

## Bike Library

A bike library is the simplest system type to deploy and requires the least technological sophistication and upfront capital. Bike libraries usually involve a fleet of bicycles that are rented out at a limited number of staffed kiosks. While bikes may be branded, they are unlikely to have checkout or tracking technology. Check-out and check-in of bikes must be handled by staff members. The lack of automation limits the size of systems that adopt the bike library model.

In terms of cost, bike libraries can range from the low end, where personal use bikes can be purchased for rent, to the higher end, where a specific type of bicycle could be purchased and used uniformly across rental locations. Bike share bicycles (as opposed to store purchased bikes) have the advantage of working for a wider range of riders and for long term outdoor use on varied surfaces. Bike share bicycles could also accommodate a formal check out process that tracks ridership. With either type of bike, a check-out kiosk would require concrete pads with bike racks on them. Then potential users retrieve a key to access the bike from a system staff member.



### SYSTEM FEATURES

In-depth data tracking	—
Opportunity for corporate partnerships	—
Potential for high ridership	—
Real time route tracking	—
Local bike share system compatibility	—
Compatible with equity programs	—
App available	—
Heads-up display with bike directions	—

### PROS

- Lower capital cost to start
- Good way to have a program also work for children

### CONS

- Difficult to track usage data
- Difficult to get users to sign waivers
- Low chance of revenue
- Lower chance of corporate partnerships
- Requires staff support
- Only accessible during hours of operation
- Bike libraries are often stocked with department store quality bikes, which gives the end user a lesser quality ride that will cost more to maintain
- Not compatible with regional bike share system

## Station-Based Bike Share

Most bike share systems that have deployed between 2006 and 2016 rely on “station-based” technology. These systems are made up of a network of automated stations where bicycles are docked. To check out a bike, a user pays with a credit card at an automated kiosk attached to the station. Users who have previously purchased a membership can use their member card to check out, either at the kiosk or simply by tapping the card to a reader on a bike dock. The system will then unlock a bike for the user to take.

With station-based bike share, it is easy to identify where bikes will be located, both for the user or the bike sharing agency. By having the physical kiosk in a permanent location, it allows visitors to simply walk up to a station and use a bike at any moment without having to be registered. Station based bikes can unlock in response to a credit card, app, or a member key, providing a secure locking point to deter theft and safely transmit usage and billing information.



### SYSTEM FEATURES

In-depth data tracking	+
Opportunity for corporate partnerships	+
Potential for high ridership	+
Real time route tracking	~
Local bike share system compatibility	+
Compatible with equity programs	+
App available	+
Heads-up display with bike directions	-

### PROS

- Most common form of bike share so many people will already be somewhat familiar
- Kiosks are user friendly
- Data tracking for trip routes as well as user health and demographics
- Not limited to hours of operation
- Can be compatible with regional bike share system

### CONS

- Capital heavy to start
- Tends to perform better in more densely populated areas
- Requires linear space in popular areas along with electrical access or a clear sky for solar power

## Smart Bikes

Smart bike systems move away from physical stations and kiosks and integrate bike share technology directly into the bikes. Using a mobile phone or website interface, the location of available bicycles are mapped. A user reserves a bicycle and receives a code that they enter on a keypad on the bicycle. The bicycle is then unlocked for use. The rider returns the bicycle to another location when finished, locks it, and “checks in” the bike via the app or a button on the bike.

Because the technology for smart bikes is integrated into the bicycle itself, costly docking infrastructure is not required. Instead of physical stations, parking locations for smart bikes can be managed through digitally geofenced “hubs,” which are often simply public bicycle racks. Locations for parking smart bikes can be easily moved, expanded, and adapted to meet the needs of the system. Smart bike technology is becoming more popular around the country because it combines lower capital costs, increased flexibility, and robust data tracking tools.

### SYSTEM FEATURES

In-depth data tracking	+
Opportunity for corporate partnerships	+
Potential for high ridership	+
Real time route tracking	+
Local bike share system compatibility	+
Compatible with equity programs	~
App available	+
Heads-up display with bike directions	+



### PROS

- **Less capital heavy to deploy than station based bike share**
- **Active GPS gives detailed rider data and tracks bikes**
- **Lock up anywhere**
- **Geofencing return zones is simple and inexpensive**
- **Kiosks can expand accessibility and visibility, but not required**

### CONS

- **Requires a constant data connection for every bike**
- **Smartphones not required, but makes system much easier to use**

## Electric Assist Technology

Electric assist bikes are the fastest growing segment of the bicycle industry. With electric assist technology, bicycles have an electric motor that helps propel a rider as they pedal. Electric assist bikes only give assistance while the user is pedaling, so there is no throttle. Riders must pedal to get a benefit. Electric assist can give users an extra boost to overcome hilly topography or wind, and make it easier for work trips where riders must arrive at their destination without being tired or perspiring.

Smart bike technology can be integrated into an electric assist bicycle, but some docking stations are required for recharging. The electric-assist motors make this technology more expensive than a typical bike share bicycle.



### SYSTEM FEATURES

In-depth data tracking	+
Opportunity for corporate partnerships	+
Potential for high ridership	+
Real time route tracking	+
Local bike share system compatibility	+
Compatible with equity programs	+
App available	+
Heads-up display with bike directions	+

### PROS

- Active GPS gives detailed rider data and tracks bikes
- Pedal assistance for riders removes several barriers that inhibit ridership
- Accommodates and encourages more types of riders
- Kiosks can expand accessibility and visibility, but not required

### CONS

- Most capital heavy of the bike share systems to deploy
- Requires docks for charging

## Smart Locks

The smart lock technology consists of a GPS-enabled lock that is put onto any bicycle. Most smart lock programs are designed for private use rentals. Citizens can sign up and acquire a lock from a vendor and then put their personal bike out for rent. This could be replicated on a public program level, but there is not much precedent of success for this type of use for a public bike share system.

