DUBLIN CITY CENTRE
TRANSPORT PLAN 2023

Technical Notes | Part 10: Digital Placemaking

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Dublin City Centre Transport Plan 2023 | Technical Notes | Part 10: Digital Placemaking

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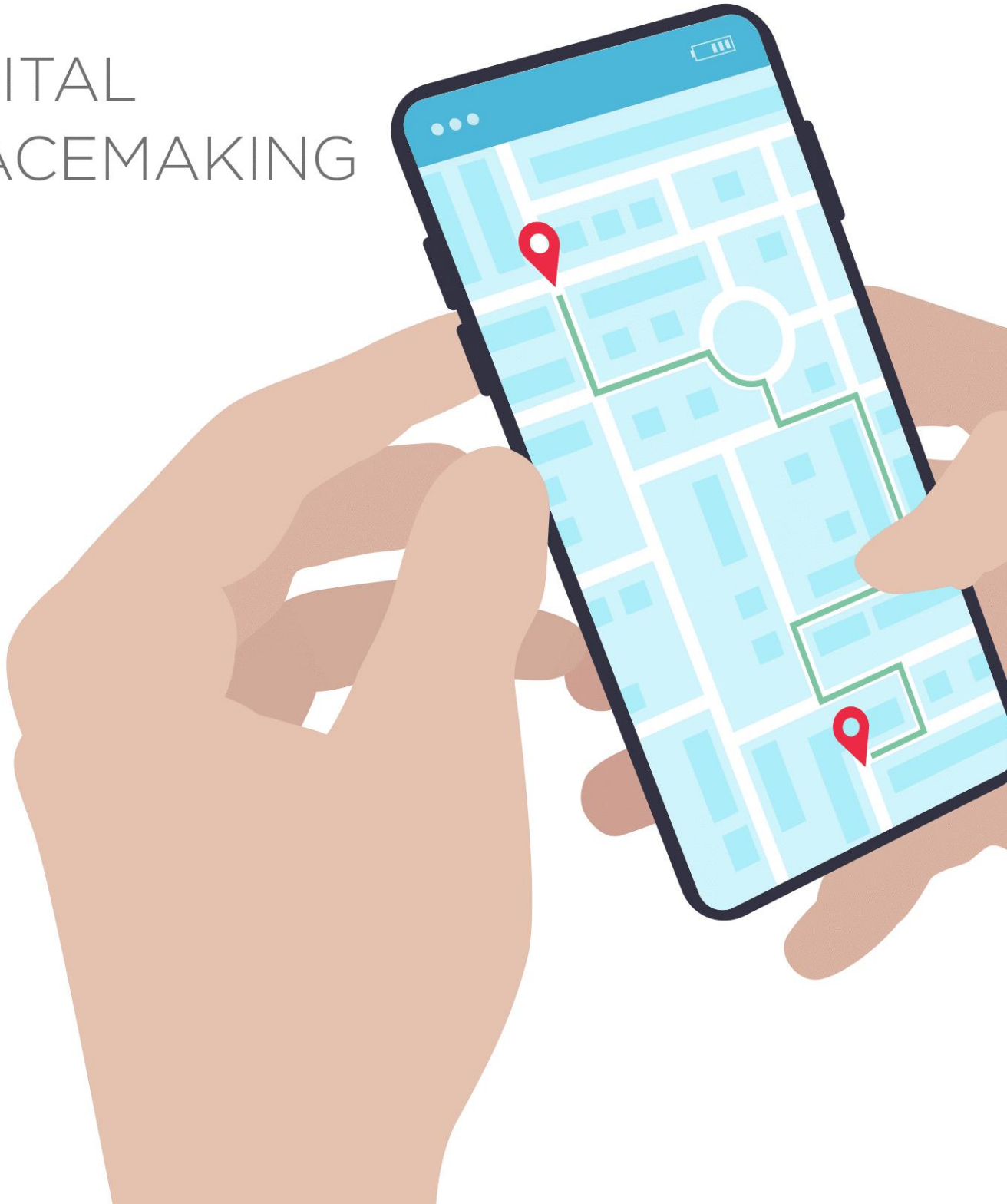
DIGITAL PLACEMAKING



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1 INTRODUCTION

1.1 Context

The Dublin City Centre Transport Plan 2023 (the Plan) is an update of the 2016 City Centre Transport Study, as provided for in the Dublin City Development Plan (DCDP) 2022-2028[1]. It is intended to frame the implementation of the DCDP and the 2022-2042 National Transport Authority (NTA) Transport Strategy for the Greater Dublin Area (the Transport Strategy) in Dublin City Centre.

The Plan considers ways to optimise and enhance the transport network to meet the transport needs, challenges, and opportunities for the city centre. This is based on prevailing national, regional and local transport policy, most notably the Hierarchy of Road Users model set out in the National Sustainable Mobility Policy (NSMP), which places sustainable modes at the top. The emerging proposals have been developed with the sustainable growth of the city and its economy as a key aim, as well as its social, cultural and environmental wellbeing.

A suite of technical notes has been produced which informed the development of the Plan. This note should be read in conjunction with the other technical notes.

1.2 Purpose of This Technical Note

This technical note sets out the digital opportunities to aid in placemaking and transport movements throughout Dublin City Centre. The technical note observes emerging trends and their uses, and how they can support and inform the users of different modes within Dublin City Centre.

1.3 Technical Note Structure

Following this introductory section, the next sections of this technical note are organised as follows:

Section 2 outlines the changing trends in society that impact on how people move throughout a city.

Section 3 investigates the transport trends and future enablers to more efficient transport systems.

Section 4 outlines the impact of digital placemaking on Dublin City Centre and for each mode outlines potential impacts and acknowledges opportunities already in use and their impact on the city.

[1] Published by Dublin City Council (DCC) in 2022

2 A NEW DIGITAL ERA

Digital Technologies are increasingly present in our lives and built environments transforming the way we live, work, play and interact with our environments. They are an increasingly important part of the places that we design, build, manage and inhabit and they play a key role in achieving the outcomes intended for these places – such as sustainability, liveability, economic growth, inclusivity, health, happiness, and investor returns among others.

To determine the most effective use of digital technology in urban areas, it is important to understand how the communities', citizens', residents', workers' and visitors' needs, choices and preferences have changed, are changing and are likely to evolve in the future, as well as identifying and understanding some of the drivers underpinning this change.

2.1 Drivers of Change

- **Changing demographics:** longer life expectancy and an aging population are changing the focus of the built environment to encourage and allow for older people to live and move more independently, with additional convenient public transport and new mobility services options. As well as an aging population, the growing demands from the younger demographic (millennials, generation Z and digital natives) for convenience and connectivity are producing similar effects.

- **Reducing Carbon Emissions:** Nations around the world are looking to achieve net-zero status to reduce the future impacts of climate change. As major population centres and main contributors to the global carbon footprint, cities need to lead the way in helping their nations achieve net-zero goals.

- **Embracing Sustainability and Resilience:** Addressing the sustainability challenge impacting our planet requires more than reducing CO2 emissions. It also implies a more responsive use of resources – our lifestyles are becoming increasingly resource intensive (e.g. energy) and the planet's resources are not unlimited.

- **Governance:** as technology develops, we are moving towards more citizen centric, participatory and inclusive governance and decision-making processes, which contribute to the diversification of market players and interventions.

