

Developing a Bike-Sharing Program at Kent State University and Kent, Ohio Final Report

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Bike Share Matrix is attached

Bike Sharing in Universities

Sustainable transportation frequently describes the use of non-motorized transportation sources, primarily walking and bicycling (Toor and Havlick, 2004). Walking is a time honored method of getting around that most people can easily access. But bicycling is a mode of transportation that requires some basic equipment. At the same time, bicycling can provide tremendous mobility while also being environmentally friendly, less costly in terms of parking and roadway infrastructure, and an ideal way of introducing exercise into people's daily lives. Bicycling for commuting purposes is used by relatively few individuals in American society. Bicycling is primarily used for recreation, and as a form of mobility is concentrated among the young who are not yet able to drive. There have been places where bicycling commands a fairly high proportion of the modal share, and many of these places are focused around college and university campuses. In an effort to increase the use of bicycles in and around the campus of Kent State University, we decided that it would be advantageous to analyze the feasibility of introducing a bicycle-sharing program.

Scope of the Problem

Studies have demonstrated that transportation policies can affect the usage of bicycles (Rietveld and Daniel, 2004). These policies can shape environments which are fairly hostile to bicycling and lead to real and perceived dangers which discourage many would-be bicycle commuters. To counter this, Pucher et al (2010) describes some ways in which to increase the share of bicycling. These involve building bike lanes and paths, fostering higher levels of safety through traffic calming, providing more storage facilities for bikes, as well as other items proven to increase the modal share of bicycling in a number of cities. These policies can all be effective, but they require that individuals have bicycles to ride in the first place. Since we suspect that many people do not have access to working bikes, including many young adults, one of the most effective policies would provide increased access. Programs that put more bicycles on the streets would also work to increase awareness and make bicycling safer for all.

Among the most useful interventions is a program that provides operating bicycles for short term usage. These bikes are not intended for recreation, such as those rented in parks and in vacation towns, but are meant solely for the purpose of getting from one place to another. These bicycle- or bike-sharing programs make operating bicycles available to people on a short term basis. As a result, it is possible to provide access to bicycles for a much larger population than would be the case if each person brought their own individual bicycle. Individual users do not have to worry about maintenance and storage, but instead can use a bike whenever they feel the need.

In the last 10 years, bicycle-sharing programs have been introduced in several cities around the world (see Nadal, 2007 for a discussion of the successful Paris bike-sharing plan). The United States has been a relatively late starter to this type of program, but several cities, notably Washington, San Francisco, Portland, Oregon, and Buffalo have initiated programs (Holtzman, 2008, Raja et al, 2009). Bike-sharing programs are especially useful in communities where large numbers of people do not have access to a bicycle on a daily basis. Because bicycle commuting, at least in the United States, is

more agreeable to a young adult population, college and university campuses would seem to be a perfect fit for this type of innovation.

Bike-sharing programs have undergone some significant changes in their 45 years of existence. As described by Paul DeMaio (2009), the first generation of bike-sharing systems involved the simple provision of bicycles often painted white, or some other obvious color. The problem is that users did not treat these free bikes well; they often trashed them or kept them for their own private use (Dell, 2008). In the 1990s, a second generation of bike-sharing systems introduced specially designed sturdy bikes, often with clear markings. These could be used for the cost of a deposit or tagged onto some kind of ID card. This was more effective than simply providing free bicycles for anybody to use, and the newest programs track the customer with the bike. With a deadline and late fees, customers have a financial incentive to return the bikes to a bike station or corral in a timely manner. Yet the second generation bike share, like the first, does not allow for checkouts and returns at different stations: customers must return the bike to the same station. The third-generation of bike-sharing programs, introduced within the last 15 years, involves the use of modern technology to match the bicycles with the customer and it allows for station to station rentals. The advantages of such a system are obvious. You can have bicycles clearly identified with each user. You can determine the length of time the user is on the bicycle, and charged him or her accordingly. And you almost never have a problem with bicycle abandonment or theft. DeMaio estimates that there were approximately 90 programs at the end of 2008. And since more programs have been coming online in the last year, these numbers have probably increased substantially. The data indicate that bike-sharing programs have more than doubled the share of trips undertaken by bicycle. While the benefits of third-generation bicycle-sharing programs are obvious, they are also more costly per bike and more difficult to maintain.

Several campuses around the United States have introduced bike-sharing programs within the last several years. Our listing, discussed later on in this report, demonstrates how most of these campus-based programs operate. The types of campuses range from a campus as large as that of The Ohio State University to small campuses such as Allegheny College in Western Pennsylvania. There is also a great deal of diversity in regard to the types of environments. Several campuses are located in urban environments – notably New York University – and several are ensconced in the countryside. Our task was to determine what would be the best fit between the bike sharing models now emerging throughout university campuses and the needs of Kent State.

Benefits of Bike-Sharing on the Kent State Campus

Our previous research, funded by the Ohio Transportation Consortium, demonstrated that bicycle commuting occupies an extremely low percentage of all commuting trips within and around the Kent State campus. In fact, a survey done in 2008 (funded by the OTC) indicated that less than 6% of all students are likely to use bicycles in any event and only 1.5% of student use the bicycle as the primary mode of transportation (Kaplan 2008). In fact only 40% of students on the Kent campus had access to an operating bike in the first place! This leaves at least 60% of Kent State's student population that would stand to benefit by a bike-sharing program. Our later survey research, reported here, indicates

there has been some improvement in the last few years. Now, 60 percent of students have access to a bike and more appear to use bikes for making some trips. Still, it would be hard to argue that a bicycling culture has taken root here.

A bike-sharing program fits nicely into the larger goals of campus sustainability. The sustainability program at Kent State University addresses the social, environmental and economic elements of sustainability with the strategic goal of meeting present needs without compromising future generations. Environmentally, increased bicycling would reduce motor vehicle use, reducing consumption of fossil fuels and air pollution. The campus itself is quite large, about a mile across, and many students feel a need to drive in order to get from residence halls to classroom or from one classroom to another. Bike-sharing would provide an easy way to make this trip, especially if parking stations were located strategically. Economically, most students are living with constrained budgets. Making bicycles available could reduce the expenses of owning, operating, maintaining and insuring cars. For the City and the University, increased bicycle ridership could reduce costs of providing parking. For businesses in downtown Kent, increased bicycle traffic by students could increase the market for their goods and services. Finally, there are a number of social benefits we hope to see as well. Quality of life can be increased by easing traffic congestion and reducing travel time. Riders would realize health benefits and a greater connection to the environment than motor vehicle passengers.

One enormous advantage of a bike-sharing program at Kent State University is to promote greater connections between the Kent campus and downtown Kent itself. There has been some reluctance among Kent State students to frequent the downtown, except for the bars. In the last five years, officials at both Kent State University and the city of Kent began to identify this as a problem that needs to be addressed. There have been many successes in creating a more attractive downtown environment, which would entice students to visit as well. Kent was awarded a \$20 million Recovery Act grant to develop a multimodal transportation facility that would be located at the eastern edge of the downtown area, creating a link with the university. The project's Kent Central Gateway is almost built and will serve as a transfer point for buses, pedestrians, bicycles and cars travelling locally and throughout the region. Other developments include the expansion of retail outlets downtown and the extension of a transportation corridor (the University Esplanade) that would provide a very bicycle-friendly pathway from campus to the downtown area. The multimodal facility itself would become a perfect location for a bike-sharing operation. Along with business and transportation developments, bike sharing could afford an easy way for students to get from campuses to the community without having to bring their own bicycles.

