White Paper

Self-Service Bicycle Rental
(Bicycle Ride-Share)

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Introduction: Self-Service bicycle rental (bicycle ride-share)

Self-Service bicycle rental, or **bicycle ride-share,** or a **bicycle-sharing system**, or **public bicycle system** in the U.S., is a service made available for shared use to individuals on a short-term basis for a price or fee.

Many bike share systems allow people to “rent” a bike from a "dock" and return it at another dock belonging to the same system.

Docks are special bike racks that lock the bike, and only release it by computer control. The user enters payment information, and the computer unlocks a bike. The user returns the bike by placing it in a dock, which may be at the same, or a different station, which locks it in place.

Other systems are dockless, and the user has or downloads an app that allows them to engage, pay for and unlock a bike using their smart phone, which also locks the bicycle at the users’ destination.

For many systems, smartphone mapping apps show nearby available bikes and open docks for single or multiple bike share systems. The majority of systems collect *data* about the user and metrics about each trip using a bike from the system and stores the data on a server or on the cloud for subsequent analysis.

The Self-Service bicycle rental, or bicycle-sharing system industry was founded in Europe and has rapidly spread to Asia and gained traction in the U.S. between 2007 and 2008.

By 2018 two trade associations represent what is projected to be a significant part of a $200 billion to $300 billion Micromobility business in the U.S. by the year 2030.

National Association of City Transportation Officials (NACTO), www.nacto.org

Founded in New York City in 1996, NACTO is a not-for-profit association of 68 major North American cities and 11 transit agencies formed to exchange transportation ideas, insights, and practices and cooperatively approach national transportation issues, to conduct research and gather data and information, and produce an annual conference.

NACTO’s mission is to build cities as places for people, with safe, sustainable, accessible and equitable transportation choices that support a strong economy and vibrant quality of life.

North American Bike Share Association (NABSA). www.nabsa.net

NABSA is a not-for-profit trade association founded in 2014 to connect the companies designing, selling (biding) and the governmental entities issuing requests for bids, purchasing and operating bike share and Micromobility systems in North America. NABSA also supports and promotes shared alternatives to traditional transportation.

There are currently 87 members, including 4 companies from the traditional bicycle and ebike business, Uber. Lyft and 30 city, county and state governments and agencies. NABSA produces an annual conference that hosted over 300 attendees in 2018.

2018: The Year of Micromobility

> Micromobility = currently defined as *urban transport in sub 500kg (1,102.3 pound) vehicles, that are human-powered, electrically assisted and electrically powered.*

During 2018 the American bicycle business and related industry changed profoundly as the economics and supply chain dynamics of the traditional business were swamped, engulfed and absorbed by the larger transportation and mobility sectors as they evolved and focused on Micromobility.

- Micromobility has already disrupted the automobile industry and has started to disrupt transportation and transport.

- Micromobility offers some of the best city-based transportation mode options because they are the fastest way across town and can be parked just about anywhere.

    - 50 to 60-percent of all passenger trips are 8 kilometers (5-miles) or less.

    - Micromobility, in the form of human-powered and electric assist bicycles and electric scooters are providing eco-friendly “last-mile” solutions.

Dockless pedal (non-electric) ride share bikes, which rapidly spread like wild-fire across the U.S. in 2016-2017 – have largely disappeared from American cities, with just 3 million trips in a handful of cities in 2018.

Ebikes emerged as a popular option, accounting for 6.5 million trips in 2018, 6 million in dockless systems and 500,000 in station-based systems.