- **People, the Internet and the 'Digitalisation of Everything'**: the availability of information 24/7, its rapid distribution and consumption, the emergence of new digital technologies combined with AI and machine learning and the 'digitalisation of everything' are driving real change in people's daily lives, choices and behaviours. These technologies are driving the shift from a reactive world to a more predictive and resilient one.

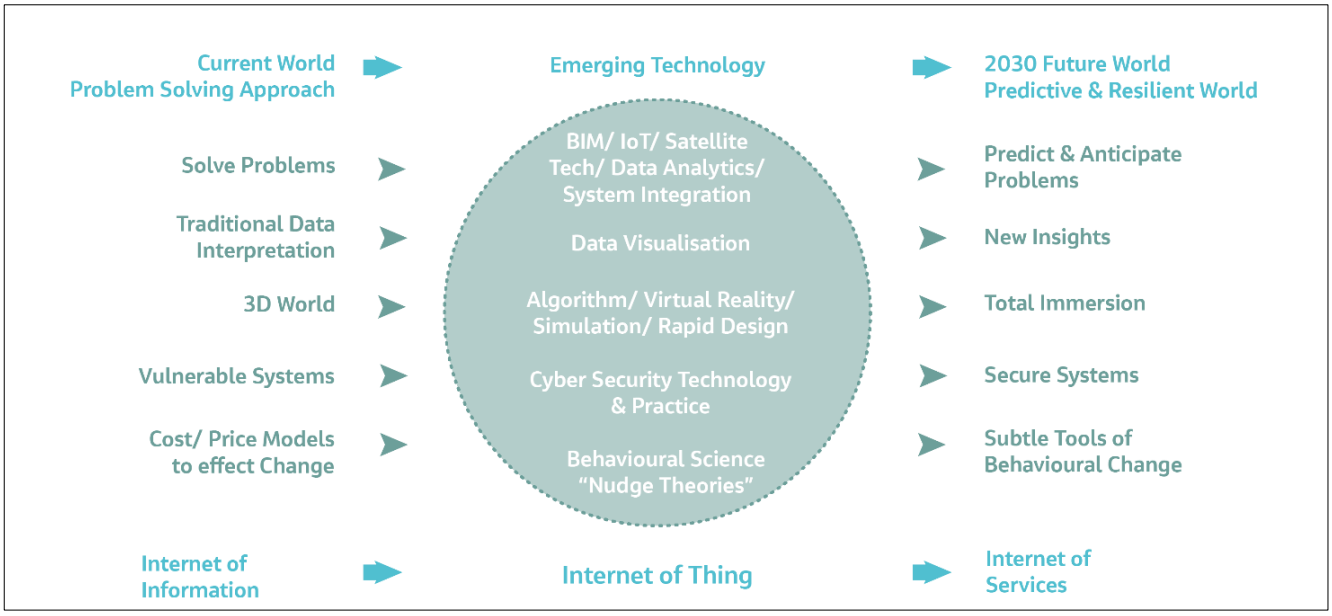

Figure 2-1: Shifting from a problem-solving world to a predictive and resilient world

2.2 Market and Societal Trends

2.2.1 Increased demand for Convenience and Quality of life

Our lives move at an increasingly fast pace and seem to be more stretched than ever before. We are increasingly looking to meet our daily needs minimising our levels of effort and therefore, Dublin, as many other cities around the globe, are embracing the 15-minute city concept.

Digital technologies can help us meet our daily needs more conveniently by:

(i) allowing us to access and consume products and services remotely and 24/7, decreasing thus, the need to travel; and

(ii) matching supply and demand more efficiently, which allows resource optimisation. In the context of mobility/transport, digital technologies can help optimise the energy usage, the time, and the space needed in trips, as well as to improve end-users experiences whilst having a more positive impact in the overall city.

2.2.2 The Rise of the Experience Economy

Recent surveys and studies argue that people tend to value more experiences and choice than the ownership of assets. In the mobility sector this is evident with the rise of on-demand shared mobility services. There is also a tendency towards customised services and people are increasingly willing to share data in return to more personalised experiences.

2.2.3 Prioritisation of Health and Wellbeing

Societies are increasingly prioritising health and wellbeing over traditional economic drivers and are looking to have a better balance between the two. Technology is increasingly allowing the monitoring of people's health offering them information to make informed decisions on the impact of their choices in their health and wellbeing.

In the context of urban mobility, besides wearables technologies – that allow end-users to access information on their heart rates, exercise done, calories consumption, etc. and to be notified when they have been idle for a long time, there are several applications and services that are being developed to allow active travellers to determine their routes based on real time air quality data, congestion, availability of green spaces, etc.

2.2.4 Increased demand for Sustainability and Resilience – Low carbon, circular and sharing economies

Societies are increasingly aware of the pressing need to address some of the biggest environmental challenges of all the times such as climate change and resource scarcity. Led by a rapidly growing number of policies from governments around the world, an increasing number of actors in the development context (public, private and civil society organisations) show their determination and commitment to tackle and respond to these challenges.

Digital technologies allow us to generate and consume data in real time and to make informed decisions based on this data. They allow us to understand how communities and environments operate, how services, infrastructures, and spaces are being used and how resources are being consumed. This together with the growing ability of digital technologies to bring efficiencies in the design, construction and management of many built assets and services, means that they will play a key role in the transition towards a more predictive, resilient, and resource efficient world.

3 THE FUTURE OF URBAN MOBILITY

The transport and mobility sector is undergoing a transformational social, technological and economic shift and it is fundamentally changing the way people and goods are moved. Today's mobility systems suffer from congestion, inefficiency, accidents, and high prices and are significant contributors to our carbon footprint. However, the future could well be greener and greater with more convenient, safe, sustainable, and economic mobility, which would in turn have a less negative impact to our health, cities and planet.

3.1 Disruptors: ACES

Mobility transformation is driven by four key technology-driven disruptive trends: Autonomous, Connected, Electric and Shared vehicles/mobility services (ACES). Taken independently, each will significantly disrupt the mobility ecosystem and, in combination they will drive unprecedented change. ACES will drive the transition from the present vehicle-centric system towards a more efficient, data-enabled and driverless ecosystem with end-users at its heart.

3.1.1 Automation, Automated Vehicles and automated driving

Connected and Autonomous Vehicles/mobility has the potential to improve safety and congestion, to facilitate independent mobility to excluded people such as younger and older travellers, and to optimise the use of resources – e.g., energy, time and space.

Its connectivity component allows Connected and Autonomous Vehicles (CAVs) to process real time data and to decide the best route possible to get to the desired destination avoiding congestion. In shared and public mobility services, besides the congestion variable, the route and pick up and drop off points, could be identified to address more efficiently the mobility needs and demand in real time. This efficiency would be translated in an optimisation of the energy, time and space needed to meet the existing mobility demand. Moreover, CAVs, whilst not being charged or maintained, are likely to be moving most of their time, which means that a lower number of vehicles will be able to meet the mobility needs of a specific community, and that most of the space dedicated to parking in our cities could be free-up to other more productive or vibrant uses.

3.1.2 Electrification - Electric vehicles / mobility services

The number of electric vehicles worldwide has rapidly increased over the last years and with future bans announced for internal combustion engine across a growing number of regions, it is expected to increase even more in the coming years.

Government's environmental and health policies are one of the biggest catalysts for consumers going electric, others are:

- Falling battery prices – the cost of battery packs, which often represent 40% of the cost of an entire EV, has declined by 70% in the past7 years and is expected to further halve by 2030 due to technological developments and production scale economies;
- Lower running costs – EVs are cheaper than petrol/diesel on a per mile basis. Their service, maintenance and repair costs tend to be cheaper due to substantially fewer moving parts;
- Declining prices for EVs; and
- Greater diversity of EV models.

