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PART

01

Executive summary



Reasons for investigation

Demand-Responsive Transport (DRT) can be characterised by a reservation mechanism to book a vehicle and travel.

There are many resources available for understanding DRT and the technology that enables this evolving mode of transport.

This document has been written to collate available information and provide a fundamental understanding of how Dynamic Demand-Responsive Transport (DDRT) differs from existing DRT systems and what role it plays within an entire transport network.

Current state of play

The transport industry now offers multiple DRT solutions. From Dial-a-ride, to paratransit or community transport services, to on-demand public transport—the technology running these services and the efficiency of each varies dramatically. Only recently has technology improved enough to make DRT a viable option across a range of network scenarios. To improve ridership and coverage, fleet operators and transit agencies are taking a closer look at how DDRT can outperform current options to improve rural transport.

There have been more than 250 DRT projects launched and over 180 are still running. As more learnings surface, Agencies and Operators are applying this new knowledge into their project launches.

A trend toward software consolidation is enabling global-fleet operations. Fixed-route to fully-flexible fleet orchestration is now available under one operations platform. This not only creates a new level of transport equity for passengers and increased customer service, but it also provides a revised look at the operational expense of running a fleet illuminating possible improvements and cost reductions.



Problems to solve

Rural areas have always suffered from a lack of available public services and this is no different for the transport industry.

As low demand and sparsely populated geographies add strain to underfunded fleet operators, the following problems repeatedly emerge.

PROBLEM	CHALLENGE	DDRT SOLUTION
Underutilised vehicles	Improve ridership and coverage	<ul style="list-style-type: none"> • Identification of feeder services through feasibility studies • DDRT 'free roam' zone designs • First-mile, last-mile service designs • Marketing support
Declining patronage		
Increased operational costs	Reduce OpEx investment	<ul style="list-style-type: none"> • Reduce dead mileage of vehicles • Increase patronage per vehicle hour with dynamic scheduling and routing capabilities
Lack of informative service data	Increase visibility to service data	<ul style="list-style-type: none"> • Transit tracking • Partial shift to 'reservation' service model
Multiple software platforms to run multiple services	Improve platform capabilities	<ul style="list-style-type: none"> • Consolidate software platforms • Comprehensive, lower-cost fixed-route to fully-flexible 'full service' platform offering

DDRT solutions

During recent times, it is evident that onboard capacity is a key piece of data that fleet operators need. Being able to track this information in real-time not only enables safer coordination of fleet movements and contact tracing, but it provides the data to accurately assess the feasibility and success of DDRT. In a bid to improve ridership and coverage, DDRT has emerged as a new mobility mode that can improve overall network performance.

Findings and recommendations

► **When coordinated well, DDRT compliments and expands the entire transport network and improves access for those who rely on public transit.**

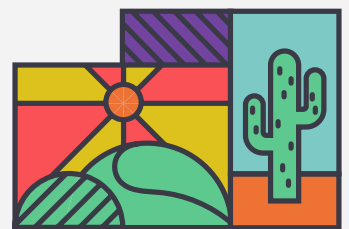
A key finding is that no ‘one-size-fits-all’ solution exists. DDRT requires a strict process around goal setting, data collection, feasibility, delivery and growth. Each geography has its own unique challenges and varying degree of demand. Low-density rural areas compound these challenges requiring more emphasis on service model, zone design and marketing to make up for inherent lack of passenger demand. When coordinated well, DDRT compliments and expands the entire transport network and improves access for those who rely on public transit.

For those wanting to explore DDRT, we recommend following an implementation guide similar to the one found in this document ([page 54](#)) and developing a strong partnership with a technology vendor that can offer their experience to serve as a guide on how best to implement a DDRT project in your unique situation.

PART

02

An introduction to rural DRT



Demand-Responsive Transport has been a common solution for rural areas over the years. As technology has advanced, opportunities have arisen allowing improved access and affordability to reshape how rural transport is designed.

This section is a collection of information designed to provide a thorough understanding of Dynamic Demand-Responsive Transportation (DDRT) technology and how it is allowing rural transit authorities and fleet operators to improve rural transport networks.

What is Demand-Responsive Transport (DRT)?



