London Overground – A success story:
Transforming neglected urban railway infrastructure to meet capacity and connectivity demands

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Abstract: London Overground illustrates the successful transformation of underused and fragmented urban railway infrastructure into an orbital service boasting record passenger satisfaction and popularity. London's metropolitan transport authority Transport for London achieved this through a combination of measures. In addition to station upgrades and new trains, the provision of integrated transport services, such as integrated ticketing and customer information, marketing and branding contributed to London Overground's success. In 2007, Transport for London took over the concession to operate and manage the neglected railway routes. Since then, London Overground has become one of best performing train operators in Great Britain. London Overground patronage has nearly quadrupled since Transport for London took over the management of the concession – surpassing demand forecasts and necessitating further capacity enhancement investment. As well as providing new radial connections, London Overground has also managed to attract passengers from London Buses, National Rail and London Underground, and thereby freed capacity on these stressed services. This paper will describe all of these transformations and draw out some principles that will be of use to other similar initiatives.

Key words: Railway; Infrastructure; Regeneration; Connectivity; Orbital transport; London overground; Transport for London.

I. Introduction

London's public transport authority Transport London has successfully transformed neglected and fragmented urban rail infrastructure into a comprehensive network that complements the existing public transport provision in London. An inner London orbital service was created by Transport for London by linking up a dispersed and fragmented collection of railway routes. This network was branded as London Overground and became part of Transport for London.

The largest component of the new London Overground network is formed from the previous Silverlink Metro routes. Transport for London took over the management of the Silverlink Metro concession in November 2007[1]. Silverlink Metro ran suburban and inner London services from Stratford to Richmond, Willesden Junction to Clapham Junction, London Euston to Watford Junction via Willesden and Gospel Oak to Barking. The map below illustrates the former Silverlink Metro rail routes rebranded as London Overground.

The Silverlink Metro ran a low quality service, marked by neglected stations, old rolling stock and low service levels. When taking over the concession Transport for London set about transforming the network with a programme dedicated to the enhancement of the level and quality of services which included:

- New rolling stock
- Upgraded infrastructure to accommodate higher service levels
- Station refurbishments
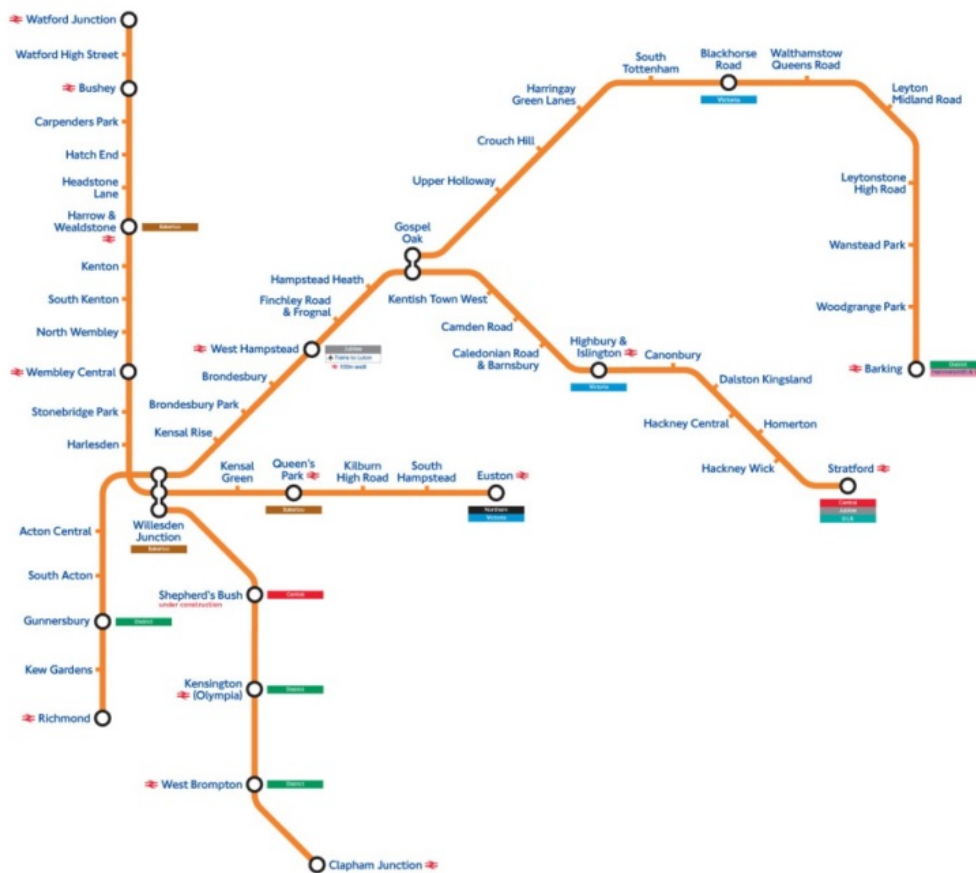- High standards of customer service[1]

