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The Potential for Orbital Public Transport Services in the Greater Dublin Area

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IDENTIFYING BARRIERS TO IMPLEMENTATION OF THE ORBITAL ELEMENTS OF A RAPID TRANSIT NETWORK FOR DUBLIN

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Abstract

Orbital routes are often considered a costly idea that is unpopular with transport users. Yet many cities provide them in a successful, often revenue-generating context. Those that do take a Network Effect approach to service design.

The idea of orbital routes within the Greater Dublin Area (GDA) transport network has been around for some time, referenced for example in the 2002 Dublin Transportation Office (DTO) "Platform for Change" Strategy, the 2006 MVA "Dublin Bus Network Review" consultants' study and most recently the National Transport Authority (NTA) Greater Dublin Area Draft Transport Strategy 2011-2030, where two notional orbital Quality Bus Corridors (QBCs) are referred to (Figure 1 below).

This paper examines current strategies to serve orbital demand and looks at the potential for and barriers to delivering such services. Future demand models indicate that strategic mode share targets cannot be met without orbital services. Analysis of residential and employment land-uses in a quadrant of the GDA indicates potential for effective orbital services.

Further study is recommended to analyse the optimum design and routing of any such services. These need to be efficient and direct with high levels of transferability between services. They should also closely reflect the urban structure (or "Core") strategy recently adopted by Dublin City Council. Current (draft) transport strategy appears to exclude key development centres, notably in disadvantaged areas, which could be integral to an effective and socially accessible transport network.

Introduction

Recently, major advancements have been made in Dublin's public transport system such as the introduction of RTPI / AVL (real time passenger information / automatic vehicle location technology), the new "Leap Card" electronic wallet and the ongoing restructuring of Dublin Bus routes. The dublinbikes on-street bike rental scheme has been recognised worldwide and attitudes towards active travel are noticeably changing [1].

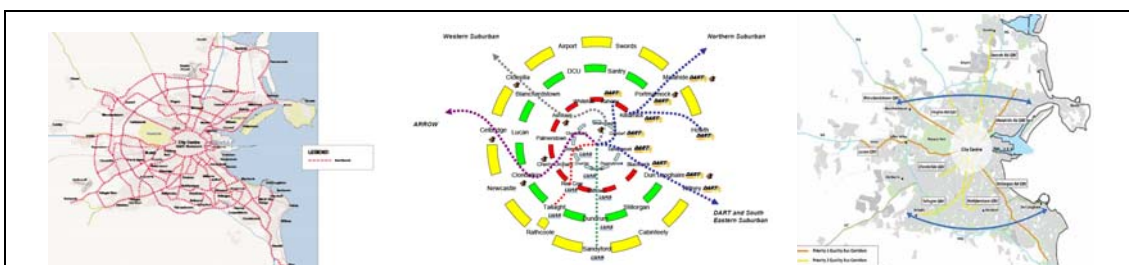


Figure 1: References to Orbital QBCs in (a) 2002 DTO "Platform for Change" (b) 2006 MVA Study and (c) 2011 NTA Draft Transport Strategy

Introducing high quality orbital QBCs could be an evolutionary step building on these progressive measures and would require a framework of inputs involving planning authorities, transport agencies, communities and government. Most importantly it would tie transport strategy properly in with land use policy, something not currently achieved by current draft strategy. This in turn can lead to a fully mobile city with connected, healthy neighbourhoods¹. The main argument for orbital QBCs is the Network Effect benefit they would deliver.

Understanding the Network Effect

Many northern and central European cities boast a transport system that provides comprehensive mobility, serving anywhere-to-anywhere trips in a relatively timely and efficient manner. Berlin, Hamburg and Zurich are a number of cities that can be designated within such a category. The most oft-cited reason for optimality in urban transport is density. It is contended here that density and land use planning has an important though much overstated role to play. Even at low-medium densities, a population of 10,000 or more - the equivalent of a medium-sized Irish town - can live within walking distance of a transport hub [2]. Paul Mees, in particular, argues that the density-patronage relationship is less clearcut than often claimed and that the most important determinant of ridership is service quality [3]. A central requirement in this regard is an idea called the "network effect". Very little has been written on this subject although esteemed authors such as Thomson acknowledge its importance [4]. The most authoritative understanding of the concept has been given by Mees and his model is worth recounting here.

