Leveraging bike-share systems to improve guest experiences and attract tourists

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Bike-share systems have become a popular method for traveling within a city, and they are rapidly growing in many cities around the world, including New York, Paris, and Shanghai. This rapid growth allows tourists to explore a city on their own, using a communal bike, giving them an essential new way to discover the city. As a result, access to a bike-share system is becoming a big part of a tourist's experience of a city and an essential hotel amenity. In this paper, we provide (1) guidance to hotels on the choice between offering guests an in-house bike-share system and supporting their use of a city-run bike-share system, and (2) prescriptions for cities on how to best design and run tourist-friendly bike-share systems.

Recommendations for Hotel Amenity Planning: In-house- or City-share?

In their continuing effort to provide the most valuable amenities, hotels are exploring the possibilities of making a bike-share option available to their guests. With the rapid growth of public bike-share systems, however, rather than offering an in-house bike-share, hotels and their guests might be able to take advantage of a city-run system.

Account for hotel-to-station distance. The question for hoteliers is: Should you offer an in-house bike-share or, instead, guide your guests to a city bicycle station? The answer to this question crucially depends on the distance to the city station. A big advantage of a short hotel-to-station distance (either with in-house-share or a city station at the hotel) is that all of the guests interested in using a shared bike can easily access it. Our research suggests that guests express significant disutility for walking, and even a short walk to a bike-share station can significantly limit its utility. As the hotel-to-station distance increases, the percentage of guests interested in bike share who would actually use it rapidly diminishes (Figure 1): about 90% for a station 50 yards away from the hotel, about 50% for a station 350 yards away, and only 5% for a station 500 yards away. Thus, for a city share to work for your guests (to ensure at least 75% usage), the nearest station should be no further than 200 yards away.

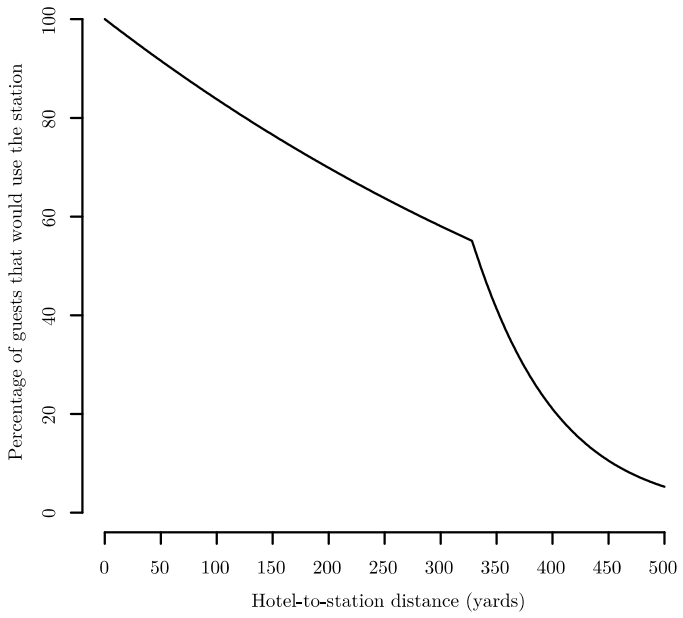

Figure 1. Percentage of guests that would use a city-station as compared to the hotel-based station depending on the distance to the station (obtained based on the method developed in Kabra et al. 2019, using data from the bike-share in Paris).

Advantages of city systems. Should you find that the existing city stations are too far, however, instead of spending money on an in-house bike-share, it might be best to consider partnering with the city to add an additional city-run station next to the hotel. The hotel can shoulder some expenses associated with the additional station, or it can provide space or infrastructure for the public system's installation. City-offered systems have advantages that are hard to replicate with an in-house bike-share. Chief among these is the one-way or modular trip, in which guests can take one-way trips, drop off the bike in any of a multitude of locations, walk for some time, pick up another bike at another location, and eventually return to the hotel. With a hotel-provided bicycles, however, the guest generally must stay with the bike for the entire time. Further, bike maintenance is done by the city and, thus, is done at scale and is more cost-effective. The downside of a city-operated station, however, is that you lose control of bike availability.

Ensure bike availability. To address the availability issue if you partner with the city (and thereby to avoid frustration for your guests), it is paramount that bike availability at the city station is high, since our

research shows that only 5% of all guests who do not find a bike at one station would use another station (Kabra et. al., 2019). Negotiating a deal with a transshipment priority for the station or, better, with availability-level guarantees would ensure a better bike-share experience for your guest. Bigger stations are likely to have bikes in-stock more often. Thus, investing in a few extra bikes, could substantially increase the likelihood that your guests would find bikes at the station. Another strategy might be to deploy hotel staff to move bikes to the hotel's station during peak-usage hours (especially in the evening).

