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PRACTICE PAPER: Bike Share 101

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ABSTRACT

There are over 1000 bike share schemes worldwide. Bike share is becoming a "must have" sustainable transport option for cities around the world.

This paper draws upon desktop research on bike share schemes in London, Paris, New York, Madrid, Melbourne, Brisbane, Seattle and Portland, as well as other research papers and guidance on bike share.

The paper provides a short overview of each of the case studies, giving background on the scale and coverage of the scheme. It outlines the operational considerations of bike share, specifically the challenge of ensuring a good supply of bikes and docking spaces as well as the outcomes of the schemes including; usage, safety, and impact on mode choice. The paper also briefly covers the issues related to bike share and mandatory helmet use.

The challenges and successes of the case study schemes are summarised and, from these insights a series of ingredients for successful Bike Share are identified.

INTRODUCTION

There are over 1000 bike share schemes worldwide and increasingly cities are introducing Bike Share schemes as a new public transit option, enabling an efficient and convenient option for short trips and the start or end of journeys. The potential benefits are obvious and numerous. The schemes vary as much as the cities they are in, some schemes are hugely successful, attracting thousands of trips each day, others seem less so.

This paper looks at eight case studies of bike share from different cities and countries and identifies their key characteristics as well as drawing upon usage data and the research of others to identify some key findings about what makes a successful Bike Share scheme.

Bike Share Case Studies

The various case study schemes are briefly described in Table 1.

Scheme name and year opened	Description	Size of scheme
Velib, Paris 2007	The Velib scheme covers a large area of central Paris. It is very successful and has become bedded in as a transport choice for many Parisians as well as tourists.	23,000 cycles 40,421 docks in 1,800 stations
Santander, London 2010	The scheme initially launched with a 44km² deployment zone and has expanded in phases to cover 100km² of central London including the Docklands area to the east. The scheme is well regarded and a strong brand has been developed helped by high quality marketing.	10,000 cycles 19,000 docks in 755 stations
Citibike, New York 2013	Citibike has become very popular and the bikes are well used. Prior to the start of the scheme, numerous community events were held to inform the design of the scheme and the location of stations. The scheme has expanded in phases to areas outside of Manhattan.	9,470 cycles Over 12,000 docks in 590 stations
City Cycle, Brisbane 2010	The scheme has a reasonably large deployment area of over 10km². However, it operates within a mandatory helmet use environment. Courtesy helmets were introduced in 2011 and this led to a doubling in patronage; however, usage levels are still quite low.	1,832 cycles 150 stations Number of docks unknown
Melbourne Bike Share 2010	The scheme has a reasonably small deployment area (around 5km²) and 600 cycles. Courtesy helmets are available as are subsidised helmets for purchase. The introduction of a free tram zone in the CBD adversely affected cycle use in the area and 5 bike share stations were moved as a result. The small deployment zone is also cited as a reason for low take up of the scheme.	545 cycles 900 docks in 57 stations
BiciMad, Madrid 2014	The scheme utilises electric bikes and has a fairly compact deployment zone of approximately 12km². Levels of use are high. The scheme has encountered some problems with vandalism and after several bailouts, the private operator was forced to sell the scheme back to the council in Sept 2016.	1,560 electric cycles 4,116 docks in 165 stations
Bike Town, Portland 2016	The scheme was launched in July 2016 and operates with 'Social Bikes' which have the technology for renting the bike located on the bike rather than the dock, enabling the bikes to be docked at simpler, non-powered stations. This enables the bikes to be docked outside of the deployment area – although users have to pay extra to do so. The scheme has distinctive orange Nike branding.	1,000 cycles 100 stations Number of docks unknown
Pronto, Seattle 2014	The scheme has a small deployment area and, like Brisbane and Melbourne, it has mandatory helmet use. Levels of daily use are low. The scheme ran in to difficulties and was taken over by Seattle City in March 2016 and in late 2016 the decision was taken to close the scheme in March 2017. The financial problems seem to be related to insufficient capital being raised to fund implementation meaning that loans were required and revenues were not sufficient to service operating costs and loan repayments.	500 cycles 54 stations Number of docks unknown

Table 1 Description of Case Study Bike Share Schemes

Bike Share operating models and funding

A number of different business models operate; however, most involve a contract with a company for the operation of the scheme with public funding meeting the capital cost for the scheme and any operating shortfall. Table 2 below compares sponsorship; operating body; contracting structure; level of subsidy; and user fees.

