managers	248 / 113	2:1	23 days
California Maintenance and Repair Workers, General	509 / 105	5:1	8 days
Business Operations Specialists, All Other	451 / 96	5:1	25 days
Customer Service Representatives	110 / 54	2:1	41 days
Software Developers, Applications	158 / 53	3:1	40 days
First-line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors	202 / 38	5:1	21 days
Public Relations Specialists	61 / 34	2:1	36 days
Marketing Managers	57 / 31	2:1	17 days
Public Relations and Fundraising Managers	42 / 23	2:1	12 days

#### Figure 12: Top Posted Occupations by Select Micro-Mobility Companies

Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Figure 13 on the following page illustrates the top 10 hard-skills sought by Lime, Spin, and Skip from March 2018 to March 2019. As the three companies continue to grow, they appear to be placing an increased emphasis on operations management, warehousing, and mechanics, while still focusing on the core software and hardware requirements necessary to maintain their micro-mobility offerings.



Figure 13: Top Hard Skills for All Job Types Sought by Select Companies

While the three previously highlighted companies provide insight into specific micro-mobility companies, it is important to also have a broader understanding of the micro-mobility landscape. To achieve this, job posting keyword data was examined. Nationwide, from March 2018 to March 2019, there were a total of 35,726 job postings with the keywords "Micro-Mobility", "E-Scooter", or "Bikesharing", with 8,632 of them being unique. The intensity for these postings was 4:1, the same as the national average. Posting length was 30% longer than the average for the region, meaning that many of these postings require a more specific skillset and therefore companies will wait longer for the right candidate.

## Figure 14: Job Postings Overview that Contain "Micro-Mobility", "e-Scooter", or "Bikesharing" Across All Occupations in the United States



Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Figure 15 provides a geographic footprint of the job posting overview displayed in Figure 14. California had the highest number of unique postings (1,865), followed by Texas (769), and New York (759). This could be due to the fact that the first dockless e-scooter rollout was in Santa Monica and the prominence of the tech industry within the state,<sup>44</sup> and Texas has multiple major markets including Austin, Houston, and Dallas. The Virginia/Maryland/D.C. area is also poised for growth due to the fact that the D.C. Board of Transportation recently granted provisional permits to eight micro-mobility companies.<sup>45</sup>

Figure 15: Job Postings by State that Contain "Micro-Mobility", "e-Scooter", or "Bikesharing" Across All Occupations in the United States



Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Figure 16 on the following page lists the companies with the most job postings containing the selected keywords from March 2018 to March 2019. Ingram Micro had the most unique postings (1,028), followed by Lime (628), and Limey Bikes (487). In addition to companies that are focused on micro-mobility, software, and information technology, the list also includes companies related to cybersecurity. Cybersecurity companies are gearing up for an increase in demand for their services specifically related to micro-mobility. Many of these companies have positions dedicated to probing and identifying weaknesses within web and mobile applications as well as software and hardware packages. It is likely that some of these organizations are focusing their efforts on the relatively young industry of micro-mobility applications and providing security recommendations.

<sup>&</sup>lt;sup>44</sup> https://www.curbed.com/2018/12/7/18130247/santa-monica-uber-lyft-bird-lime-scooter-bike-app

<sup>&</sup>lt;sup>45</sup> https://dc.curbed.com/2019/1/4/18168928/dc-electric-bikes-scooters-mobility-transportation-transit

#### Figure 16: Job Postings by Company that Contain "Micro-Mobility", "e-Scooter", or "Bikesharing" Across All Occupations in the United States