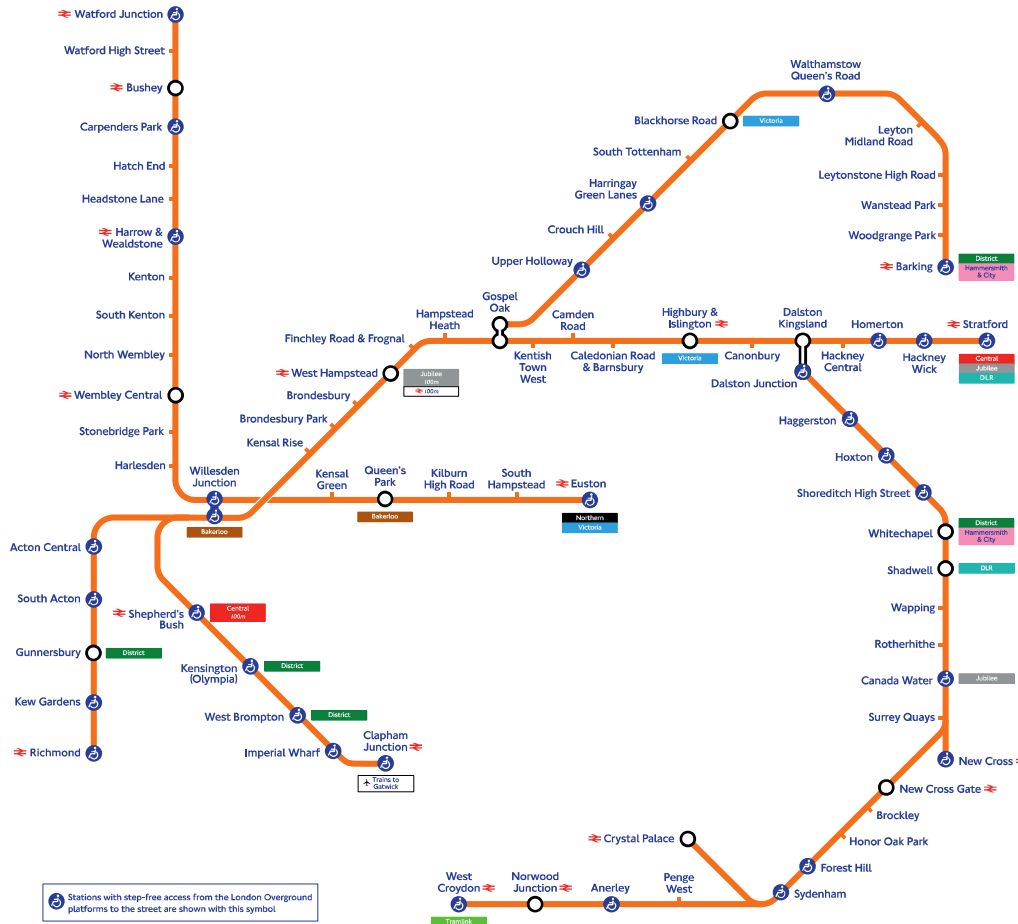**Figure 1: London Overground Network in 2008[2]**

Figure 2: London Overground Network in 2011 (with East London Line Extensions[5])

A. East London Line

Another existing route to be integrated into the London Overground was the London Underground East London line from Whitechapel to New Cross Gate[3]. The East London Line was closed in 2007 to become part of the London Overground network. The infrastructure of the former London Underground East London Line needed to be upgraded to accommodate the new levels of service. The work involved the installation of new signaling and communications equipment as well as the replacement of tracks and construction of new bridges. In the same fashion as the former Silverlink Metro stations, all existing stations were refurbished to offer modern and high level of customer service and experience.

The East London line was extended both to the north, to meet the Richmond to Stratford line at initially only to Dalston in 2010 and later Highbury & Islington in 2011, and to New Cross, Crystal Palace and West Croydon via separate branches in the South[1,4]. The section north of

Whitechapel uses the route of the old railway lines into Broad Street station, which was closed in 1986. Along this section four new stations were constructed. The section south of New Cross Gate runs alongside the existing mainline railway tracks[3]. A full service between Highbury & Islington and New Cross/Crystal Palace/West Croydon via the City opened on 28 February 2011[4]. A map capturing the expanded network to the East and South East is shown below.

