

1 **City Bike Hire Schemes - Emerging Trends in Europe**

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Abstract

This paper examines the recent increase in the uptake of city bike hire (also known as “bike share”) schemes and provides an analysis of the emerging trends that are being witnessed. The paper is based on an ongoing study into the spread and distribution in the adoption of bike hire schemes throughout Europe. The data collection consists of two stages that first seek to build a picture of the current situation before moving on to a more detailed discussion with the scheme adopters.

The paper presents a brief history of bike hire schemes and describes the theoretical basis for the investigation, drawing on innovation and diffusion theory. It then reports the findings of the research, which suggests that the expansion phase of city adoption of public bike hire schemes may be past its peak. The research also identifies useful relationships between city size and bike hire scheme size and explores the extent to which existing schemes have expanded or plan to expand. There appears to be evidence of regional differences in adoption which may be explained by the private sector providers that manage and co-develop many of these schemes. Discussions with scheme adopters explored the learning processes behind the adoptions and highlighted the role of both individuals and external influences in the uptake process.

81 1. INTRODUCTION

82
83 Public bike hire schemes as an innovation have become increasingly popular in recent years
84 with a significant portion of this growth occurring over the past decade. Their origins can be
85 traced to Europe but they have since spread across the globe with schemes being created in
86 Asia, Australasia and North and South America [1]. This growth leads us to consider what
87 role such schemes may play in future transport systems and to question whether they have the
88 potential to become a valuable part of an integrated transport system or if their scope is
89 limited to being a niche innovation.

90 The purpose of this research is to examine the uptake of city bike hire schemes and to
91 establish an understanding of the trends in the spread and distribution of their adoption. The
92 research focuses on a European context, as this is where the origins of bike hire schemes can
93 be traced to and where the majority of growth has occurred. Diffusion theory will be utilised
94 to enable a greater understanding of the emerging trends in uptake of such schemes.

95 City bike hire schemes have now emerged onto the global stage after several decades
96 of relative anonymity outside of Europe. This newfound attention also brings the need to
97 better understand the process bike hire schemes have been through, particularly over the past
98 decade. By examining this innovation from a policy transfer and diffusion theory perspective
99 we can better understand the recent trends and therefore help to inform subsequent schemes
100 around the world and even the next generation of models that have yet to emerge.

101 This paper provides an explanation of bike hire schemes and discusses how they have
102 evolved over the past few decades. It will also report on a current study being conducted into
103 3rd generation schemes in Europe, which seeks to assess the current situation and build a
104 better understanding of the reasons behind the adoption of such schemes. The key results and
105 subsequent analysis of this study will be presented. This paper will then conclude by
106 discussing the next stage of research in this ongoing study and drawing some initial
107 conclusions from the data that has been collected to date.

110 2. INNOVATION AND THE DIFFUSION OF INNOVATIONS

111
112 This paper is examining how an innovation (public bike hire schemes) makes its way into the
113 policy mainstream. This section provides a short introduction to some key theoretical
114 perspectives which have been used to shape the analysis and interpretation of the results.

115 Diewald [2] identifies an innovation as the development and application of something
116 new. He suggests that two separate processes need to be considered. Research generates the
117 new products, materials and practices whilst ‘technology transfer’ is what enables
118 implementation (p59). Technology transfer is the movement of know-how amongst
119 individuals with institutions or companies. In the field of public policy, the technologies that
120 are transferred can be policies, technologies, ideals or systems and this is typically referred to
121 as ‘policy transfer’ [3].

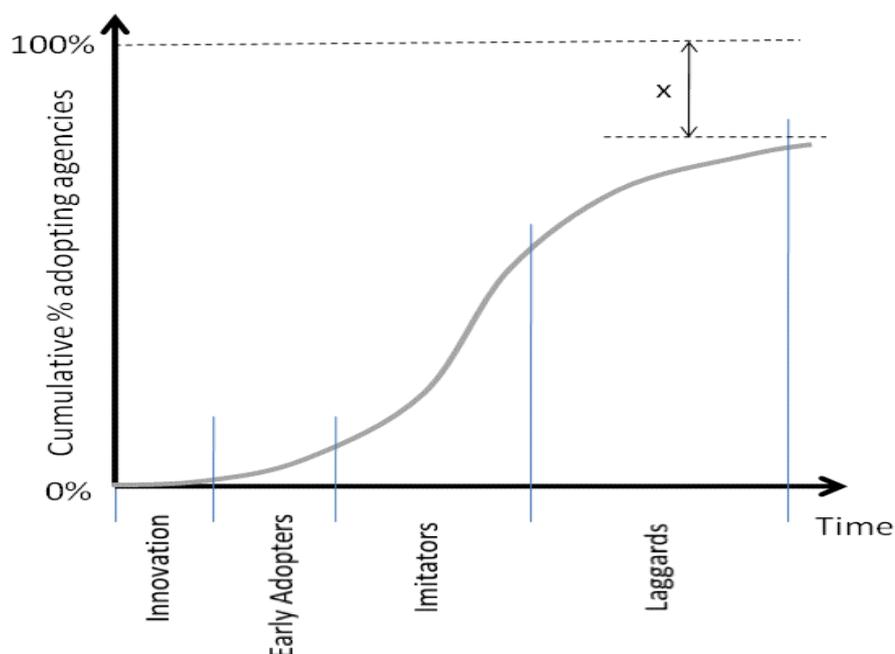
122 Geels [4] provides a long-term perspective about major technological transitions. He
123 suggests that three broad levels need to be considered to understand the reasons for particular
124 innovations being adopted and being able to embed themselves in and alter current patterns of
125 consumption. At the macro level are ‘landscape developments’ such as climate change, which
126 may alter the policy frame within which systems develop. At the meso level are ‘socio-
127 technical regimes’ which comprise the interaction of systems of provision, consumption and
128 governance. At the micro-level are new technological innovations which are seeking to enter
129 into the mainstream but which may fail.