An interest in creating a bike-sharing program has been expressed from multiple sources at Kent State. However, each has also raised questions about how to implement a program successfully. Kent State has an enrollment of 2000 international students. These students are even more likely than other students to not own a car and also to have more experience using bicycles as transportation. In Fall 2010, a second generation bike sharing system, called Flashfleet, was inaugurated with a great deal of support from the student body and the administration. There are now seven stations and 62 bikes.

Students, faculty and staff check out the bikes with their “Flash Cards” and can keep the bikes for an entire day. From all accounts, the program has been a success.

The introduction of a full bike sharing program at Kent State has raised the possibility that the university may seek to develop a true station-to-station third generation program. Of course, such a program would have to grapple with questions of student demand and how to finance such a system.

Project Components and Personnel

The Bike Sharing Proposal consisted of six distinct components that were aided by specific personnel. The PI, **Dave Kaplan**, was involved in each component. The Co-PI, **Melanie Knowles**, assisted with the overall direction of the project as well as specific components.

1. Survey of Kent State Students. In late Spring 2011 we developed and distributed a web based survey that concentrated on how people are using bicycles, how they are traveling across campus, how they travel between campus and the surrounding community, and their attitudes towards the Flashfleet program. **Meg Petroski** was principally responsible for helping Dave Kaplan develop the survey questions
2. Focus groups of Kent State students. **Meg Petroski**, **Gina Butrico** and **Rachel Will** were responsible for conducting the focus groups and typing up the results
3. Measurement of non-vehicular traffic. During the Fall 2012 semesters, we examined the degree of non-vehicular traffic at key intersections leading into Kent State. This consisted of both pedestrian traffic and bicycle traffic. These data were counted at the same basic time of day and then added to spreadsheets and maps. **Gina Butrico** assembled the group responsible for getting these counts over a three day period
4. Development of a Bike sharing matrix. **Matt Flemming** and **Meg Petroski** helped develop the initial Bike Sharing Matrix in 2010 that shows all of the colleges and universities with some sort of bike sharing program. **Rachel Will** updated this list for 2012/2013.
5. Site visits and phone interviews with other campuses involved in bike sharing. **Meg Petroski** and **Gina Butrico** were principally responsible for on-site visits. **Gina Butrico** also conducted a number of telephone interviews.
6. Assessment of the costs involved in putting together a third generation bike sharing system. **Melanie Knowles** was chiefly responsible for putting together information on costs
7. Development of Maps. **Andrea Szell** was kind enough to lend her time to create some last minute maps.

The State of Bicycling and Bike-Sharing at Kent State University

Earlier studies have demonstrated that Kent State University has a very low level of bicycle usage, especially in regard to commuting. Our study undertaken in 2008 indicated that only about 40 percent of all Kent State students had access to a bicycle. The level of usage was well under five percent for any sort of commuting. These low levels were also confirmed by our analysis of actual bicycling activity, which was also quite low. The city of Kent had no nearby bicycle shop (the last one had closed about a decade prior) and it seemed that a bicycle culture was lacking.

Since then, there have been a number of positive developments. There have been two new bicycle shops opened up in the vicinity; the renovation of the downtown of Kent has provided more bicycle friendly destinations. More bicycle paths, including the University Esplanade, have been constructed and expanded, and the University embarked on a new bike-sharing program – Flashfleet – in Fall 2010.

Our most recent data shows some uptick in bicycling among Kent State students and among the community at large. We can see this through some of the survey data and a few bicycle counts that were undertaken.

Survey Data

In Spring 2011, we conducted an internet based survey of Kent State students. We had a large sample of 1074 students.

We began the survey with a basic question as to whether the respondents had access to a working bicycle. When we posed this question in an earlier survey, in 2008, roughly four out of ten students had access to a bicycle. In this instance, the percentage with access was at 59 percent, a major increase. Whether this is coincidental or part of some of the new infrastructural improvements remains to be seen. But it shows positive development. Upperclassmen/Graduate students and students who live further away are more likely to have access. Unfortunately, students living well beyond a mile may be out of bike commuting range and so may not really have the ability to use it on campus unless they load it onto their car.

Do you own or have access to a working bike?

	Yes	No
Freshman	54%	46%
Sophomore	51%	49%
Junior	55%	45%
Senior	66%	34%
Grad Student	67%	33%
Total	59%	41%

Do you own or have access to a working bike?

	Yes	No
On campus	52%	48%
Within a mile	53%	47%
Beyond	68%	32%
Total	59%	41%

The next set of questions was asked of students who stated that they had access to a bike. Our concern is how bicycles are used and the consensus is that the vast majority of students use their bicycle for recreation. However forty percent of those who lived within a mile of campus did report using their bike at least sometimes for transportation around town and campus. All told, about 14 percent of *all* students surveyed used a bicycle as a form of transportation at least some of the time. This is a fairly low percentage for a university campus, and shows a great deal of upside potential.

What purpose do you use your bike for? (bike owners)

	Recreation	Transport	Sport
Freshman	78%	19%	3%
Sophomore	74%	21%	5%
Junior	64%	30%	6%
Senior	66%	25%	9%
Grad Student	73%	23%	4%
Total	70%	24%	6%

What purpose do you use your bike for? (bike owners)

	Recreation	Transport	Sport
On campus	70%	28%	2%
Within a mile	55%	40%	5%
Beyond	79%	14%	8%
Total	71%	24%	6%

The frequency of bicycle usage was another concern raised in this survey. Regular usage, defined as at least a couple of times a week, was reported by only a quarter of bicycle owners. Those students living off campus but close to campus were the most likely to use their bicycles frequently, probably as a form of transportation.

How often do you use your bike? (bike owners)

	Several times		Several times		Occasionally	Rarely
	Everyday	a week	a month			
Freshman	3%	9%	12%		38%	38%
Sophomore	2%	19%	13%		29%	37%
Junior	11%	14%	11%		30%	35%
Senior	6%	21%	12%		29%	32%
Grad Student	5%	23%	14%		33%	24%
Total	6%	18%	12%		32%	32%

How often do you use your bike? (bike owners)

	Several times		Several times		Occasionally	Rarely
	Everyday	a week	a month			
On campus	3%	14%	8%		38%	37%
Within a mile	8%	27%	15%		20%	29%
Beyond	6%	15%	13%		35%	31%
Total	6%	18%	12%		32%	32%

This next question concerns the distance limits to which students will bicycle. This was asked of all students. Most find that they are willing to bicycle within five miles which would cover all of the city of Kent and many apartment complexes just outside.

What distance would you consider bikeable?