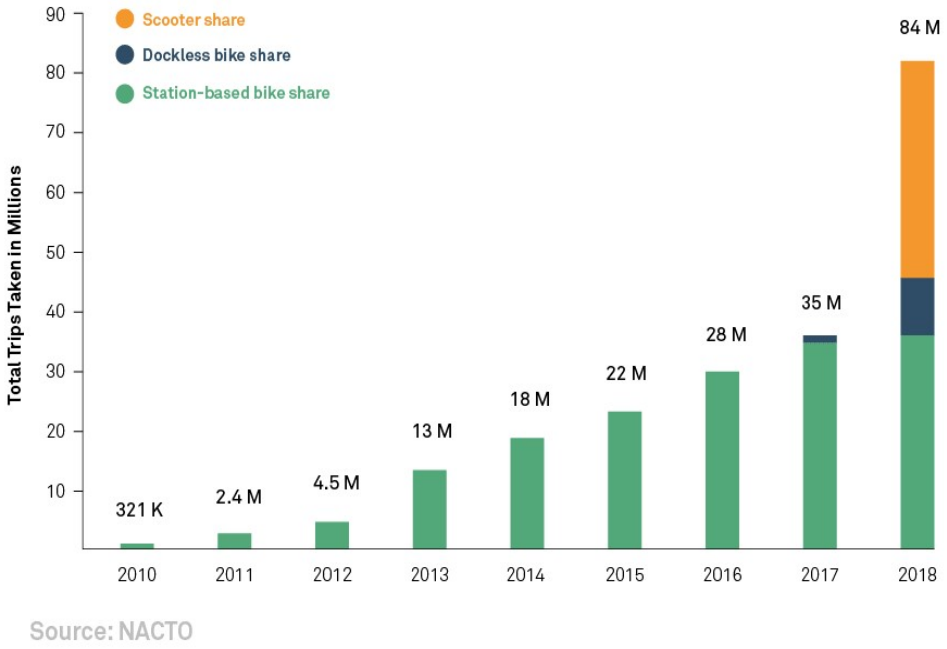
Shared Micromobility has evolved and grown rapidly, far quicker and with greater growth than the traditional American bicycle business – and part of the shared Micromobility evolution has been the rapid growth of electric scooters.

In 2018 Americans took 84 million trips on Shared Micromobility, more than double the number of trips in 2017. 38.5 million or 46-percent of this total number of trips in 2018 were made on shared e-scooters.

Chart C shows the rapid growth of shared e-scooter, dockless pedal and electric assist and docking station pedal and electric assist over the nine-years from 2010 through 2018.

Chart C

84 Million Trips on Shared Micromobility in 2018



Source: NACTO

What is Shared Micromobility?

According to NACTO Shared Micromobility "…encompasses all shared-use fleets of small, fully or partially human-powered vehicles, such as bikes, e-bikes and e-scooters. All fit inside the definition of Micromobility that we presented previously.

It is possible that the traditional bicycle business in the U.S. would have resisted this definition and the rapid changes that support it – if it wasn't for the fact that the changes have attracted three groups of very interested and involved brands and companies from the electric bicycle, automobile ride-share and automotive sectors.

Uber, Lyft and Ford have all made recent acquisitions in Shared Micromobility and Bosch, along with Jump, owned by Uber, and Motivate, owned by Lyft are members of the North American Bike Share Association.