To explain it at its most basic level a theoretical city is imagined which has 10 un-networked (in this case north-south) routes serving a grid of evenly populated districts (see Figure 2, below left) with similarly even trip distributions.

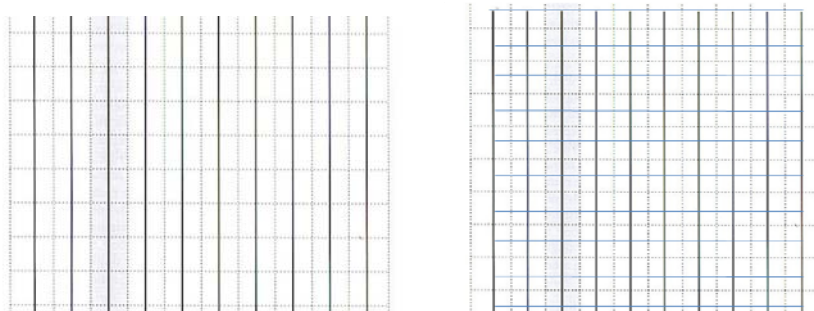


Figure 2: "Squaresville": the Network Effect illustrated (Source: Mees, 2002)

In this model, using conservative assumptions (low-medium densities and a 30-40% propensity to choose public transport), a total of approximately 6% of all trips are likely to be by public transport. Doubling the frequency of those routes, at standard elasticity of demand rates (say, a 50% propensity to transfer), would lead to a potential 9% of trips served by public transport. In this case costs have doubled but patronage has only risen by 50%.

However, if instead of doubling frequencies 10 new networked (i.e. east-west) routes are added a different picture emerges (see Figure 2, above right). In this model, using the same assumptions, a total of 40% of trips are likely to be by public transport. Now, for the same cost outlay, patronage and revenue have both risen more than 6-fold.

This is a theoretical model assuming an even population distribution. In a typical urban scenario many of the routes could be loss-making or feeder routes, however the overall network stands to gain as a result. Most businesses understand that such cross-subsidy is

¹ The idea of Healthy Neighbourhoods is well explained in Barton et al [2] and alludes to the design of urban areas such that communities can enjoy active healthy lifestyles in a risk-free, amenable environment. Absence of noise / air pollution and opportunities for active travel are key components considered, as is high social mobility via public transport.

essential to develop a viable market. This, according to Mees, is nearly always a feature of successful transit cities [5].

Joining up Dublin's Neighbourhoods

The question is prompted whether the principle of the network effect is appropriate for Dublin's urban structure. The Dublin City Council Development Plan 2011-2017 has a Core Strategy (see Figure 3 below right) [6]. A critical element of the strategy is the designation of Key District Centres and Key Developing Areas. Another vital component of the Core Strategy is three arterial Economic Corridors along with a Strategic Green Network. This vision suggests an orbital network of well connected district centres with strong connections to the centre.



Figure 3: Dublin City Council Development Plan 2011 – 2017 Core Strategy

Demand for the orbital and “networked” trips suggested by the City Council’s Core Strategy not only exists but is very strong according to land use demand models prepared by the NTA.

Figure 4.6 of the NTA Draft Transport Strategy (reproduced below) indicates that fully 56% of morning peak trips in the GDA are orbital, while 39% of trips are either arterial or inbound [7]. Many, possibly even a majority of these arterial trips are likely to be “networked” trips, i.e. requiring a transfer to reach their end-destination.

In 2030 the percentage of orbital trips is forecasted to reduce to 46%. But if it is assumed that a significant share of arterial trips require some transfer, at least half possibly two-thirds of all trips will not be served by the Strategy.

That is unless a high level of orbital service is provided, in turn with a high level of transferability. Without an orbital service the forecast suggests that the NTA draft Transport Strategy cannot inherently deliver the high levels of mode transfer to which it alludes².