Less than a mile	6%
1-2 miles	22%
2-5 miles	36%
5-10 miles	20%
10+ miles	15%

Students were asked what they felt were some of the impediments to biking on and near campus. Many picked several options, which was possible. Not surprisingly, traffic was considered a major impediment but so too were pedestrians. Later information indicated a real problem with pedestrians being unaware of bike paths and the need to stay out of these paths. While a slight majority of respondents said they knew where the bike paths were, most indicated that the location of these paths was unclear. A bike map would be helpful, according to most.

What are some Impediments to Biking? (multiple answers possible)

Safety	42%
No Paths	42%
Traffic	51%
Pedestrians	50%
Unclear Rules	19%
Other	17%

Do you know where bike lanes are?

Yes	57%
No	43%

Is it clear where bike lanes are?

Yes	41%
No	59%

Would a biking map be helpful?

Yes	84%
No	16%

Finally, a question was asked regarding the location of bicycle racks. Several students felt that more bike racks near bus stops and near all buildings would be helpful.

Where would additional Bicycle Parking be most useful?

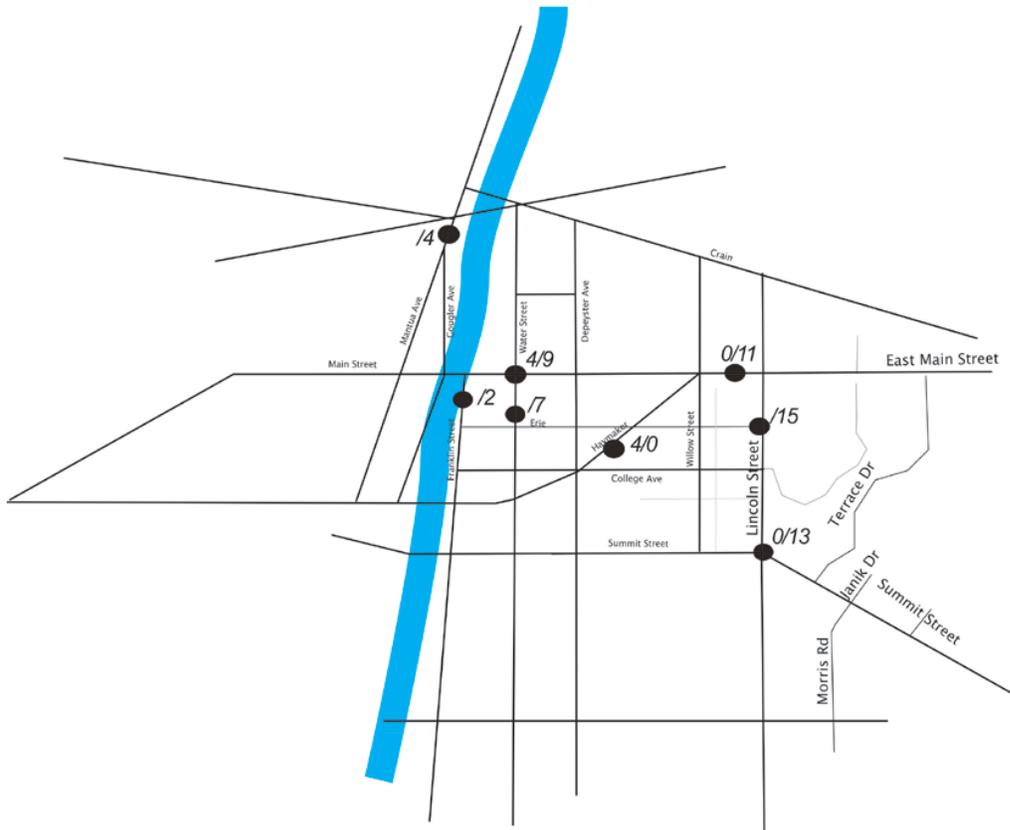
Nowhere	24%
Bus Stops	46%
Buildings	45%

Bicycle Counts in Kent

In earlier studies we had counted bicycle and pedestrian traffic at key intersections. While our original design did not include another traffic count, this September we were invited to take part in a bike counting week. The data has been added to earlier information in order to show changes. To provide consistency, only afternoon counts are included since these are the more comparable.