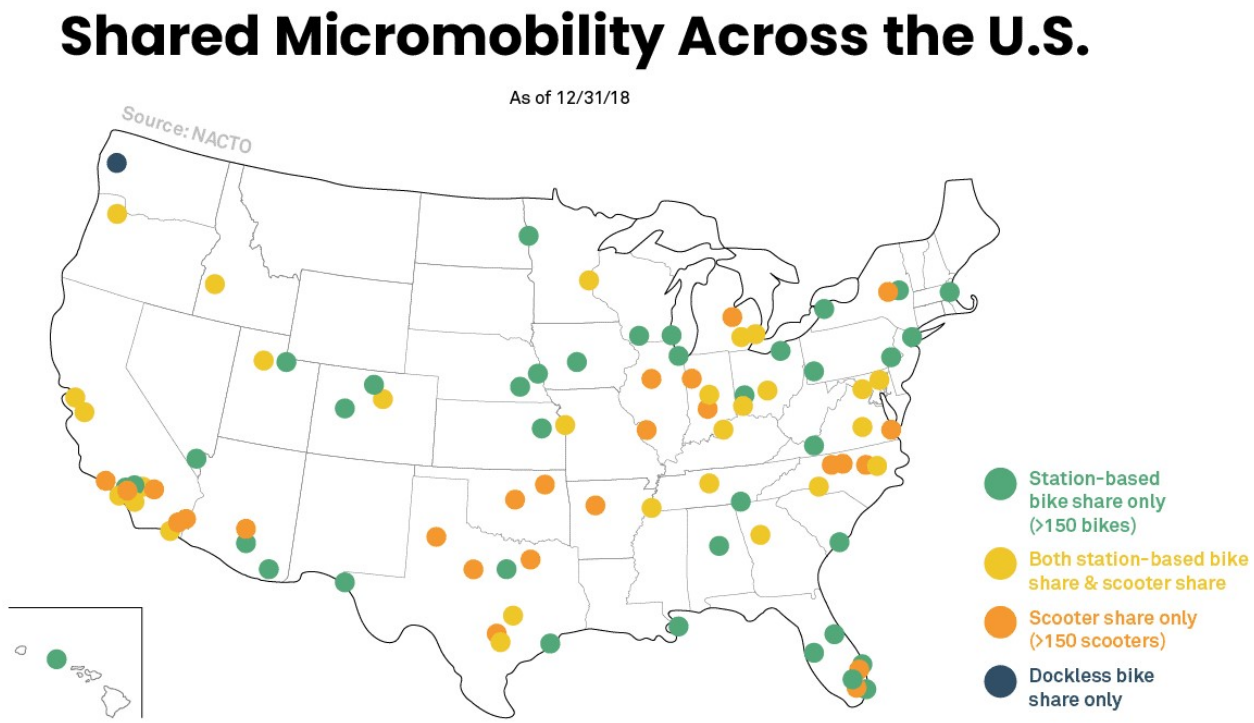
In 2918, Americans took 36.5 million trips on station-based bike share systems and as we have already referenced, 38.5 million trips on shared e-scooters.

According to NACTO since 2010 Americans have taken 207 million trips on shared bikes and e-scooters.

Chart D shows the locations in the United States of the 55 docking station based bike share systems with 150 or more bikes (in green), systems with both docking station

based bike & e-scooter share (in yellow), e-scooter share only with 150 or more e-scooters (in orange), and dockless bike share only (in blue).

Chart D



Source: NACTO

History in the U.S.

One of the first community bicycle projects in the United States was started in Portland, Oregon in 1994 by civic and environmental activists. It took the approach of simply releasing a quantity of bicycles to the streets for unrestricted use. While Portland's *Yellow Bike Project* was successful in terms of publicity, it proved unsustainable due to theft and vandalism of the bicycles.

The *Yellow Bike Project* was eventually terminated and replaced with the *Create A Commuter* (CAC) program, which provides free secondhand bicycles to certain preselected low-income and disadvantaged people who need a bicycle to get to work or attend job training courses. Since 1994, many community projects around the country have attempted programs similar in nature to the *Yellow Bike Project*, most of which were abandoned for the same reasons the original project was terminated.

Outside Europe, bike-sharing finally began to take hold in 2008, with new programs in Brazil, Chile, China, New Zealand, South Korea, Taiwan, and the U.S. By the end of

2007, there were about 60 bike-ride share programs globally. By the end of 2008, there were about 92 programs.