3.1.3 Shared Mobility

We are increasingly seeing a shift in mobility consumption patterns and ownership, especially within urban areas. Surveys and studies suggest that this shift will consolidate in the coming years.

Central Statistics Office (CSO) figures shows a slight decline in under-29 years olds in Dublin who hold driving licenses with a ~2% decrease in license holders in Dublin between 2013 and 2019. This number decrease is propelled by 25–29-year-olds who see a ~5% reduction in license holders in the same period compared to other age groups who see an increase in license holders, see Table 3-1. Note that for the discussion surrounding Table 3-1, 2021 data is deemed to be an outlier due to large pattern variations – presumably as a residual impact of the Covid-19 Pandemic restrictions hence discussion will be based on 2019 numbers.

Table 3-1: Driving Licenses for Under-29's in Dublin 2013 - 2020 (CSO ROA26)

	17 - 20 years		21 - 24 years		25 - 29 years		Under 17 years		Total Under 29 Years	
Year	**Total**	**Change from 2013 (%)**	**Total**	**Change from 2013 (%)**	**Total**	**Change from 2013 (%)**	**Total**	**Change from 2013 (%)**	**Total**	**Change from 2013 (%)**
2013	14,103	0.0%	31,472	0.0%	59,767	0.0%	18	0.0%	105,360	0.0%
2014	14,975	6.2%	31,502	0.1%	59,116	-1.1%	19	5.6%	105,612	0.2%
2015	15,221	7.9%	31,159	-1.0%	57,901	-3.1%	17	-5.6%	104,298	-1.0%
2016	15,293	8.4%	30,636	-2.7%	57,556	-3.7%	24	33.3%	103,509	-1.8%
2017	13,965	-1.0%	30,511	-3.1%	56,678	-5.2%	14	-22.2%	101,168	-4.0%
2018	13,442	-4.7%	29,969	-4.8%	55,154	-7.7%	28	55.6%	98,593	-6.4%
2019	15,096	7.0%	31,677	0.7%	56,518	-5.4%	34	88.9%	103,325	-1.9%
2020	15,761	11.8%	32,751	4.1%	55,786	-6.7%	20	11.1%	104,318	-1.0%
2021	20,146	42.8%	36,578	16.2%	59,527	-0.4%	43	138.9%	116,294	10.4%

And as the number of driver licenses fall, demand for consumer mobility 'as a service' increases. Especially through the emergence of on-demand private car hire firms such as Uber and Lyft, and of shorter-term car rental schemes.

Mobility-as-a-Service (MaaS) is driving the shift from ownership to usership. MaaS includes multi-modal aggregation of transport modes as well as on-demand mobility. It integrates different public and private transport modes (e.g., underground, overground, bus, bikes, taxi, scooters, shuttles, boats, etc.) by different providers into a single system/platform. The latter advises customers in real time on the best options (which may combine several transport modes) available for their desired journey. This system adds more variability into the supply side of transportation, providing a more flexible and customised offer.

3.2 Emerging Trends

Below are several trends shaping the future mobility landscape which are driven by technology development on the above three pillars, the growing collective awareness and commitment to address climate change and other environmental challenges – which are giving way to a set of new government policies to reduce emissions – and the penetration of digital technologies in our everyday lives, choices, and lifestyles.

- Promotion of Active and Sustainable Travel

Cities have redefined car lanes to create more space for active travel and more sustainable travel, and government incentives to help the automotive industry have encouraged the use of carbon-neutral solutions and stimulated the development of electric vehicles.

- Uptake of EVs will become more mainstream

While not as profitable as Internal Combustion Engine (ICE) vehicles today, market analysis – assessing battery-cost and efficiency improvements, power-electronics scale economies, and indirect cost reduction based on increase volume production – show that EVs have the potential to reach cost parity with and become equally profitable as ICE vehicles by around 2025.

The growing number of public charging points along with improved battery life is also contributing to give users confidence and to embrace electric mobility. Finally, OEMs continue to invest in new models increasing market diversity and consumers choices.

- Shift from ownership to Usership

As mentioned above, consumers are increasingly valuing experiences and choice over asset ownership, which is driving the rise of shared mobility services. People can choose the mode most appropriate to them, the vehicle of the right size for their different trips, and to pay as they go rather than to pay for having their private car idle most of its time.

- Private vehicle ownership will decrease

The increased availability and convenience of shared mobility services coupled with a growing set of emerging policies and actions by governments around the globe – penalisation of private vehicular mobility through congestion and emission taxes and the reallocation of road space in favour to active and more sustainable and shared transport services – is translating and a rapid decrease of private vehicle ownership, especially in urban areas.

- Consumer preferences

Consumer preferences are shifting and in addition to convenience, they are increasingly becoming more focused on digital channels and sustainability issues. As a result, demand for greener, more integrated, convenient, flexible and customised services as well as personalised and enhanced experiences is on the rise.

- Shared, integrated and seamless transport solutions and services

Shared, integrated and seamless transport solutions and services will become more 'the norm' as a result of end-user's preferences and city managers and policy makers ambitions, goals and targets.

3.3 Future mobility landscape

The above technological advancements and trends are shaping the future mobility ecosystem which, especially in urban contexts, looks as represented in the indicative diagrams below (Figure 3-1 and Figure 3-4).

