

Assessing the Impact of Digital Innovations in the London Transportation Network

Dr. Zena Wood,¹ Dr. Glenn Parry,² Dr. Janet Carruthers,² Dr. Kayla Rose³



¹ University of Greenwich

² University of West England

³ Bath Spa University



EXECUTIVE SUMMARY

In 2012 the US transport service, Uber, launched in London with a new private hire transport business model, challenging the established Black Cab and private hire taxi businesses that had arguably pervaded in London for over 300 years. Digital platform technology allows Uber's customers to be directly connected with drivers, changing the process of how a taxi might be obtained and the customer's decision on their mode of transport given that availability can be viewed before even leaving a building. This report seeks to understand the impact of digital innovation on the contemporary London transport system, supported by the Research Council UK's NEMODE Fund. A review of the impact of Uber on the traditional taxi industry within the city is included in addition to the implications for the wider transportation system. Data has been collected via a customer survey and focus groups and interviews with 40 taxi drivers (20 Black Cab and 20 Uber). Private hire and taxi regulation and policy documents, available online from Transport for London (TfL), were studied in addition to relevant published statistics.

Initial findings suggest that the digital innovations introduced by Uber disrupted the market and changed the nature of how people interact with the wider transportation system. Uber has made it easier for individuals to move around the city, filling a gap in the existing transportation system. Uber have rapidly achieved a leading position in the private hire taxi service across the city. Regulation for Black Cabs needs to change if they are to compete and remain a service in the broader customer market.

Since completing this report there has been some changes with regards to the regulation of private hire operators and private hire drivers in London¹. The new regulations require all private hire drivers require a national insurance number and, those who are not from an English speaking country, to sit an exam to prove their English reading, writing and listening skills. Hire and reward insurance must be in place for the entire licensing period including when the vehicle is not being used as a taxi. Private hire candidates undertaking the topographical skills assessment appear not to be able to make use of a GPS aid with current guidelines stating that they are only provided with an atlas and an answer sheet². The addition of an English language test brings the requirements to become a licensed private hire driver more in line with the requirements to become a Black Cab driver in London, whose language skills are tested during oral and written examinations. Black Cab drivers are also not allowed to use a GPS aid when undertaking their assessments.

Private hire operators must provide a booking confirmation prior to the start of the journey via either text, email or phone. As a minimum the booking confirmation should include the driver's name, vehicle registration, driver's private hire licence number and, where the passenger can receive it, a picture of the driver. Before starting a journey a private hire operator should inform the customer of an precise estimate of the fare and a record of the final destination. Recent legislation would also require customers to be able to speak to the private hire operator, or a person acting on their behalf, in real-time via telephone. However, there is now no restriction of where the operator or individual may be based - they could be at the operating centre or at a fixed address inside or outside the UK. This latter piece of legislation is currently the subject of a legal challenge and will not be enforced until the challenge is settled. In October 2016, a UK employment court ruled that Uber drivers are not self-employed and should be paid the national living wage³. This ruling could have implications for Uber's business model.

These changes in regulation do not affect the key discussions of this report; many agree with some of our original suggestions. Therefore, the report has remained unchanged. However, the changes are outlined above for completeness. The statistics that are presented within the report remain the most recent to be published; the Department of Transport will release a new update in March 2017.

1 Transport for London (2016). 'Changes to private hire regulations'. Date Accessed: February 2017. Available from: <https://tfl.gov.uk/info-for/taxis-and-private-hire/new-private-hire-regulations>.

2 Transport for London (2016). 'Topographical Assessment Guidelines'. Date Accessed: February 2017. Available from: <http://content.tfl.gov.uk/topographical-assessment-guidelines.pdf>

3 Employment Tribunal Aslam and Farrar vs. Uber B.V, Uber London Ltd. and Uber Britannia Ltd. (2016). Available from: <https://www.judiciary.gov.uk/wp-content/uploads/2016/10/aslam-and-farrar-v-uber-reasons-20161028.pdf>

INTRODUCTION

Today the London transportation system comprises taxis, boats and networks of tubes, trains and buses. Until the middle of the eighteenth century travel by boat, or over London Bridge, were the only ways of crossing the Thames River. As early as 1193, the Thames Watermen plied their trade on the river in London, transporting people around the city. As was standard practice in the guild system, they had a 7-year apprenticeship, during which time they had to learn the ebb and flows of the river and get to know numerous routes and slipways, which are recorded in the Domesday Book of 1086 [1]. Their trade was disrupted in the seventeenth century, mainly by the English Civil War, which saw many apprentices leave their masters to serve as soldiers [2], and innovations in travel from the continent in the form of the horse and carriage. Improvements in bridge building effectively ended their trade as wheeled transport took over.

Despite the growing popularity of the railroad in the mid-nineteenth century, George Shillibeer launched the first 'hail and ride' horse-drawn omnibus service in 1829. Horse and carriage continued to dominate the hire transport market in London until 1903, when the first petrol-powered taxis were licensed [3]. The change was rapid, with 3,623 horse-drawn buses and 13 petrol-powered buses operating in London in 1903, to just 142 horse-drawn and 3,522 motor-powered by 1913 [4]. Black Cabs (BCs) evolved directly from the Hackney carriage, as did their training [5]; an apprenticeship taking at least 3 years and requiring the driver to learn the many routes across the city and cope with myriad diversions. These skilled trades were controlled by guilds that ensured standard and practice, whilst keeping market entry difficult thus prices high, such that a fair living could be earned [6].

The US transport service, Uber, entered the market in 2009, launching in London in 2012, with a new business model that challenged the established apprenticeship model that had arguably pervaded in London for over 300 years. Innovations in technology allow drivers to be informed of the routes that they should take and, via cloud technology, link passengers directly to the service provider. The digital platform technology used by Uber allows each driver to be considered as a separate business instead of the guilds that existed in the industry previously. With barriers to entry removed, a proliferation of new drivers has also been able to ply their trade. With more availability, prices have fallen in London, this has led to individual transport at prices often equivalent to the different mass transport systems that the city also offers.

This report outlines the findings of a project that aimed at identifying and analyzing the key variables that would allow the impact of digital innovations on the London transportation network to be measured. Uber was the focus of the project due to the technology that they employ. The project was undertaken by academics from the University of Greenwich and the University of West England (UWE Bristol) supported by the Research Council UK's NEMODE (New Economic Models in the Digital Economy) Fund.

Due to the short time scale the project focused on identifying where the necessary and sufficient data could be found. Regulation and policy documents were studied in addition to relevant published statistics. Semi-structured interviews were carried out with 40 taxi drivers (20 BC and 20 Uber) allowing participants to freely talk around the impact of changes in the market. An online survey and a focus group were used to obtain feedback from 31 and 6 customers respectively relating to their reasons behind using taxis and how the introduction of Uber has affected the way that they move around the city.

The report will give a brief overview of Uber followed by a discussion of how the introduction of Uber has affected the traditional taxi industry and how customers interact with the wider transportation network. The report is structured as follows. In the first section we briefly describe Uber, how it works and how drivers qualify for a licence. We then examine the number of taxis plying for trade on the road and the impact increasing numbers has had. How the customer is provided for by drawing on customer and driver data. We briefly look at questions of location and access to transport and then look at job creation or destruction. An overview of potential policy considerations is given before the conclusion to the work.