Bicycling Intersection Counts

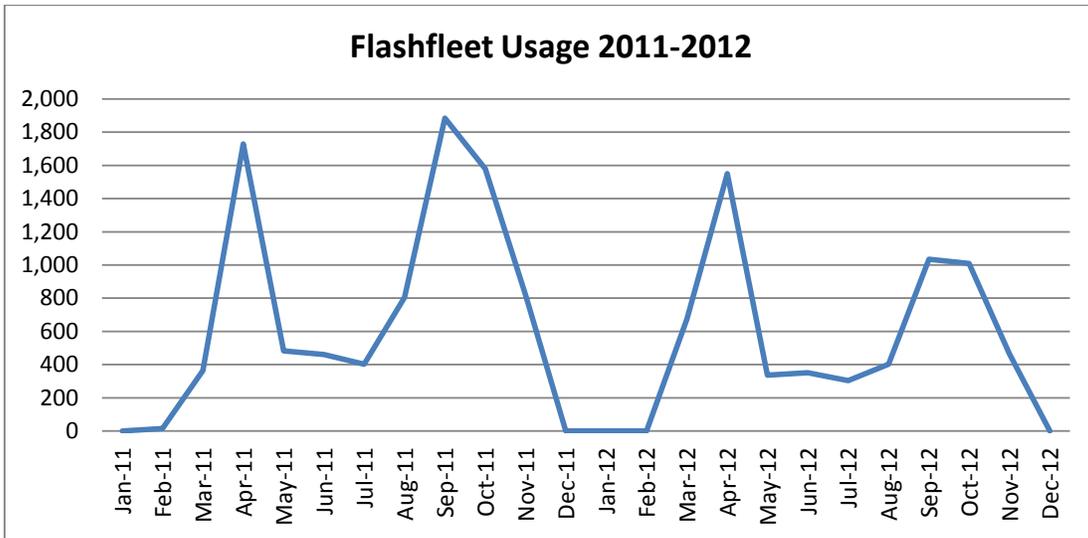
First Number 2008/ Second Number 2012



FlashFleet Program

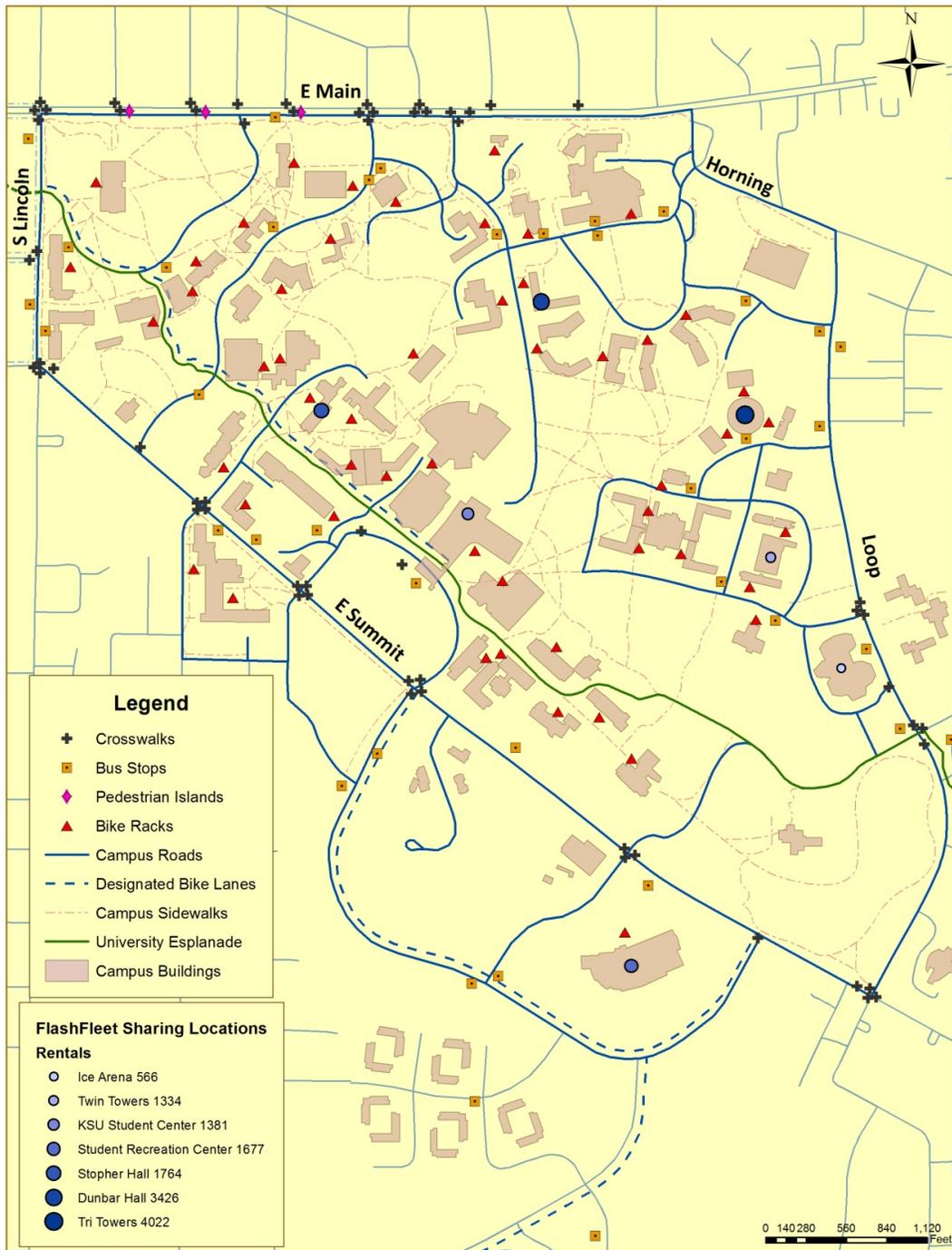
Since 2010, Kent State University embarked on a new bike sharing program called Flashfleet. It was inaugurated in the Fall of 2010 with about 60 bicycles distributed among seven bicycle stations found through campus. The Flashfleet program is a first generation bike sharing program. Students, staff and faculty are able to check out a bicycle at no cost and are expected to return it to the same destination before closing.

All accounts indicate the Flashfleet program has been successful. There were a total of 8,538 rentals in 2011 and 6,129 rentals in 2012. The monthly figures below provide a good window into overall activity. The program is closed during the winter months and peaks during spring (especially April) and fall (September and October) semesters. During these peak times, there are still enough bikes to go around, provided they are in working condition, but it varies between some bikes which are not used much (perhaps because of repairs) and others which have averaged nearly two uses a day during peak months.



The following maps provide a sense of how many rentals are taken from each of the seven rental locations. As can be seen, there is an enormous variation with the Tri Tower complex on the east campus experiencing the most rentals and the fewest rentals found in the non-residence hall stations.

The map also shows various features leading into sustainability such as designated bike paths, the location of bike racks, crosswalks and sidewalks. The potential for bicycling on the campus is clear.



Flashfleet Usage Information

Our Spring 2011 survey was conducted after the first semester of Flashfleet and so we could add questions regarding how students used the program. Flashfleet also administers a survey, and we will compare the responses we received from our survey with the responses given by the Flashfleet survey when relevant.

The first question was asked of all students whether they used the Flashfleet program. Overall, 12 percent reported using the program, with the highest percentage of users being sophomores. This lines up with the Flashfleet in-house survey which showed that the plurality of users of the program were sophomores, followed by juniors and freshmen. Students who live on campus are also more likely to utilize this program. The Flashfleet in-house evaluations indicated that two-thirds of users lived on campus.

Do you use the Flashfleet program?

	Yes	No
Freshman	14%	86%
Sophomore	19%	81%
Junior	10%	90%
Senior	9%	91%
Grad Student	9%	91%
Total	12%	88%

Do you use the Flashfleet program?

	Yes	No
On campus	28%	72%
Within a mile	10%	90%
Beyond	3%	97%
Total	12%	88%

We were curious to the extent that Flashfleet use varied by whether students had access to their own bikes. Surprisingly, students with access were about as likely to use the program as students without access.

Do you use the Flashfleet program?

Do you own or have access to a working bike?	Yes	No
Yes	11%	89%
No	13%	87%
Total	12%	88%

Sophomores, juniors and people living on campus were also more likely to use the Flashfleet program more frequently, though graduate students are the heaviest users. About one quarter of students who used Flashfleet responded that they presently used the program weekly. However, the in-house surveys showed that students anticipated using the program even more, with about four out of ten indicating that they would use the program weekly

How often do you use the bike sharing program? (of those who use Flashfleet)

	3 times a week	1-2 times a week	1-2 times a month	Less than 1 time a month
Freshman	4%	19%	38%	38%
Sophomore	6%	26%	37%	31%
Junior	10%	29%	19%	43%
Senior	5%	5%	50%	41%
Grad Student	23%	9%	23%	45%
Total	9%	18%	34%	39%

How often do you use the bike sharing program? (asked of those who use Flashfleet)

	3 times a week	1-2 times a week	1-2 times a month	Less than 1 time a month
On campus	9%	22%	33%	37%
Within a mile	6%	16%	41%	38%
Beyond	13%	6%	31%	50%
Total	9%	18%	35%	39%

At the same time, most students did not feel as if program changed their commuting habits, according to this survey. The in-house survey showed about 50 percent of Flashfleet users stating that the program did not change driving habits. Many said that it meant they did not have to drive on campus or that they could drive less. The vast majority of respondents liked the idea of bike sharing.

Has bike sharing changed the primary way you travel? (of Flashfleet users)

Yes	24%
No	76%

Is bike sharing an effective way to get people to cover medium distances and run errands?

Yes	80%
No	20%

In terms of the quality of the existing program, there was a generally positive consensus in regard to the quality and quantity of bikes available.