B. Completing the Orbital

The orbital was completed with the final link currently planned on the London Overground orbital network in December 2012. London Overground's newest addition is an extension across south London between Surrey Quays and Clapham Junction station. Four new stations were built along the route. Thereby, offering a new level of connectivity to the residents along the route[4].The complete transformation of neglected a fragmented urban rail infrastructure into the orbital London Overground network to date cost Transport for London £1.5 billion[4].
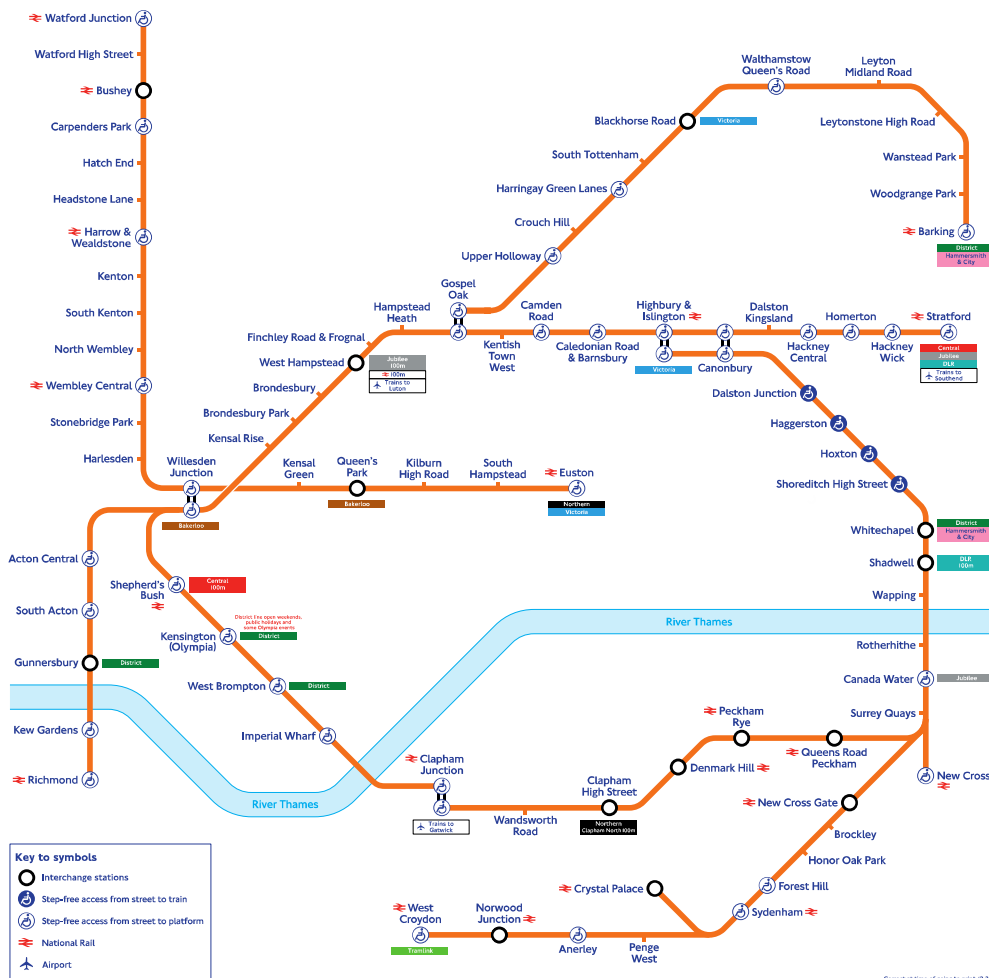

Figure 3: London Overground Network as of December 2012[6]

C. Alignment with the London Plan and Mayor's Transport Strategy

The London Plan is an overall strategic plan for the UK capital which sets out an integrated social, economic, environmental and transport framework for development in London for the next twenty years[7]. The London Plan was developed alongside the Mayor's Transport Strategy, in which the Mayor of London sets out his vision for transport in the next twenty years. With high levels of residential and employment migration into to London, 1.25mil and 0.75mil respectively by 2031, sustainable transport is the key keeping London moving[8]. Alongside this significant population growth rail demand is forecast to grow by two-thirds by 2031[9]. This will inevitably put pressure on the transport network, leading to greater crowding levels and thereby adversely affection both journey times and reliability. The public transport network is vital to keeping London moving. Urban rail in particular carries 80% of all journeys into London[9]. London Overground is therefore vital to providing greater capacity and offering alternative routes in order to relieve capacity in Central London[9]. One of the ways the London Plan proposes to enhance London's transport connectivity is to provide an orbital rail network, i.e. London Overground, which would support future development, regeneration of priority areas and increase public transport capacity.

London Overground's orbital service complements the existing services by providing links between inner London areas without customers needing to travel via central London. London Overground facilitates strategic interchanges between orbital and radial routes. The concept of these strategic interchanges is outlined in the Mayor's Transport Strategy[10].

Strategic interchanges will help to relieve passenger dispersal pressures at central London rail termini through two primary means:
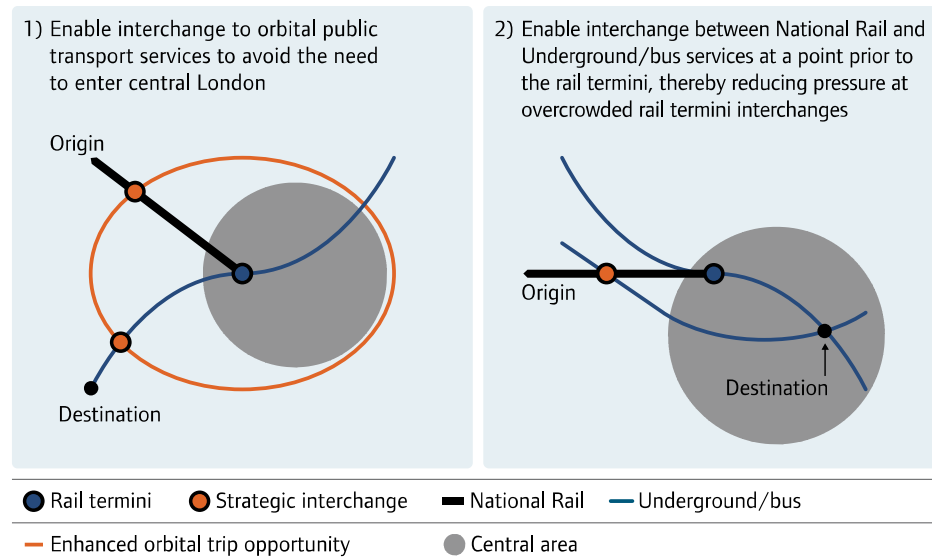

Figure 4: Strategic Interchange Concept[10]

Interchanges expand the level of accessibility to opportunities and services as well as improve connectivity and passenger journey experiences. Strategic interchanges outside of central