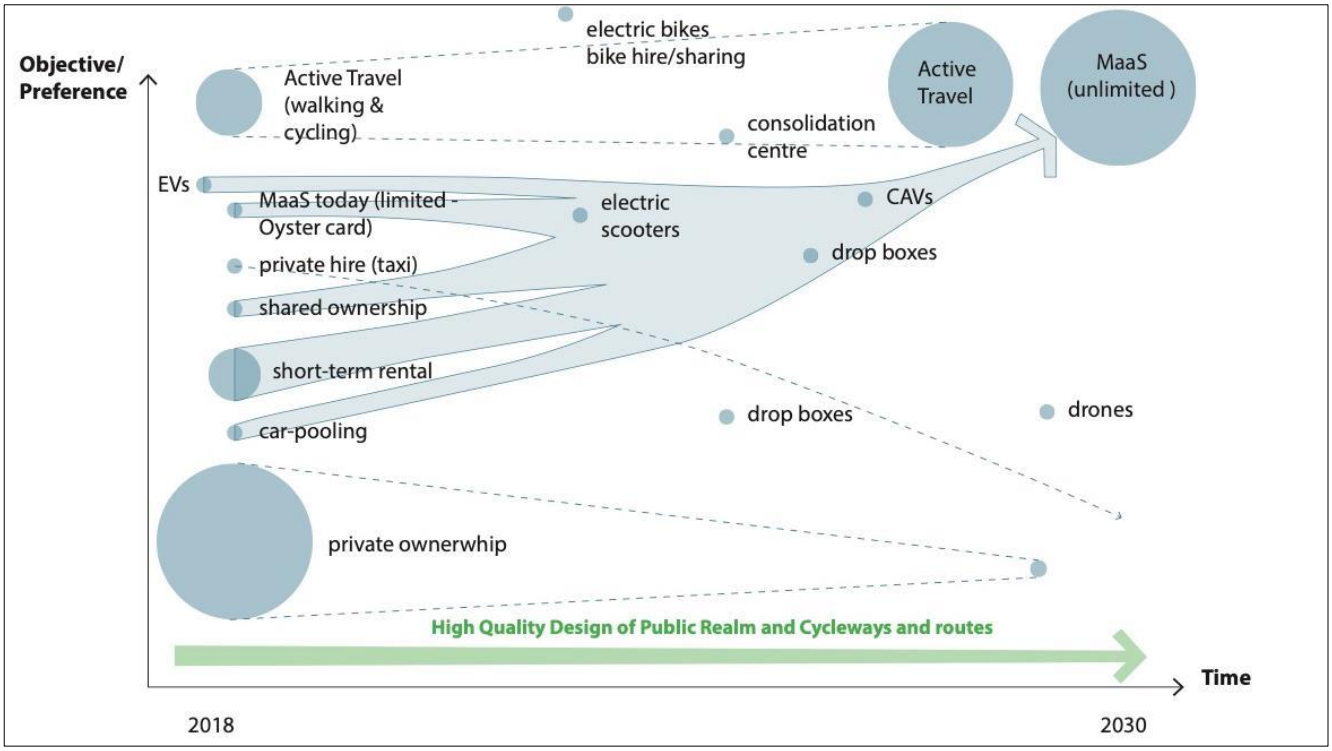

Figure 3-1: The Evolution of the Mobility Landscape

Active travel will grow as a result of some emerging trends:

(i) its increased space allocation – many cities around the globe are shifting some of the space that was previously allocated to private vehicular mobility to pedestrians and active travel modes;

(ii) (ii) higher quality design of public spaces and realm will also be determinant in making active travel safer, more comfortable and enjoyable; and

(iii) (iii) the rise of the 15-minute city, which is likely to provide more self-sufficient neighbourhoods and urban centres, where a wide variety of uses, facilities and services will lie in close proximity and within a 5 to 15-minute walk or cycle.

At the moment, technology development and digitalisation have given way to a diverse number of innovations and solutions which are currently coexisting with traditional mobility solutions and services. So services such as carpooling, short-term rental, private hire and micro-mobility, are coexisting with more traditional services such as buses, underground and overground, private vehicles, etc. And, as shown in Figure 3-1 and Figure 3-2, all these services are likely to consolidate around Mobility-as-a-Service.

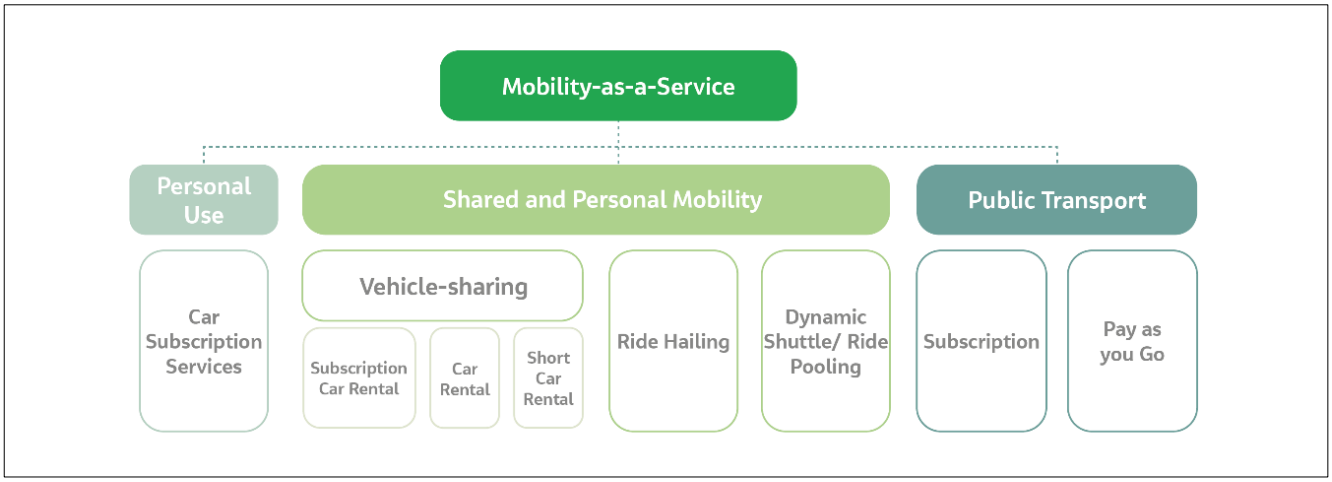

Figure 3-2: Emerging shared mobility solutions and services

The shift towards MaaS will be further accelerated by the wide and diverse range of benefits it offers:

- Greater social inclusion: studies say that the miles travelled per capita per year in public and shared transport are cheaper than private transport, so MaaS could be 40% cheaper than private ownership.
- The reduction of emissions and the carbon footprint.
- Greater optimisation of assets (vehicles, energy, space, etc.).
- And more diverse and customised services for our journeys.

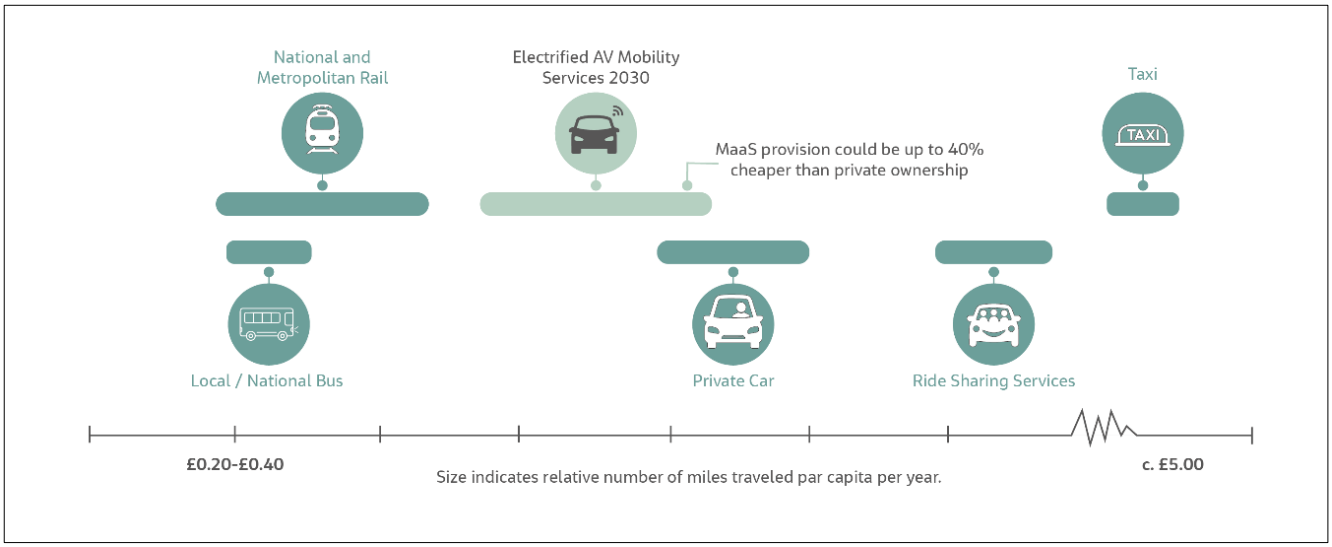

Figure 3-3: Indicative cost per miles

Figure 3-4 represents the emerging mobility ecosystem that is resulting from the combined impact of the technological, market and societal trends mentioned above:

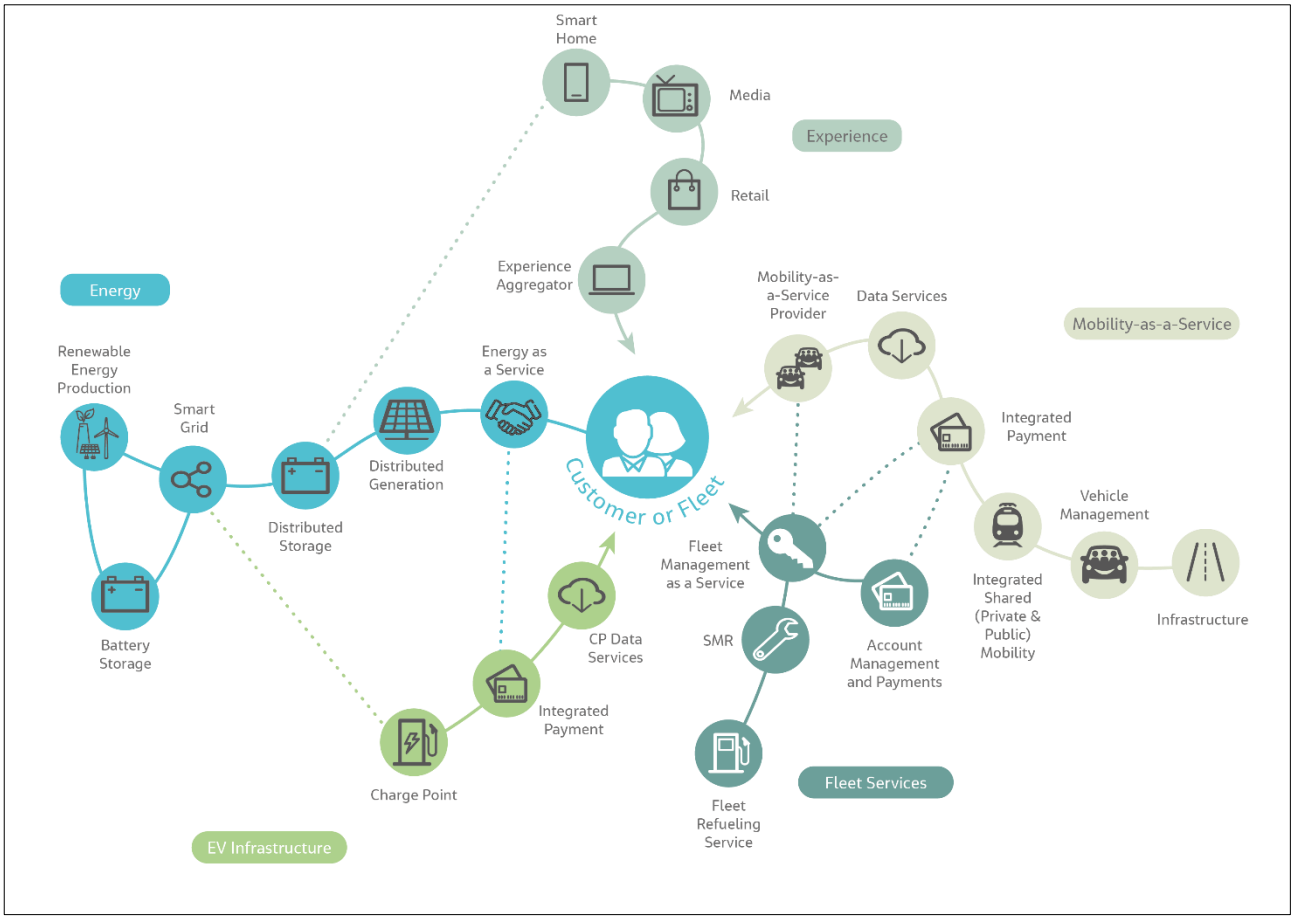

Figure 3-4: Emerging Mobility Ecosystem

4 DIGITAL PLACEMAKING SUPPORTING DUBLIN'S TRANSPORT NETWORKS AND PLACEMAKING

This section outlines some examples of digital services and infrastructure which can effectively support the different transport networks in Dublin, the delivery of higher quality designed public realms and enhance and improve end-user's experiences.

4.1 Potential Digital Services supporting the Pedestrian Network

4.1.1 Environmental monitoring:

It involves collecting and analysing data gathered from air quality, noise, footfall, traffic, and soil sensors to provide new insights and enable data-driven decision making. Data collected can be made available to the public via an open data platform.

This data can be used to divert traffic away from high-footfall areas and to allow active travellers to make informed decisions on their routes/paths to their destinations prioritising areas, streets and roads with higher air quality.

Benefits:

- Protects the health of residents.
- Optimises the operations and maintenance of Dublin realising efficiencies and reducing costs.
- Enhances local education curriculums, increases street vibrancy, and stimulates the local business environment.

4.1.2 Digital Wayfinding:

Digital Wayfinding allows people to find the way to their destination effectively. It also allows them, if desired, to identify and get through green routes through the development for leisure, exercise, commuting, shopping and visiting. It can encourage people to discover new areas by foot or bicycle which support active and healthy lifestyles as well as increasing appreciation of nature and green areas.

Active travelers can define their routes and opt, in real time, for the quickest route, the least busy route, the least congested route, the least polluted route, the greenest route, the one offering more shopping opportunities, etc.

Benefits:

- Helps the modal shift to more active travel through:
    - Realtime data capture and movement analytics
    - Intelligent and responsive live information
- Provides Inclusive and socially engaging user experience.
- Supports effective navigation of environments that are constantly changing and evolving.

4.1.3 Flex-space

This is a real time and flexible road/public space management service. Based on real-time traffic flow of vehicles and pedestrians, and real time demand for specific activities in public realm spaces, this platform service allows to effectively allocate urban space to the use or mode in most demand.

The service can allocate road network space to different modes based on real-time and predictive demand and needs. For example, on a sunny and dry day more space could be allocated to active travellers whilst on rainy days, most of the road space might need to accommodate an increased demand of public transport services.

Public space could also shift between activities, at peak commuting times space might be allocated to different transport modes and when the mobility demand decreases it can be allocated to other community uses – sports, pop-up markets, etc.

Benefits:

- Optimisation of space, one of the scarcest resources in urban centres.
- Increased city operation and management efficiency.
- Increased liveability/vibrance of urban spaces.
- More inclusive city – increased sharing of urban space.

Progress made on the above services to date are currently on a national scale rather than Dublin scale whereby air pollution data is made available by the EPA, while digital wayfinding is available by services such as Google or Apple maps. While flex-space is not commonplace in Dublin on a widescale, progress has been made to reallocate road space at peak times towards more sustainable modes – predominantly through reassignment of car parking spaces to bus lanes at peak hours such as on Northumberland Road; as well as Parliament Street which underwent a pedestrianisation trial in off-peak times on weekend evenings starting in 2022.

4.2 Potential Digital Services supporting the Cycle Network

4.2.1 Bike network

A fleet of bikes or e-bikes, complemented by a booking app, pickup/drop-off stations and charging infrastructure could provide a sustainable, healthy travel option for medium length journeys or deliveries.

This service might be used for commute trips within the city to reach working, shopping and leisure destinations.

If located within a transport/mobility hub, people could change from a train or bus to a bike for their last mile travel

Benefits:

- Helping the modal shift to more active travel .
- Improved health as the population could increase their activity levels.
- Reduction of the city's carbon footprint as people shift from fuel vehicles to active and more sustainable modes.
- Optimisation of road infrastructure and public space as people give up their private vehicle and embrace safe and comfortable cycling, which is less space consuming.