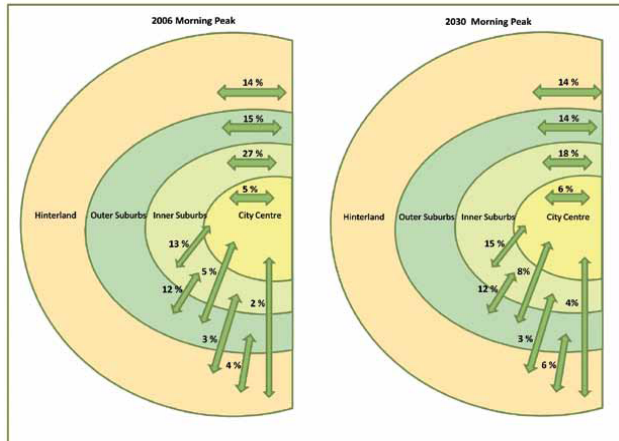


Figure 4: “Figure 4.6” of the NTA draft Transport Strategy

Potential for and Barriers to Orbital Public Transport Services

The concept of a quality orbital system interlinking with quality arterial routes to form an urban transport network appears to be a critical feature then. Research was undertaken as part of an undergraduate dissertation by Colin Broderick to identify the potential for and barriers to implementing an orbital rapid transit network in Dublin [8]. The study was restricted to the north eastern quadrant of Dublin, generally described as everything east of the Ballymun Road Corridor. This sector of the city is characterised by low-medium density suburban housing of mixed socio-economic status (although with large pockets of

² The NTA Draft Transport Strategy, unlike previous transport strategy documents does not explicitly state mode share targets. Some reference is made to contributing to targets (45% car; 20% bicycle) set out in the national government’s Smarter Travel Policy Document

disadvantaged areas). The area also comprises of extensive ageing manufacturing zones containing declining industry. Investment is low in the area and transport to outside of the area is essential for employment opportunities to many [9].

The first stage of the research was to identify which orbital lines would be used for assessment. A review of existing strategy and published policy for public transport in Dublin identified certain relevant options: -

- 2030 Vision - Draft National Transport Authority Strategy [10]
- Dublin Bus Network Review (the “MVA Study”) [11]
- Currently released elements of Dublin Bus Network Direct [12]
- Dublin City Development Plan 2011 – 2017 Core Strategy [13]

A map was extracted from the Open Street Map database. The extracted map was then imported into Adobe Illustrator where the various strategies were simplified and drawn by eye onto the map. Google Earth provided baseline aerial photography predominately dating from the 2010 period for the majority of the Dublin city area. The study area was mapped for the main uses that generate trips for public transport such as employment/industrial areas, schools, hospitals, shopping centres, etc.

2030 Vision - Bus Strategy Map. The 2030 Vision Draft document shows two aspirational orbital routes, one north and one south (see Figure 1c). There is no clear indication of the destinations they should serve or how they will tie in with the radial QBC’s shown.

2006 Dublin Bus Network Review (MVA Study). MVA consultants were commissioned in 2005 to prepare a strategy for developing the Dublin Bus network over a five year period from 2005 - 2010 and also at strategic level up to 2015 [11]. The strategy report was published in February 2006. The report proposed 4 orbital routes one of which should run outside of the M50 ring, being those yellow lines in Figure 5. The (blue) arterial routes are substantively in place as part of the GDA QBC network. This was implemented between 1998 and 2010, primarily by the Quality Bus Network Project Office in line with the DTO “Platform for Change” Strategy [14]. The routes from the MVA map were redrawn onto the OSM map (figure 6) to illustrate their on-the-ground coverage within the study area.