Make city-share your amenity. When bikes are offered by the hotel, they are unambiguously perceived as the hotel's amenity. But hotels can also become a part of the city system. To integrate city stations into the hotel offering, hotels could provide their knowledge of the system to reduce barriers to its use, purchase daily passes, or subscribe to appropriate institutional memberships and make the benefits of these subscriptions available to their guests. These memberships may be co-branded with the hotel and the city operator. The hotel can also purchase ad-space at the bike-share station and highlight the particular station as having been made possible with the collaboration of the hotel. Ultimately, the hotel staff could even check out and deliver city-bikes to the hotel for the guest interested in riding.

Recommendations for the Office of Tourism, City Governments, and Transportation Authorities

For cities that want to attract tourists and substantially improve their experience, it is crucial to create a strong bike-share infrastructure that addresses the needs of tourists and not just local residents. This is even more salient for bike-friendly cities with large tourist volumes, as we discovered in our study of Paris.

Build denser station networks. Given that distance to the station has a high impact on its use (referring again to Figure 1), networks that have higher station density attract substantially more tourists. Thus, to increase ridership and user satisfaction, system operators should build denser networks! Note that higher station density can be achieved via the addition of new stations or also via reconfiguration of an existing network. For example, for the bike-share system in Paris, without adding a single new bike, simply by breaking down existing stations into smaller ones, a substantial increase in system use (up to almost 4%) could be achieved (see Figure 2). Alternately, a similar increase of about 4.4% can be achieved by increasing the number of stations by 10% (Kabra *et al*., 2019).

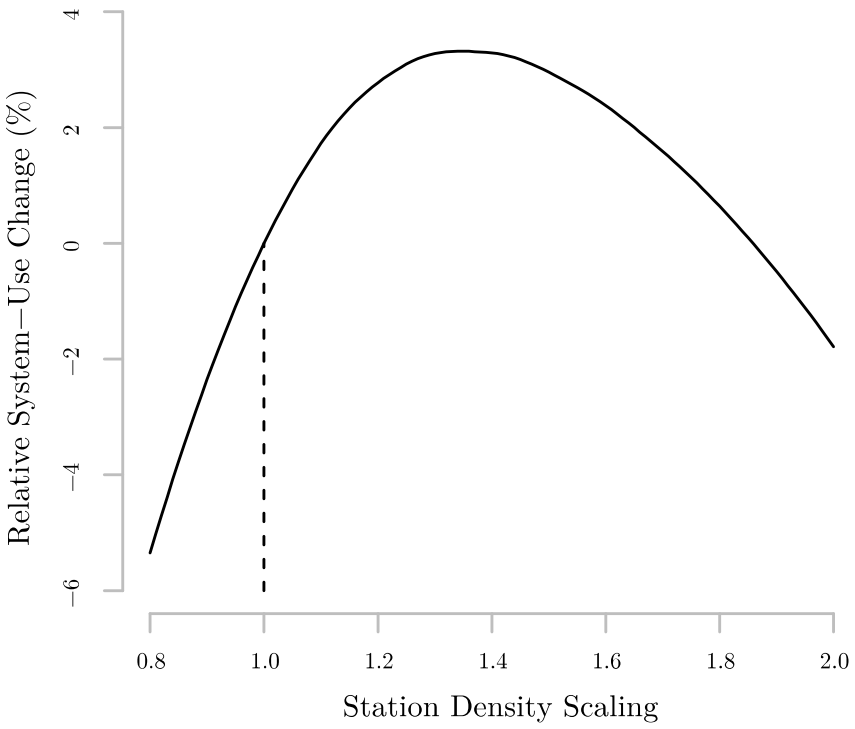

Figure 2. Increase in system use from uniform station density change in the Paris bike-share system (keeping the total number of bikes unchanged), relative to the current system-use. Dashed line indicates current station density.

Target density increases. It is important to note that not all increases in station density are equal. Expansion has a higher effect in areas with more cafés, supermarkets, metro stations, or overall more

points of interest, where the existing system has a lower station density, and in areas with low average bike availability (Kabra et al., 2019). System operators should also take advantage of so-called mobile or "valet staffed" stations, which allow the hotel to *temporarily* increase station density at *specific time of the day*. These should be employed in the "right" parts of the city throughout the day. Figure 3 provides guidance on such prioritization: densely populated areas, and those close to supermarkets, cafés, and metro stations (in that order) should be targeted during the day, while areas next to bars, cafés, restaurants, and hotels (in that order) should be targeted in the night hours.