The success of bike sharing services has been seen in the rollout of services such as DublinBikes, Bleeper and Moby in Dublin City in the last 10 years which have made cycling a more accessible and affordable mode of transport in Dublin City and its surrounding areas.

4.3 Potential Digital Services supporting the Traffic Network

4.3.1 Intelligent Transportation System (ITS)

ITS is an advanced application which combines IoT and Ai to connect vehicles, traffic signals, toll booths, and other infrastructure to ease congestion, prevent accidents, reduce emissions and make transportation more efficient. It provides information relating to different modes of transport and traffic management to enable users to be better informed and make safer, more coordinated, and efficient use of transport networks.

Besides managing general traffic in the city more efficiently, this service can be extremely helpful to call for emergency services when an accident occurs and to facilitate the quickest way to arrive to the location of the accident.

Benefits:

- Increased productivity, less time spent in city trips.

- Reduced congestion and pollution.
- Increased safety.

In Dublin City, SCATS aims to maximise network efficiency for private and public transport reducing delay for network users through connected signalling and actuated phasing.

4.4 Potential Digital Services supporting the Public Transport / Shared Transport Network

4.4.1 Connected (and potentially autonomous) - Mass-transit service

Digital connectivity, IoT and Vehicle to everything (V2X – which includes vehicle to vehicle communications, vehicle to infrastructure communication, etc.) facilitate the delivery of intelligent and resilient transport systems and services. Connected vehicles have access to real time information about existing demand, road status, congestion, accidents, as well as access to weather forecasts and events' times and venues within the city which allow them to predict future demand. Both, real time data and predictive capabilities allow connected mass transit to make informed decisions on their routes and distribution/deployment within the city.

Connected (and potentially autonomous) public transport systems use buses, pods, or rail-bound vehicles, along with IoT, Vehicle to everything (V2X) and autonomous driving technologies to optimise service provision of shared mobility options within a defined geography. Pricing for these systems can be varied based on variables of the journey and demand to encourage certain (more sustainable) behaviours.

Benefits:

- Increased seamless mobility and convenience.
- Reduced private vehicular mobility.
- Reduced congestion levels.
- Optimisation of resources – e.g., energy, time, road space occupation).
- Improved safety and reduced number of accidents.

4.4.2 Micro-mobility services

A fleet of bikes, e-bikes, and e-scooters, complemented by a booking app, pickup/drop-off stations and charging infrastructure could provide a sustainable, efficient, and healthy travel option for medium length journeys or deliveries. If located within a transport hub, people could change from a train or bus to a bike for their last mile travel.

Micro-mobility services could replace other larger and bulkier shared transport options such as buses and be deployed as a last-mile option in urban centres with high density of flows to reduce congestion, minimise road traffic and vehicle presence, and improve the area's liveability and look and feel. Micro-mobility services are also a good mobility option within campuses and large urban parks as they would facilitate accessibility/mobility within these areas minimising the presence of larger vehicles.

Benefits:

- Helping the modal shift to more active travel and sustainable travel.
- Reduction of the city's carbon footprint as people shift from fuel vehicles to electric vehicles.
- Improved health as the population shifts to more active and sustainable modes.
- Optimisation of road infrastructure and public space as people give up their private vehicle and embrace safe and comfortable shared micro-mobility services which are less space consuming.
- Optimisation of the number of vehicles needed to meet the mobility needs of a community as these are shared and provide services to a wider number of people.

Progress on digital services supporting public transport has been seen in Dublin through rollout of leap cards and associated 90-minute fares, as well as the ever-growing prevalence of bike share schemes in Dublin through schemes such as DublinBikes and Bleeper. Along with the traffic network, SCATS also aims to provide efficiency to the public transport network in the city.

4.5 Potential Digital Services supporting the Goods, Movement and Freight Network

The rapid growth in the e-commerce industry along with the penetration of internet has resulted in the rocketing of online shopping. Today a great percentage of traffic congestion in our city centres is due to home deliveries, a trend that needs to be addressed if we want to have productive, healthy, lively and people centric neighbourhoods. Below are some examples of how digital services/infrastructure can help.

4.5.1 e-cargo bikes

A fleet of e-bikes, complemented by a booking app, pickup/drop-off stations and charging infrastructure could provide an efficient, sustainable, and healthy travel option for medium length and last mile deliveries.

A network of e-bikes within each Dublin neighbourhood in combination with a network of micro-consolidation hubs at the neighbourhood level could help optimise last mile deliveries, ease congestion, and improve the look and feel of city centres, making them more vibrant and pleasant for people.

Benefits:

- Helping the modal shift to more active and more sustainable travel modes.
- Reduced congestion.
- Reduction of the city's carbon footprint .
- Improved liveability of urban centres as they will be less congested and the space optimised could be dedicated to other community uses increasing vibrancy levels.

4.5.2 Micro-consolidation centres / flexible click and collect points

These are facilities to consolidate goods closer to the delivery point. A network of micro-consolidation centres well distributed within urban centres at the neighbourhood level, will be key ease congestion and to optimise deliveries.

To bring greater efficiencies, these micro-consolidation centres should be located within community hubs (e.g co-working spaces, education institutions, supermarkets) and mobility hubs so heavier parcels can do their last mile on an e-cargo bike.

Benefits:

- Reduced congestion.
- Reduction of the city's carbon footprint.
- Improved liveability of urban centres as they will be less congested and, the location of these micro-consolidation centres close to community hubs will increase footfall to these areas, increasing their vibrancy levels.

4.5.3 Autonomous last mile deliveries

Technological advancements in autonomous vehicles and artificial intelligence (AI), lidar, and sensing algorithms, coupled with the increased demand of home deliveries has resulted in the development of small robots and drones for last mile deliveries.

Obviously, the deployment of these solutions need to take into consideration the nature and characteristics of the urban environment in which they might be deployed as well as the existing legislation. At the moment, this type of last mile delivery solutions seem to be a better fit for low density and suburban areas.

Benefits:

- Improved efficiency.
- Reduced congestion – as these solutions are for last mile delivery, reducing congestion from delivery vans.
- Reduction of the city's carbon footprint.

Presently, initiatives such as those outlined above are in various stages of implementation in Dublin. Initiatives like micro consolidation are becoming more prevalent with click and collect points, while bike share schemes such as Bleeper are expanding the market for e-cargo bikes with supports for businesses and local rollout schemes in various areas across Dublin.

4.6 Digital Services supporting the underpinning infrastructure for the successful functioning of the above Network

The digital services supporting the networks mentioned above rely on some fundamental digital infrastructure:

4.6.1 Smart Street lighting:

It is a public lighting fixture that incorporates technology, such as cameras, light-sensing photocells, and other sensors, to introduce real-time monitoring functionalities.

Benefits:

- Affects positively residents/people's sense of safety and social inclusion.
- Improves visibility for cyclists and other vehicles.
- Creates an inviting environment for business, tourism and play after dark.
- Brings municipalities significant savings in power consumption and lighting maintenance system.
- Provides a platform to host/deliver a variety of applications – e.g. public Wi-Fi, environment monitoring solutions (e.g. pollution, weather, traffic, etc.), charging points for electric vehicles, etc.