In London, Santander Cycles operates with a high level of cost transparency. The contract with Serco is based on cost-plus principles. A lucrative sponsorship deal with Santander, along with user fees, helps offset operating costs. The scheme requires a fairly hefty public subsidy which equates to around NZ$1.75 per bike use. Whereas in Paris it is far more difficult to identify the cost of the scheme to the public purse, as JCDecaux finance and operate the scheme in return for advertising rights on billboards in the city.

The New York scheme operates without public subsidy. The user fees are higher than in other schemes but there is a still a high level of patronage. Motivate are bearing the financial risk of the scheme, and the financial imperative appears to have driven innovation and improvement at a more rapid rate than in other schemes. Biketown in Portland also aims to be financially self-sustaining.

The Pronto scheme in Seattle was originally owned by a non-profit organisation but it became insolvent and was bought by Seattle City Council. It appears that the financial problems were largely due to inadequate funding at the start, As a result, loans were taken out to fund part of the capital cost of the scheme's implementation. The income from user fees and sponsorship was not sufficient to fund the operating costs and repay the loans.

Similarly, the BiciMad, electric bike scheme in Madrid was initially privately operated but, after several bailouts the operator was forced to sell the scheme back to the City Council.

Cycle Hire Scheme	Sponsor	Operator	Contracting structure	Annual public subsidy	Annual membership fee (NZ$)
Velib, Paris	N/A	JC Decaux	Privately operated, (infrastructure reverts to city council at contract end)	No direct subsidy.	$43 - $57 Unlimited trips, first 30 minutes free
Santander, London	Santander (£37.5 million over 5 years)	Serco	Privately operated / publicly owned	Yes - £7M +	$159 Unlimited trips, first 30 minutes free
Citibike, New York	Citi Bank, Mastercard	NYC Bike Share (owned by Motivate)	Privately owned and operated	No	$215 unlimited trips and first 45 minutes free
City Cycle, Brisbane	Lipton Ice Tea	JC Decaux	Privately operated / publicly owned	$520k	$63 Unlimited trips, first 30 minutes free
Melbourne Bike Share	N/A	RACV	Public / private	Estimated at $5.73M over 5 year period	$62.50 unlimited trips, first 45 minutes free
BiciMad, Madrid	N/A	Madrid City Council (formerly Bonopark)	Initially - Privately operated / publicly owned, now publicly operated and owned.	$791K	$22 - $37, first 30 minutes $0.73; 2nd 30 minutes $0.89
Bike Town, Portland	Nike (US$10M over 5 years)	Motivate	Unknown	No	$200 up to 90 minutes ride time per day

Cycle Hire Scheme	Sponsor	Operator	Contracting structure	Annual public subsidy	Annual membership fee (NZ$)
Pronto, Seattle	Alaska Airlines (and others)	Motivate	Privately operated / Publicly owned	Currently owned by local council, operational costs estimated to be US$2m per year.	$118 unlimited trips with the first 45 minutes free

Table 2 Contracting arrangements of Bike Share case studies

User Pricing

Systems have an annual subscription fee and also casual user fees. Users can hire a bike for 30 or 45 minutes before any additional charges are incurred. Pricing is generally structured to encourage annual membership and short journeys (30 minutes or less).

The electric cycle scheme, BiciMad in Madrid has a reasonably low cost annual membership fee but users have to pay for the period of hire. This pricing structure may have been necessary due to the higher operating costs involved in operating an electric cycle fleet.

Sponsorship

Sponsorship is a key feature of some schemes (in particular, London, New York and Portland) which have naming sponsors who contribute a significant financial boost to these schemes. An advantage of having a long-term naming sponsor from the start is that the branding can be incorporated easily.

Melbourne Bike Share has tried unsuccessfully to attract a sponsor. It may be that sponsors are less keen to sign up to a deal prior to a scheme going live as there is uncertainty about how successful it might be and it is difficult to place a value on the sponsorship opportunity.

OPERATIONAL CONSIDERATIONS

Network Size

Most schemes start with a core area covering the city centre and expand in stages, building momentum and patronage. It is generally recognised that small pilot schemes are not effective as people need to see that the cycles can be used to access a variety of locations that they might wish to travel to and they need to know that as long as they stay in the deployment zone they will be able to find somewhere to pick up or drop off a cycle. The Institute for Transportation & Development Policy (ITDP) Bike Share Planning Guide recommends a minimum coverage area of 10 km².

Melbourne has a fairly small deployment area and this may be one of the factors behind the low take up of the scheme.