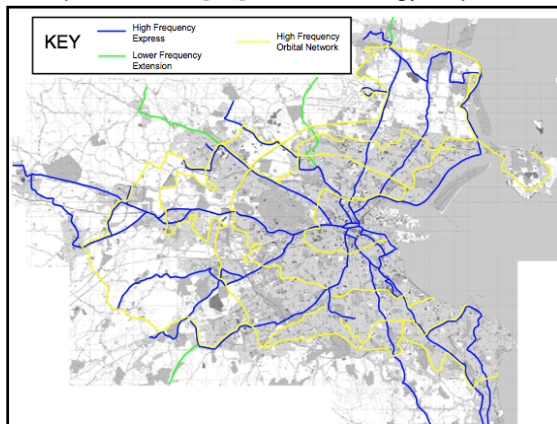


Figure 5: Dublin Bus Network Review Strategy

Network Direct. Network Direct is the brand name given to the implementation (albeit modified) of the recommendations of the MVA strategy for Dublin Bus Network Review.

The lines shown in this reproduced map of the various routes from Network Direct is a compilation of the released line type diagrams which form the new route diagrams at Dublin Bus halts along the routes effected.



Figure 6: MVA Study Orbital Routes and Study Area

The routes are being released on a phased basis from Dublin Bus and in the absence of a complete Dublin Bus planned network, it was not easy to produce a full route map [12]. The resulting map is shown below in Figure 7.

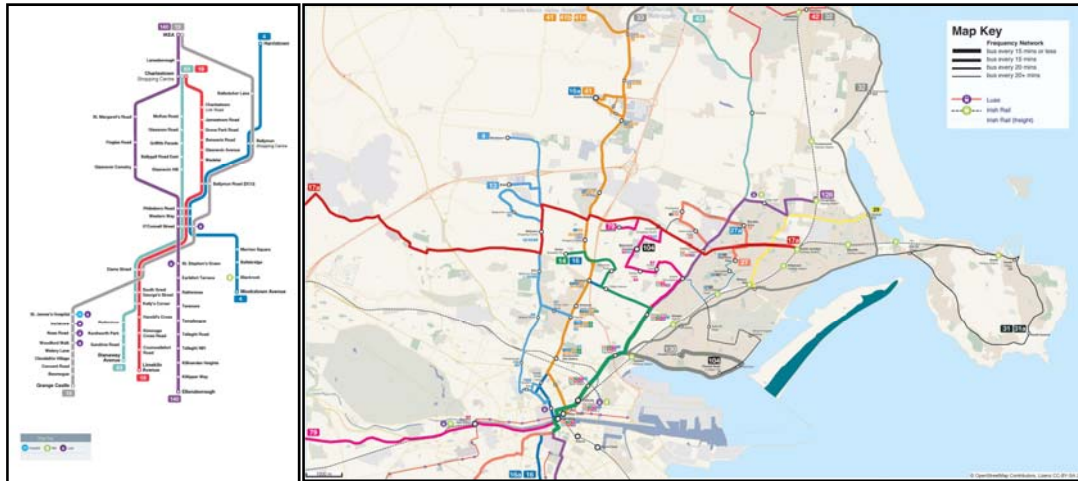


Figure 7: Dublin Bus Network Direct Diagrams Finglas area (left) and mapped (right)

There are only 2 partial orbitals operating within the study area, the 17A from Howth Junction to Blanchardstown via Coolock, Beaumont Hospital, Santry and Ballymun, and the 104 from Clontarf to Cappagh Hospital, which Dublin Bus term a “social service” [15]. Thicker lines indicate higher frequencies. The 17A runs at a comparable frequency to the radial QBC trunk routes.

Integration with Land Use Strategy

The current land use plans for the study area were used in conjunction with the aerial photography in order to produce the map. A number of potential trip generation origin / destination's were identified, including two universities, three major hospitals, a number of major industrial / employment areas, four planned key development centres and the Dublin Airport complex. These major trip generators are relatively dispersed throughout the Northern Area of the city, see Figure 8.