Are there a sufficient number of bikes at each station? (of Flashfleet users)

Yes	65%
No	35%

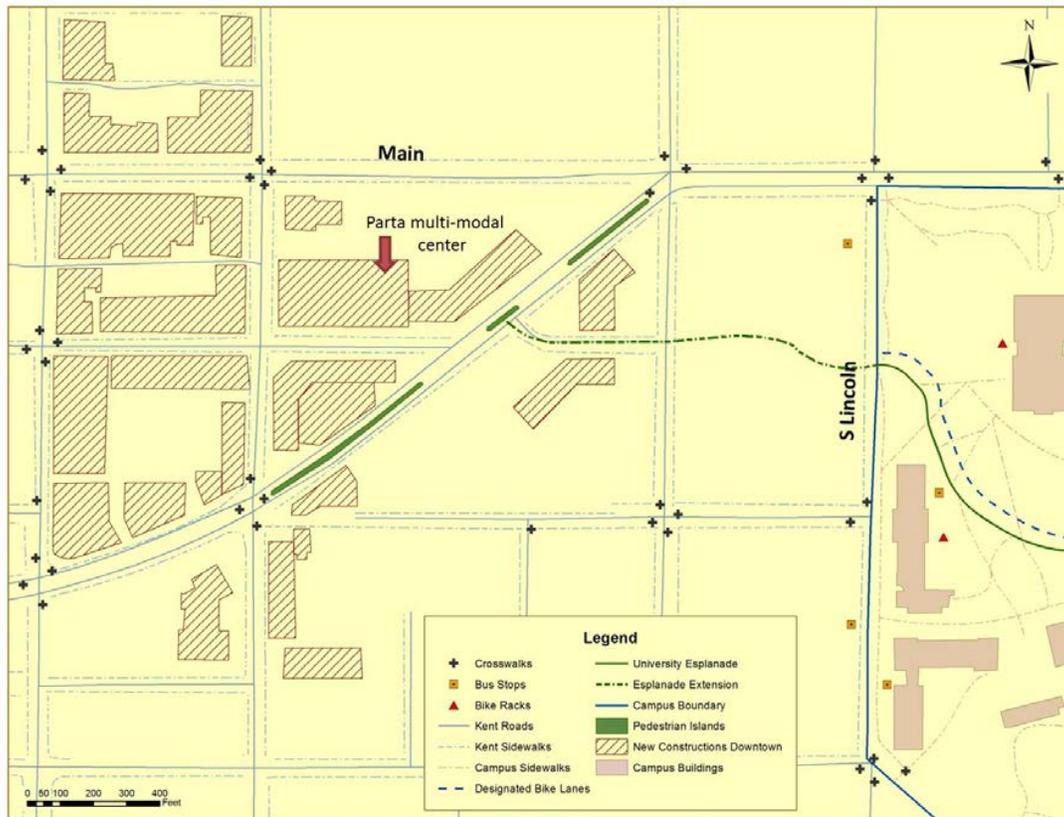
How did you feel about the quality of the bikes? (of Flashfleet users)

Good	76%
Could be better	24%

If the program were to be expanded, there would likely be more stations added. The choices of where to put these stations were put to the students. Having a station downtown was a clear favorite, followed by a station at Kent City Library, just across the river from downtown. The choice of downtown was also echoed by the in-house survey. Placing a rental station at Dix stadium was also quite popular.

Where would you like to see Bike Sharing Stations?

Good as is	38%
Downtown	40%
Specific Buildings	22%
Acme Plaza	21%
Wal-Mart	22%
Univ. Plaza	23%
Kent Library	35%



The above map shows the extension of the Esplanade from the University campus itself into the downtown area. The location of a bike sharing station in the new Multimodal facility could provide easy access from the residence halls on the east side of campus.

Students were quite happy with the fact that the Flashfleet program is now completely free. This has been echoed in focus group comments. Expanding the program would likely cost some money. We asked students what improvements they would be willing to pay for. Being able to return the bikes to a different station was chosen by nearly half the sample as an improvement worth paying for. In the in-house survey, when students were asked how much they would be willing to pay, more students chose a pay per use fee of about \$1. Less popular were semester or yearly fees.

What Improvement are you willing to Pay For?

Increased Bikes	40%
Increased Stations	33%
Better Bikes	29%
Return to a Different Station	46%
Easier Check-out	20%
Other	31%

Focus Group Information

We had the opportunity to conduct a total of three focus groups where we spoke directly with students. These groups occurred in May 2011, October 2011, and October 2012. Each group had about 8-15 participants and took place from 60-90 minutes. The last group was conducted in a slightly different way. Rather than a fixed attendance and time, we interviewed groups of student spontaneously. This provided us with a group that was perhaps less bike-oriented to begin with. The summaries are available in the appendix, but we were able to extract a few themes from these discussions.

State of bicycle infrastructure: Many respondents complained about the usage of bike lanes on campus and the fact that many people walked on these when they should be walking on the walking paths. Many blamed the fact that bike lanes are not clearly marked. Some students stated that they did not notice the bike lanes on campus. This has been brought up in previous studies and represents a fairly easy thing to fix.

Bringing bikes to campus: As indicated in our survey data, many students do not have access to bikes on campus. Many find it inconvenient to take bikes if they are commuting. There is also a question of having enough room to keep bikes. International students, who arrive by airplane, will not have a bike nor be motivated to buy a bike in the period they are here.

Knowledge of the Flashfleet Program: The first two focus groups were fairly self-selected in that mostly students aware of bicycling programs attended. The last focus group in October 2012 introduced a greater range of students and found several students who were completely unaware of the program. This indicates that the marketing efforts to date could probably be improved to raise awareness. This could be focused on freshman before they arrive on campus so they know about the programs existence. Clearer, more obvious, signs were also suggested to show the Flashfleet locations. More advertising was also suggested. One interesting point was made by a student who knew of the program because a station was located in her building, but did not think that friends in buildings without a station were aware of the program. Oddly, one commuter student did not think that she was eligible to use the program.

Interest in the Flashfleet Program: Among those students who did not know of the program, there was a high degree of interest. It seemed that students would be willing to try it at least one time. There was some concern about using the program during the winter.

Some Existing Problems with the Flashfleet Program: Students who had used the program were generally happy. However, some issues came out. One student complained about bicycles that were “broken” when she tried to use it. Some students noticed that there were not enough functioning bikes available.

Suggestions for Improvement: There were several suggestions for improvement. Most of these fit under the categories of having longer hour available from which to check out bikes. One student suggested multi-day checkouts, perhaps unaware that these are

already available at the Rec Center. Year round availability of the program was also a suggestion. Several students wanted to see the program expanded to other venues: downtown, closer to the cluster of Science Buildings, near apartment complexes, and other locations. The opportunity to check in and out at different stations was considered a major asset.

Paying for Enhanced Program: None of the students we spoke to have an interest in paying for an enhanced program. They wanted to keep it free. One student mentioned that there could be a small fee to pay for insurance.

Bike Sharing Programs Throughout the Country

Features of Bike Sharing Programs

As part of this project, we were able to compile a list of all the campus bike sharing programs in the country. This list is voluminous and is included as an attachment with this report. There were some general patterns in terms of the programs. From examining the bike share programs that no longer exist, there are some clear issues:

- A prominent lack of proper maintenance of the bike especially since less expensive bikes were more likely to break down. Some programs had this problem and purchased smaller fleets of more expensive bikes when they revamped their program.
- There was rampant student bike abuse in some situations because students did not respect the program.
- Some programs shut down due to lack of popularity with low ridership and a lack of publicity.
- Some campuses exhibited great potential for a bike share but still shut down. These issues were attributed to lack of publicity, having elements of the bike share run by more than one department and no consistent funding.