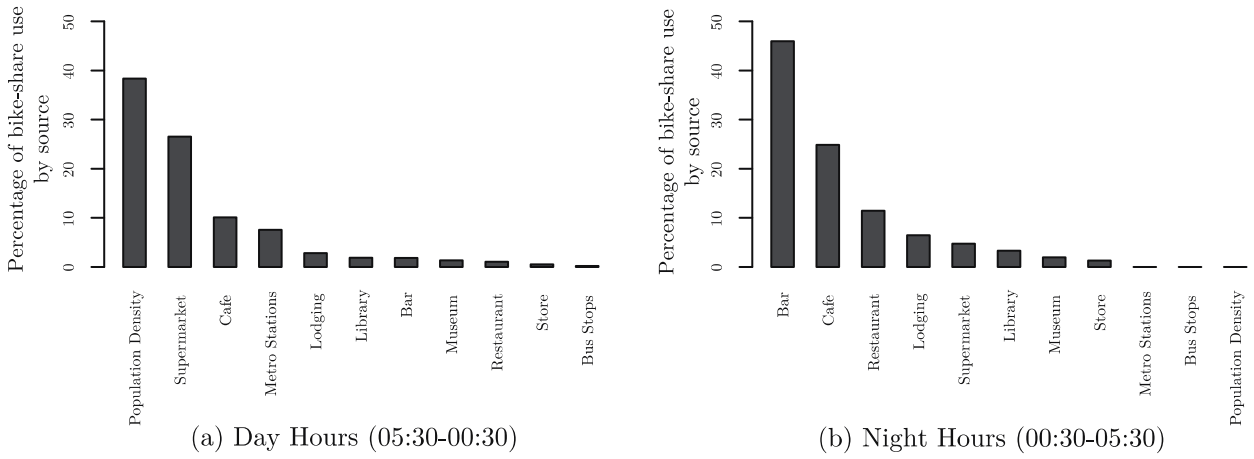

Figure 3 Main sources of Paris bike-share use for the day (5:30 am -12:30 am) and night (12:30 am - 5:30 am) hours.

Focus bike-availability improvement efforts. Not finding a bike at a station is a huge source of frustration for tourists (or any potential user). Bike availability can be improved for a certain set of stations by setting a higher priority for transshipments and by better preventive maintenance scheduling for these stations. To most effectively increase system use, bike-availability improvements should target young, densely populated, and touristy areas. Targeting such areas leads to double the benefit as compared to older and less populated areas. Improving bike availabilities in the evening time (4:00-8:00 p.m.) also gets almost double the efficiency as compared to other times of the day (Kabra et al., 2019). During other hours of

the day, the system operator should schedule fewer resources. To achieve the best results, it is also important to target areas with certain kinds of attractions. Figure 4 helps with the prioritization: improving the availability for stations in the vicinity of supermarkets, cafés, metro stations, and bars and hotels (in that order) yields the highest benefits.