130 Geels suggests that socio-technical regimes are critical to understanding how
131 innovations survive or fail. The regimes comprise multiple inter-twined relationships for
132 example between the infrastructure provided, the technologies available and user practices.
133 These are typically supported, over time, by legislative policies and by an ever more
134 established industrial-technology nexus which seeks to continue propagating the current
135 practices. One can, for example, consider the difficulties of developing the capability for a
136 network of electric vehicles where there is very large commitment to the manufacture of the
137 internal combustion engine, the established fuelling infrastructure for this and a tax base
138 which has grown, to a degree, reliant on the income from fuel consumption. Geels classifies
139 innovations that occur within these conditions as typically incremental rather than radical. So,
140 one can consider the development of real-time passenger information at bus stops an
141 incremental innovation within an established regime. Bigger transformational innovations,
142 Geels argues, are developed in strategic niches (such as the military) where they can be
143 developed outside of the normal rules of market forces. However, not all of these innovations
144 make it into the mainstream due to the combination of pre-existing systems and practices in
145 place [4 & 5]. The difficulty of embedding new practices in existing systems is sometimes
146 also referred to as path dependence [6]. In the case of city bike hire schemes, we suggest that
147 this began as a niche innovation but that it may now be being incorporated into the
148 mainstream transport system.

149 Diffusion theory treats the way in which innovations spread through social systems
150 [7]. Almost fifty years of research in diffusion theory across many disciplines identifies some
151 strong and recurrent themes. Within different policy or practitioner communities there are
152 typically individuals (or organisations) that seek to adopt new policy ideas before they
153 achieve widespread acclaim (e.g. in transport one could consider London's decision to adopt a
154 congestion charging zone as one such decision). Some of these individuals or organisations
155 are seen as 'different' and therefore do not connect well to other practitioners or networks to
156 spread their knowledge. Some well networked individuals or organisations that mix with both
157 the innovators and the mainstream community exist however and these are critical to
158 demonstrating and disseminating new practices. The 'mainstream' adopters can be further
159 classified as 'imitators' or 'laggards' depending on the timescales over which they
160 subsequently adopt an innovation. This implies that social interactions are critical to
161 disseminating knowledge – consistent with organisational learning theory and the earlier
162 reference to innovations which notes the importance of situated learning to allow the
163 application of practices [8].

164 This rather simple introduction to diffusion theory masks a number of important issues
165 which have been uncovered over time. The theory is better at explaining how an innovation
166 diffuses than why it was selected and successful in the first place. Indeed, the evidence base is
167 populated by successful examples not failures or those which achieved only small scale
168 application [7]. The reasons for adoption are complex and depend on local circumstances. It is
169 likely that innovations will not be equally relevant to different circumstances and Rogers [7]
170 highlights the 'matching' stage as being important in organisational adoption decisions.
171 Multiple solutions might also be applicable to a particular problem, in which case diffusion
172 will be affected by the extent to which local preferences steer the selection of one system or
173 policy over another. The literature suggests that policy innovations are most likely to be
174 adjusted and tailored more specifically to local needs by early adopters who take a more pro-
175 active role in the policy learning process [9]. By contrast, later adopters tend to adopt policies
176 as a response to pressure to do so and are more likely to accept the most common practices [9
177 & 10] Whilst later adopters are often the less networked individuals in the system it is a matter
178 of empirical research to establish whether the 'imitators' or 'laggards' are losing out from
179 later adoption or complete rejection of innovations.

180 Kern et al. [11] looked at the extent to which cities belonging to different regions of
 181 Germany had adopted the UN sustainable development policies through adopting a Local
 182 Agenda 21 agreement in one of the few organisational diffusion studies with strong
 183 connection to transport. As of June 2006, 2610 local authorities (around 20%) had initiated
 184 Local Agenda 21 (LA21) policies and the numbers seem to have reached a plateau, perhaps
 185 related to a post Kyoto switch in emphasis to climate change. Kern et al. found that “the local
 186 authorities’ capacities (size, wealth, political institutions, social capital) and location appear to
 187 be crucial for LA21 diffusion. LA21 pioneers tend to be middle-sized or large cities.” (p.610).
 188 State capitals and university towns were often pioneers. The LA21 case study found the S-
 189 shaped adoption curve typical of innovation diffusion [7]. The slow start is typical of many
 190 product innovations as is the flattening of the curve as the adoption process reaches its
 191 conclusion (see Figure 1).
 192



193 **Figure 1: Framework for policy adoption amongst local delivery agencies**

194
 195 The different classifications of adopters across the diffusion process is expanded on below.
 196

- 197 • Innovators – forward thinking agencies where new policy ideas are developed at a local
 198 level.
- 199 • Early Adopters – agencies which are looking for solutions within a particular area and
 200 see the policy fit of the proposal, are not overly risk averse in the context considered
 201 and are prepared to engage in shaping the policy to their locality.
- 202 • Imitators – agencies which wait for policies to become more standardised and accepted
 203 as current practice before they are prepared to commit to adopting. There is likely to be
 204 a mixed degree of commitment to the application of the policies.
- 205 • Laggards – agencies which do not see sufficient reason to adopt a policy. Such reasons
 206 may include lack of policy fit, limited potential effectiveness in their area or a lack of
 207 resources to implement.

208
 209 Taken together the innovation and diffusion literature provide evidence that the ability
 210 of innovations to make it through to the mainstream will depend on the extent to which they

211 are provided with a ‘safe’ environment to develop at the early stages and the degree to which
212 they are seen to be beneficial by the mainstream adoption community. Whilst there is
213 evidence to support the role of social interactions in communicating and transferring policies
214 it is also the case that the broader institutional environment and support conditions will also
215 be important in their ultimate adoption [12].

216 We suggest here that city bike hire schemes have accelerated in their adoption and the
217 purpose of this paper is to explore how this expansion has occurred in Europe and to consider
218 the future prospects for its growth.

219
220

221 3. CITY BIKE HIRE SCHEMES HISTORY

222

223 City bike hire schemes are based on the simple principle of providing users with cheap, on
224 demand access to bicycles whilst giving them the flexibility of multiple pick-up/drop-off
225 stations [13]. Bike hire schemes are often cited as being the mode that can fulfil the needs of
226 transport users during the ‘last mile’ of their journey. The last mile refers to the distance
227 between workplaces or homes and the public transport stops where users have disembarked
228 [13]. If these distances are too great to walk in a reasonable time, bike schemes offer users an
229 attractive option to help them complete their journey.