Company	Total/Unique (Mar 2018 - Mar 201	9) Posting Intensity	Median Posting Duration
Ingram Micro Inc.	2,825 / 1,02	28 3:1	42 days
Lime	1,905 / 62	28 3:1	20 days
Limey Bikes Inc	1,213 / 48	87 2:1	44 days
Defense Point Security, LLC	1,915 / 46	69 4:1	54 days
Uber Technologies, Inc.	481 / 19	91 3:1	22 days
Oracle Corporation	657 / 17	79 4:1	11 days
Deloitte LLP	492 / 14	42 3:1	27 days
Kapsch Trafficcom Inc.	478 / 12	29 4:1	38 days
Siemens AG	703 / 11	19 6:1	51 days
COMPASS GROUP PLC	528/5	91 6:1	59 days

Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Figure 17 examines the top job titles for postings containing a selected keyword across all occupations from March 2018 to March 2019. Some of the most common titles relate to software and technology development including software engineers (400 unique postings), security engineers (136), and Java developers (127). Operations managers, marketing managers, sales managers, and product managers are in the top 10 job titles, supporting the idea that micro-mobility companies are also looking for business professionals.

#### Figure 17: Job Postings by Job Title that Contain "Micro-Mobility", "e-Scooter", or "Bikesharing" Across All Occupations in the United States

Job Title	Total/Unique (Mar 2018 - Mar 2019)	Posting Intensity	Median Posting Duration
Software Engineers	3,073 / 400	8:1	46 days
Operations Managers (Management)	593 / 278	2:1	28 days
Product Managers (Computer and Mathematical)	716 / 188	4:1	11 days
Operations Specialists (Business and Financial Operations)	733 / 172	4:1	48 days
Maintenance Mechanics	494 / 150	3:1	32 days
Security Engineers	760 / 136	6:1	58 days
Java Developers	832 / 127	7:1	36 days
Marketing Managers (Management)	285 / 106	3:1	33 days
Sales Managers (Management)	368 / 99	4:1	36 days
Product Managers (Management)	555 / 99	6:1	45 days

Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

Figure 18 looks at the in-demand hard skills in job postings across all occupations that contained a micro-mobility keyword from March 2018 to March 2019. Skills related to software and technology development have the strongest demand including Agile software development (14% of job postings), software engineering (11%), Java (11%), application programming interface (9%), JavaScript (8%), and cyber security (8%).

#### Figure 18: Job Postings by In-Demand Hard Skills that Contain "Micro-Mobility", "e-Scooter", or "Bike sharing" Across All Occupations in the United States



Source: Economic Modeling Specialists International (EMSI) 2019.1 Dataset

## Implications for Higher Education

As the new economy evolves, many industries will be disrupted. The impact of micro-mobility on higher education advances will be felt across many industries.

- Manufacturing and the Sciences: Institutions of higher education appear to be keeping pace with Science, Technology, Engineering and Mathematics (STEM) education at the degree level, but advances in manufacturing and engineering approaches may arrive earlier than the new degree approval process for many institutions. Therefore, graduate certificate and training opportunities may arise in advanced manufacturing processes, supply chain and logistics, GPS tracking and location analysis, automation, robotics and other topics.
- Smart Cities: With Generation Z and young Millennials favoring alternative modes of transportation, the question remains as to how it might impact our cities. It is likely that alternative travel routes may be built to accommodate them for safety and efficiency purposes. As a result, there may be greater opportunities around urban planning, land use, the impact of 5G and the digital city, policy and energy management, Internet of Things (IoT), and the potential redevelopment of commercial facilities for community or residential use. New courses within existing engineering, public policy, business, urban planning, architecture and other programs could and should be built to address many of these inevitably evolving topics. Again, highly specialized certificates and workshops may hold greater value, as many employed in these fields already hold graduate degrees.
- **Healthcare:** Early indicators suggest that micro-mobility efforts are likely to improve the health of our society. As a result, educational opportunities in healthcare may arise around reducing pollution or measuring impacts, adoption of new models of health management, greater development and use of personal health technologies and fitness tracking, data analytics, and other topics. While degrees currently exist around the management of health, certificates and workshops around these evolving areas may hold promise.

Other industries will certainly be impacted. These three above are just examples that require college and university leaders and visionaries to strategically plan for the future, as the future is closer than many think.