Since its launch in 2009 Uber has transformed the taxi industry in over sixty countries. The company claims that it makes cities more accessible by connecting drivers directly with their customers via a smartphone application. The CEO, Travis Kalanick, aimed to have 42,000 drivers within London in 2016 claiming that many of the drivers would be new to the business leading to job creation [7]. He also stated that for each of their cars on the road Uber were taking seven and half cars off of the road promoting a more sustainable and environmentally friendly road network [7].

Uber has two companies: Uber London Limited (ULL) and UberBV (UBV) [8]. The former company is a licensed Private Hire Operator (PHO - a company that can operate private hire vehicles) that is based in the City. They are responsible for employing the drivers, dispatch, booking, promoting the company and equipping drivers with mobile phones. Based in the Netherlands, UBV is responsible for the platform technology operation including the customer app, calculating the fare and charging the money. When a customer wishes to hire a driver, UBV will obtain all location data via ULL's cloud-based server. The locations of Uber taxis are then reported to the customer. When the customer confirms the booking a car is dispatched via a ULL request. UBV calculates the fare, using the cloud, and communicates this to the driver and customer via their apps. This process means that legally there is no taximeter in use since the current definition of a taximeter relates to a physical attachment; UBV performs the calculation using the cloud.

The technology that Uber employs seeks to make it easier for someone to become a taxi driver or a customer.

Becoming An Uber Driver

To become a taxi driver within London all individuals must be a licensed driver and have access to a licensed vehicle. A driver license can be granted for up to three years. Transport for London (TfL) are currently required to license any individual who meets their requirements but may restrict the license according to the area where the driver may ply for hire or the type of vehicle that may be used.

There are two main groupings of taxis, Black Cab (BC) and Private Hire (PH). For both sorts of occupation drivers need to: be at least 21 years old; have had a full DVLA, NI or other European Economic Area (EEA) state driving license for at least three years; have the right to live and work in the UK; be of good character (i.e., pass an enhanced DBS check); and, be medically fit (shown via a medical certificate obtained from their GP).

Unlike BC drivers who must pass The Knowledge, PH drivers must pass a topographical skills test. Designed in consultation with Private Hire associations the specification for the topographical skills test is written as a set of learning outcomes. Split into five modules, the skills covered by this assessment include: understanding a map index; the ability to locate streets and locations on a map; and selecting the most appropriate route for a designated journey. Module 5, which covers 'general topography' is the only one where it is specified that the candidate cannot use an atlas or mapping tool. To pass all the other modules a candidate can make use of such facilities, including a satellite navigation aid. The ability to read English is mandatory, but there is no mention of an oral examination.

In London, Uber have six categories of cars: UberX, UberXL, UberExec, UberLux, UberTaxi and UberPool. For each of these categories Uber clearly states who will be suitable as a driver. For example, a driver within the UberX category will have a PH license, commercial insurance and drive a 'full-size saloon that comfortably seats four passengers'. If you do not have a PH driver's license, you can attend one of Uber's one-day licensing sessions as part of their 'ignition' programme. The session covers: completing the form for an enhanced DBS check; map-reading training and the topographical skills assessment; and assistance in completing TfL's online application. The application will take 6-8 weeks to process. Attending a session is free if 20 Uber customer trips are completed by the driver upon joining, but individuals will still need to pay the TfL licensing application cost of £250 [9].

Once an individual has received their license and Uber is satisfied with the documentation, the individual will receive a phone with the Uber app installed and access to the Uber platform. The individual can then start driving for Uber and will receive a monetary welcome reward, currently £300, after completing 50 trips [9]. The documen-

tation required for Uber includes Private Hire Vehicle (PHV) license, PH insurance certificate or cover note, personal documentation and vehicle documentation.

The streamlined process to become a driver that is offered by Uber reduces the barriers into the marketplace that are faced by those wishing to be BC drivers. As stated earlier, BC drivers must pass The Knowledge, which took an average of 3 years to pass with the drivers that we interviewed, with the cost met by the individual. The examination cost of becoming a licensed BC driver (£1023.79 - £1043.19) is considerably more than that to become a licensed PH driver (£308.85). This does not include the cost of the car, which is also much more expensive for a taxi driver.

Within 'Go Your Own Way' [10], a set of short videos that are given to applicants to explain the process, Stephen Thomas, a Knowledge Examiner, states that it took him three and half years to complete the Knowledge. He estimates that he undertook 23,400 miles learning the routes, 1,840 hours on the road and quadruple the number of hours spent on the road studying. Taking the minimum wage for a 21-24 year old (£6.70 an hour) and a cost of 10p per mile to run a scooter, someone studying the same amount as Stephen would spend £295,640. This price does not include the cost of the scooter, application, exams or any additional study aids such as maps. This is a significant barrier to entry for new BC drivers that is not posed by Uber if they wish to drive for them (see later section on Policy Recommendation).

GPS and apps were regarded as the future by both BCs and Uber drivers but for BCs it was a useful addition to the Knowledge rather than replacing it. The majority of BCs all had a GPS in the cab and did refer to it when working outside London.

"The app? It is the way of the future. Listen, I have an app here, it's the future." (A BC driver)

The majority of Uber drivers interviewed used the app that Uber provided. A couple of Uber drivers complained that the navigation tool sometimes let them down and the app Uber provided was not very good. One driver demonstrated an alternative app that they used to navigate their way around London. A couple of the Uber drivers had upgraded their phone as the phone provided by Uber was basic and for some the screen too small given that they were relying on it to get around the city.

HOW MANY TAXIS?

It could be argued that the ease of becoming an Uber driver has led to an increase in the number of licensed PHV vehicles within London. The Department of Transport publish the Taxi and Private Hire statistics for England every 2 years. The latest available report at the time of writing is March 2015 [11].

England has seen an increase in the number of licensed vehicles particularly in the PH industry. The total number of licensed vehicles in 2015 was 242,200; this is an increase of 9.3% from 2013. 60% of all licensed vehicles are PH. The number of driver licenses is 297,600, an increase of 4.3% from 2013.

London has 35% of the licensed vehicles and has seen the largest increase in licensing figures. Figures 1 and 2 show how the number of licensed vehicles and drivers in London has evolved over the last 10 years. We can see that there has only been a small increase in the number of licensed taxis (i.e., BCs) compared to that of PH, which have significantly increased since 2012. Figure 3 shows the number of PHO licenses that have been issued in the last 10 years with a slight decrease observable since 2013. Although there is no breakdown of which PHOs employ the new drivers, it should be noted that 2012 was when Uber launched in London and this correlates to period of increase. However, Private Hire Vehicle (PHV) licenses have been steadily increasing since 2002.