► **The underlying differentiator to public fixed-route transit services is the inclusion of a reservation mechanism.**

Traditional DRT balances the sustainability benefits gained from mass transit and the convenience and personalised nature of a private taxi service.

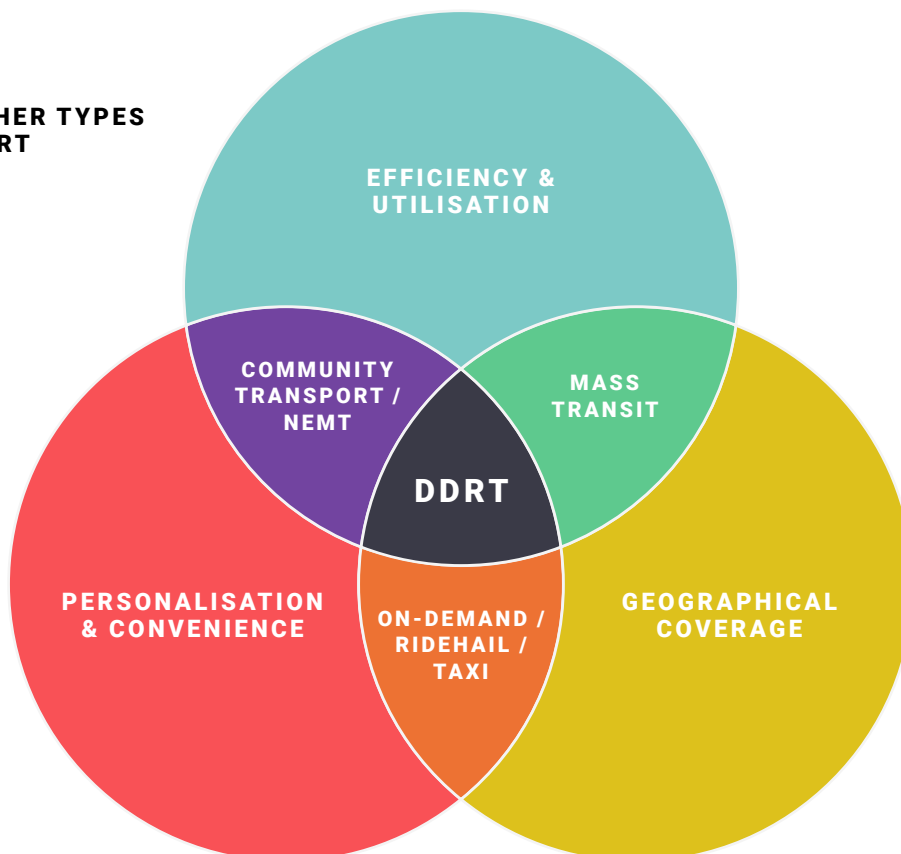
It is characterised by flexibility and efficiency, providing passengers with the ability to book transport around their own schedule without the need to conform to an often infrequent fixed timetable. The underlying differentiator to public fixed-route transit services is the inclusion of a reservation mechanism. Whilst traditional rural DRT services will connect passengers to medical, grocery, retail and other essential services, they typically run in very narrow service windows. This means passengers must book sometimes days in advance and thus limiting the flexibility and immediacy of the service.

How does Dynamic Demand-Responsive Transportation (DDRT) improve rural transportation?

► **Rural transport systems are usually infrequent or too expensive to run¹.**

DDRT combines the efficiency of mass transit with the convenience of private transport to provide a cost-effective alternative to traditional fixed-route or dial-a-ride transit. The technology is characterised by its ability to maximise the utilisation and service coverage of a vehicle whilst providing passengers with a level of convenience unprecedented in previous transit models. As a result, DDRT provides members of rural communities with greater access to affordable transport whilst providing fleet operators with efficiency gains enabling them to service more of the public.

DDRT VS. OTHER TYPES OF TRANSPORT



Revitalising rural transportation systems

Our transport systems have remained relatively unchanged for the past 50 years. Rural areas are typically known for being underserved. Often there is some form of fixed-route service with scheduled pickup times, or infrequent DRT services requiring bookings to be placed days in advance. In either case, neither of these approaches serves the population at an adequate level.

As our elderly population continues to expand they represent a significant percentage of the population.² This means we must ensure that equality and efficiency is built into our future transport systems. Factors such as disability and affordability will expose an inability to rely on private car ownership, thus making our transport systems a critical resource to connect these members of society to essential services.