4.6.2 EV charging infrastructure (for vehicles and bikes/scooters, etc.)

EV charging infrastructure is a network of electric charge points which could be deployed integrated within lampposts or as self-standing electric vehicle support equipment (EVSE). These charging points supply electrical power for charging plug-in electric vehicles including – cars, vans, buses, bikes and scooters.

Benefits:

- Sustainability - supports the shift from fuel to electric vehicles.
- Reduced carbon footprint.
- Improved energy grid resilience.

4.6.3 Battery storage

Battery storage systems (BESS) are devices that enable energy from renewables, such as solar and wind to be stored and then released when power demand increases.

Lithium-ion batteries, which are used in electric vehicles are currently the dominant storage technology for large scale plants to help electricity grids ensure a reliable supply of renewable energy

Benefits:

- Increased sustainability and reduced emissions as it speed up the replacement of fossil fuels with renewable energy.
- Increased autonomy of EVs.
- Plays a pivotal role between green energy supplies and responding to electric demands even when the sun isn't shining or when the wind has stopped blowing.

4.6.4 Sustainable Energy Management Systems:

An advanced control strategy and data system, uses algorithms and external data sources to control energy systems. The aim is to optimise the system according to cost, energy and carbon savings, ultimately, bringing about efficiencies.

Benefits:

- Optimisation of resources (energy, financial, etc.).
- Increased efficiency – collective and responsive management of electricity, balancing increased use of electricity and impact on the grid.
- Reduced carbon footprint.
- Optimisation of energy.

4.6.5 Integrated Travel Planning

This is a software infrastructure that allow users to make informed decisions about their journeys and seamlessly pay for their desired transport options. It provides information on the status of local public/shared transport services. This information is supported by information about the weather, existing traffic/congestion, air quality, the carbon footprint of different travel options/ journeys, the estimated time duration for the journey, etc.

Benefits:

- Effective planning of journeys using sustainable modes and multi-modes enabling easy comparison of travel times and routes to allow for informed choices in travel planning for users.
- Streamlines planning and payment process for multi-modal journeys using data and integrated ticketing.
- Reduces congestion and air pollution while improving health outcomes.

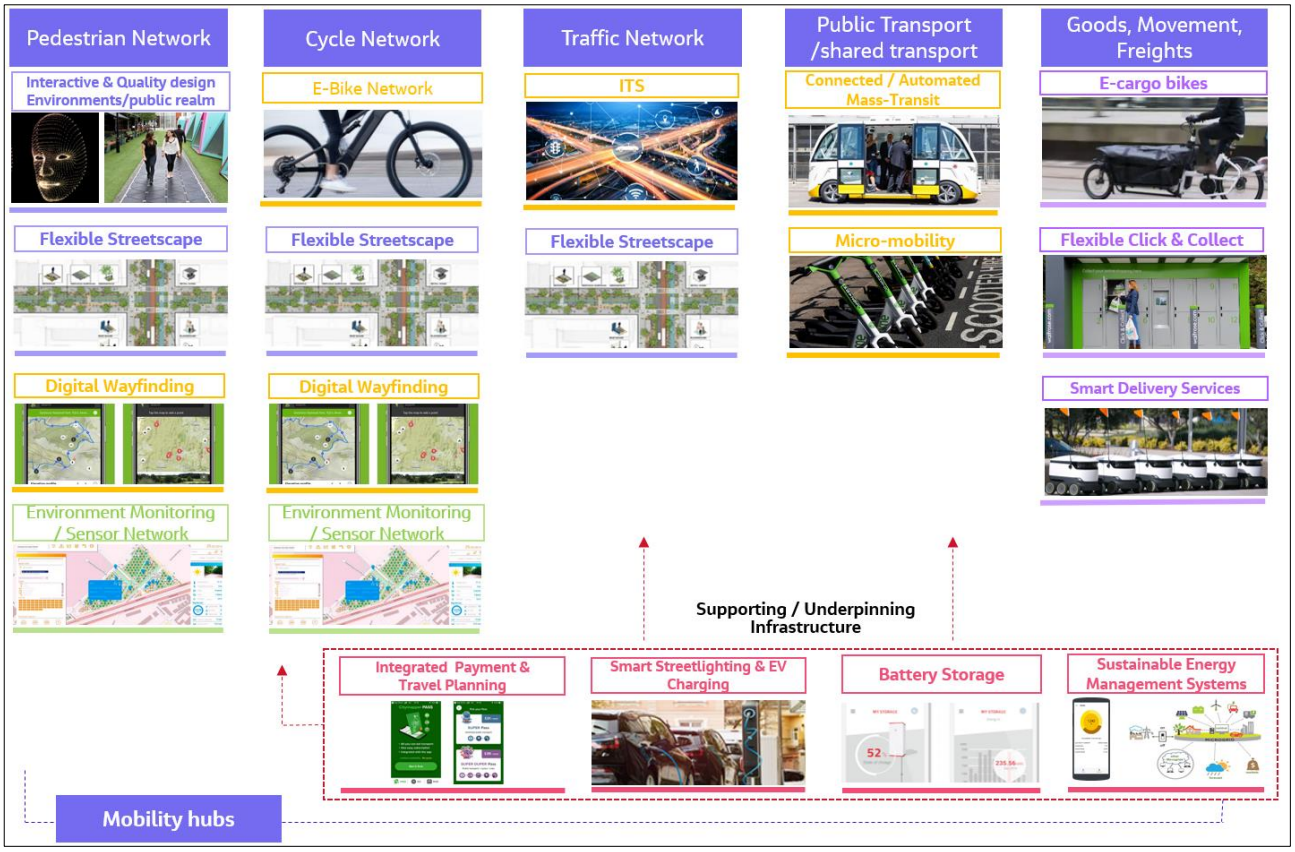

Figure 4-1: Summary of how digital services and infrastructure support the different transport networks

Through the examples ongoing use of digital services outlined within this section, there is an ever-growing library of resources and tools at transport users' fingertips to make informed and efficient journeys. Services range from the introduction of bike and car sharing schemes such as Bleeper and GoCar, to the rollout of EV charging points across the city, and growing reallocation of space towards sustainable modes on a permanent or flex-space basis.

5 MOBILITY HUBS

Mobility hubs have a strategic role to play in the provision of integrated, seamless, and sustainable shared mobility services in cities.

To achieve a modal shift towards more active and shared sustainable modes, to move people and goods more effectively, and to increase Dublin's social inclusion, sustainability, resilience, and vibrancy levels, all the above-mentioned networks, digital services, and underpinning infrastructure, need to be articulated within a network of mobility hubs.

5.1 A Network of Mobility Hubs

The network of mobility hubs should be integrated by hubs of different sizes, scales, service offers, and infrastructure based on their location within the city, that is, based on the characteristics of the urban area where they sit – e.g. the area's density, mix of uses, building typologies, density of flows – and on the existing demand for mobility and logistics/delivery services.

In suburban and lower density areas with lower density of flows the mobility hub might only consist of the provision of micro-mobility services (e.g. bikes and scooters), a mini car-club, a micro-consolidation centre, and a few e-cargo bikes as well as the EV charging infrastructure needed for these services. People would have sufficient shared sustainable transport options to get to the closest mobility/transport hub – of a larger size/scale – to shift mode and continue their journey to their destination seamlessly.