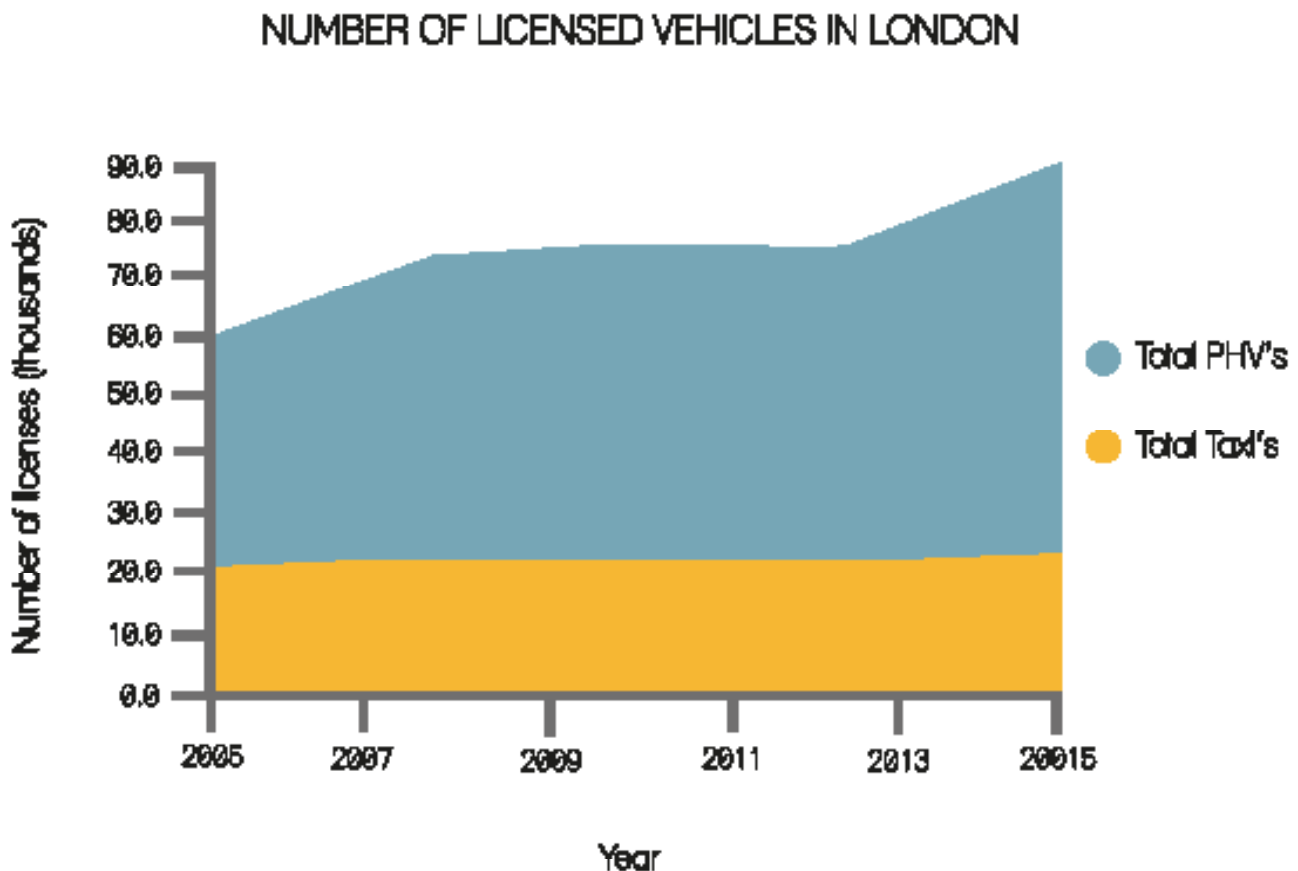


Figure 1. Source: Department of Transport Taxi and Private Hire Vehicle Statistics England 2015

NUMBER OF LICENSED DRIVERS IN LONDON

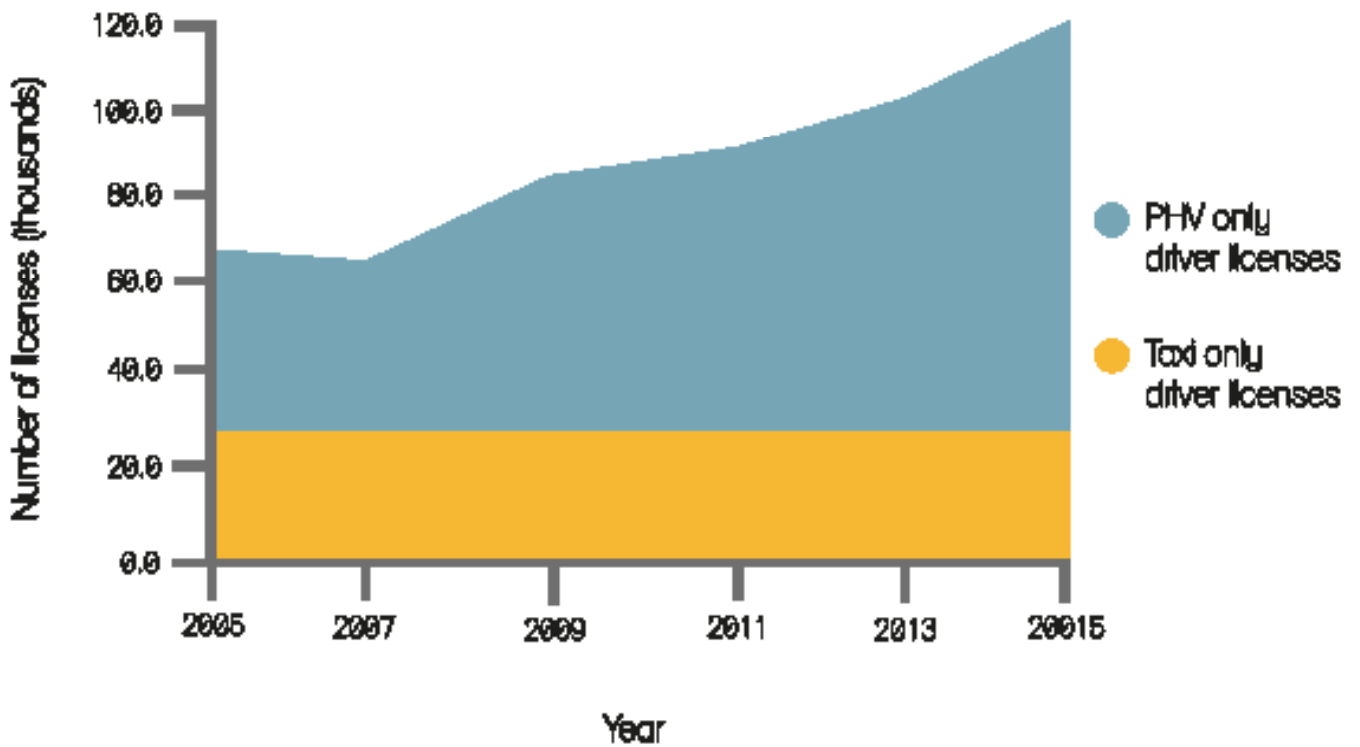


Figure 2: Source Department of Transport Taxi and Private Hire Vehicle Statistics England 2015