London have the potential to reduce travel times for the individual customer and relieve crowding in central London. Key to achieving these goals is the quality of the interchange. To achieve world-class interchanges which encourage multi-modal public transport use and attract passengers from using their private cars Transport for London has published Interchange Best Practice Guidelines[11] to ensure high quality and effective interchanges across their jurisdiction. As part of the Transport for London family, London Overground stations were also designed to ensure customers would have a good interchange experience.
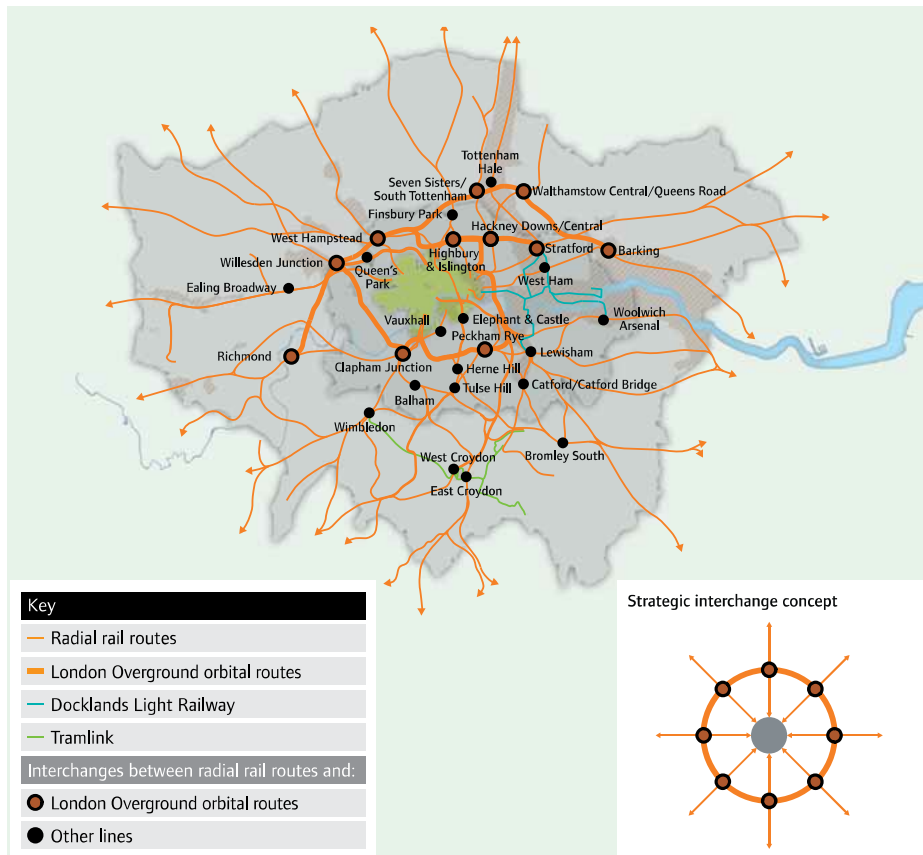

Figure 5: Examples of Strategic Interchange Locations Outside Central London[10]

As you can see in the figure above the London Overground provides the backbone potential radial orbital interchanges, improving journeys for customers through reduced journey times and freeing up capacity at Central London interchanges.

II. Success of London Overground

A. Passenger Numbers

London Overground patronage tripled in the four years following Transport for London's take-over of the concession, between November 2007 and 2011. A large part of the growth occurred on the East London Line with its new extensions. However, the rest of the London Overground network also experienced passenger numbers increasing by 110%[1]. Today, four times as many passengers are using London Overground than before the concessions were taken over. The latest four week period (Period 3 for 2013/2014) was the busiest for the London Overground to date with 10.9 million passengers[12].

Peak services are already crowded. In 2009, new high capacity trains were introduced and in 2011 the service frequency was doubled[13]. The popularity of the service is highlighted by demand for the service having grown in line with capacity increases. Demand for the services has increased steadily. London Overground has already completed an additional capacity enhancement programme since it's initial upgrades. In 2010 the train capacity was increased by over a third by adding an additional car to the train along the North and West London Line. Initially only three car trains were introduced, these were extended to four car trains already in use on the East London Lines in 2010[1]. The crowding levels today match those recorded before these two measures were implemented. By 2016, as illustrated below, it is anticipated that demand will exceed Transport for London's planning standard of no more than three passengers per square metre standing in the morning peak[1]. Demand across the whole London Overground network alone is expected to increase by another forty per cent by 2021[15].
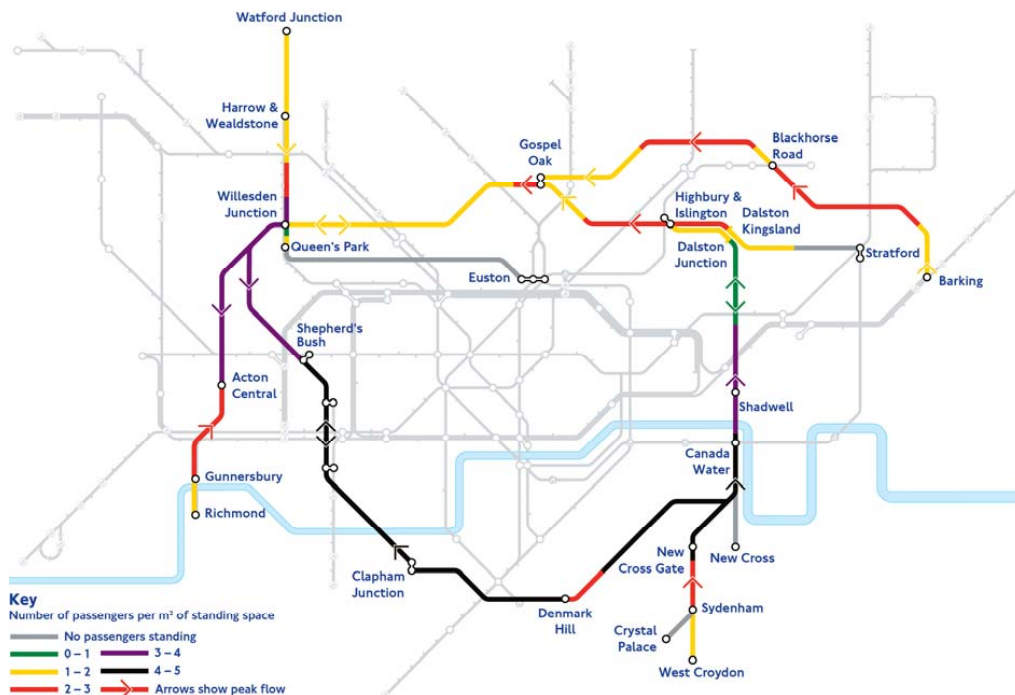