230 Bike hire schemes emerged in the mid-1960s with the introduction of the ‘white bikes’
231 of Amsterdam in the Netherlands [1]. This 1st generation scheme simply consisted of a
232 number of old bicycles that were painted white and distributed around the city to be used by
233 anyone, free of charge. Only a limited number of 1st generation schemes ever existed and
234 their success was restricted by the lack of security for the bikes, which meant that they were
235 frequently stolen.

236 The general failure of 1st generation schemes was eventually met with the emergence
237 of a 2nd generation that began to adopt a more structured and secure approach to bike hire
238 schemes. This improved security came in the form of coin-deposit docking stations although
239 the low fee for deposit meant that bikes would often be taken for long periods or never
240 returned [13]. The first 2nd generation schemes were in the towns of Farsø and Grenå in
241 Denmark and were both opened in 1991 [1]. The scheme in Copenhagen, Denmark – opened
242 in 1995 - is perhaps the most recognised 2nd generation scheme and is an early example of the
243 implementation of a scheme on a large-scale.

244 The first 3rd generation scheme was opened in Rennes, France in 1998 [14]. The
245 advent of this generation was made possible by the utilisation of new technology that enabled
246 greater control over the hiring of bikes. This improved control helped to make the schemes a
247 much more viable enterprise and allowed them to garner the success they have, where 2nd
248 generation schemes failed. A number of new characteristics differentiate 3rd generation
249 schemes from the previous generations. These include “improved bicycle designs,
250 sophisticated docking stations and automated smartcard (or magnetic stripe card) electronic
251 bicycle locking and payment systems” [14] (p.3). Third generation schemes also commonly
252 use websites to provide real-time information for users and a portal through which customers
253 can manage their accounts [14]. Figure 2 shows a system diagram for a typical 3rd generation
254 scheme and illustrates the processes customers go through when using a scheme.

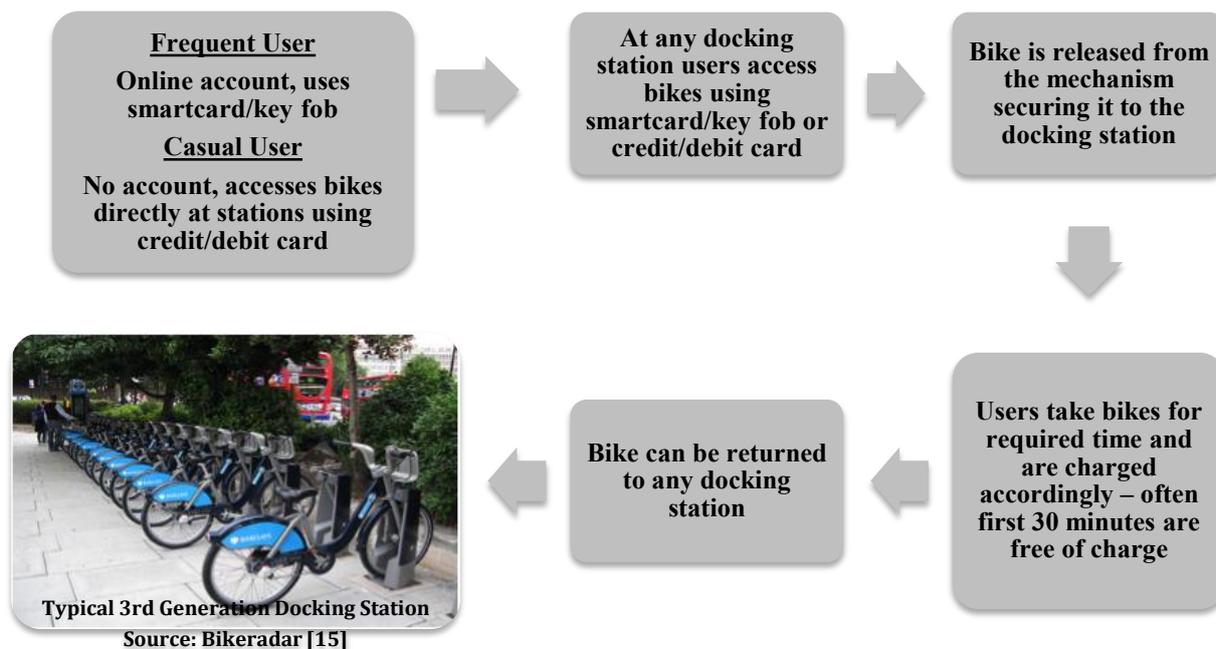


Figure 2: System Diagram - Typical 3rd generation bike hire scheme

The evolution of this innovation has brought us a series of generations that have each sought to better the last. Midgley [14] introduces the concept of an emerging 4th generation, which may integrate newer technologies such as solar-powered docking stations, power assisted bikes and the use of smartphone applications for real-time updates. A clear benefit of this generation would be its increased appeal for potential adopting cities that have previously been unable to adopt because of the topography of their city. This section highlights one of the key difficulties in studying the spread of an innovation – the innovation itself evolves. A key feature of the investigation must therefore be to look for sites of learning to evidence which systems have been influential in the spread of adoption.

4. THE SURVEY

To understand the trends in the adoption of city bike hire schemes it is necessary to build a picture of the current situation. To achieve this a review of 3rd generation European schemes was conducted using short, online surveys directed at each individual scheme that was identified. Two surveys were designed, the first to be sent to cities where a scheme already exists and the second to those cities that were considering the implementation of a scheme. Whilst the use of two separate surveys was necessary for practical purposes relating to the phasing of questions, the purpose of them was identical. This was to collect basic data about the size of the scheme, identify the involvement of an external sponsor and begin to understand the reasons for the adoption of the scheme.