Figure 5-1: Representation of Mobility Hub by CoMo UK

The mobility/transport hub located in dense urban areas with high population densities, intensive mixed-use, and high density of flows would need to be of a larger size/scale. The mobility hubs located in busy and dense urban centres; besides the provision of seamless and integrated travel, they have another important strategic role to play: reduce communities' need to travel. Hubs in these locations could offer a wide range of services and thus, become a one-stop-shop for the community. Some of the services and facilities they could offer, besides those linked to mobility, are co-working spaces; gym; entertainment, retail and food, logistics hub; health and care services, etc.

In between the smallest mobility hub in a low-density area and the largest mobility hub in the city's highest density urban centre, there are a number of in-between urban centres and hubs of different sizes and scales which would have associated a different service offer and infrastructure requirements.

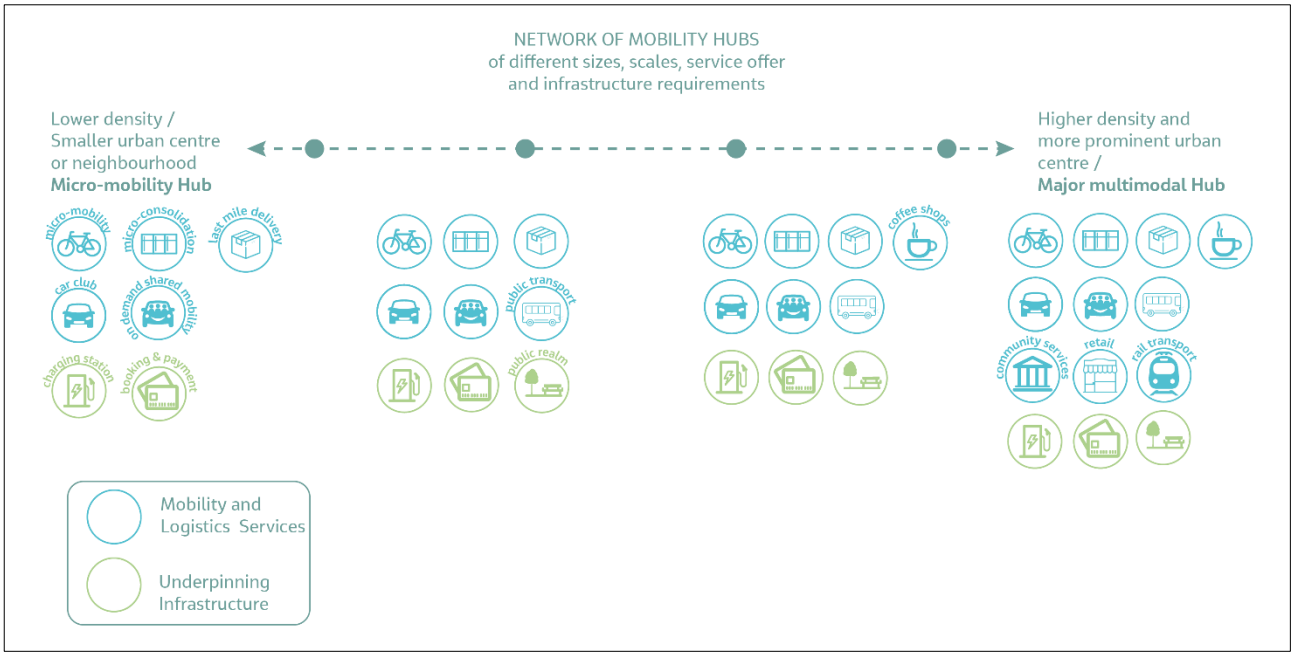

Figure 5-2: Network of Mobility Hubs of different sizes, services and infrastructure

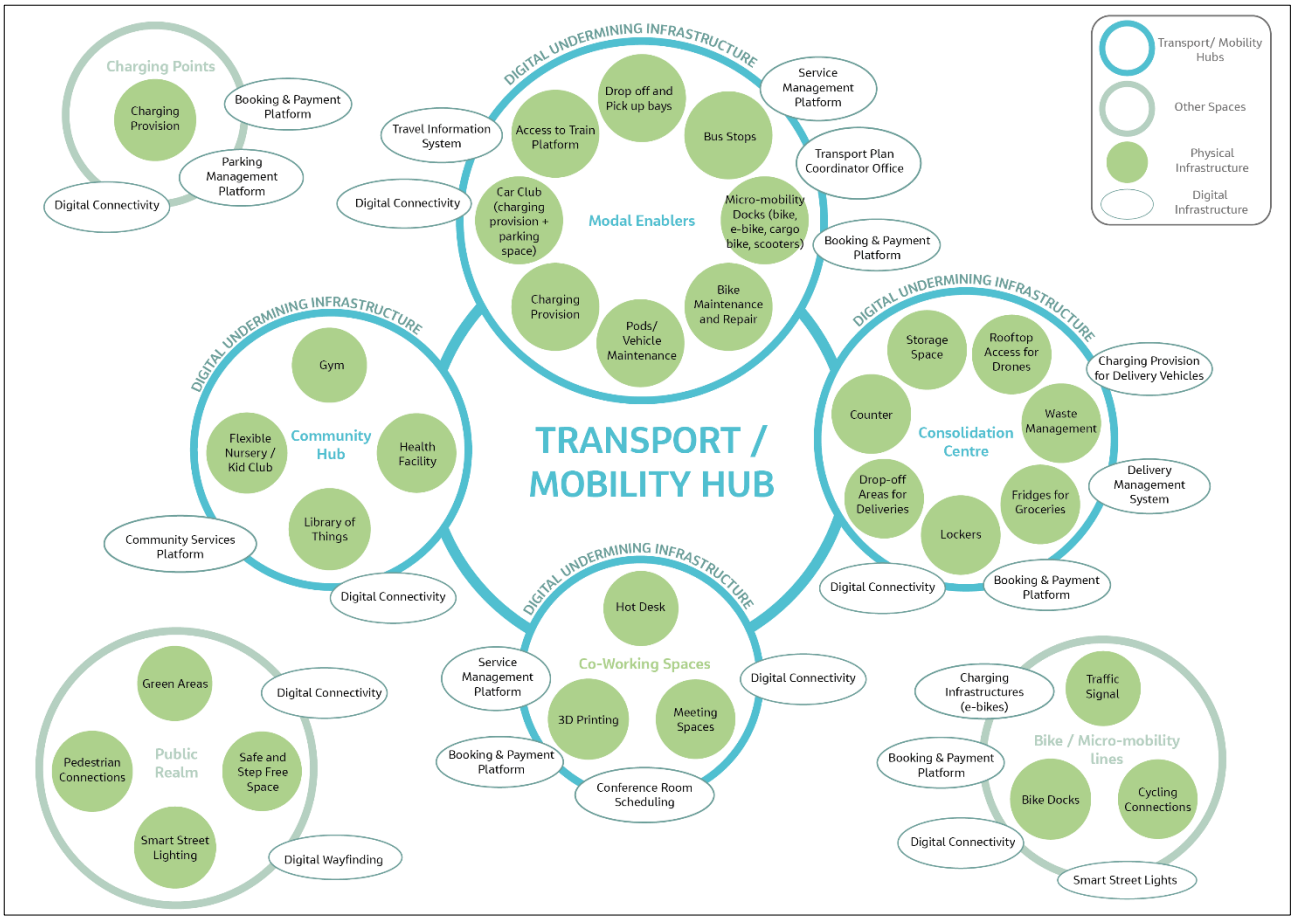

Figure 5-3: Potential Services and Infrastructure (physical and digital) integrating mobility/transport hubs


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National Transport Authority
Jacobs