Figure 6: Forecasted Crowding on London Overground in 2016[1]

The fastest growing section of the network has been on the Willesden to Clapham Junction route between the two new stations along that route: Shepherd's Bush and imperial Wharf. Shepherd's Bush now provides links with London Underground's Central Line as well as easy access to a large urban shopping mall[1]. Imperial Wharf station has provided new levels of connectivity to an area previously underserviced by public transport. The popularity of the service along this section has outstretched capacity already. These two section are the busiest sections along with the Highbury & Islington to Dalston section. Crowding in the peak surpasses the crowding levels Transport for London designs for, namely three passengers per square metre. The London Overground Loadweight[12] report from the weeks commencing the 10th and 17th June 2013 indicates that crowding levels of up to 6 passengers per square metre standing are

reached close to passenger safety crowding threshold of 7 per square metre. Maximum train loading is considered 5 passengers per square metre – which these peak services are exceeding - and 7 passengers per square is considered *crush load*[14,15]. Peak loads are increasing necessitating further capacity investment.

The popularity of the link demonstrates the former gap in public transport provision that the London Overground has managed to fill. It is servicing new areas and providing easy connections between previously underserviced routes. The popularity of this section also highlights the importance of good interchange facilities which encourage customers to undertake multi-modal journeys to access new services and opportunities.

Transport for London will be increasing the number of cars on the routes using electric 4-car trains (all bar Gospel Oak to Barking on which diesel trains run) from four to five cars to further increase capacity on the lines. This London Overground capacity enhancement scheme will increase capacity by more than a quarter and thereby reduce crowding on trains. The scheme will first be rolled out to the East London Line, from Highbury & Islington to West Croydon/Clapham Junction, from December 2014. The rolling stock upgrade will follow on all other electric lines in 2015[13]. Transport for London has placed an order for 57 new cars with the original manufacturer Bombardier worth £88 million. This is part of a wider £320million capacity enhancement programme which also includes the construction of longer platforms, depot enhancement, new signalling and power works[16,17].

B. Drivers of Growth

Key drivers of rail demand are the economy, demographics, fares and service levels. During an economic downturn rail demand is therefore, assumed to slow. However, this has not been the case in London and South East of England. On the contrary, rail demand grew strongly between 2010 and 2012[1]. Instead, other drivers contributed to London Overground's growth in patronage, namely:

- Service frequency
- Operational Performance
- Service Quality, including stations and rolling stock
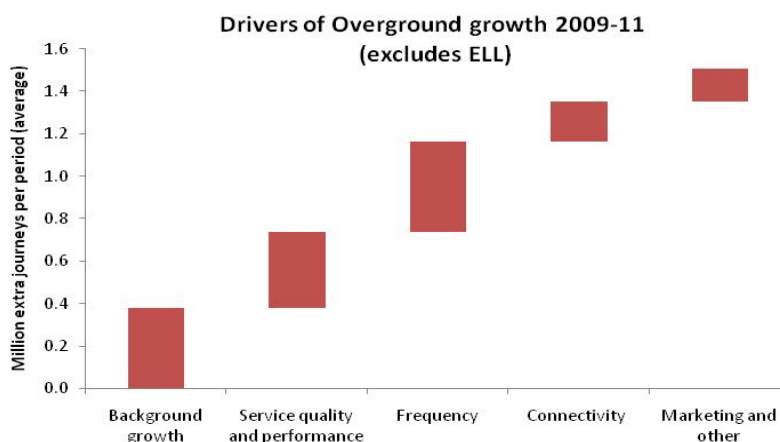- Connectivity
- Marketing

Figure 7: Drivers of Growth on London Overground

The impact of each of these drivers to the overall patronage increase was calculated by Transport for London using industry elasticity to generate a waterfall chart, as depicted above[1].

In the first instance, London Overground has benefitted from a buoyant rail market in London and South East England[1]. Despite the economic downturn rail usage has steadily increased. Background growth, however, has only contributed a quarter of the patronage increase observed on the routes between 2009 and 2011. The largest contributor to London Overground's growth was service frequency.