From the most successful programs come a few creative ideas:

- Utilizing the student population to improve the program. There were many ways this was accomplished. It seems that more student involvement led to more program success. A lot of universities advertised for student volunteers to repair bikes. These students were trained as bike mechanics and taught to repair bikes. Sometimes a perk was involved, sometimes not.
- Some universities take the email address of students who check out bikes and ask questions about their experience, what they would like to see in the program, and how used their bike. Kent State's Flashfleet uses surveys and may be able to adapt the program based on the responses.
- If a semester program is instilled there could be a volunteer incentive to lower the cost of the semester rental. This was a popular option with many semester-long rentals.
- Some universities "hire" student applicants from business, marketing, conservation and design majors, etc. It can be great internship experience for the students, who are usually looking for internships anyway. Some universities even have "teams" of as many as ten students in each of these majors to work together to create ideas. Cornell might be the best example of this.
- Make use of abandoned bikes each year. All universities, especially larger ones, have many abandoned bikes at the end of each school year. Some universities repair them and use them for their bike fleets, or strip them for parts to use in their co-ops or repairs. These bikes are sometimes even fixed up (by co-op or other volunteers) and auctioned off to generate extra funds for their program.

- Some universities have programs where individual campus departments provided some of their own bikes for majors to use. These bikes are usually better maintained.
- Many universities hold community bike events, or events for the student population. This brings a lot of attention to the programs and many volunteers are generated from these. Some offer bike trips or picnics or other fun events. This could be done as early as the first week when new freshman are on campus
- Some universities only allow students in good academic standing to check out bikes. Idea is that those who care about their grades might be more likely to take good care of the bicycle. Apparently it reduces bike damage.
- Some universities with multiple check-out stations have a website that says how many bikes are available at each station. Students know where to go to get a bike.

Programs that took student bike needs into consideration were the most successful. There were a lot of second generation programs with more than one type of rental plan. Often free short term rentals and some sort of long term rental at a reasonable fee. Most programs with different rental length options find themselves with more demand than they have bikes. There were some creative ways to generate funding and help defray costs: alumni bike donation, bike auctions, and co-op programs with a dedicated student population to work as volunteer mechanics. While money is certainly important, there are other important intangibles. Some programs spent a lot of money to improve their systems but were not always the most successful.

Selected Bike Sharing Programs

College Name	Student Pop	Setting	# bikes	Ridership	When Began	Sponsoring Unit	Mechanism	Rental Length	Cost - Campus	Cost - Student	Community Coordination
Michigan State University	48,906	Town	223	n/a	2003	MSU Surplus and Recycling	2 hourly to yearly	2	No cost to University. Grants and Donations.	\$0 after 6 volunteer hours OR \$15/\$20 (prices vary)	School
University of British Columbia	48,768	City	50	300-400*	1998	AMS Bike Co-op	2 Free for all	2	University. Grants and Donations.	hours OR \$15/\$20 (students/other)	Community
University of Arizona	39,236	City	55	6174	2009	Parking & Transportation Services	2 24 hours	2	subsidized by PTS department	\$0	School
University at Buffalo	28,881	City	60	171	2006	Buffalo State Evergreen Initiatives	2 48 hours	2	bikes donated	\$25 or 6 hours of service	Community
University of Colorado at Boulder	28,235	Town	240	1000+	2009	Environmental Center	2 48 hours OR semester	2	\$25,000/year (offset by sustainable grant)	\$0 (48 hour program) \$85 (semester)	School
University of California, San Diego	28,000	City	100	500+	2008	Commute Solutions	2 72 hours	2	refurbished bikes (abandoned bikes)	\$0	School
University of Tennessee, Knoxville	27,379	City	20	~100	2011	Civil and Environmental Engineering	3 4 hours	3	\$0 (Research Project)	\$0	School
University of California, Irvine	26,984	City	28	250	2008	Parking and Transportation Services	3 3 hours	3	Paid by Transportation & Distribution Svcs	\$40 per year	School

College Name	Student Population	Setting	# bikes	Ridership	When Began	Sponsoring Unit	Mechanism	Rental Length	Cost - Campus	Cost - Student	Community Coordination
Northern Arizona University	26,000	Town	185	n/a	Green NAU	2	7 days	Unclaimed Bikes	\$0		Community
Washington State University	25,000	Rural	120	10,000+	Wellbeing	2	1 day/1 week	BIXI/mountain bikes	\$0		Community
University of Oregon	20,376	City	100+	800+	2008 Outdoor Program	2 (3-soon)	1 term/1 day: 1 - 3 weeks	Mix of donation bikes/abandoned bikes	\$65 deposit/ \$20 fee per term		School
Georgia Tech	19,945	City	40	850	2010 Viacycle/Parking & Transportation departments	3	Under 24 hours	membership costs recycled bikes	Viacycle Pricing		School
University of Rhode Island	15,900	Town	100	n/a	2001 various departments	2	2 days/semester	\$11,000/year	\$0/\$30/\$35		Community
University of Montana	14,207	Town	70	1,020	2000 Office of Transportation	2	2 days/semester	Grants for purchasing bikes-	\$25/students		School
University of Wyoming	13,476	Town	100+	250	2005 Outdoor Program	2	semester/academic year	usually break even	\$50/staff per semester		School
University of Idaho	11,957	Rural	250	175 new/year	1998 International Programs Office	2	*Length of time on campus	Very little cost - much volunteer work	\$20 user fee \$30 deposit		Community
Texas Christian University	7,471	City	60	n/a	2006	2			\$0		School
SUNY Cortland	6,199	Town	100	<100	2005 Recreation Department	2	7 days OR semester	Volunteer work/donated bikes/ASC grant	\$0 (yellow) OR \$35 (semester)		Community
Mesa State College	6,165	City	50	n/a	2009		unlimited (uncontrolled)	50 bikes purchased from local shop	\$150 refundable deposit		School

College Name	Student Population	Setting	# bikes	Ridership	When Began	Sponsoring Unit	Mechanism	Rental Length	Cost - Campus	Cost - Student	Community Coordination
University of Denver	5,324	City	600	n/a	2009		1 by 7pm	donated (city-wide project)	fund-raised \$50,000	Community	
Bucknell University	3,583	Rural	60	192	2008	Outdoor Education and Leadership	2 up to 7 days	\$34,000 Start-up	\$0	School	
St. Xavier University	3,169	City	65	n/a			3	\$250,000 start with est. \$3,000 per year	free first 15min, \$0.60 every 15min after	School	
Wellesley College	2,502	Town	15	100	2012	Office of Sustainability	3 24 hours	\$40,000	\$0	School	
Bowdoin College	1,777	Town	200	200+	2006	Yellow Bike Club	2 semester	funded by Student Activities/Outdoors Club	\$25/semester	School	
Pomona College	1,532	Town	200+	200+	2007	Sustainability Committee	2 24 hours or 1 week/semester	donations/abandoned bikes/volunteer repair	\$0	School	

In Depth View of Five Bike Sharing Programs

In working to develop a model for a successful bike share program, it is beneficial to consider existing programs. Established bike shares vary greatly in size, function, and technology. Semi-structured interviews were conducted through phone conversations and campus visits with five universities to gain perspective into the logistics, successes, and challenges of their bike share programs. The programs vary from first to third generation, rural to urban, and old to newly-established.