Given the large geographic area over which the schemes were located, online surveys were identified as the most suitable and practical method of collecting the data from the respondents. Both surveys followed similar avenues of questioning, seeking information on three topics. The first area of interest referred to basic data about each scheme including the year of opening and original, current and future bike and station figures. The second part of the surveys sought to establish the level of involvement, if any, of external partners in the

287 uptake of each scheme. This line of inquiry was a response to the notable involvement of a
 288 number of large companies, specifically outdoor advertising agencies, in many 3rd generation
 289 schemes. The final section dealt with initial questions about the reasons for the adoption and
 290 which other cities were learned from in the decision-making stage.

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293 5. RESULTS

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295 Uptake of Schemes

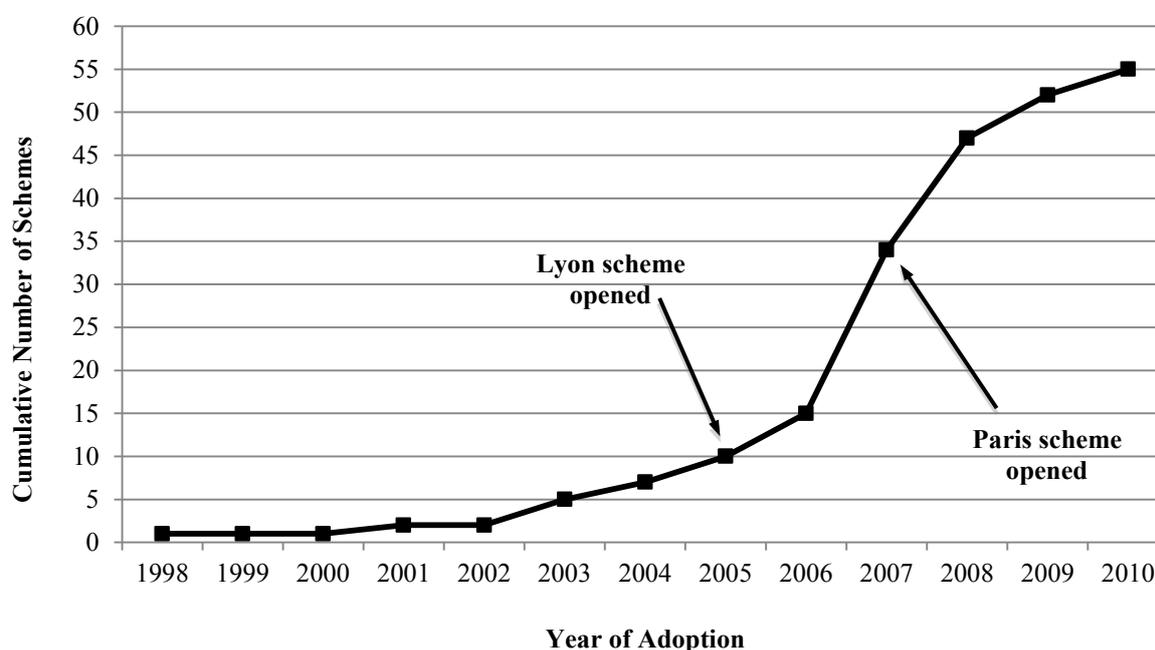
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297 The first key metric to consider in the study of the diffusion of city bike hire schemes is the
 298 year of adoption. This allows us to understand the shape of the adoption curve and to
 299 hypothesise about whether we are in a state of expansion or saturation.

300 To supplement the primary data obtained directly from the schemes through the
 301 surveys, secondary data has also been included from a recent study by the Optimising Bike
 302 Sharing in European Cities Project (OBIS) [16]. This has allowed us to analyse the adoption
 303 years for a greater number of 3rd generation schemes in Europe, 55 in total, and has resulted
 304 in the diffusion curve presented in Figure 3.

305

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307

308

309 **Figure 3: Diffusion curve for 3rd generation European bike hire schemes**

310

311 Figure 3 shows an S-shaped curve where the adoption of bike hire schemes begins with a
 312 slow uptake before ‘taking-off’, a feature of diffusion recognised in the literature [7]. The
 313 uptake of 3rd generation schemes was very limited up until 2005 with less than 10 in
 314 existence. 2005 saw the arrival of the Vélo’v scheme in the French city of Lyon, which has
 315 become one of the most notable 3rd generation schemes. The Lyon scheme opened with 1500
 316 bikes and was the largest 3rd generation scheme at the time with 300 bikes more than the
 317 scheme in Oslo, Norway, which was the second largest. Within the literature it is regarded as
 318 a success story [17] and amongst the survey respondents 35% cite Lyon as one of the key
 319 cities they learned from during their own implementation process.

320 What is notable about the Lyon scheme is that after its implementation we see the
321 adoption of schemes beginning to increase. Whilst Lyon cannot claim sole responsibility for
322 this increase it is certain that, given its prominence amongst bike hire schemes, it did play a
323 role in encouraging other cities to adopt a bike hire scheme policy.

324 The diffusion curve illustrates that the adoption of schemes began to 'take-off' in 2003
325 with the most significant increases in scheme numbers occurring between 2006 and 2009. A
326 further scheme to mention at this point is the Vélib' scheme in Paris. Implemented in 2007,
327 this scheme has quickly become the largest in Europe with 20,600 bikes and 1451 stations
328 [18]. Along with Lyon, Paris is also regarded amongst the survey respondents as a key city to
329 learn from. 40% of respondents looked to Paris for knowledge and experience when they
330 were creating their own bike hire schemes.

331 The S-shaped curve in Figure 3 suggests that the adoption of 3rd generation schemes is
332 beginning to slow. As the curve begins to level off in 2010, the momentum of 2007 and 2008
333 appears to have waned. This may, in part, be due to the financial crisis that has afflicted
334 much of Europe since 2009 and which has led to reductions in government spending.
335 However, as we shall review, not all schemes are dependent on local government funding so
336 it may be that the main acceleration of adoption is over. This does not mean that worldwide
337 bike hire schemes are losing favour in fact the literature suggests the opposite [1]. It does
338 however raise some questions about the future adoption of 3rd generation schemes in Europe.
339 The surveys that were targeted at European cities that are yet to create a 3rd generation scheme
340 have identified 5 cities that are currently in the process of finalising the implementation of a
341 bike hire scheme. This suggests that despite the slowdown in the uptake and the increasing
342 reality of a 4th generation scheme, 3rd generation schemes are not yet irrelevant and are still
343 sought after.