C. Frequency

When Transport for London took over the concession from Silverlink Metro in 2007, up to six trains per hour ran between Stratford and Richmond and three trains per hour between Clapham and Willesden Junction. In the off peak frequencies were notably lower at four and two trains per hour respectively. There have been two updated timetables since the concession was taken on, one in 2010 and 2011. The frequency was changed to three trains per hour from Stratford to Clapham Junction and three trains per hour from Stratford to Richmond. The schedule was changed to service the increasingly popular link between Clapham and Willesden. In 2011, the service frequency was increased to four trains per hour on both routes[1].
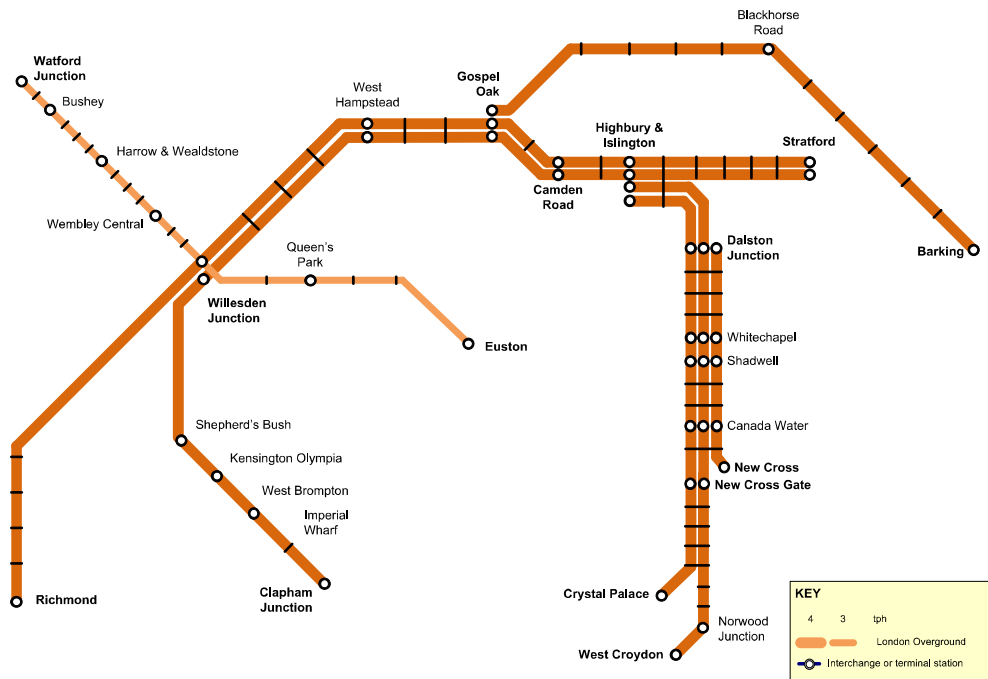

Figure 8: Frequency of London Overground Services[1]

Based on extensive research conducted for London Underground, Transport for London has set the frequency all stations should receive at least four trains per hour throughout the week, wherever appropriate[9]. The research demonstrated that this level of standardized frequency addressed customer preconceptions that the journey would be lengthy and inconvenient[9]. Instead the "turn up and go" service frequency encourages customer to use the service without planning their journey in advance, thereby attracting customer from other frequent services such as the bus and London Underground.

D. Service Quality - New Trains

All London Overground routes bar the Gospel Oak to Barking route are now served by a four car high capacity train. Longitudinal seating and walk-through carriages maximise capacity. The trains have a capacity of 700, designed to carry customers in comfort for short distances[1]. The suburban old rolling stock was replaced for a metro style rolling stock.

E. Service Quality - Safe Stations

During 2011, all London Overground stations were refurbished to provide a safe and secure station environment to customers. This was achieved through:

- Modernising stations
- Improving lighting
- Installing more CCTV
- Managing stations more effectively
- Visible policing and security patrolling
- Providing more Help Points
- Implemented alcohol and smoking bans
- Enhanced information systems
- Continuous station maintenance and cleaning[9,13]

The design principles developed by Transport for London's dedicated team, Crime Prevention Through Environmental Design, were also applied to London Overground to *design out* crime[13]. The success of these efforts is captured by the Passenger Focus surveys[18,19] in which passengers self-assessment of their personal security whilst using the station increased by nearly thirty percentage points from a satisfaction level of 45% to 74% since Transport for London took over the concession. There were also significant increases in customer satisfaction in the overall station environment, for which the passenger satisfactions rates increased from 50% to 69% between Spring 2010 and 2011 - during this period a considerable number of stations underwent the station refurbishment as outlined above. The new maintenance and upkeep periodicity also received high customer approval rates. Passenger satisfaction rates went up with statistical significance by nearly 20% for the same time period with regard to cleanliness and station upkeep/repair of the station buildings and platforms[18].

F. Service Quality – Staff

All London Overground stations are staffed while trains are running, to enable customers to access help from members of staff available. In additions this will also increase the safety at the stations[20].

G. Branding

London Overground has been branded with the same operational branding as the rest of Transport for London. A recognizable adaptation of the Transport for London roundel brand originally designed Edward Johnston for London Underground in 1918 has been adopted for London Overground[21]. The bright orange formerly used to denote the London Underground East London Line which was incorporated in the London Overground network was adopted for the London Overground with a roundel mirroring the London Underground icon with the red replaced with orange.