Transport in rural settings has always faced

Who is this document for?

Access to affordable transportation is a fundamental right for all members of society. As our transport systems go through unprecedented challenges, new opportunities are presented to redefine what equitable and sustainable transportation means.

its share of challenges. From inefficient design to funding cuts, there is mounting pressure on delivering affordable, safe and efficient, taxpayer-funded transport services.

Through the advancement of technology, the economics of rural transport systems can be reset. However, careful consideration should be made for the application of technology that supplements or replaces these essential transport systems.

This document will explore the types of Demand-Responsive Transport technology available, where it is most applicable, and the considerations needed to ensure it is fit-for-purpose and serves the community appropriately as a part of an efficient transport network.

The challenge for fleet operators

► **Recent times have exposed a need for real-time onboard capacity tracking, contactless payments and a way to improve the utilisation of lower-density feeder services.**

History has shown us that people want convenience. We have seen the evolution of companies such as Uber redefining what it means to access personalised transport. These services have disrupted an industry and challenged government at both Local and Federal levels to rethink legislation and introduce new infrastructure. Then there is the wake of a global pandemic—changing societal behaviour patterns, bringing an entire industry to its knees as ridership evaporated overnight.

For fleet operators, it presents a unique opportunity to reassess what is actually required to deliver a great service.

Up until now, fleet operators have had multiple roles coordinating public transport, paratransit or non-emergency medical transport (NEMT) and community transport. Each of these services demand a different approach (and sometimes software). It's not until recently that technology has enabled the consolidation of fixed-route to fully flexible transit under one platform. And do it well!



Most Operators will track fleet movements through some form of archaic telematics, dispatch vehicles to a location and (hopefully) in some cases, be able to optimise vehicle routes. This is no longer adequate as passengers are expecting more.

Recent times have exposed a need for real-time onboard capacity tracking, contactless payments, and a way to improve the utilisation of lower-density feeder services.

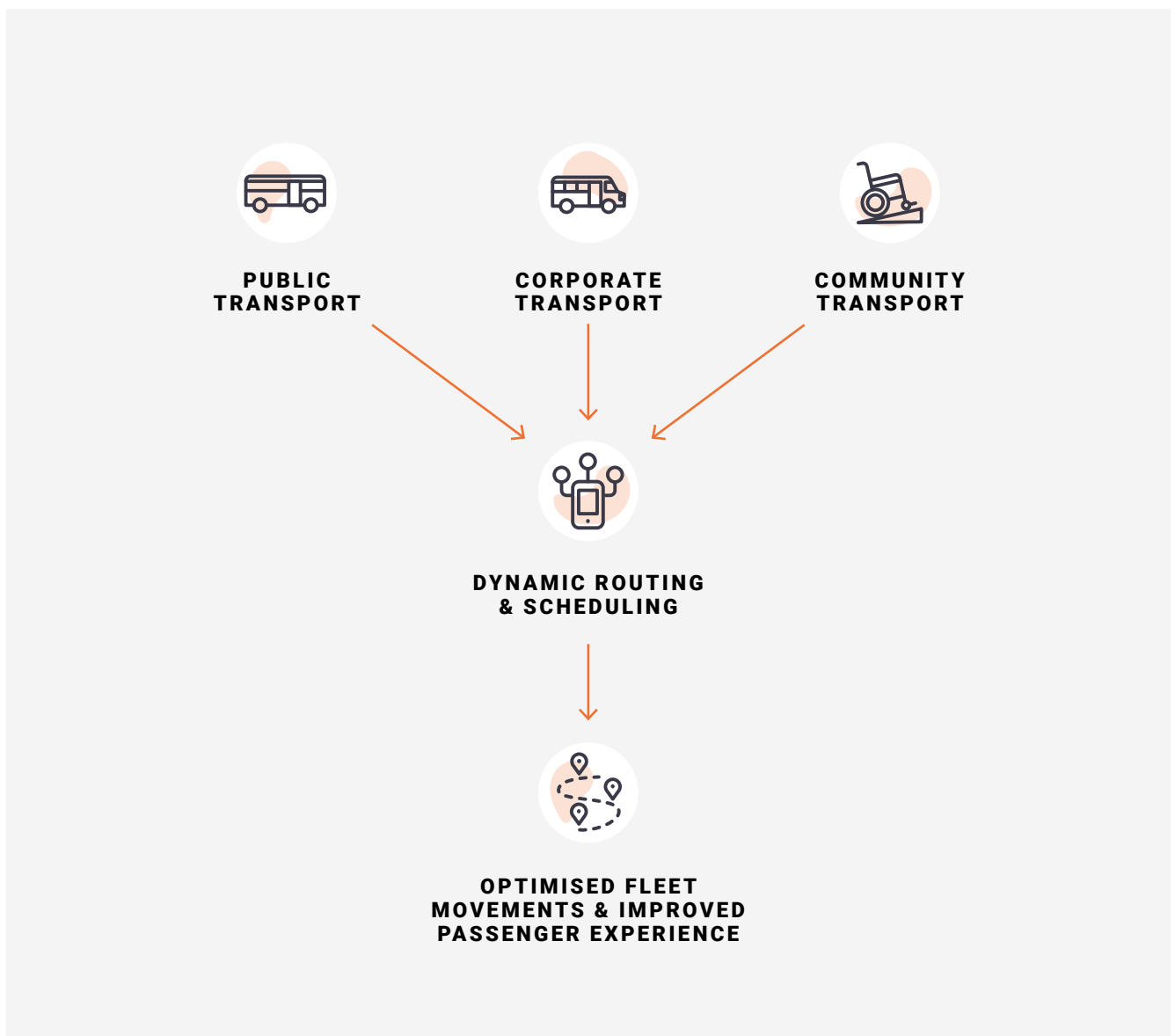
The challenge Operators have is to ensure these needs are met without the cost of multiple software platforms, all the while working within a changeable and pressured service environment.