The Bike Co-op at Oberlin College was established in 1986 and can be classified as a first generation bike share system in a rural setting. It is staffed by volunteers who receive free bike rentals as compensation. The co-op receives an impressive amount of donated bikes and bike parts, which are stored in the basement of Keep Cottage, a living co-op on campus.



The program is open to students, faculty, and community members. To pay for bike rental, users may put in ten volunteer hours or pay \$8 per semester or \$18 for a year. The bikes are mainly used for transportation around campus, though some students report riding the bikes for recreation. Bikes are built specifically for the user from the plethora of parts available and maintenance is free. The co-op bike workshop is available to all members free of charge to work on their own bike or help the co-op build new ones. It is difficult to gauge the number of bikes rented from the co-op each year because of the organic nature of the program.

The Bike Co-op at Oberlin College is a first generation program because the bikes are manually distributed and returned. It lends its success and steady growth to volunteer labor, donated parts, and a community enthusiasm for biking. The program reports few challenges, save for a few bike thefts and lack of bike lanes on campus.

The University of Idaho began a small bike loan program in 1995 that has grown into a fleet of nearly 400 bikes. It may be classified as a first generation program with a few second generation characteristics in a rural setting. The program relies on volunteers and the donation of bikes and bike parts. It also receives funding from the Associated Students of the University of Idaho and International Programs. Another similarity is the long-term rental period, which averages 4-8 years. There is a nonrefundable user fee of \$30 in addition to a refundable \$20 deposit that helps ensure bikes are returned at the conclusion of the loan period. An electronic database is used to track bike maintenance, loan status, and how much money has been invested in each bike. The program is open to students and extended family members, though the majority of users are students. The bikes are meant for transportation, though many students report using the bikes for recreational purposes on the weekends. University of Idaho's bike loan program stresses bike safety and repair education, as well as personal responsibility. Bike workshops are held regularly to increase user education and ridership numbers, which are two challenges the program identifies. Another challenge is improper use of the bike lanes and sidewalk riding, which is illegal in the state of Idaho.

Rutgers started a bike share program in September of 2011 that may be classified as a second generation system in a suburban/urban setting. This was intended as a way to relieve the over-saturation of public transportation. The program strives to provide a gateway for students to eventually purchase their own bikes. A grant from the Rutgers Energy Institute allowed for the purchase of 150 Jamis Earth Cruiser 2 bikes. Student and faculty may rent a bike for \$10 a month or \$25 for a semester. Bike distribution is much more automated than Oberlin and University of Idaho's programs, using an online map that shows bike availability at the seven checkout locations. Most available bikes are rented within a week of availability, and some in as little as three hours. Demand is very high, and there has been pressure from students and faculty to increase the number of bikes. However, lack of storage space has made it impossible to expand. Bike theft is another challenge the program faces, with an average of 10 percent of bikes stolen in the last year. U-locks are given to every renter to help counteract this problem. The biking infrastructure in and around campus ranges from satisfactory to hazardous. Some hazards to biking include steep elevation, small lanes, and abruptly ending bike lanes. The current state of biking infrastructure deters many users from biking, though the program remains very successful.

Another example of a second generation bike share system is the Bike Red Bikes program at Cornell University. Employees and students use their Cornell ID to check out a bike from the library circulation desk. There are currently 35 Worksman MG Super Comfort and Worksman NYC Dutchie bikes in circulation with plans to expand with the completion of a second checkout station. The user is allowed 25 hours of bike use for free, with a \$5 charge for every hour exceeding this amount. The purpose of the charge is to discourage users from using the bikes recreationally, since the intent of the program is sustainable transportation. Another method of discouraging recreational use of the bikes is the required return of bikes before the end of the day. Failure to return the bike results in late fees that may reach up to \$650, which is the total cost of the bike and accessories. The program closes in the winter and reopens in the spring to prevent danger to the user

and damage to the bikes. Like the bike share program at Rutgers, u-locks are distributed with the bikes to help prevent bike theft. One of the major challenges the program faces is the hilly terrain on campus, which is not well suited to the current bike models. Bike lanes are reportedly used properly on campus, different from the other universities interviewed.

Washington State University has one of the only third generation, fully automated bike share systems on a university campus in the country. The Green Bike program was started in 2008 with five bikes on a second generation system. Demand for the bikes was so high that the program purchased 40 more bikes the following year. In 2010 the university received a grant that allowed for the purchase of a fully automated BIXI bike share system, including 9 checkout stations and 95 bikes. It has been very successful, with 10,200 checkouts and 5,000 unique users in 2012. The BIXI bikes are used for transportation, while the original 40 non-automated bikes are rented for recreational purposes. Full-time students use their student identification card to check out a bike automatically. The bikes must be returned to a BIXI station by 11:30pm to avoid late fees. The BIXI bikes are equipped with RFDI chips, which tracks check-out/check-in locations and times, as well as user data. The biggest challenge to the program has been improper use of the automated system. The BIXI program is also quite costly, with each station including the bikes averaging between \$35,000- \$40,000. Otherwise the program reports a successful, smooth bike share operation that they are excited to see grow and expand.

Options for a 3rd generation Bike Sharing Program at Kent State

The implementation of Flashfleet created essentially a second generation bike sharing program on campus. Options for improving the program would be a third generation bike sharing program or enhancements to a second generation bike sharing program. While improvements like an increased number or quality of bikes are fairly straightforward, other improvements prove more challenging.

Under the current Flashfleet system, locations for check out were selected because of their convenience, but also because they had existing staffed desks where Flashfleet duties could be integrated relatively easily. Adding locations would mean finding other staffed locations, or hiring staff to create such locations. Additional staffed locations are not obvious, and hiring staff would significantly increase the current operating costs for the program. A third generation program may make it possible to check out bikes from an unstaffed location, but would also carry increased costs for technology.

Another desired improvement that poses a challenge is the ability to borrow a bike from one location but return it to another. This is the improvement that would allow greater usage of existing bikes and truly make Flashfleet a bike sharing program rather than a short-term rental. The current system used for check out does not allow bikes to be traced to other locations. When Flashfleet was originally implemented the check-out was entirely on paper. However, very quickly the program switched to using RecTrack. Since the Flashfleet program is administered by Recreational Services, they were able to use their existing software for checking out equipment like basketballs and apply it to Flashfleet. For little or no additional cost, each Flashfleet location was equipped with RecTrack, and students were then able to use their Flashcards to check out the bikes. Since the RecTrack system was intended for use within one building, either the Student Recreation and Wellness Center or the Ice Arena, the system does not track location. In order to incorporate the multiple location components into the system new software would need to be adopted at additional cost to the program.

It should also be noted that the bikes currently used by Flashfleet are ordinary hybrid bikes that were not designed for a bike sharing program. Heavy use has required significant maintenance and caused wear on the bikes. As improvements to the program are considered, the option of updating the fleet with bikes made for a bike sharing program or simply a more durable bike should be considered.