344 **Expansion of bicycle numbers**

345
346 Another important element of the examination of the growth in city bike hire schemes is to
347 study what happens within adopter cities. Are the schemes maintained and do they grow?
348 This is considered further in Figure 4. This bar chart displays the bicycle numbers of the
349 schemes that took part in the surveys and indicates if there have been any increases on these
350 numbers since the scheme opened. Figure 4 displays in black the bicycle numbers for each
351 scheme when they were opened. The grey bars indicate where the current levels are and help
352 to distinguish where increases have occurred. There are some notable points that immediately
353 emerge from this figure.
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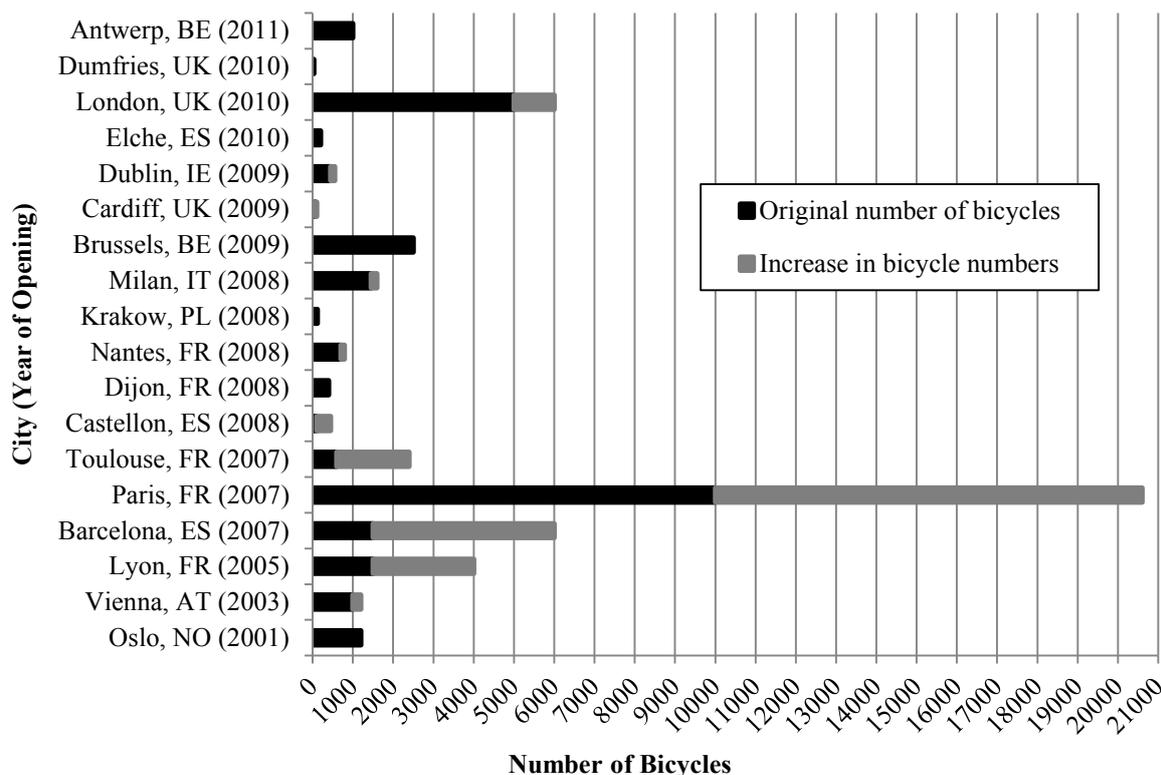


Figure 4: Increases in the number of bicycles since opening

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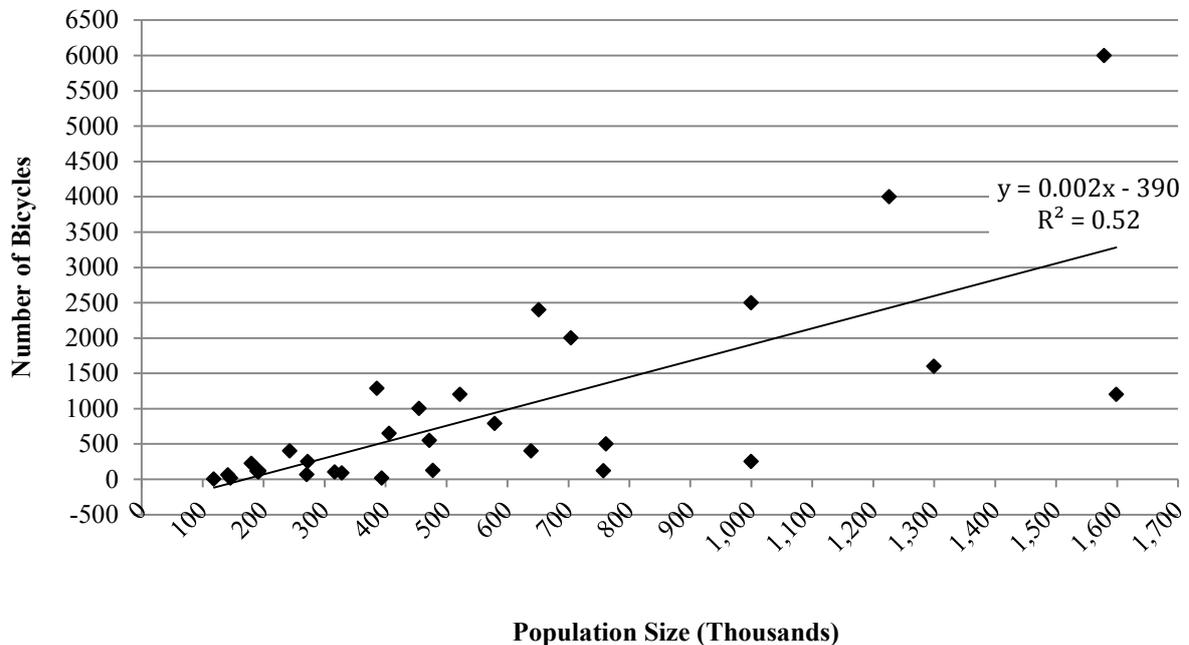
The length of time that a scheme has been opened does not appear to affect the level of increase in bicycle numbers. For example, Oslo is one of the earliest 3rd generation schemes, opening in 2001. In the 10 years that it has been operating it has not had an increase in the bicycle numbers, although they remain optimistic for future increase stating in their survey response that future bicycle numbers could reach 1500. On other hand, the Barclays Bike Hire scheme in London has only been open one year and has already increased its numbers from 5000 to 6000 bikes.