Whatever platform a fleet operator chooses, it must be suited to low-density operations.

Being able to aggregate low-density demand across a large geographical area has always been a challenge for DRT Operators. Global fleet orchestration is now enabled due to improvements in algorithms powering

the technology today. Modern-day DRT technology enables real-time reservations giving passengers more travel time options while optimising fleet movements.³

This means multiple services can be consolidated under one platform providing personalised transport to customers regardless of the service model.



What should the focus of a DRT project be?

► **Having a clear definition of the problem and solution will go a long way towards feasibility and success.**

There are many problems that a DDRT service can solve. Having a clear definition of the problem and solution will go a long way towards feasibility and success. This is where a technology partner can support your journey by providing valuable insights on how best to design, deliver and grow your service.

The following stages outline a series of tasks to focus your DRT project development.

01 - DESIGN

- Identify gaps in current services (utilisation, underservicing, excessive cost)
- Define target audience (current mode preference, payment habits, where they consume their information, accessibility requirements)
- What ancillary services will be required (call centre bookings, web bookings, promotional coupons, marketing support, timetable integration)
- Develop a robust launch plan backed by measurable, time-bound goals
- Perform data collection and feasibility studies to validate assumptions
- Define final messaging for the service (how are you going to communicate this effectively)

02 - DELIVERY

- Facilitate frequent cross-company and interdepartmental communications
- Ensure all design assets are accessible for platform design
- Follow through with user-acceptance testing and confirm the 'live service' user experience
- Perform stakeholder training (drivers, call centres, operations & admin teams)
- Execute comprehensive communications and marketing efforts to raise awareness and encourage an action by new passengers

03 - GROW

- Map out all critical success factors & metrics (e.g. cost of vehicle mile, pax per vehicle hour, total patronage)
- Perform periodic performance reviews (frequency can vary as long as you are consistent)
- Make service adjustments to suit changes in demand (modify pickup configuration, add new vehicles)
- Revisit marketing effort and assess effectiveness—modify and re-run campaigns
- Set new milestones for the service

What will you gain from this document?

This document is a collection of knowledge from across the demand-responsive transportation industry and illustrates how new transport technology platforms improve the capabilities of fleet operators, transport agencies, and their passengers.

By reading this document you will gain a thorough understanding of how Dynamic DRT technology can improve rural transport systems and give you an easy-to-follow framework for designing, implementing, and marketing a new Dynamic DRT service.