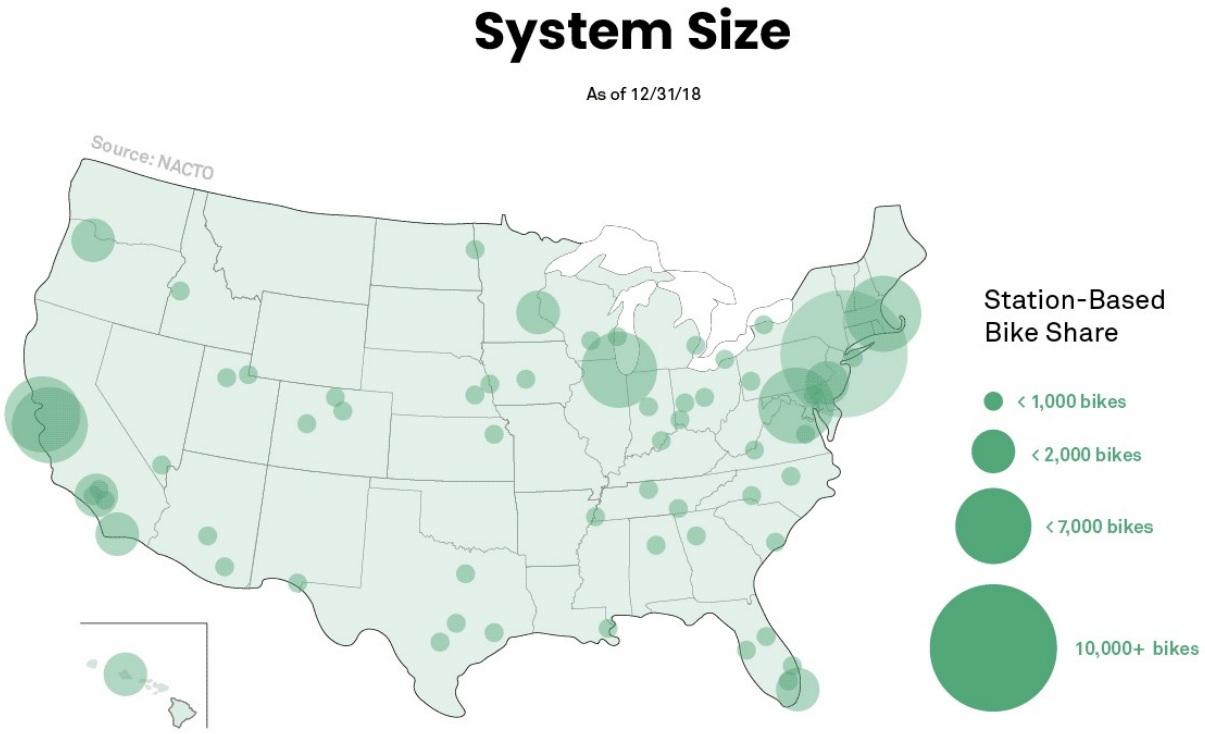
Bike share technology has evolved over the course of decades since the 1990's, and development of programs in Asia has grown exponentially since 2008. Of the world's 15 biggest public bike share programs, 13 are in China. In 2012, the biggest are in Wuhan and Hangzhou, with around 90,000 and 60,000 bikes respectively.

In the U.S. bike share began to gain popularity in 2007-2008 and by 2010 there were 4 to 5 systems, defined as having at least 10 stations with docks and 100 ride-share bicycles.

By 2018, as bike share evolved to Micromobility NACTO reports 55 systems with at least 10 stations and 100 ride-share bicycles from which people took 28,000,000 trips.

Chart E shows the relative size of the docking station-based bike ride share systems in the United States.

Chart E



Source: NACTO

Docking Station Systems

Frequent reference has been made to Docking Stations and Station-Based ride share. The picture below illustrates what a Bike Share Station-Based system with Docking Stations looks like in the real world.

Dockless Systems

We have also made frequent mention of Dockless Systems, and this picture illustrates what Dockless bike ride share system looks like.

What the pictures don't show are the electronics and technology built into each ride share bicycle, both for docking-stations systems and for dockless systems. Both types of ride-share bikes are designed and manufactured specifically for self-service rental, and both types incorporate communication, GPS and connectivity technology.

The docking-station bikes, both pedal powered and electric assist incorporate a locking system that mates to the docking-station design and communicates with the docking stations in the system as well as the systems servers, whether located in a central "back-room" server farm or on the cloud.

Docking-station systems are typically solar powered and have also been updated to communicate with smart phones utilizing APP's. The systems process credit, debit and public transit cards through smart phones and kiosks at each station and collect data on

each user and metrics on each ride they take as well as logging ride and use metrics for each individual bike.

Dockless system bikes have essentially the same communication and connectivity technology built into them as their docking-station bike share cousins, but they a smart phone linked by an APP to upload a debit, credit or public transit card to the system, which unlocks the bike so the user can be on their way.