NUMBER OF PHO LICENSES ISSUED

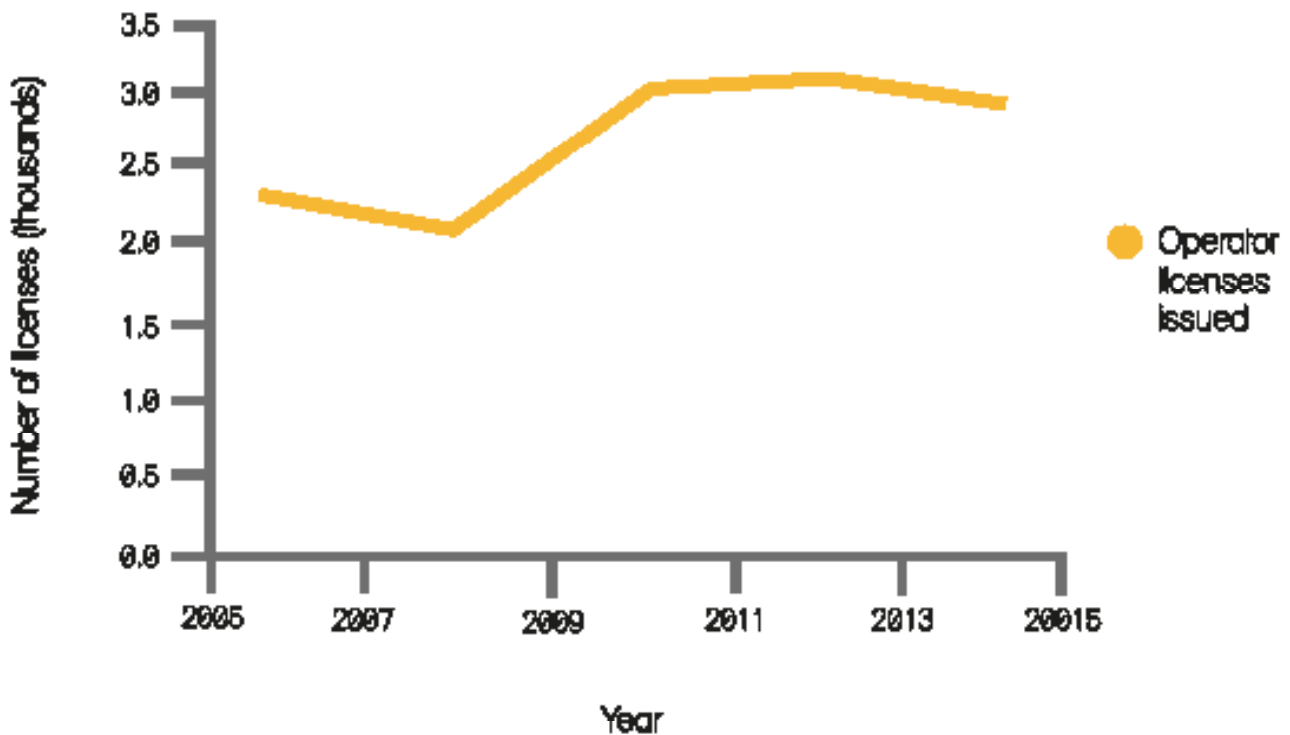


Figure 3: Source Department of Transport Taxi and Private Hire Vehicle Statistics England 2015

IMPACT OF INCREASE IN TAXIS ON LONDON TRANSPORTATION SYSTEM

Increases in PH drivers and vehicles are often cited as reasons for an increase in congestion and pollution within London. A recent study [12] completed by INRIX, and commissioned by Uber, shows that road journey times within London are increasing annually by 12%. The increase in registered vehicles could suggest why the increase in PH drivers is cited as a reason for increased levels of congestion and pollution within the City. However, the INRIX study has shown that car travel in Central London decreased between 2013 and 2015 by 2.4%. The report states that taxi and PH vehicles are not to be blamed for rising congestion. Even though there was an increase in the number of licensed PH vehicles in London in 2015, only 3% of registered vehicles were PH vehicles and taxis. The analysis undertaken by INRIX also shows that only 5.9% of all Uber trips took place in the congestion zone during charging hours.

It is important to note that the regulation of PH vehicles is stricter than that of BCs in terms of emissions. To apply for a BC vehicle license the vehicle at the time of licensing must: meet Euro 6 Standards for emissions and be no older than 15 years. Any vehicle that can carry up to eight passengers can become a licensed PHV. New vehicles and unlicensed vehicles up to five years old must meet Euro 4 standards for emissions; this is stricter than the BC standards. If previously licensed the vehicle must be no more than ten years old.

Figures 1 and 2 show that there are more licensed drivers than vehicles within London suggesting that some vehicles are being shared between drivers. This can be good for the transportation network and the economy. A London Chamber of Commerce and Industry (LCCI) report from 2007 [13] assesses the state of the taxi industry in the run up to the Olympic games. The report includes the London Business Leaders Panel Survey Results, a survey undertaken by LCCI and a survey company to obtain the perspective of businesses within London. 129 company directors were interviewed across all sectors in addition to 200 London licensed taxi drivers. 50 PHOs were interviewed via phone.

93% of company directors interviewed stated that a good taxi network was important or very important for the London economy. Although availability of BCs during normal working hours was found to be adequate/good, the availability between 5-7pm was rated as poor/very poor. 59% of directors also rated availability after midnight as poor/very poor. The survey of London taxi drivers in the 2007 LCCI report revealed that less than one fifth of the drivers worked after 9pm at least once per week. 6% worked past midnight one or more times a week. The variation of night working by the taxis was found to be inversely proportional to the need from the late time economy. The phone interviews with PHOs suggested that much of their trade came post 9pm. A recommendation was included in the report that BC drivers be encouraged to share vehicles to improve the availability of taxis in the evening.

PROVIDING FOR THE CUSTOMER

We undertook an online survey that was completed by 31 customers. The findings were tested on a small focus group of 6 London based consumers. The work aimed to capture consumers' reasons for using taxis and how the introduction of Uber has affected the way in which they move around the city. Although a small sample of customers, it did suggest that the digital innovation offered by Uber appears to have led to a change in how the individuals interact with the transportation network.

Of the 31 individuals that completed the online survey; 28 worked in London and 23 considered themselves to live in London. The majority of the respondents (17) mostly used the tube to get around the city. 17 took taxis at least once a month, 9 used them weekly and 1 individual took a taxi 1 or 2 times a day. For work 14 respondents typically used a BC, 6 used Uber and 3 used a different taxi service; 8 did not use taxis for work. In contrast, 20 used Uber outside of work compared to 11 who would typically use BCs.

Figure 4 shows the variation in reasons customers choose their type of taxi when in and outside work. The 'other' reasons given for choice outside work included: supporting BC drivers, The Knowledge and reliability. For inside work 'other' included similar reasons in addition to not knowing mini-cab numbers or how to use Uber.