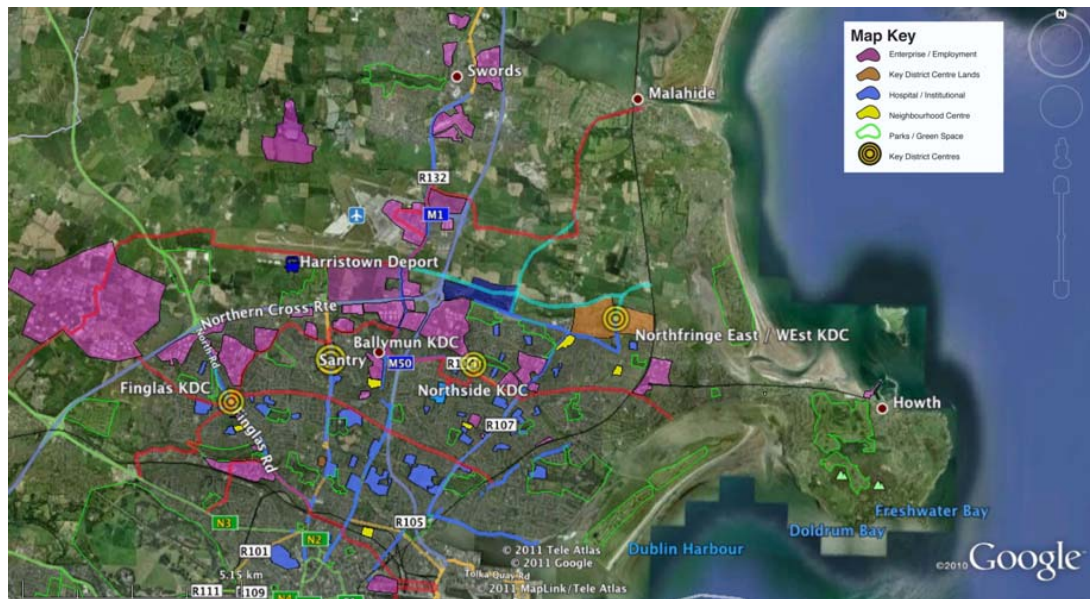


Figure 8: Land-use study of extended North Eastern Quadrant

As part of the modelling carried out for the NTA Draft Transport Strategy, the NTA produced two "heat" maps of where areas of intense employment and population density will be located in 2030 [16].

Two scenarios for future population growth, derived from the Regional Planning Guidelines (RPGs), were used by the NTA when preparing the strategy: "Scenario A – 'compliance with minimum RPG targets and policies' and scenario B – 'Large town and rail focused development, also compliant with RPG policies'" [17]. Scenario B was the preferred scenario adopted by the NTA. According to the strategy, Scenario B assumes "a greater consolidation of population within the Metropolitan area and large growth Hinterland towns, particularly in the vicinity of rail stations". Scenario B is based on Department of Environment, Communities and Local Government's 2022 regional forecasts and the GDA Draft RPGs county level estimates up to 2022 and which were then extrapolated out to 2030 by the NTA.



Figure 9: Orbital Strategy overlaid onto Population (left) and Employment (right)

Density Projections

The identified potential orbital routes were plotted over these along with some of the main interchange points. The inner three orbital lines serve the more dense areas of population density, namely the areas of 5000 - 10000 population density under this scenario in 2030. On the map of employment density the northern-most two lines plus the inner-most loop line, serve the major employment density bands of 50 - 500 and 500 - 5000 density per km and potentially serve quite a large number these work trips.

Revealed Anomalies between Land Use and Transportation Strategy

Finally, the Dublin City Development Plan 2011 – 2017 Core Strategy objectives were overlaid onto the comparative transport network strategies so relationships with land use and urban structure strategy could be determined (see Figure 10). Examination of land use strategy and planning highlights two issues with the spatial structure of the forecasts, if not the forecasts themselves.

Firstly, an Bord Pleanála in 2011 granted permission for an application on the site of the current Northside Town Centre comprising 1,300 residential units, 45,000 sq. metres of retail space, a new town centre and associated employment uses, which according to the applicant would yield a net increase in population of 3,400 to 3,460 [18]. This does not appear to be reflected in the isopleth maps for either population or employment.