There are varying levels of expansion amongst the schemes since their opening. Notably, 6 out of 18 schemes that were examined have at least doubled the size of their scheme. One such city is Paris and the size of its scheme sets it apart from the other cities having more than doubled its numbers to 20,600 bikes since its opening. It is also worth noting a number of other schemes that have experienced a greater increase in their bicycle numbers in proportion to their original levels. Toulouse, Barcelona and Lyon have all gone further by more than doubling their numbers. The overall growth in bicycle numbers can also be illustrated further by considering the mean and median of the collective numbers. The mean number of bicycles at opening is 1545 whilst the median was 850. The reason the mean is so much greater is because Paris and London opened their schemes with 10,000 and 5000 bikes respectively. As Figure 4 shows, these numbers are much greater than the others meaning that they result in a much higher mean. The median of 850 is perhaps therefore more realistic in this instance. The current bicycle numbers show an increase in the average size of a scheme with the mean now 2730 and the median increasing to 1100.

The data does also suggest however, that many of the schemes are experiencing minimal expansion in the size of their bicycle numbers. Of the 18 schemes examined 10 cities had only a moderate growth and in some cases no growth at all. This includes cities such as Vienna, Nantes, Dublin and Milan. The size of the population in a city is influential

385 in determining the size of the scheme. Figure 5 plots a range of cities based on a comparison
 386 between their population size and current bicycle numbers (excluding Paris and London due
 387 to their quite different characteristics). The figure confirms the expectation that the larger the
 388 population, the more bicycles a city can accommodate and support although there is clearly
 389 variation between cities of similar size.

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Figure 5: Comparison of scheme size versus population size
 Source of city size data: Eurostat [19]

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Comparison of initial size of scheme against future size of scheme

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399 Figure 6 shows the existing bicycle numbers against the predicted future numbers for each
 400 scheme. The future numbers are derived directly from the survey responses and are each
 401 schemes own estimate. There are a reduced number of cities included in Figure 6 compared
 402 to Figure 4 because not all of the respondents were able to provide an estimate of the future
 403 numbers.
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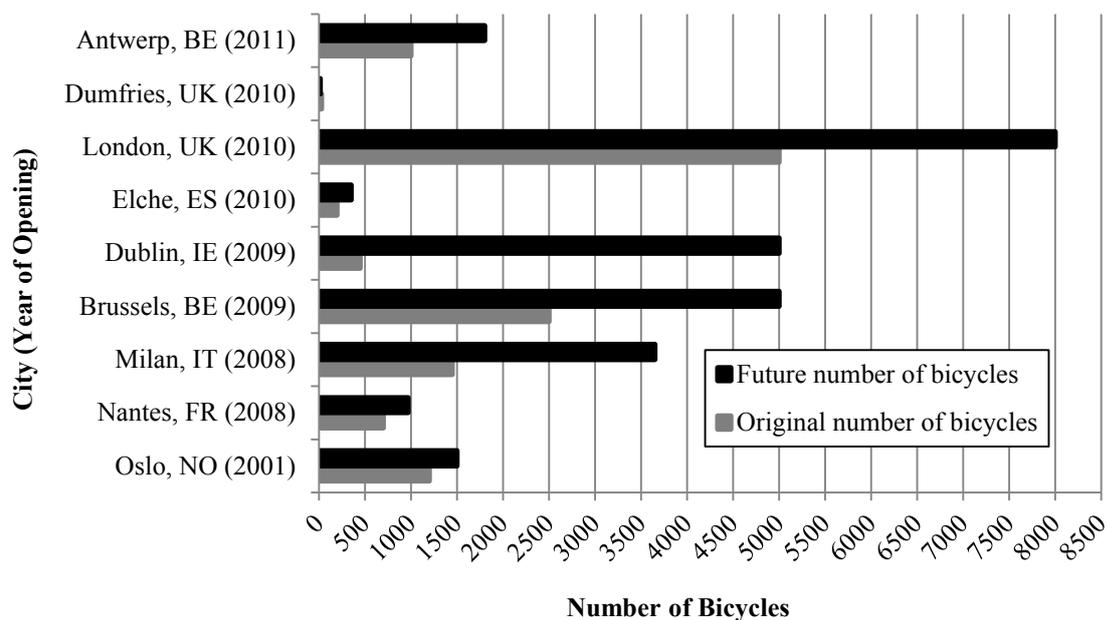


Figure 6: Comparison of initial size of scheme against future size of scheme

As Figure 6 shows, the schemes with the larger initial bicycle numbers are the ones with the expectations to expand to much greater levels in the future. This is likely to be related to population and potential demand. However, there are examples of cities that start small and see ambitious growth potential (Dublin). Schemes such as Dumfries, Elche, Nantes and Oslo all only anticipate relatively conservative increases in their numbers and the factors behind this bear further investigation. It could be that they were only ever intended to serve a small population or niche or that their adoption has not been as significant as had been anticipated. It is critical to look at these lessons to ensure that suitable learning can be provided for other cities about appropriate numbers of bikes and docking stations on system start-up.

Operator Models

It is common for external operators such as JCDecaux, Clear Channel and Nextbike to work alongside city authorities in the implementation of a bike hire scheme. These operators have their own bike scheme models that they sell to the city. Whilst they differ in their visual design, these models have many similarities with regards to system design sharing characteristics such as electronic docking stations, robust bicycles and smartcards or key fobs.