REASONS FOR TAXI USAGE: WORK AND OUTSIDE WORK

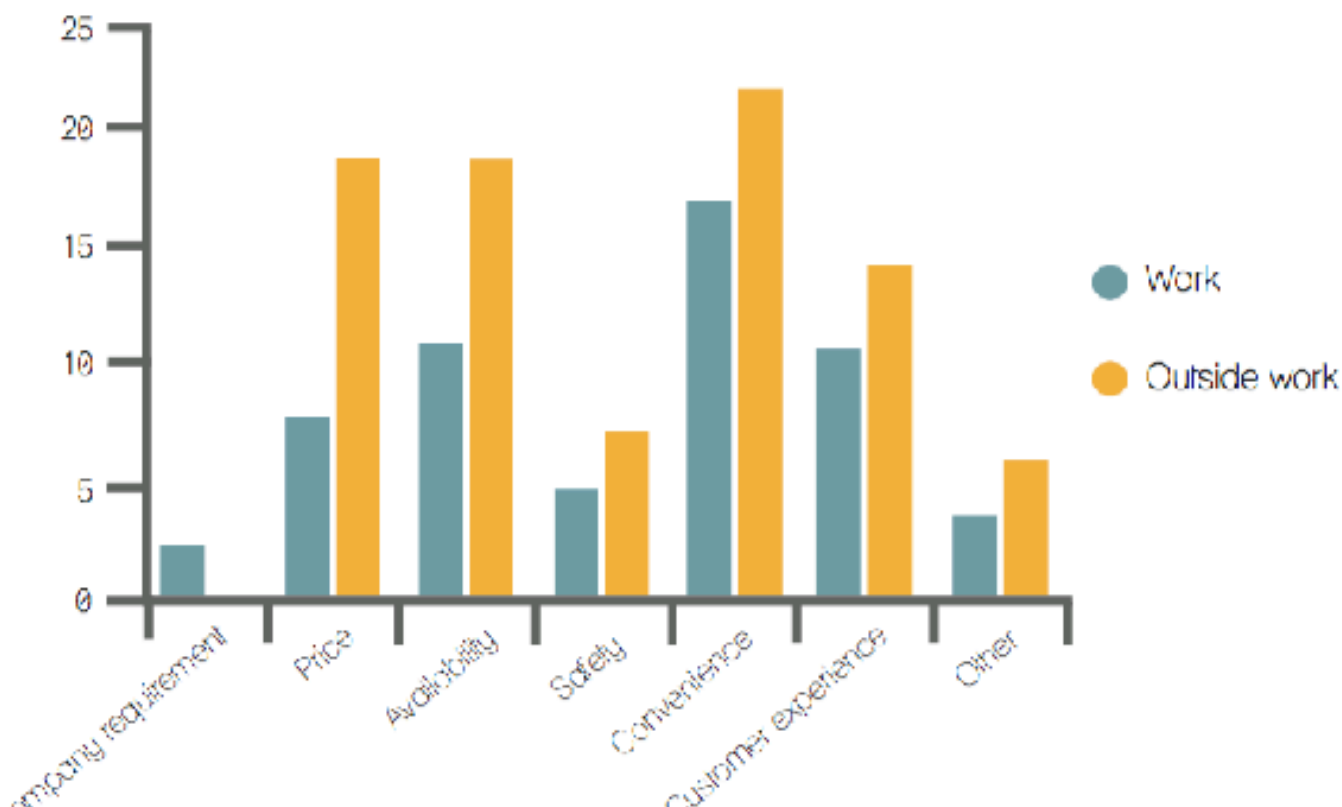


Figure 4: Reasons for choice of taxi inside and outside work by customers that completed the online survey

Importance of Cost

Within our online survey cost was considered a key reason for choosing Uber over a BC with the perception that BCs are more expensive. BC fares are set by TfL based on a cost index model [14]. There are currently 3 tariffs with a minimum fare of £2.60. The different tariffs apply at different times of the day and days of the week with some journeys possibly crossing tariffs; in this case, the new tariff will only be applied from when that tariff comes into effect. Once the speed of the vehicle drops below 10.4mph, a charge is added based on time and not distance. Extras may be added at the end of the fare (e.g., for luggage).

Uber fares are market led. For example, if demand increases the price surges and customers have to accept the surge before making a booking; this is possible due to the technology that they employ. Uber can be much cheaper than BCs but during surges a BC may well be cheaper.

“Very cheap, I mean I will give an example, from Canary Wharf to Camden Town if you are going by black cab at least a minimum with a black cab £35 or £40, your local mini cab something like that exactly, but when you come to Uber it comes around £12 or £13, a lot of difference.” (An Uber driver)

The cost of BC taxi fares was given as a significant disadvantage in the survey of directors presented in the LCCI report from 2007. According to the report, Tariff 3 was introduced in 2001 to encourage BC drivers to work at night. However, it set prices for the customer at a higher rate than other times and it did not increase the number of BC drivers. It also went against the wishes of Business directors who already considered BC fares to be expensive.

Changing Habits

18 respondents within our online customer survey stated that their usage of the London transportation system had changed since the introduction of Uber. Many of these respondents seemed to choose Uber where they would have previously taken the bus, especially at night. Others said that they used Uber instead of the tube when the tube was closed or when in an area which is inconvenient areas for public transport. One respondent also stated that they would rarely have taken a taxi before Uber. 2 of the 18 said that they would now take an Uber when travelling in a group.

“Rather than brave night buses, will get uber instead”

“Ubers are cheaper so use more frequently. Would never get black taxi so uber makes me consider a taxi”

“Uber has made it very convenient to travel cheaply, especially when in a group. I use the tube less often at night”



Importance of Digital Engagement

Within the focus group of customers, individuals stated that the non-cash payment system offered by Uber was a benefit and a reason for them to switch services. Although most of the London transportation network offers payment via contactless, or Oyster cards, BCs do not do so uniformly, with many BCs still only accepting cash. At least half of the BC drivers interviewed were cash only. The remainder of the BC drivers offered various methods of payment including two apps, 'Hailo' and 'GETT'.

TfL does not currently mandate card payments for BCs, but they are investigating how this could be done. The cashless Uber was considered a distinct advantage over the BC with the drivers that were interviewed.

"We are cashless, someone tries to come out of a restaurant and wants to go home, you don't have time to stop at the ATM and so I think in the meantime Uber is better than others." (An Uber driver)

The BC drivers realised that they need to compete with the Uber drivers on ease of payment. One driver stated that things might improve for the BC when the majority of BC drivers take cards.

"I think if you are standing on the corner, waiting for an Uber car and there is an orange light passing and you know you can pay by card, you have your finger on the cancel button and even if it costs £2 more, 'I don't care, I got there quicker!' I think with the credit card thing, [BC accepting credit cards from October 2016] it will make a change with the people that don't use us already and think they'll give it a try. Hopefully they will be surprised" (A BC driver)



ACCESS AND LOCATION

Within the focus group, geographical area was given as a reason for choosing Uber over an existing mode of transport. There are now more transport choices available to get around and out of London. The tube, bus and boat networks within London are fixed. However, BCs and PH vehicles are dynamic allowing them to bridge existing gaps in the network. If the overall network is to be efficient, and fully integrated, the dynamic nature of the taxi journeys should be evident across the whole system.

A couple of the BC drivers acknowledged that there is still a perception that BC drivers will not go to certain areas but that these drivers were in the minority. All of the BC drivers stated that they took all fares and did not turn down fares on the basis of the destination going wherever the fare takes them. Some did acknowledge that they preferred to work certain areas. The respondents all appeared to work in the central West End area.

*“As a cab driver, you go where the work is, most of the work is in Central London so yeah, I do most of my work in and around the city. In the old days when we were just about the only method of cab you went everywhere, these days most of their work is taken up in and around the West End and the city.”
(A BC driver)*

“I wouldn’t turn down a job to anywhere, especially today.” (A BC driver)

A couple of the Uber drivers disputed this claim after hearing stories from customers who have been turned down by BCs.

“Some [black cabs] are swearing, last night for example, one old woman came out and wanted to go to Bromley, she stopped 10 black cabs and said ‘will you take me to Bromley’ and they said ‘no, we’re not going that way’ then she ordered an Uber and it picked her up in 2 minutes.” (An Uber driver)



For Uber drivers there are implications for cancelling jobs, they get less work via the app.