Third generation bike sharing systems use one of two approaches to technology. The original third generation technology was housed primarily in the station. While the bike incorporates technology as well, such as GPS and a unique identifier, the technology for checking out and locking/unlocking the bike is in the station. Most third generation bike sharing systems use this approach. However, a new trend is a system that incorporates all of the technology into the bike itself. This allows stations to use ordinary bike racks, or even eliminate the concept of a station by allowing bikes to be “returned” anywhere within the geographic scope of the program. Bikes that are available are indicated by

some method such as a green light, and can be checked out by phone rather than with a card swipe at a fixed station.

Current Flashfleet Costs

The Flashfleet program started in 2010 with 50 bikes. Total setup costs for the program were about \$33,300. Twelve additional bikes were added at the cost of \$400 per bike, or \$4800. The cost of individuals operating the program was absorbed into the staff costs for Recreational Services and Residence Services. Cost of maintaining the bikes is paid for entirely by late fees for the bikes.

Alta Bike Share –<http://www.altabicycleshare.com>

Alta Bike Share is a third generation bike sharing program with technology in the station. They also offer options for marketing, operating and maintaining the system.

B-Cycle – info requested <http://www.bcycle.com/>

B-Cycle is a third generation bike sharing program with technology in the station.

Bixi <https://montreal.bixi.com/>

Bixi is a third generation bike sharing program with technology in the station. It could be both integrated with the Flashcard system, allowing students, faculty and staff to check out the bikes by swiping their Flashcard, as well as allow for credit card use, which would open the same system to community members and visitors without a Flashcard. The cost of setting up the program, including the bikes, stations and software is about \$3000 per bike, with operating and maintenance costs of \$1600 per bike. At the current Flashfleet size of 60 bikes, set up costs would be about \$180,000 with annual costs of \$96,000.

Collegiate Bicycle Company <http://www.collegebikes.com/>

Collegiate Bicycle Company is a third generation bike sharing program with technology in the station. All bikes are customized for the campus, both in terms of function (frame, gears, and accessories) and aesthetics (colors and artwork). The cost of setting up the program, including the bikes, stations and software is \$3500 to \$4000 per bike, with operating and maintenance costs of \$1000 per bike. Collegiate Bicycle Company uses a formula to recommend the size of the program. They assume that one bike serves 10 people a day, and that 5% to 10% of people on campus will ride. Therefore, with 33,000 people on the Kent Campus, 1650 to 3300 people would ride. The recommended program size would be 165 to 330 bikes. At 165 bikes, the startup costs would be \$577,500 to \$660,000, with operating and maintenance costs of \$165,000 per year.

viaCycle –<http://www.viacycle.com/>

viaCycle is a third generation bike sharing program with technology integrated into the bike. The program can include viaCycle bikes or can be retrofitted to existing bikes. Rather than swipe a card or credit card at a station kiosk, members check out bikes with a mobile phone by calling, texting, or with a smart phone app. viaCycle also offers the option to operate and maintain the program.

Zagster - <http://zagster.com/>

Zagster started as CityRyde which offered bike sharing software without providing bikes. While Zagster still offers this option, they also now operate a third generation bike sharing program with technology integrated into the bike. Flashfleet could opt to use the Zagster software for \$10/bike/month, which would allow users to return Flashfleet bikes to other locations. At the current Flashfleet size of 60 bikes, this would cost \$7200 per year.

To use the full Zagster system is \$100 per bike per month. This includes everything except the cost of bike racks if needed, and a setup fee which covers signage and marketing. It is an online program. Users register online with a credit card before checking out a bike. It is possible to have a paper registration at a staffed location as well. At the current Flashfleet size of 60 bikes, this would cost \$72,000 per year.

Bike Sharing Company Comparison

Systems with Stations:

	Start Up Costs	Annual Operating/ Maintenance Costs
Alta Bicycle Share	Info requested	
B-Cycle	Info requested	
Bixi	\$3000/bike	\$1600/bike
Collegiate Bicycle Company	\$3500 - \$4000/bike	\$1000/bike

Systems Integrated with Bike (no Stations):

Company	Start Up Costs	Annual Operating/ Maintenance Costs
viaCycle	Info requested	
Zagster (formerly CityRyde)		\$1200/bike
Zagster (formerly CityRyde) *Software Only		\$120/bike

Funding Options

While it is clear that a third generation bike sharing system will be more expensive to operate than the current Flashfleet system, it is less apparent what the best method for funding that cost will be.

Advertising – While advertising holds the advantage of not creating fees for usage or coming out of University funds, Kent State University has also been hesitant to allow obtrusive marketing across campus. After serious consideration in 2007, Clear Channel bike sharing was ultimately rejected for this reason. However, the University could consider less obtrusive advertising or sponsoring options, such as logos or ads on bikes rather than billboards and signs on stations.

Student Fee – There is significant resistance to the idea of adding a student fee to fund bike sharing. At a time when the economy is still recovering and the cost of education continues to rise, additional fees are adopted very rarely. For a bike sharing program, other funding options would be prioritized over this.

Membership/Usage Fee – A fee for membership or using the bikes has an advantage over student fees in that it would be optional. However, it may also have the effect of reducing usage if the fee is too high, or the resulting program did not have the advantages considered worthy of a fee. Survey results indicated that students were not willing to pay for the program. However, when asked what improvements they would be willing to pay for, the top response was the ability to return bikes to a different location than where they were checked out.

Grant – The idea of a grant is clearly appealing. While it may be possible to find grant funding to set up a third generation bike sharing program, it is considerably less likely that grant funding could be obtained to sustain such a program. All of the third generation systems have operating and maintenance costs that go along with the technology in addition to the maintenance of the bikes.

References

- Dell, K. 2008. Bike-sharing gets smart. *Time*, 171(25): 113-115.
- DeMaio, P. 2009. Bike-sharing: Its history, models of provision, and future. Velo-city 2009 Conference.
- Holtzman, D. 2008. Share-a-Bike. *Planning*, May: 20-23.
- Kaplan, D. 2008. *Kent State University's Sustainable Transportation Initiative Final Report*.
- Kaplan, D. and T. Clapper 2007. Traffic Congestion on a University Campus: A Consideration of Unconventional Remedies to Nontraditional Transportation Patterns. *Planning for Higher Education*. 36(1): 28-39.
- Nadal, L. 2007. Bike sharing sweeps Paris off its feet. *Sustainable Transport*, Fall: 8-13.
- Pucher, J., J. Dill, and S. Handy. 2010. Infrastructure, programs, and policies to increase bicycling: An international review. *Preventive Medicine*, 50(S): 106-125.
- Raja, S., M. Ball, J. Booth, P. Haberstro, and K. Veith. 2009. Leveraging neighborhood-scale change for policy and program reform in Buffalo, New York. *American Journal of Preventive Medicine*, 67: S352-S360.
- Rietveld, P. and V. Daniel. 2004. Determinants of bicycle use: Do municipal policies matter? *Transportation Research Part A*, 38: 531-550
- Toor, W. and S. Havlick. 2004. *Transportation and Sustainable Campus Communities: Issues, Examples, Solutions*. Washington DC, Island Press.