These operators have created schemes in a range of countries with JCDecaux and Clear Channel being the most prevalent. JCDecaux operates 11 schemes in 4 countries and Clear Channel has slightly more with 13 schemes in 6 countries [18]. Call-a-bike and Nextbike are both quite large operators but have in the past not used docking stations. Call-a-bike have now implemented 2 schemes with docking stations in Germany and Nextbike have also more recently created a scheme in Germany. As well as the larger operators there are also smaller companies that have developed their own models that they will sell to cities. A good example of this type of company is OYBike in the UK. This company operates two small schemes in the UK but it has recently expanded to three cities in France [20].

Companies such as JCDecaux and Clear Channel, who are both outdoor advertising agencies, have undertaken a degree of diversification to move into bike scheme provision but their motivations could largely be attributed to the fact that they negotiate free advertising rights in the cities in return for the provision of the bike schemes. Despite this they have

440 clearly played a role in the increased uptake of bike hire schemes, not least as this largely
441 defers the need for significant up-front investment from local government.

442 Certain operators appear to dominate in different countries, suggesting some emerging
443 regional trends. For example, the French company JCDecaux who operate under the brand of
444 'Cyclocity' is responsible for a large number of schemes within France. On the other hand,
445 Clear Channel is responsible for the creation of all three of the schemes that exist in Norway.
446 This would appear to indicate that a major driver of the diffusion of these schemes are private
447 sector entrepreneurs and that there is a degree of 'push' in promoting the policy. This suggests
448 that a more in-depth analysis of utilisation rates would be interesting as it could be that some
449 city schemes are more appropriate than others and that some may not have occurred had it not
450 been for the semi-commercial provision model.

451 **Learning Process and Future Role**

452
453
454 The second stage of this study involved conducting short follow-up interviews with survey
455 respondents to gather more in-depth data regarding the adoption of the schemes in their cities.
456 From the initial surveys stage, four respondents were willing to participate in a telephone
457 interview. These were: Antwerp in Belgium, Dublin in Ireland and Cardiff and Dumfries in
458 the UK.

459 A key theme that immediately emerged from the interviews was the role of policy
460 entrepreneurs. Policy entrepreneurs can influence policy direction by identifying solutions to
461 policy problems that can attract the attention of decision makers [21]. In this context the role
462 of policy entrepreneurs is fulfilled by the external operators discussed above. The
463 respondents note the role of the external operators in bringing expertise and knowledge to the
464 adoption process in their own cities and helping to influence their decision to adopt. One
465 example of this process in action comes from Dublin, where JCDecaux proposed the
466 provision of a bike hire scheme as part of a raft of measures to secure advertising rights in the
467 city.

468 Rogers [7] argues that within the diffusion of an innovation amongst organisations the
469 existence of an innovation champion can have a significant effect on the successful adoption
470 of the innovation. Of the four cities interviewed, the presence of an innovation champion is
471 evident in two - Antwerp and Dublin - and appears to have played an important contribution
472 towards the successful adoption of the bike hire schemes. In Antwerp, the Deputy Mayor
473 utilised his position to champion the innovation through the decision making process and
474 ultimately ensure its successful adoption. In Dublin, it was a city councillor who was
475 influential in helping to implement the policy in the face of significant opposition from those
476 unconvinced of the schemes potential.

477 Evidence of adopting cities learning from previous adoptions also emerged from the
478 interviews. The respondents from Cardiff and Antwerp both detailed how they focussed on
479 the past successes and failures of bike hire schemes to understand how they could create a
480 scheme with a greater chance of long-term success. Policy entrepreneurs again feature here,
481 with respondents highlighting their ability to pass on their own previous experiences to the
482 adopting cities.

483 The 'last mile' concept, discussed above, features heavily in the interviewees
484 responses, indicating how bike hire schemes can make a contribution to fulfilling this need.
485 Antwerp, Dublin and Cardiff all see their bike hire scheme as helping to integrate their
486 transport systems by providing users with a transport option to link their final destinations
487 with the existing public transport infrastructure. For cities seeking to create a more integrated
488 and sustainable transport system this is an attractive feature of the schemes.

489

490 6. CONCLUSIONS

491
492 The number of public bike hire schemes in Europe has expanded very significantly in the last
493 decade. The data suggests that the biggest leap in adoption followed from the introduction of
494 a large scale system in Lyon which was subsequently adopted on an even bigger scale in
495 Paris. These systems are the most well known ‘go to’ examples for cities to learn from in
496 considering adoption.

497 There is a very large range of size of system. By comparing the city populations
498 against the size of the scheme we confirmed a relationship between city and system size.
499 Once opened very few of the systems show significant growth although several cities,
500 particularly the larger cities, still aim to expand their systems in the future. Further data on
501 utilisation rates will be necessary to explore the potential for expansion further and to
502 examine the success of the schemes installed to date.

503 The emerging evidence suggests that the explosion of scheme adoption in Europe
504 occurred over the period 2006 to 2008 with the adoption rate now tailing off. The adoption
505 pattern certainly follows the typical diffusion curve. However, we are aware of at least 5 cities
506 and towns that are actively considering adopting such a scheme. It is not yet clear whether
507 this is a fairly small niche innovation which has largely saturated the market it might appeal to
508 or whether other factors, such as the economic downturn, have put a temporary break on
509 adoption rates. The schemes adopted have a strong commercial angle through the advertising
510 companies Clear Channel and JCDecaux. There are many cities that have not yet adopted that
511 are as large as those that have and therefore where the commercial incentive to push for
512 adoption still remains. This suggests that there may still be a long tail in the adoption curve.

513 The fact that there are less 3rd generation schemes being implemented in Europe than
514 in previous years does not mean that demand for schemes is decreasing worldwide. It is clear
515 from the literature that outside of Europe there is in fact an increasing demand for bike hire
516 schemes.