PART

03

The difference between rural & urban DRT



For rural transport agencies, their jobs are very different from their urban counterparts. Without the population density that comes with urbanised developments, rural agencies cannot rely on the high volume and high demand seen in dense urban environments.

Rural agencies must balance their cost of operations differently, and in most cases, this results in a loss of vehicle frequency due to the low and diffuse demand. In most occasions for riders, this just makes accessing transport more difficult.

There are four key differences between Rural DRT and Urban DRT:



Longer trip times and fewer travel options

Typically a rural commute or journey is longer than those in urbanised environments. This makes it difficult for rural Operators to justify the cost of some routes, reducing service coverage and frequency.

By applying smart algorithms to optimise the routing and scheduling of DRT fleets, operational savings can be made and more passengers across a larger geography can be serviced.



An aging population choosing to stay at home

More elderly members of the community are making the choice to 'age-at-home' and forgo moving to an aged care or retirement facility. Due to disability and socioeconomic reasons this cohort of individuals will require more 'on-demand' services that cater to their needs.

With a lack of alternative services and a reluctance to take on the burden and cost of vehicle ownership, transport infrastructure will be particularly important for this aging population.



Distance to opportunities

People may move out of urban areas to seek more affordable housing, yet the job opportunities in low-population areas are limited, creating a vicious cycle.

Residents in these areas then must travel longer distances for employment, often relying on cars for transport, in much higher levels than their city counterparts.

To compound this issue, if there is poor public transit infrastructure to connect individuals to opportunities, then they may be forced into taking lower paying jobs and develop a forced reliance on public transport to connect with community and employment.



Low population

Low population areas typically have less access to a broad offering of services and employment options. Included in the reduced number of services offered is transportation.

For rural transport Operators, it is important that vehicle routes are optimised to maximise the passengers per vehicle hour and minimise the occurrence of deadheading (driving around without passengers). Efficient use of technology can reduce these extra costs.

Types of DRT technology:

► **The ideal application of DRT is not always the result of having the most advanced technology. It is the ability for the technology to work within the localised geography and known constraints of the service zone.**

When assessing options for rural DRT, technology plays a major role influencing the service design and delivery. While there are many forms of Demand-Responsive Transportation there are various capabilities and limitations to any platform.

The ideal application of DRT is not always the result of having the most advanced technology. It is the ability for the technology to work within the localised geography and known constraints of the service zone. DRT is not a one-size-fits-all approach. The technology must be configured to suit the conditions of the service zone.

The 'reservation' characteristic of the transit service defines DRT.⁴ The differing ways a 'reservation' is made can be seen across the varying types of technologies available.

Types of DRT service:

• COMMUTER TRANSIT

These are connector services or 'first-mile, last-mile' services that get commuters to and from a main commute hub during peak travel periods.

• PUBLIC TRANSPORT

Designed as 'free-roam' zones, these public transport services act as a point-to-point service connecting passengers to a destination within a defined zone.

• NON-EMERGENCY MEDICAL TRANSPORT

Designed as 'free-roam' zones, these public transport services act as a point-to-point service connecting passengers to a destination within a defined zone.

• CORPORATE TRANSIT

A private fleet contracted to an organisation to provide transit services for employees.

• EDUCATIONAL TRANSIT

Demand-responsive transit has been used to provide special needs students with accessibility-enabled transport.

Types of DRT technology:

PLATFORM	DESCRIPTION	LIMITATIONS
Dial-a-ride	<ul style="list-style-type: none"> • Phone-based scheduling • Manual assignment of vehicle dispatch 	Inefficient vehicle dispatch and higher cost of operation
Telematics and Dispatch-based DRT	<ul style="list-style-type: none"> • Computer aided vehicle dispatch • Live vehicle tracking for operations • (Some) routing optimisation—typically run one day in advance for next day shift 	Requires manual entry and/or periodic fleet optimisation
Ridehail / On-Demand	<ul style="list-style-type: none"> • Full scheduling and routing of vehicles for passengers • Auto-dispatch of vehicles • Optimised to handle last-minute bookings for passengers • Vehicle supply ratio is critical to service advanced booking demand • Queues multiple requests then dispatches available vehicles 	Inconsistent vehicle dispatch for advanced bookings means less certainty of actual pickup time
Dynamic DRT	<ul style="list-style-type: none"> • Full scheduling and routing of vehicles for passengers • Continual optimisation of fleet movements for greatest efficiency • Handles advanced and last-minute bookings for passengers • Matches request to available vehicle and guarantees pickup option • Encourages more pooled trips 	Guaranteed advanced bookings will be prioritised over last-minute requests

Where does Rural DRT fit?