London Overground design standards were introduced to promote a high level of quality and consistency in appearance and all communications. London Overground design standards fall in line within the Transport for London family brand. To ensure the continuity and consistency in brand design separate London Overground design standards were developed for basic elements, signs, posters, the built environment, stationary and train graphics. The standardised appearance of the patchwork network was achieved with a design standard for stations. The adaptation of the roundel also implied a service quality and level that the customers are accustomed to from the other Transport for London brands. Supplementing the visual appearance with an higher service quality and frequency, increased maintenance regimes, improved customer service and Transport for London's smart card ticketing system, presented the London Overground network as a *fully-fledged* member of the Transport for London family both in terms of appearance and performance.

H. Marketing

In addition to the rebranding of the stations and routes Transport for London took over they also had an active marketing campaign to raise awareness and encourage the use of the new network. In 2008, they launched a campaigned called *London's New Train Set* which intended to inform passengers about the new London Overground network[20]. London Overground also appeared on the London Underground network maps in addition to its appearance on the London Rail maps. This placed London Overground firmly on the map for Londoners and visitors navigating the city. The "turn-up-and-go" service frequency enabled this as London Overground services were now a reasonable journey alternative.

The success of the marketing campaign is captured in the survey results of customer research conducted for London Overground East London Line[22]. Surveys were undertaken pre and post opening of the extended and refurbished line. Pre-opening 62% planned to use the service. Post opening a slightly smaller proportion 57% had already used it and an additional 19% planned to use it. In total 76% (89% and 61% of the survey users on rail and bus respectively) had used or intended to use the new service[22].

I. Integrated Ticketing

From when Transport for London took over the concession of the Silverlink Metro routes, the smart card ticketing already used on Transport for London's other services such as London Underground, London Buses and Tramlink could be used on the London Overground network[20]. The smart card ticketing facilitated and encouraged the use of the network and multimodal journeys. The smart card eliminated the barrier to using the service created by the need to purchase a separate ticket and the higher financial cost associated with of National Rail tickets. Instead the Transport for London smart card offers customers the best fares and will cap at less

than the price of an equivalent Day Travel Card or One Day Bus card if multiple journeys are under taken in a 24-hour period[20].

J. Integrated Transport

An indication of the success of the integration principles applied to London Overground is the level of interchanging passengers from London Overground onto different other modes. In the London Overground Impact Study[1] it was identified that a fifth of London Overground passengers interchange with London Underground or Transport for London's light rail network the Docklands Light Railway. Another 20% interchange onto London Buses or other London Overground branches. This compares to half of all mainline railway passenger who switch onto London Underground or Docklands Light Railway in the morning peak when arriving in London[1].

K. Switch from other services

The largest share of passengers switched from using London Buses or London Underground to London Overground since Transport took over the management of the London Overground network.
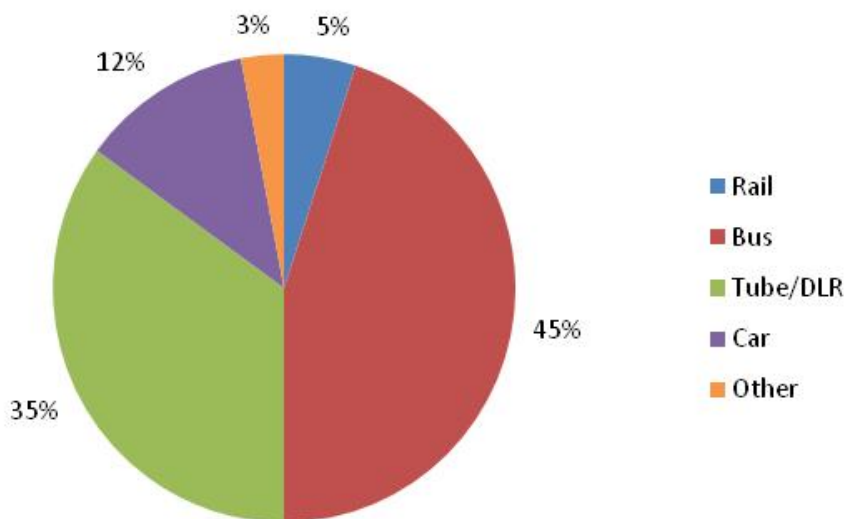

Figure 9: Modes Previously Used By Additional London Overground Passengers[1]