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540 **REFERENCES**

- 541
- 542 [1] DeMaio, P. Bike sharing: History, impacts, models of provision, and future. *Journal of*
543 *Public Transportation*. Vol. 12, No. 4, 2009, pp.41-56.
- 544
- 545 [2] Diewald, W. Requirements for successful technology transfer in the highway industry.
546 *Public Works Management Policy*. Vol. 6, 2001, pp.59-69
- 547
- 548 [3] Dolowitz, D. and D. Marsh. Learning from abroad: The role of policy transfer in
549 contemporary policy making. *Governance*. Vol. 13, No. 1, 2000, pp.5-24.
- 550
- 551 [4] Geels, F. Technological transitions as evolutionary reconfiguration processes: A multi
552 level perspective and a case-study. *Research Policy*. Vol. 31, 2002, pp.1257-1274.
- 553
- 554 [5] Van den Bergh, J., E. Leeuwen., F Oosterhuis., P. Rietveld. and E. Verhoef. Social
555 learning by doing in sustainable transport innovations: Ex-post analysis of common factors
556 behind successes and failures. *Research Policy*. Vol. 36, 2007, pp.247-259.
- 557
- 558 [6] Low, N. and R. Astle. Path dependence in urban transport: An institutional analysis of
559 urban passenger transport in Melbourne, Australia, 1956-2006. *Transport Policy*. Vol. 16, No.
560 2, 2009, pp.47-58.
- 561
- 562 [7] Rogers, E. M. *Diffusion of Innovations*. Free Press, New York, 2003.
- 563
- 564 [8] Boonstra, J.J. Introduction. In *Boonstra, J.J. Dynamics of organisational change and*
565 *learning*. John Wiley and Sons, England, 2004, pp.1-24.
- 566
- 567 [9] Westphall, J.D., R. Gulati. and S. Shortell. Customization or Conformity? An
568 Institutional and Network Perspective on the Content and Consequences of TQM Adoption.
569 *Administrative Science Quarterly*. Vol. 42, 1997, p.366
- 570
- 571 [10] DiMaggio, P. and W. Powell. The iron cage revisited: Institutional isomorphism and
572 collective rationality in organisational fields. *American Sociological Review*. Vol. 48, 1983,
573 pp.147-160.
- 574
- 575 [11] Kern, K., C. Koll and M. Schophaus. The diffusion of Local Agenda 21 in Germany:
576 Comparing the German federal states. *Environmental Politics*. Vol. 16, No. 4, 2007, pp.604-
577 624.
- 578
- 579 [12] Marsden, G., K.T. Frick, A.D. May. and E. Deakin. How do cities approach policy
580 innovation and policy learning? A study of 30 policies in Northern Europe and North
581 America. *Transport Policy*. Vol. 18, 2011, pp.501-512.
- 582
- 583 [13] Shaheen, S.A., S. Guzman and H. Zhang. Bikesharing in Europe, the Americas and
584 Asia: Past, present, and future. Transportation Research Record: Institute of Transportation
585 Studies, UC Davis, 2010.
586 <http://escholarship.org/uc/item/79v822k5;jsessionid=5E0F13FAB15796E4098533B05BC0C>
587 [C94#page-1](http://escholarship.org/uc/item/79v822k5;jsessionid=5E0F13FAB15796E4098533B05BC0C). Accessed June 6, 2011.

- 588 [14] Midgley, P. Bicycle-sharing schemes: Enhancing sustainable mobility in urban areas.
589 United Nations Department of Economic and Social Affairs, New York, 2011.
590 http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/Background-Paper8-P.Midgley-
591 [Bicycle.pdf](http://www.un.org/esa/dsd/resources/res_pdfs/csd-19/Background-Paper8-P.Midgley-Bicycle.pdf). Accessed June 6, 2011.
- 592
593 [15] Bikeradar. 2010. [http://www.bikeradar.com/news/article/london-cycle-hire-scheme-to-](http://www.bikeradar.com/news/article/london-cycle-hire-scheme-to-expand-eastwards-for-2012-28375/)
594 [expand-eastwards-for-2012-28375/](http://www.bikeradar.com/news/article/london-cycle-hire-scheme-to-expand-eastwards-for-2012-28375/).
- 595
596 [16] OBIS. *Common Country Study and Market Potential Data File*. Optimising Bike
597 Sharing In European Cities, 2009.
598 <http://www.obisproject.com/palio/html.run? Instance=obis& PageID=200& LngID=21& C>
599 [atID=722& countryCode=& NewsID=362& Index=1&pic=1& CheckSum=-1743408064.](http://www.obisproject.com/palio/html.run? Instance=obis& PageID=200& LngID=21& C)
600 Accessed July 11, 2011.
- 601
602 [17] Bührmann, S. *New Seamless Mobility Services: Public Bicycles*. European Commission,
603 2008.
604 http://ange.archangelis.com/typo3/niches/fileadmin/New_folder/Deliverables/D4.3b_5.8_b_P
605 [olicyNotes/14397_pn4_public_bikes_ok_low.pdf](http://ange.archangelis.com/typo3/niches/fileadmin/New_folder/Deliverables/D4.3b_5.8_b_P). Accessed May 5, 2011.
- 606
607 [18] Midgley, P. The role of smart bike-sharing systems in urban mobility. In *Journeys:*
608 *Sharing Urban Transport Solutions*, LTA Academy, Singapore, May 2009, pp. 23-31.
609 www.ltaacademy.gov.sg/doc/IS02-p23%20Bike-sharing.pdf. Accessed May 5, 2011.
- 610
611 [19] Eurostat. *Regional Yearbook 2010: European cities*. European Union, Luxembourg,
612 2010.
613 http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/R_Y_CH02_2010/EN/R_Y_CH02_2010-
614 [EN.XLS](http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/R_Y_CH02_2010/EN/R_Y_CH02_2010-). Accessed May 18, 2011.
- 615
616 [20] Calais Scheme Opened. *OYBike*, 2011.
617 <http://www.oybike.com/oybike/cms.nsf/x/2B41DEB179801015802577690035897B>.
618 Accessed July 11, 2011.
- 619
620 [21] Mintrom, M. Policy entrepreneurs and the diffusion of innovation. *American Journal of*
621 *Political Science*. Vol 41, No. 3, 1997, pp.738-770.
- 622