Secondly, a draft Local Area Plan is being prepared, in line with Council policy, for the regeneration of Finglas village. These lands have already been the subject of significant development plans, which have in the wake of the economic downturn never been realised. However, it is likely that the Council will designate the area for some substantial regeneration-led development.

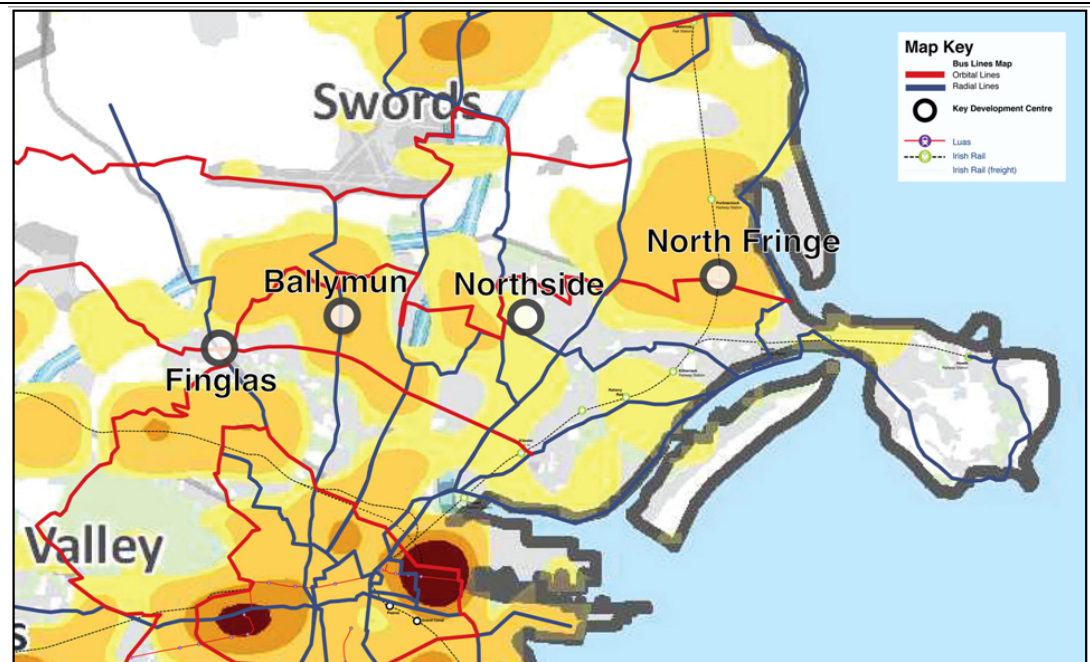


Figure 10: Core Strategy Development Centres overlaid onto Population Heat Map

This analysis would suggest that both the population and employment forecasts informing the development of the strategy are based on an assumption of significant development at rail hubs. There does not appear to be an alternative scenario to deal with locations that will not be served by rail or otherwise reliant on any other mode of transport.

Conclusions

Dublin has the potential to create its own “network effect” phenomenon based on highly integrated orbital and arterial serving key development centres. The current implementation of the Network Direct strategy does not appear to emphasise orbital routes nor capitalise on the potential cross-subsidisation benefits of high-quality networked routes. The draft transport strategy for the GDA appears misaligned with the land use strategies of the City and County Development Plans in critical locations. Often these appear to be disadvantaged locations.

Evidence suggests that a greater alignment of transport strategy-making with land use strategy would lead to more effective services rather than the current system in Dublin where land use strategy must follow transport strategy. Increased accountability would ensure equity in the distribution of such services [19]. This coupled with a wider economic appraisal would lead to the increased network benefits of transferability and increased route choice. Current analysis frameworks tend to promote a corridor-based approach which excludes the economic benefits of transfer and feeder services.

The study indicates that further modelling and analysis of potential orbital routes is merited but only in the context of a strongly planned network with high levels of transferability and integration with land use strategy. This should incorporate strong interchange design at key development centres, (principally considering the evolved urban structure set out in the statutory City Development Plan). This may represent some break with conventional transport planning and appraisal principles but could capitalise on the strong urban structure inherent in the Greater Dublin urban framework.

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