Built in GPS tracks and records the ride and stores the data, just like the docking-station system, except the dockless system software was originally designed to collect even more user and bike data than the docking-station systems. The docking-station systems have been acquired and had infusions of capital – so their hardware, APPs, firmware and software have all been recently upgraded.

The recent upgrades have included the introduction of electric-assist and dockless bikes to established docking-station systems and some of the dockless bikes have the hardware to lock into a docking station if appropriate.

E-scooters have all the technology of a dockless ride-share bike built into them and are engaged, or rented, unlocked and locked with an APP on a smart phone with the same GPS tracking and reporting functionality of ride-share bike systems.

In addition to the obvious differences between scooters and bikes, ride-share e-scooters are less expensive, resulting in a lower investment for system suppliers and system operators.

It is estimated that a docking-station costs $12,000 to $18,000 for ten bikes, including the cost of the kiosk and solar power grid. The share-bikes for a docking-station system are estimated to cost $800 to $1,000 each.

Dockless ride-share bikes are estimated to cost $600 to $800 each, not including any attendant “back-room” costs.

An e-scooter is estimated to cost $400 to $750.

How does a bike / scooter ride-share system make money?

Start by separating the system operator from the system supplier or provider. The bike / scooter ride-share system operator is typically a municipality, county or a sub-division of a local governmental agency or a university or collage. There are a few large corporations that seek bike / scooter ride-share systems for their campuses as well.

The operator works with an engineering firm and/or consultant to design and draw-up the specifications, operating and revenue plan for the bike / scooter ride-share system and puts it to a vote, and if approved, issue an RFB, or request-for-bid.

The system suppliers or providers, most of which are listed in this section, respond to the RFB and submit their bids – that include, but are not exclusively, the equipment, hardware, software and annual operating costs.

The operator selects the bid that meets their requirements and seeks authorization to contract with the supplier or provider of choice.

The selected supplier, who now has a contract with the operator and proceeds with installation of the bike / scooter ride-share system and typically hires local employees or independent contractors to manage and run all aspects of the system as the contractor to the operator.

It is up to the operator, the municipality, county or a sub-division of a local governmental agency or a university or collage, to establish the user price and fee structure for the bike / scooter share system, and further, to determine if they make a profit or not on what is now a part of the public transportation system available to the public or students.

The contracted supplier makes its profit on the sale of the system hardware, equipment, software, installation, and ongoing operation of the bike / scooter ride -share system, including the maintenance and "back-room" operating costs.

There are systems that have failed and gone bankrupt and out of business, but the cash-flow and profit made by the contracting suppliers has been the underlying reason multi-billion dollar companies like Lyft and Uber have recently made significant acquisitions in the bike / scooter systems supply side, and is the reason one of the leading consulting practices in the US. has projected the Micromobility business to reach revenue of $200 billion to $300 billion in the U.S. alone by the year 2030.

Some Old and Mostly New companies and brands attracted to bike / scooter ride share in the U.S.

There are at least ten companies competing for the business of cities, counties, universities and colleges and private corporations for a piece of the growing bike / scooter ride-share market, including, but not limited to:

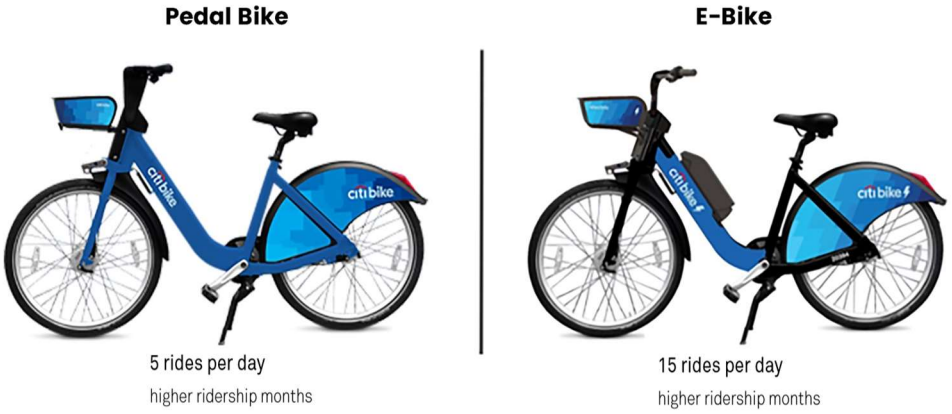
B-Cycle (owned by Trek Bicycle Company)
Motivate (owned by Lyft)
Jump (owned by Uber)
Lime Bike
Zagster
Spin
Clear Channel Outdoor
PBSC Urban Solutions