Station Density

The ITDP Bike Share Planning Guide identifies a direct correlation between station density and market penetration – the higher the density of stations the greater the market penetration. The ITDP Guide recommends a density of between 10 – 16 stations per km². In Paris, London and New York, the guideline density was one station every 300m which equates to fourteen stations per km². This station proximity provides good coverage but also provides customers with options when they either cannot find an open docking station or available cycle.

Number of Cycles and Docking Points

The ITDP Bike Share Planning Guide recommends the ideal ratio of bikes per population is between 10 and 30 cycles per 1,000 residents. In the Paris and New York schemes there are around 9 bikes per 1000 residents whereas in London the figure is around 23 bikes per 1,000 residents. This may be due to lower residential densities in central London in comparison with New York and Paris and a high level of use by commuters accessing the city by public transport and then using the bikes for the last part of their journey. The ITDP Guide recommends that once up and running the scheme should seek to have a ratio of around 10 members to each bike.

Operating Systems

The schemes reviewed generally work in broadly the same way, with a terminal at each station and users either hiring the cycle via the terminal or using a smart card at the docking space to release the cycle. A common teething problem with many of the schemes relates to IT issues at the docking points.

The Biketown scheme launched in mid-2016 in Portland and this scheme utilises a different sort of system to the other case study schemes. The system is supplied by Social Bicycles (SoBi) and rather than having the technology on the docking station, the technology for hiring the bike is on the bike itself meaning there is no need for standalone terminals or powered docking spaces. The cost of on the ground infrastructure is less and this should also mean that expanding the area covered by the scheme will be easier too. The cycles have on board GPS trackers which make it easier to track down the cycles if stolen or lost.

Link to Public Transport Smart Cards

Most systems are integrated with PT smart cards which improves ease of payment and helps to identify bike share as part of broader public transport system. The London scheme does not have integration with the Oyster Card (PT smart card) but this will be implemented when the new contract commences in July 2017.

Rebalancing and Maintenance

Rebalancing of cycles to ensure a supply of cycles and empty docking spaces where they are needed is an important factor in the efficient running of the scheme. Most schemes require some level of rebalancing by crews with vehicles. The strong tidal demand in London gives rise to the need for rebalancing and in cities with hilly topography rebalancing is needed to ensure there is a supply of cycles for use at the top of hills.

Various techniques have been employed to incentivise users to rebalance the system by docking cycles at certain stations, such as providing customers with a credit on their account if they dock a cycle at a high demand station. If effective, they present a cheaper and more sustainable way of managing cycle and dock supply. In New York, the Bike Angels initiative has recently been launched which rewards volunteers for rebalancing bikes to empty stations.

In addition to ensuring the availability of cycles, ensuring the cycles are in a safe and usable condition is also a key operational consideration. Serco the operator of Santander Cycles in London have their performance measured against an indicator stating 95% of cycles shall be on-street at all times, so allowing that 5% (or around 500 cycles) of their fleet will be in a workshop. As well as fixing cycles in their two workshops, mechanics also travel on mopeds around the city to fix cycles at docking stations.

The rebalancing and maintenance function as well as the office based functions of running the schemes involve a significant number of staff. Around 250 staff are employed in the operation of the London scheme.

Helmets

Helmet use is mandatory in Melbourne, Brisbane and Seattle. When the Australian schemes were launched courtesy helmets were not provided but in order to boost patronage, both schemes introduced courtesy helmets. The courtesy helmets seem to have been well received. The cost of providing the helmets and the system in place to clean and replace the helmets is not known. In Melbourne $5 helmets are also sold, the cost of these is subsidised by the City Council.

It is difficult to isolate the impact the helmet law has on patronage in the Brisbane and Melbourne schemes. In research undertaken in both cities, non-cycle hire users were asked what the barriers deterred them from using the scheme, convenience emerged as a key theme. The three most frequents responses were; *'*: "*driving is more convenient'*, *'*convenient", "*docking stations are not close enough to my house* & work" *and work'* and "*I don't want to carry a helmet with me*'.[i]

In Seattle the approach to helmet provision was fully considered during the feasibility stage, with various options costed and considered. The chosen solution was to provide helmet dispensers next to a docking station. This reportedly costs around $US200,000 a year.