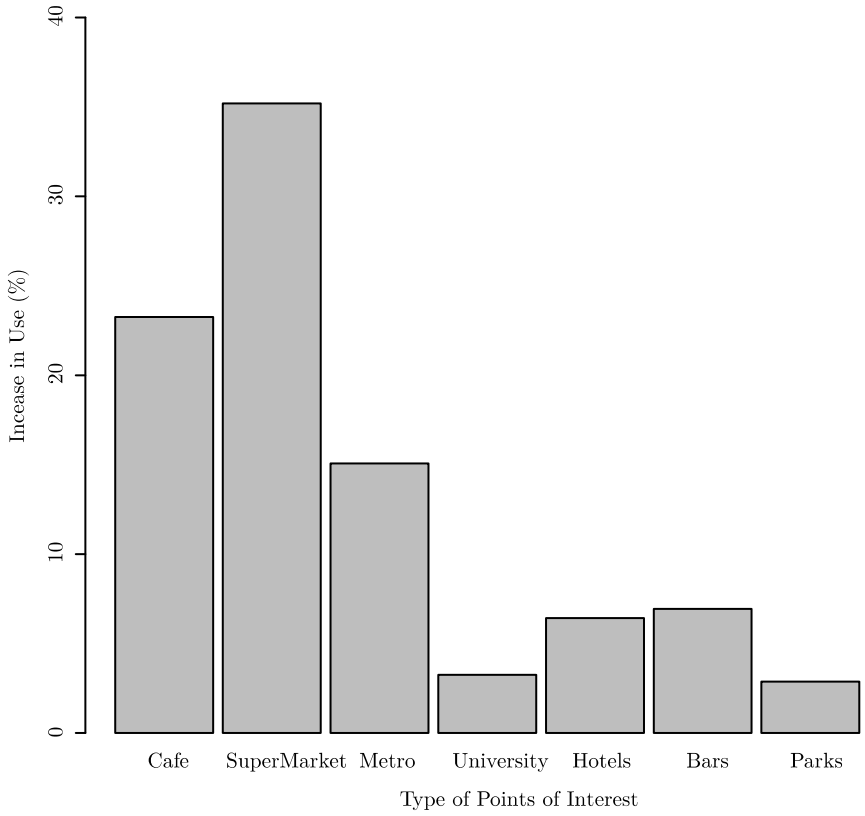

Figure 4. Gains of increasing bike-availability of the four stations closest to all locations of a specific type (e.g.: to all cafés) in the Paris bike-share system by 10%. The increase in use is relative to average station-use in the system. These effects are normalized by the number of stations affected in each case.

Citations

Kabra A., E. Belavina, and K. Girotra, “Bike Share Systems: Accessibility and Availability,” Forthcoming at Management Science, 2019.

EXECUTIVE SUMMARY

Bike-share systems are becoming a big part of a tourist's experience of a city and an essential hotel amenity. This article helps hotels with choosing between in-house and city-offered bike-share systems and provides prescriptions for cities on how to design and run bike-share networks that are well suited for tourists and residential users.

Recommendations for hotel amenity planning. Given that city-offered systems have advantages that are hard to replicate with an in-house bike-share, partnering with the city to bring a new station next to the hotel might be a better option than investing in the in-house system. However, to ensure that the majority of hotel guests would be willing to use the city-run station, it should be no further than 200 yards away. Furthermore, on experiencing a stocked-out station, most people do not switch to other stations. Thus, to avoid guest frustration, bike-availability at the station must be maintained at sufficiently high levels (e.g., via transshipment priority, or bike repositioning by the hotel staff). Finally, it is essential to make city-share *your* amenity by offering bike-deliveries, free or reduced-fee access to city-share to your guests, and by reducing barriers to its use.

Recommendations for the office of tourism, city government, and transportation authority. To fully deliver on the promise of enhancing tourist experiences and transforming urban lifestyles, cities should build a dense network of stations. The best targets for adding stations are areas where the existing system has a lower station-density, low average bike-availability, more cafés, supermarkets, metro stations, or overall more points of interest. We also identify the times and areas that would most benefit from mobile or "valet staffed" stations. For the highest gains in system use, availability improvement efforts should target young, densely populated, and touristy areas; stations in the vicinity of supermarkets, cafés, and metro stops during the day and stations in the vicinity of bars, cafés,

restaurants, and hotels in the night hours. Evening availability improvement efforts are especially important.

ABOUT THE AUTHORS

Elena Belavina is an Associate Professor of Operations Management at the School of Hotel Administration and the Cornell SC Johnson College of Business. She collaborates with startups, established companies, and public agencies to study issues of sustainable urban transportation, food waste, grocery retail, and supply chains. Her recent research has studied how the grocery industry's structure and pricing policies influence food waste, the environmental impact of online grocery shopping and the design of bike-share systems. She has also studied sustainable sourcing, relational contracts, and supply network design including the role of supply chain intermediaries. Methodologically, her research involves a holistic analysis of logistic and economic systems, and econometric analysis of large datasets to advise on system improvements and policies. Before joining Cornell, Elena was on the faculty of the Booth School at Chicago, earned a Ph.D. from INSEAD and bachelor's and master's degrees in applied mathematics and physics from the Moscow Institute of Physics and Technology.

Ashish Kabra is an Assistant Professor in the Decision, Operations and Information Technologies Department at the University of Maryland Robert H. Smith School of Business. His expertise is in developing and applying estimation algorithms to study new business models such as bike-share systems (eg: Citibike) and marketplaces (eg: Uber). He has studied topics related to "accessibility" (sufficient reach), availability (service is available when a user needs it), and that of the effectiveness of promotions in scaling marketplaces. He has also studied online

grocery retail models (eg: Amazon Fresh), specifically its financial and environmental concerns using mathematical economics models. His research has been published in Management Science and won the MSOM Best Student Paper Award, was a runner up at POMS Best Student Paper Award in Sustainability and earned third place at IBM Best Student Paper Award in Service. He earned his Ph.D. in Technology and Operations Management at INSEAD, France. He has also worked for Adobe Systems and a high-tech supply chain analytics startup in the past.