“Uber drivers can’t see the destination you are going to until we start the journey, so as soon as you got in I started and that’s when I see it. So you get a lot of Uber drivers, when you request it will call you and ‘hi, where are you going?’ and if you say so and so they will be like ‘see you in a minute’ and as soon as you hang up they’ll cancel the job if they don’t want to go there, which is bad but that is another thing that affects the Uber drivers, if you cancel jobs as it is done via an app it affects your ratings and you get a lot less jobs after. That is why it is difficult for Uber drivers, there are scenarios where I don’t want to do a job as I don’t want to go to South London as I live in North London, so if I cancelled a job bit affects my rating and then tomorrow when I want more jobs it takes long as they want to give it to another driver who does accept them all.” (An Uber driver)

Technology employed by Uber can record the efficiency of drivers, how much of the network that they are covering and analysing the efficiency of the routes that are being taken.

Some individuals are restricted to which mode of transport that they can use due to a lack of accessibility. All London BCs are wheelchair accessible. This ensures that passengers can travel where other transport may not be suitable [15] and reflects the lack of accessibility provided by TfL on the other transport networks (e.g., tube). All PH drivers must provide assistance to passengers in wheelchairs, without additional charge, if their taxi has been designed to be wheelchair accessible. Uber have just launched their own service, uberASSIST, to provide wheelchair accessible vehicles in London. There is no data in the Department of Transport report on how many PH vehicles are wheelchair accessible. However, there appears to be no push to register more wheelchair accessible vehicles. This is an issue of public good and raises a question for policy makers: why not mandate a percentage of PH vehicle fleets to be wheelchair accessible?

JOB CREATION OR DESTRUCTION WITHIN THE TRANSPORTATION INDUSTRY

The increase in licensed vehicles could suggest job creation with more individuals entering the taxi industry. However, our research, though very limited, has found it is difficult to support the claim that many of the drivers starting work with Uber are new to the industry with the data that we have collected. The majority of the drivers that were interviewed had previously been employed in the industry in mini-cab firms. Some drivers were working for Uber part-time in addition to a second job.

The introduction of Uber has effected recruitment into the taxi industry. The BC drivers have all trained for years to gain the knowledge at their own expense. The increase in competition and the turn down in the economy has meant that some of the BC drivers that were interviewed were leaving the industry to pursue other opportunities including bus driving. One of the respondents had taken six years to train part time to become a BC driver; they could not see a future in the industry given how much it has changed in light of Uber and increased competition.

There are too many challenges including a perceived lack of support from TFL and the media. A number of BC respondents echoed these feelings.

"A younger fella coming into the trade, I wouldn't recommend it. I definitely wouldn't. Unless he is prepared to work 12 hours a day, we have seen better days, let's be honest." (A BC driver)

Driving for Uber allowed those interviewed to work in a flexible job that fitted around family time and other jobs. Some Uber drivers acknowledged that driving was not their full time job. Some were happy that they had a job driving, they enjoyed the freedom of the job, being self-employed and it fitted in with family life.

"It is good, the good option is anytime you want you are free so you just put online and go for the job, so it's like a self service, self employer." (An Uber driver)

"I was working for a security company installing CCTV cameras and alarm systems. I went into this job because of the flexibility, you can work whatever hours or days you want to work." (An Uber driver)

Some Uber drivers, particularly the younger ones, expressed dissatisfaction with the job due to lack of earnings and long hours.

"I had a cousin who was doing Uber but only for 1 month and then he left. Same scenario, too many drivers and it wasn't worth it. Don't get me wrong it is good you can leave straight away and you won't lose anything even if the car isn't yours. You can quickly leave and you won't have lost anything, but it is the hassle." (An Uber driver)

"Now there are so many drivers what I earn has gone down big time and the only thing I can think to do is leave Uber and go onto another cab company or completely leave the cab industry." (An Uber driver)

Our interviews have shown that a different type of working environment now exists with the biggest change for BCs being the lack of work. They are working longer hours so work practices have had to change. It is a common scene in London now to see ranks full of BCs, which was never the case a few years ago, even with mini cabs and similar alternatives available. The BC drivers have seen their wages decrease and the hours they work, including time spent driving between ranks looking for work to get a fare, increase due to a lack of work in London with the influx of cabs onto the market.

"To be honest with you I never used to work on a Saturday but we have families and stuff and now I am working as I can't even get a fair crack at it." (A BC driver)

"The biggest change is, there's no work there anymore. Years ago, you'd come out to go to work, drop a job and didn't have to think where you were going to pick another up, it was there, now you are looking, where am I going to go once I drop that job off, can I get on any ranks? The other day, I couldn't get on any ranks, truthfully." (A BC driver)

From an Uber perspective drivers stated that they were not earning the income that they had expected when they signed up. Uber often undercut the BC fares, which can be by as much as 50% on some routes. Uber takes 20-25% off every fare depending how long the driver has been with Uber.

"We have very small tariffs, I should stay a minimum of 12 – 14 hours per day to earn good money." (An Uber driver)

These long hours may be familiar to those who run their own business, but such practices are also part of the reason the guilds developed in the past.



POLICY RECOMMENDATIONS

Our pilot study has indicated that Uber has affected the traditional transportation system, especially the BCs and how individuals are interacting with the overall network. A wider study is needed to fully understand the effects on the overall network. However, some recommendations can be made, particularly in terms of BCs, if they are to remain an important part of the network due to their ability to fulfil gaps occurring geographically and due to a lack of accessibility. The initial study has led to recommendations relating to cost, becoming a driver and licensing spend.

A review of policy and regulation documents pertaining to private hire and taxi transportation in particular has shown discrepancies in the treatment of BCs and PHs which appears to have directly impacted the industry. Although the majority of the requirements to become a licensed taxi driver are very similar for BC and PH the additional qualifications, and overall costs, are significantly different.

A BC driver must pass The Knowledge of London before receiving their badge and license where as a PH driver must pass a topographical skills test. The Knowledge took an average of 3 years to pass with the drivers that we interviewed, with the cost met by the individual. To become a Private Hire driver a topographical skills test is undertaken at an assessment centre and takes less than a day.

Table 1 shows the costs of becoming a licensed taxi driver, not including check and send from post office and the medical test. The variation in DSA Hackney Carriage Test is due to when it is taken; it is more costly if it is taken in an evening or on a Saturday. The cost of the topographical skills test will vary according to the assessment centre. Some assessment centres charge as little as £25. Uber has their own test centre and builds the cost into their one-day licensing sessions, such that the driver may not have to pay anything upfront.

Item	Cost for taxi driver	Cost if PH driver
Initial application	£80.00	£250.00
DBS application	£58.85	£58.85
All London written exam	£200.00	n/a
One off appearance fee	£400.00	n/a
Issue of fee	£192.00	n/a
DSA Hackney carriage test	£92.94 - £112.34	n/a
Topographical skills test	n/a	Variable
TOTAL	£1023.79 - £1043.19	£308.85

Table 1: Cost of becoming a licensed taxi or private hire driver in London

The barriers to entry are substantially lower for PH than for BCs in terms of study time and cost. We would not necessarily suggest removing the Knowledge. The Knowledge is significantly respected by both BC and Uber drivers that were interviewed. The BC drivers felt that the Knowledge was an investment; it gave them the advantage of finding their way round the city and knowing all the shortcuts.

"You could not get around London without it, if I am going down a street and something is shut in front, I have the knowledge, I can get out of it in 3 different ways." (A BC driver)

"No, the knowledge is very, very important as you know, it has been for many many years and we do supply the best service in the world. So yes it is very important." (A BC driver)

However, streamlining the process of assessment with the use of technology could help reduce costs and the time taken to complete the Knowledge. Admitting that BC drivers could make the use of GPS tools could also reduce the number of routes that need to be covered. The TfL specification for the topographical skills test does not state precisely how or what test should be given and, therefore, the service could be delivered differently at different assessment centres. For example, some may give a paper-based test where others could be electronic. This method allows the applicant's preferred method of learning to be taken into consideration, thus getting the most out of them.