It can be assumed that the need to carry a helmet is likely to be a factor in whether people use the cycles opportunistically on the spur of the moment. When examining the proportion of trips by cycle hire which are

planned vs opportunistic, it is unlikely that spur of the moment trips account for a high level of overall cycle hire patronage

OUTCOMES

Level of use

The graph below shows the average number of uses per bike per day in the different schemes. There is detailed usage data available for the London and New York schemes and both exhibit seasonal variations in usage, with higher uptake in the warmer months and lower usage during winter.

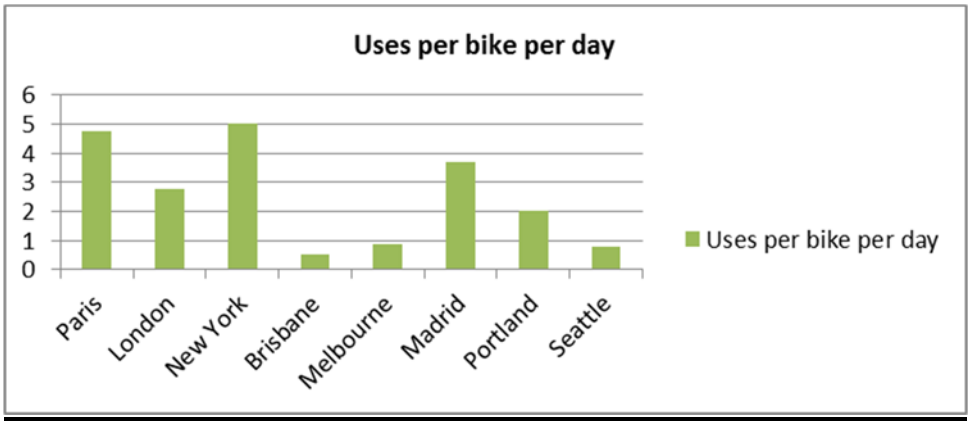

Figure 1 Graph showing the average number of uses per bike per day

As the graph illustrates, there is a large variation in the level of use across the case study schemes. In the Brisbane, Melbourne and Seattle schemes the average number of uses per bike per day is less than 1. This low level of take up is likely due to multiple reasons. Research undertaken in Brisbane found the top 4 reasons stated for not using bike share were: *1) driving is more convenient; 2) docking stations are not close enough to my home; 3) I'm concerned for my safety riding in traffic; 4) I don't generally carry a helmet with me*.[1]

Safety of Cycle Hire

Bike share cycle safety generally compares favourably with private cycle safety, with a lower level of accidents occurring for those on hired cycles. In London a study found that those on Santander Cycles are three times less likely to be injured on a trip than other cyclists.

The favourable safety record of bike share is likely due to a number of factors; the bikes are heavier and slower than most private cycles and riders have a more stable, upright riding position. The cycles are distinctive in appearance and vehicle drivers are perhaps more aware of hire cycles.

The graph below is based on data from 10 cities in the USA and indicates that cycle related injuries reduce following the implementation of cycle hire schemes.

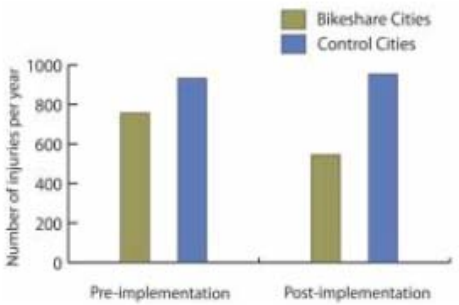

Figure 2 Graph showing number of cyclist injuries per year pre and post implementation in bike share cities and non-bike share cities[2]

[1] [1] Barriers to bikesharing: an analysis from Melbourne and Brisbane, Fishman et al, 2014
[2] Fishman 2015, Bikeshare – A review of recent literature

Mode Substitution

The graph in Figure 3[ii] shows the mode substitution in various Bike Share schemes. In London, the public transport network is congested, especially in peak hours, and almost 60% of trips undertaken by bike share would previously have been made by public transport whereas only 2% of journeys would have been undertaken by car. In Brisbane and Melbourne there is a different pattern of substitution with around 20% of trips which would have been taken by car.