A smart lock system is more flexible than some other bike share system options. Locks and bikes can be located anywhere, and any type of bicycle provided by anyone can be integrated into the system. However, there are tradeoffs including lack of uniform safety and maintenance standards, and limited opportunities for corporate partnerships (there are no stations, kiosks, or on-bike space for ads, info, or system marketing).



### SYSTEM FEATURES

In-depth data tracking	+
Opportunity for corporate partnerships	-
Potential for high ridership	~
Real time route tracking	+
Local bike share system compatibility	-
Compatible with equity programs	-
App available	+
Heads-up display with bike directions	-

### PROS

- Active GPS gives detailed rider data and tracks bikes
- Low cost

### CONS

- No maintenance regulation
- Bikes may not be uniform
- Not a proven formula on any large scale
- Locks not attached to bikes, could be removed
- Little opportunity for corporate partnership
- Not compatible with regional bike share system
- Generally requires a smartphone

## What is Dockless Bike Share?

As the name suggests, dockless bike share does not require a dock for the bicycle to be returned to. These bikes can be returned and picked up from anywhere. Some dockless bikes, including smart bikes (described elsewhere in this study), have built in locks that allow them to be fixed to bike racks and other predetermined pick-up and drop-off locations. There are also a class of dockless bike share bikes which are not locked up to a rack or dock at all, but instead lock inside the rear wheel, meaning the bike remains untethered from physical objects such as a bike rack. By contrast, kiosk-based bike share requires users to pick up and return bikes from designated stations, in which bikes are locked into stationary docks.

## Dockless Bike Share Benefits

Dockless bike share, including “smart bikes,” offers several advantages over station-based bike share:

**Cost:** Capital costs for equipment tend to be lower for dockless systems than station-based systems.

**Bikes First:** Dockless systems allow bike share systems to focus investments more directly in bicycles for end users, rather than support infrastructure. This supports more bikes and more users for a similar level of investment.

**Coverage:** Because they can be parked anywhere, dockless bike share bikes can provide greater geographical coverage, with greater flexibility for users who do not need to return bikes to physical stations.

## Dockless Bike Share Concerns

As dockless bike share systems expand across the United States, communities are learning important lessons about potential drawbacks of dockless bike share systems:

**Business Model:** Some for-profit vendors of dockless bike share have demonstrated business model sustainability issues including:

- Relying heavily on short-term venture capital funding
- Selling user data by collecting information on user phones
- Creating deposit schemes that require users to deposit money into an account for the bike share company to invest and earn interest, like an unregulated bank
- A focus on market-share growth that does not account for long-term viability of bike share operations or community impacts

**Safety:** There are some dockless vendors producing bikes that do not meet basic American safety standards. Any vendors considered for bike share should be required to provide third party documentation that bikes comply with federal consumer safety standards (16 CFR 1512, ISO 4210), as well as any local requirements for lighting, from a reputable U.S.-based bicycle testing lab.

**Maintenance:** For-profit dockless vendor operational models often do not include maintenance of the bikes. When bikes go missing or are in disrepair they are typically replaced rather than fixed. This creates both operational and liability issues, since most models only plan for bike replacement every two years, and the maintenance and safety of each bike is certain to degrade over time. Bike share operations should require documentation of regular maintenance checks and repairs on every bike.

**Cluttering of Streets and Sidewalks:** Operations in cities across the country have highlighted community challenges with dockless bike share parking. The flexibility of parking bikes anywhere can also lead to blocking of public rights of way, and critical

ADA access. Some for-profit dockless bike share systems do not have mechanisms to lock bikes to anything, making return of a bike in the middle of a sidewalk or laying over into the street possible. Some dockless bike share vendors are working with state governments to preempt local regulation of dockless bike share, which would limit the ability of local governments to effectively manage the parking of dockless bikes in their communities.

**Coverage and System Balancing:** Dockless bike share can have greater area coverage than station-based bike share due to the flexibility of moving and parking anywhere. However, some dockless companies do not balance bikes by moving them to neighborhoods that aren't ridden to as often. This results in an uneven distribution of bikes, puts underserved neighborhoods automatically at a disadvantage, and means bike share bikes are not always available where people want to use them most.

**Waste:** Because some dockless bike share vendors use low quality bikes and do not provide maintenance of bikes once deployed, these bikes are sometimes considered "disposable." When riders find bikes in disrepair, they typically dispose of them where they are, and there are many examples of bikes in waterways, greenspace, impound lots, and junk yards. In some cases, cities collect disposed bikes at taxpayer expense while bike share vendors import additional new bikes into the market.

**Longevity:** Because it is so new, the dockless bike share industry remains volatile. There are no successful examples yet of for-profit dockless bike share companies maintaining services and operations in a sustainable model, year to year. Some of the world's largest dockless bike share companies have recently shut down, with a loss of deposits for users. Other large for-profit dockless bike share companies have announced their intent to shift away from bike share to car-sharing and other services. This uncertainty creates some additional risk for local governments making long term plans for bike share amenities in their communities.