Of this list Motivate, owned by Lyft, Jump, owned by Uber, B-cycle, owned by Trek and Lime Bike who is independent but well financed represent what appear to be the major players.

While not yet competing with companies and brands on this list, the Ford Motor Company purchased GoBike that operates a bike ride-share system in the Oakland, California area.

Types and styles, including electric

Docking Station Share Bikes



While the previous pictures give an idea of the types and styles of share bike and scooters for docking systems, the pictures above provide a much better look at both pedal-only and electric assist bikes designed for docking station share systems. Keep in mind that these bikes, with all their technology are estimated to cost $850 to $2,500 each.

Data from the National Association of City Transportation Officials (NACTO) shows that were ebikes are available they average 15 rides per day during higher ridership months compared to 5 rides per day for pedal only ride-share bikes from the same system.

The pedal bikes, e-bikes and e-scooters designed for dockless ride share systems are shown in the following pictures. The estimates for the costs range from $600 to $800 for pedal only and $900 to $2,650 for a dockless ride share ebike while the estimated cost of ride-share e-scooters is between $400 and $500 each.

Dockless System Ride Share Bikes & E-Scooters

Pedal Bike

E-Bike

E-Scooters

Law and regulation

There doesn't seem to be a great deal of controversy about Docking Station bike-share systems, and since they are mostly integrated into municipal public and mass transit systems legal and regulatory issues seem to be considered and resolved when the addition, inclusion or expansion of bike / scooter ride-share is first propose and considered.

NACTO does provide a complete set of Regulatory Guidelines that members and non-members can obtain and consult.

The regulatory and legal landscape around dockless bike share has seen more controversy over the last year - but has seemed to abate with the withdrawal of the Chinese based companies from the North American market.
With about eighteen to twenty-four months of existence, one U.S.- focused Chinese company, BlueGoGo, filed for bankruptcy, and others have ceased operations in the U.S.

The Chinese reinvented dockless bike ride share, incorporated current technology that focused on *data collection* and grew exponentially in China in 2016 and 2017 and at point in 2017 there were no less than seven Chinese dockless bike ride share brands trying to establish themselves in the U.S. including the two largest, MoBike and Ofo, and at least four domestic start-ups following the Chinese business model.

The Chinese dockless bike ride share companies were intent on flooding U.S. cities with large quantities of dockless bike ride share, just as they had done in China. However, they soon ran headlong into U.S. regulation and law and found themselves involved in expensive legal, regulatory and legislative battles that they had never experienced in China.

By the end of 2018 all seven of the Chinese dockless bike ride share companies had left the U.S. market – but they taught the domestic start-ups some valuable lesions, and the largest, Lime Bike (www.limebike.com) attracted significant capital investment, expanded into e-scooter share and grew its network of systems in the U.S. by working within state and local laws and regulations.

They also were a wake-up call to the more traditional docking station system suppliers who quickly made optional dockless bike ride share, electric bike ride share and e-scooters available in markets were there was both a fit and new start-up competition.

Expected Growth of the Micromobility Ride Share Industry
With strong year-on-year growth since 2010, bike / scooter share is gaining hold as a transportation option in cities across the U.S. Significant ridership in an ever-widening collection of cities and clear indications of cross-over use between bike / scooter ride-share and traditional bus and rail transit indicate that Micromobility can provide an essential “last mile” transportation solution for more people in a growing number of U.S. cities.

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