With an aging population there will be more pressure put on our transport systems. As elderly members of the community choose to 'age-at-home' rather than move to aged care facilities, access to convenient transportation will be critical.

Linking members of the community to medical appointments, retail, points of interest, and general day-to-day essential services requires a robust and sustainable transport network.

Rural DRT is more relevant than ever due to the high cost of vehicle ownership in rural areas. People need to be connected and there is a direct correlation between access to transportation and poverty in rural areas.⁵ By improving the technology powering these services, we can overcome the failing economics of rural transport. Dynamic DRT should be a serious consideration for any rural transport provider.

Why is there so much interest in Dynamic DRT?

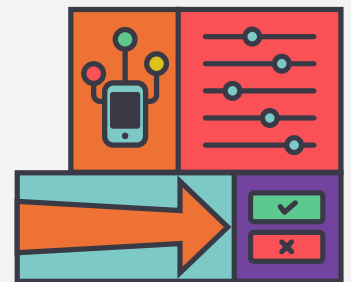
DRT can change the transportation landscape and provide greater access to essential services. DRT has attracted increasing interest because:

- It provides more equitable access to transport
- It unlocks the potential to lower the cost of operations
- It gives fleet operators a way to increase service coverage without increasing costs
- It improves passenger experience
- It delivers real-time monitoring of fleet capacity and utilisation
- It generates automated and efficient vehicle dispatching and routing

PART

04

The anatomy of a transport network



How do DDRT systems improve service coverage?

'Hub-and-spoke' networks are common transport network designs. They focus on providing one main hub for passengers to enter a high-frequency, high-capacity transit corridor. This is very successful in the centre of the system; however coverage and frequency often decrease as you move away from the dense urban core.

Dynamic DRT systems enable Operators to distribute supply across a greater geography and in turn, improve efficiency for low-density areas.⁶ Instead of having

► **Dynamic Demand-Responsive Transport systems enable Operators to distribute supply across a greater geography and in turn improve efficiency for low-density areas.**

fixed locations throughout a service zone, vehicles can have service routes, pickup and drop off locations dynamically assigned in a 'best-fit-for-current-purpose' manner. This expands coverage in the outer sections of these 'Hub-and-spoke' models of service.

This not only improves the level of perceived service experience by a passenger, it increases the number of opportunities a passenger has to access the transport network and provides public transit to individuals who were never serviced before.

What are the structural elements that make up a transport network?

Rodrigue, J-P et. al. outline some of the key characteristics of a transport network. They describe the structural elements that make up a transport network being characterised by the type of activity they facilitate or what type of relationship they have with other parts of the network.⁷

• **NODE**

A location that provides a passenger with access to the network.

• **LINK**

A route or transit path connecting two or more nodes together. When referring to DRT the term 'link' is being redefined. Rather than a fixed-route between nodes, the vehicle is routed by way of 'best fit' within a defined service zone using a routing algorithm.

• **FLOW**

The amount of traffic moving on a link.

• **FEEDER**

A transit route that connects a node to a hub.

• **GATEWAY**

Is an access point for passengers to enter a network from another separate transport network.

• **HUB**

A hub is a node that facilitates the movement from one part of the network to another, i.e. A DRT service that connects to a fixed-route scheduled bus service.

• **CORRIDOR**

Typically, a series of nodes that are connected by a single form of transport mode and facilitates a high flow of a patronage. A Corridor will often be connected to a Gateway.