L. Performance – Customer Satisfaction

The railway passenger watchdog Passenger Focus undertakes research throughout the year to gauge railway passengers' opinion and raise concerns across the country. Passenger Focus's mission is to get the *best deal for Britain's passengers*[23]. Twice a year Passenger Focus undertakes a National Passenger Survey to produce a report on each of the UK's train operating company's performance. The graph below illustrates how passenger's overall satisfaction levels have increased by nearly a half from 64% to 93%.
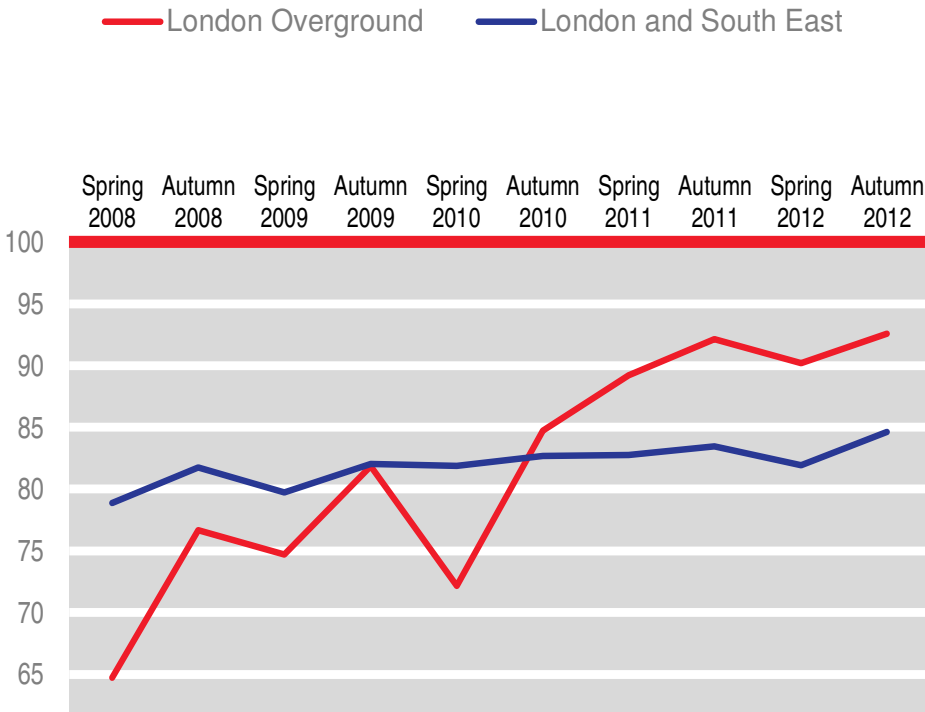
Figure 10: Overall Satisfaction with London Overground between 2008 and 2012 (%)[19]

M. Performance – Punctuality

Like all UK train operating companies London Overground is given a score on its performance with regard to punctuality of its services. Two measures are used: Public Performance Measure and Right Time. The former indicates which percentage of the services that the train operator runs arrived within five minutes of the train's scheduled arrival time[24]. The Right Time performance measures the percentage of trains arriving early or within 59 seconds of schedule[25]. The graph below indicates London Overground's performance since Transport for London took over the concession in 2007. The latest figures for London Overground are 96.8% on Public Performance Measure and 86.6% on Right Time Measure, both annual moving averages for July 2012 to 2013. These compare to 91.1% and 73%, respectively, when the management of the routes was taken over by Transport for London. As the graph below illustrates, on top of the notable increase in punctuality, the gap between the Public Performance Measure and Right Time measure has been narrowed since the concession was taken over.
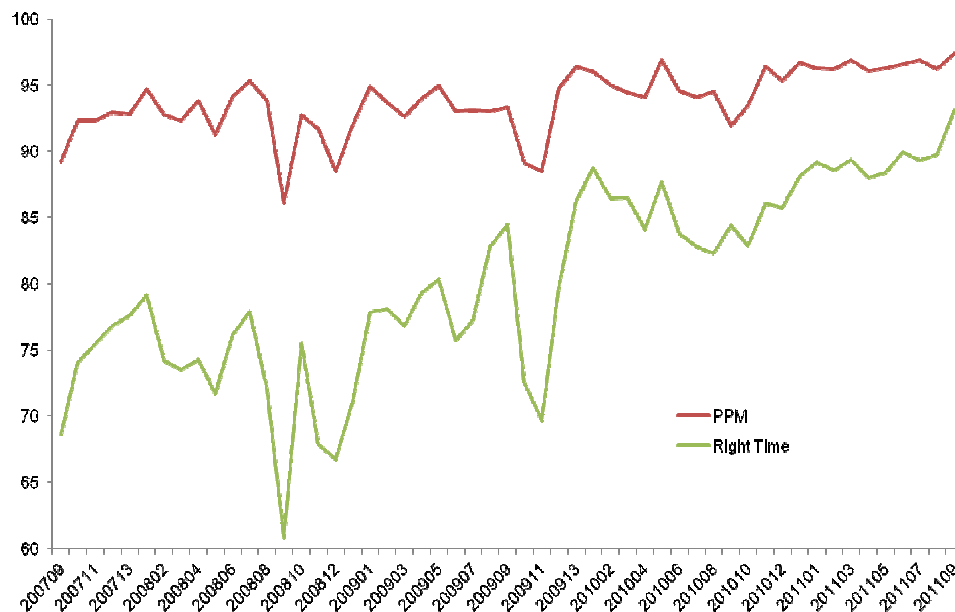
Figure 11: Public Performance Measure & Right Time Performance on London Overground from 2007 to 2011[26]

III. Conclusion

London Overground has been a success with regard to various metrics. It has provided a popular complementary service with enhanced capacity along the routes and in turn freeing up capacity on other routes. It has also demonstrated the validity of Transport for London's call to give the Mayor of London, who supervises Transport for London, greater powers over transport in the capital[9]. Not only can this offer customers a better integrated transport provision, but it can also ensure the efficient use of investment and maximise revenues. Transport for London believes that giving the Mayor a budget to operate London's entire rail network would *enable the Mayor to balance London's transport needs and service standards across the capital*[9]. London Overground's success underlines the argument for Transport for London's call.

London Overground is a successful example of the *in-fill* services Transport for London refers to in their *Delivering the Mayor's Transport Strategy*[9] which are intended to complement the major schemes by focusing management and invest in transport provision. London Overground has improved connectivity to the areas it services, the popular service reroutes journeys that previously were via Central London and thereby frees up capacity in the central areas. The strategic interchanges it has creates between radial and orbital services contributes to this. The higher service quality and frequency as offered customers across London better transport provision and greater access to opportunities and services.

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