We propose that the method of assessing the Knowledge be revised. Whilst such a revision is beyond the scope of this project, possible approaches could be to find a way that allows drivers to ply for trade whilst they learn the knowledge, perhaps as a PH driver. Such an approach would reduce the overall cost of taking the Knowledge to the individual and reduce the impact on the environment. However, more work is required to address this issue in detail.

The LCCI report of 2007 [13] suggested using incentives to attract new BC drivers. We found no evidence of this for BCs but Uber do offer monetary incentives to drivers which seemed to be successful in attracting individuals to the industry.

The static tariffs offered by TfL make the cost of transport transparent. However, innovations in technology allow this structure to be more flexible and market led, like those adapted by Uber. Again, detail of such a change to tariff is beyond the scope of this project, but a flexible pricing structure that took into account the current state of the existing transportation system (e.g., considering congestion levels, events, disruptions on other networks) could be considered.

OVERVIEW OF LICENSING INCOME 2014/2015

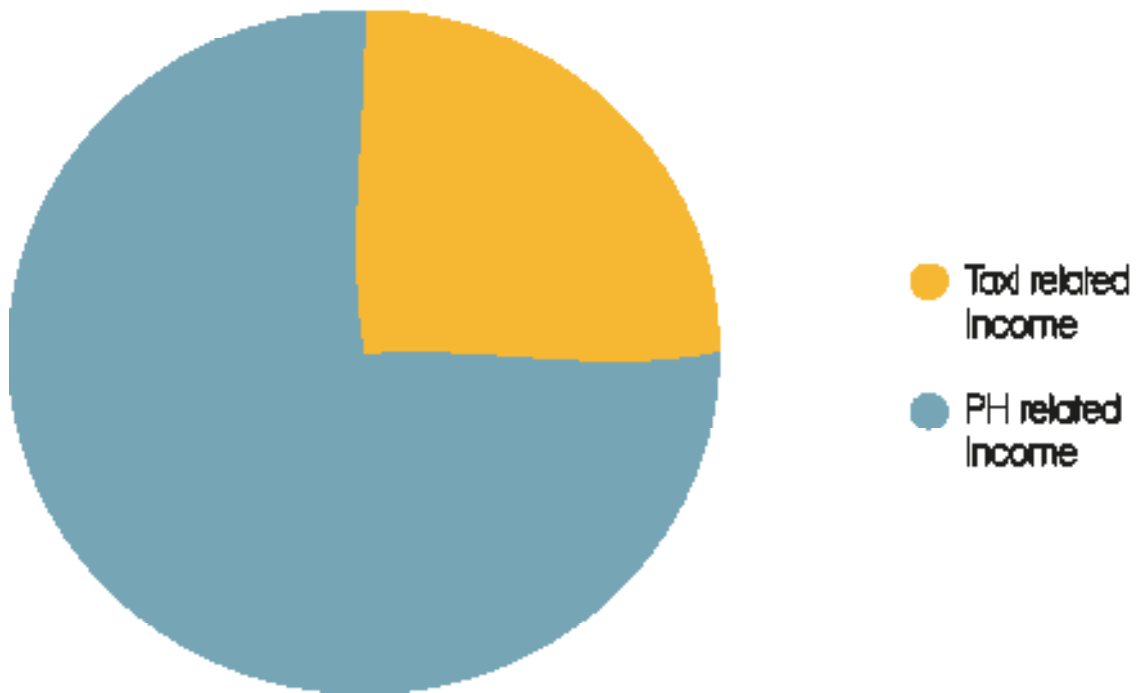


Figure 5: Source Department of Transport Taxi and Private Hire Vehicle Statistics England 2015

BREAKDOWN OF TAXI AND PRIVATE HIRE INCOME

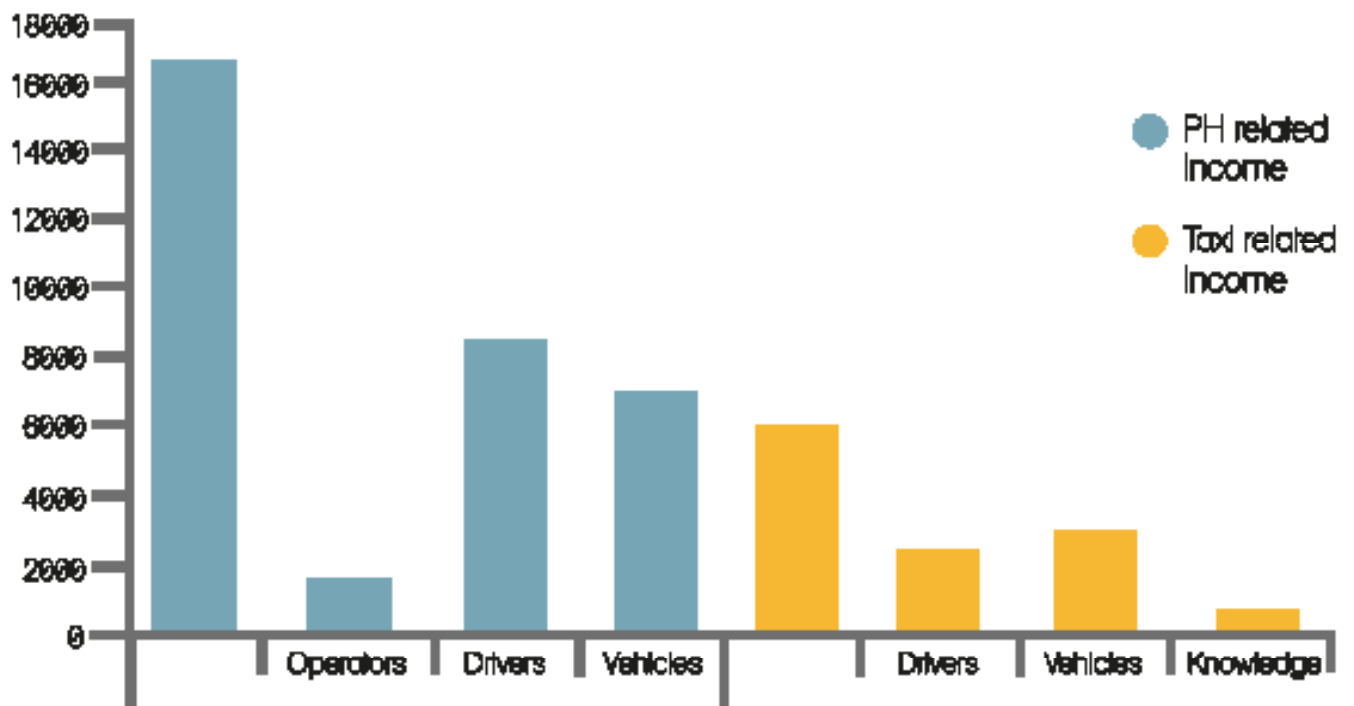


Figure 6: Source Department of Transport Taxi and Private Hire Vehicle Statistics England 2015

Implications of Licensing Spend

Legislation requires all income from license fees received by TfL be spent on taxi and PH license deliver and compliance services.