Structural illustration of a transport network

KEY



HUB



GATEWAY

CORRIDOR

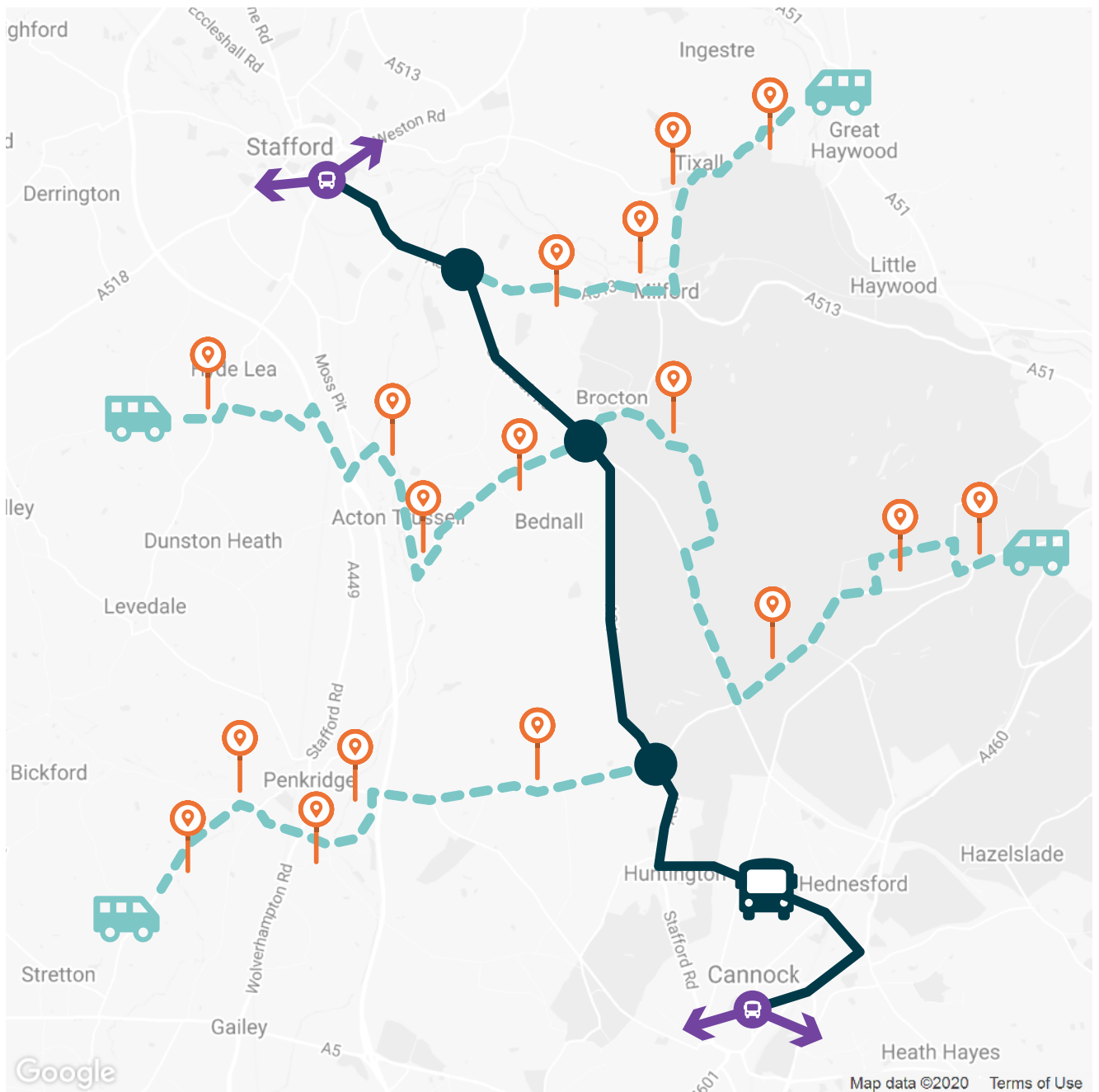


NODE



FEEDER

LINK



PART

05

Why do we see empty buses? (and how to fix it)



Adopting a fixed to fully-flexible mindset

It's common knowledge that fixed-route mass transit is one of the most efficient modes for moving large volumes of people. That's why adopting a fixed to fully-flexible mindset for network design is important. The sum of a service's effectiveness should not be constrained by an individual route or service zone. Rather it should account for the overall network effectiveness.

There are routes that demand a fixed-route service as it is the most efficient means for servicing the existing patronage. For other services across the network, certain indicators point to inefficiencies that can now be improved.

Occupancy as a lead indicator

In rural settings, a transport network may have infrequent or limited routes adding to the complexity of servicing demand across a large spatial area.