Data from Paris shows that car use in the city has reduced by 25% following the introduction of Velib, it is not known how much of this change is attributable to Velib, but given the high daily usage of the bikes it is safe to assume Velib has made a significant impact on mode choice

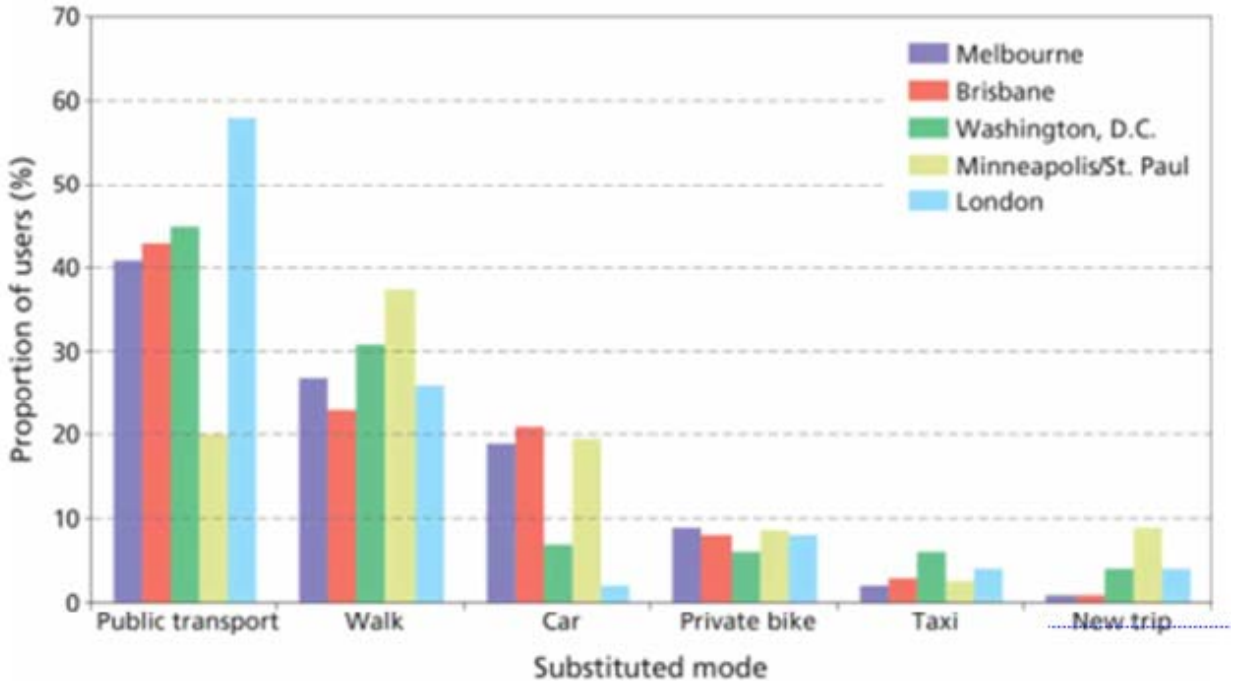

Figure 3 Mode Substitution in selected Cities

Cycle Infrastructure Improvements

Many of the schemes were implemented around the same time that new cycleways were built. In London the Mayor(s) were keen to promote cycling and improve conditions in the city for cyclists and cycle superhighways were implemented around the same time as the bike share scheme. Likewise in New York there was a programme of street improvements for pedestrians and cyclists and the bike share scheme has complemented this.

CHALLENGES AND SUCCESSES

Some of the various challenges and successes of each of the case study schemes are outlined in Table 3 below.

City	Challenges	Successes
Paris	• The occurrence of bike theft; and vandalism of cycles and stations has been higher than expected. • Occasionally there are no cycles at stations.	• The scheme is well used – 86% of Parisiens use Vélib' and each cycle is used around 4.6 times a day. • High level of user satisfaction – 87% like the service and 99% would recommend it to a friend. • Around 8% of tourists visiting Paris use Vélib'.