Figure 5 shows an overview of licensing income that was published by TfL as part of the 2014/15 financial summary [16]; a more detailed breakdown is shown in figure 6. Nearly £22 million income was received with 75% coming from the PH industry. This substantial gain from the PH industry does not give the government an incentive to reduce the number of PH vehicles and arguably leads to policy implications.

The financial summary states that some of the income goes towards Metropolitan Police enforcement officers but it is unclear what these officers enforce and why the City of London does not receive benefit.

TfL gives their expenditure in 2014/2015 at £19.6 million and note that the surplus will be spent on additional compliance officers and new payment functionality. However, some aspects of the current legislation are difficult to enforce and one could question as to whether additional officers will help. For example, the offence of illegally plying for hire is ill-defined [Ref]. Between January 1st and 30th April TfL successfully prosecuted only 33 drivers for illegal activity including illegally plying for hire.

A taxi vehicle license is issued for 12 months. Once licensed, it is exempt from the congestion charge. PHVs are exempt from the Congestion Charge if they are carrying out PH related duties. Black Cabs have 'Hire and Reward' insurance in place at all times. A PHV is only required to have this insurance when on a PH journey. However, how can these factors be policed in practice? It would appear from the levels of prosecution that identification and action over illegal activity is very difficult. As such, we recommend reconsidering the use of licensing income to improve marketing of taxi services and adding incentives for drivers to join the industry.

CONCLUSION

Uber's digital innovation has caused some disruption in the London transport market. The technology that they employ allows drivers to be informed of routes, makes each driver a separate business linked via the digital platform technology and allows their customers to be directly connected with drivers. This report details the findings of a study which aimed to understand the impact of this digital innovation on the contemporary London transport system.

A mixed methodology was adopted to understand the changing nature of transportation. To understand the impact of digital disruption and change in value propositions for the individual, it is necessary to capture data from them. This is done in three ways: focus groups, surveys and interviews. Exchange or utility value can be captured from management accounts and secondary data. This captures a record of the past transportation choices. Policy and regulation are also captured from the relevant organizations, typically via publicly available sources such as the Internet.

Initial findings suggest that the digital innovations introduced by Uber has disrupted the market and changed the nature of how people interact with the wider transportation system. For example, the introduction of Uber has led to many of our interviewees moving away from night buses. Uber has made it easier for individuals to move around the city, and they also appear to be fulfilling a gap in the existing transportation system where other modes of transport do not fully support the transport needs of individuals.

The Provisional Taxi and Private Hire Strategy of 2015 [14] included the Mayor's Transport Strategy. In the introduction, the report refers to the taxis (i.e., BC) and PH taxis as forming a 'two tiered system, which has co-existed in London for the past five decades'. The two tiers are considered as being unique, catering for different journeys, services and geographic markets. The strategy notes that regulation must keep up



with technology, particularly mobile phone applications that have led to an increase in the number of PH drivers, to allow 'fair competition across the two industries.' However, it is not clear what is meant by fair and to whom the fairness should apply to.

Throughout the Provisional Taxi and Private Hire Strategy of 2015 suggestions are made to increase the regulation for PH vehicles, but there is no real discussion of evolving strategy or the policy that dictates much of the business model for BC provision in the city. The suggestions in the strategy could remove some of the innovative aspects introduced by PH operators like Uber that are welcomed by customers, but are not offered by BCs due to TfL regulation. The proposed strategy developments would not enable BCs to become more competitive and this is a key problem that we have identified with the current regulatory approach. BCs are not able to control their competitive boundaries such that their business model cannot be adapted to compete or morph to meet specific customer requirement.

The Strategy does not seem to recognize the positive affect that the introduction of Uber has had on the wider transportation network with customers changing the ways they move around the city. For a successful and efficient transportation system, all networks need to be linked allowing the customer to move around without difficulty. This includes the more dynamic networks that are provided by the taxi industry.

Going forward, a larger study is being prepared that will look at the impact of digital innovation on the London transportation network in more detail and the findings compared to other EU cities (e.g., Paris, Rome and Warsaw). The larger project will allow the changing nature of transport within cities and the impact that digital innovation is having on these transport networks across Europe to be studied in more detail.

REFERENCES

1. Apprentice record books, as well as quarterage, complaints and affidavit books for the Company of Watermen and Lightermen are held at Guildhall Library. Ms 6289, 6291, 6301-6305, 6401-6404, 6819, etc. (1688-1923)
2. John A. Shedd, 'The State versus the Trades Guilds: Parliament's Soldier-Apprentices in the English Civil War Period, 1642-1655', *International Labor and Working-Class History*, 65 (2004), pp.105-116 (108)
3. Vukan R. Vuchic (2007) *Urban Transit Systems & Technology*. Hoboken, N.J.: John Wiley & Sons, Inc., p. 9.
4. F.M.L. Thompson, 'Nineteenth-Century Horse Sense', *The Economic History Review*, 29, 1 (1976), pp. 60-81 (61)
5. Danny Roth (2015) *Where to, Guv? The Complete History of the British Taxi Service*. Stroud: The History Press
6. M.E. Beesley, 'Regulation of Taxis', *The Economic Journal*, 83, 329 (1973), pp. 150-172.
7. Ian Silvera (3rd October 2014). 'Uber CEO Travis Kalanick: We Will Have 42,000 London Drivers in 2016'. Available from: <http://www.ibtimes.co.uk/uber-ceo-travis-kalanick-we-will-have-42000-london-drivers-2016-1468436>
8. Sam Loveridge (2014). Uber legal in London, rules TfL . Available from: <http://www.trustedreviews.com/news/uber-legal-in-london-rules-tfl>
9. driveuberuki (2015). Date accessed: June 2016. URL: <http://www.driveuberuki.com/private-hire-booking/>
10. Transport for London (2013). Go Your Own Way. Date accessed: February 2016. Available from: <https://www.youtube.com/watch?v=ONyJlPgjt-w>
11. Department of Transport (2015). 'Taxi and Private Hire statistics: England 2015'
12. INRIX (2016) London Congestion Trends Report. Available from: <http://inrix.com/londoncongestion/>
13. London Chamber of Commerce and Industry (LCCI) (2007). 'The London Taxi Trade – a report by London Chamber of Commerce'
14. Tariffs (2016) . Date accessed: June 2016. <https://tfl.gov.uk/modes/taxis-and-minicabs/taxi-fares/tariffs>
15. Transport for London (2015). 'Provisional Taxi and Private Hire Strategy 2015'. Available from: <http://content.tfl.gov.uk/taxi-and-private-hire-strategy2.pdf>
16. Transport for London (2015). 'Taxi and Private Hire Licensing and Compliance Services 2014/15 Financial Summary'. Available from: <http://content.tfl.gov.uk/financial-summary-tph-2014-2015.Pdf>

The authors would like to acknowledge the funding provided by the RCUK-funded NEMODE network.

Principle Investigator: Dr. Zena Wood, Senior Lecturer Computer Science, University of Greenwich
Contact: Z.Wood@greenwich.ac.uk

Co-Investigator: Dr Glenn Parry, Professor of Strategy and Operations Management,
Bristol Business School, University of the West of England
Contact: glenn.parry@uwe.ac.uk

Senior Researcher: Dr Janet Carruthers, Senior Lecturer Marketing, Bristol Business School,
University of the West of England

Researcher: Dr Kayla Rose, Research Fellow in Design History, Bath Spa University

Graphic Designer: Jardene Sinclair, University of Greenwich