City	Challenges	Successes
		• The profile of cycling has improved and the number of cycles in Paris has increased by 41%. Car use has decreased by 25%.
London	• There is a significant rebalancing operation to ensure adequate supply of cycles. However the performance indicators which measure full and empty docking stations are frequently not met.. • The level of use of each bike (around 2.7 uses a day) is on the lower end of what is considered desirable from a cost / benefit perspective. • Initially the scheme was not aimed at 'after rail' use. However, whether by design or not, the scheme does cater for after rail journeys and the demand for cycles at some mainline rail stations far exceeds the capacity of the docking stations during peak hours.	• The branding / sponsorship of the scheme is very visible. • The scheme has had a positive impact on cycling in London. • The scheme is well regarded by users; surveys conducted in 2015 show a high level of satisfaction, 86% of casual users and 80% of members were satisfied with the service.
New York	• Initial problems were experienced with software. The resolution of the problems entailed a retrofit of all of the docking spaces. • Ensuring the supply of cycles and docking spaces is a challenge.	• The scheme has been well received and is well used. Each cycle is used for around 6 trips a day. • Solutions have been swiftly implemented to overcome some challenges. • The 'Bike Angels' scheme has been recently launched to incentivise rebalancing.
Brisbane	• There is a low level of use per cycle - around 0.5 uses a day. • Initially the scheme operated between 5am to 10pm which drew some criticism, the bikes are now available 24/7. • The level of public subsidy is higher than anticipated. This has led to some negative press coverage. • There is a legal requirement to wear a bike helmet in Brisbane.	• The scheme is well-liked by users. • Use of the scheme continues to grow each year. • CityCycle users said that they felt safer on a CityCycle than their own private bike. • Initially courtesy helmets were not provided but were later introduced and this move boosted patronage.
Melbourne	• The scheme has low levels of patronage, with each cycle achieving between 0.4 and 0.8 uses a day. • Promotion of the scheme has been limited. • The area covered by the scheme is relatively compact and lack of investment has prevented scheme expansion. • The free tram zone in the city centre has had a detrimental impact on the scheme within this area. • There is a legal requirement to wear a bike helmet in Melbourne.	• Geospatial analysis of ridership data has identified that some of the strongest trip patterns occur between stations located in areas of relatively weak public transport accessibility. • Five stations have been relocated to outside the free tram zone. Since relocation a 135% increase in use has been seen between the five stations. • When courtesy helmets were introduced, there was an increase in scheme patronage of almost 50%.
Madrid	• There has been a significant level of cycle theft and vandalism. • The supply of cycles at certain locations does not always meet the demand. • There have been problems with securing the funding to expand the scheme and in	• The cycles are well used.

City	Challenges	Successes
	September 2016 the operator had to transfer the scheme to the city council	
Seattle	• The scheme is not well used with each cycle achieving around 0.77 uses a day. • The service area of the scheme is small (around 7km^2) and the station density is below the optimal level. • The steep topography of Seattle means 61% of journeys are undertaken with a downhill destination, giving rise to the need for rebalancing between uphill and downhill stations. • There is a legal requirement to wear a bike helmet in Seattle.	• The cycles weigh less than those used in other schemes and have 7 gears. • Helmets are provided at dispensers next to docking stations.
Portland	• Helmet wearing is not mandatory in Portland but is encouraged; there is a campaign for courtesy helmets to be introduced.	• The scheme has been well received with nearly 59,000 uses in the first month of operation.

Table 3 Challenges and successes of the case study bike share schemes

KEY INGREDIENTS FOR A SUCCESSFUL BIKE SHARE SCHEME

Below is a set of guidelines for councils and organisations seeking to introduce successful a bike share scheme:

- The system should be easy to use. This includes the ease of hire so users do not need to pre-register for casual use; operability with passenger transport smart cards bikes that are easy to ride with a selection of gears and good availability of cycles and return docking spaces at convenient locations.

- The hardware (bikes, docking stations) and software should be reliable and resilient as breakdowns affect confidence in the system.

- Strong and sustained political support for the scheme is essential. This includes being clear and open about the objectives of the scheme and the likely cost and public subsidy.

- Stakeholder engagement is vital during all phases. It is vital to know the market and engage with users.

- A robust business case is needed for the scheme with clarity about the likely initial and ongoing capital costs as well as public subsidy for the ongoing operational costs. The scheme should be viewed as a part of the public transport network and subsidised in a similar way.

- A reasonable sized deployment area is just the start, a programme of expansion should be planned to follow, building on the initial momentum.

- Build upon a growing cycling trend – launch the scheme around a similar time to new cycle infrastructure, provide routes and cycle friendly streets which will be inviting and feel safe for cyclists to use.

- In cities with mandatory helmet use, it will be important to consider how this might impact on use of the scheme and what can be done to make it easy and attractive for users to wear a helmet or seek legislative change to exclude mandatory helmet wearing for Bike Share users. Seek the views of would-be users on how to best accommodate helmet use.

- High quality marketing for the scheme is essential; creating a brand that residents and visitors are aware of is important and can be helped by having a naming sponsor.

- Launch the scheme in the spring or summer to get people using the bikes as a habit while the weather is best.

References

Fishman E, 2015 Bikeshare – A review of recent literature

Institute for Transportation & Development Policy (ITDP), The Bike-Share Planning Guide,

Barriers to bikesharing: an analysis from Melbourne and Brisbane, Fishman et al, 2014