Metcalfé's law states that the value of a network is proportional to the number of connected nodes.⁸ Meaning the more access points a network has, the more attractive it becomes to potential passengers. More stops mean more passengers.

Unfortunately, this does not translate well for fixed-route services as costs can escalate quickly. However, an empty bus can become an indicator for further investigation. Empty buses should be a catalyst for DRT feasibility studies.

Here are some common reasons why we continually see empty buses:

1. Inappropriate network design
2. Lack of visibility to onboard capacity
3. Infrequent assessment of service routes (Zone Health Checks)



1. Inappropriate network design

The cost of operating a fixed-route service can be high. Commercial miles have increased whilst Government supported miles have not grown in proportion. Operators are in a continual squeeze to balance funding with service availability and unfortunately something must give. Underutilised feeder services are being cut, leaving members of the community without a viable alternative.

Transport poverty is increasing and providing equitable and sustainable network design is high on the agenda. Establishing a criteria to identify underutilised routes is the first step to improving overall network design. Data collection is a priority when it comes to selecting services for improvement. This will allow you to assess the level of access passengers have to the existing transit routes.

2. Lack of visibility to onboard capacity

A lot of Operators will have the ability to track their bus, yet they are unable to tell you the utilisation of the vehicle at any given point in the day. Being able to track ridership effectively is an easy step towards understanding if DRT is right for you. Fixed-route data can be analysed using DRT simulation software to determine whether the route can be replaced.

3. Infrequent assessment of service routes (Zone Health Checks)

Public sector spending cuts have led to reductions in rural bus services since 2010.⁹ This not only makes it hard to improve existing services, but it also means complex assessment of services are de-prioritised.

With today's technology, 'Zone Health Checks' can be performed quickly and cost-effectively. TransitScan™ is a quick and inexpensive proprietary process developed by Liftango to identify poor coverage areas suitable for DRT. Once an Operator has identified the service routes to be investigated and adequate patronage data is available, DRT feasibility studies can be performed easily. This exposes potential efficiency opportunities within traditional network designs.

Talk to your DRT technology partner about

a Zone Health Check as a cost-effective option to assess your existing services and promote cost effective services in the future.

Replacing underperforming routes with Dynamic DRT

Many rural transport networks operate in hub-and-spoke models with feeder lines connecting to a main hub. This has traditionally resulted in a series of fixed-route feeder services running empty at times during the day in a bid to balance coverage and ridership.¹⁰

As technology has progressed, these feeder services are slowly being decommissioned, de-funded or abandoned for a 'dial-a-ride' or some form of demand-responsive service. Unfortunately, there is one inherent problem with these types of supplement services. They often work in isolation or at times that are inconsistent with the main network. Thus, failing to create a network effect and improve the efficiency of the overall transport network.

Dynamic Demand-Responsive transport systems provide the ability for a much greater network effect by replacing feeder lines or even an entire service.

The primary role of a ‘feeder service’ or ‘spoke route’

The primary role of a feeder service is to provide more nodes for passengers to enter the network. This expands the overall reach of the transport network (coverage) and feeds more passengers (ridership) onto the main transit corridor. The benefits of this are increased use of a main service corridor and mass transit line.

Where this falls down is in a rural setting. Demand is not great enough to overcome the operational costs of additional services. The balancing act of coverage vs ridership fails, and costs escalate. Not enough convenient nodes cause riders to opt for another form of transport or to forgo travel at all.

Mobility Hubs

Mobility Hubs are not a new concept, rather a result of an increasing need throughout the world as our population grows. These are destinations where place and shared transit co-exist. Instead of accessing an area with private transport, these locations are designed to be accessed through the convenience of shared transport. Multiple modes of transportation are offered to improve the level of convenience, access and connectivity with the ultimate goal of improving the interaction with the streetscape and surrounding facilities. These hubs also make the connection to onward transport easier whilst allowing fixed routes to complete onward journeys into denser areas.

Careful design and interconnectivity between transport modes are critical. Each

mode should complement each other and not cannibalise passengers. For example, whilst DRT is an effective and convenient mode of transport, it must not come at the expense of existing fixed-route passengers. That’s why DRT feeder or Mobility Hub services must provide the necessary integrations of fixed-route timetables. This ensures that patronage is maintained on the effective fixed-route services, and additional patronage can be serviced through DRT.

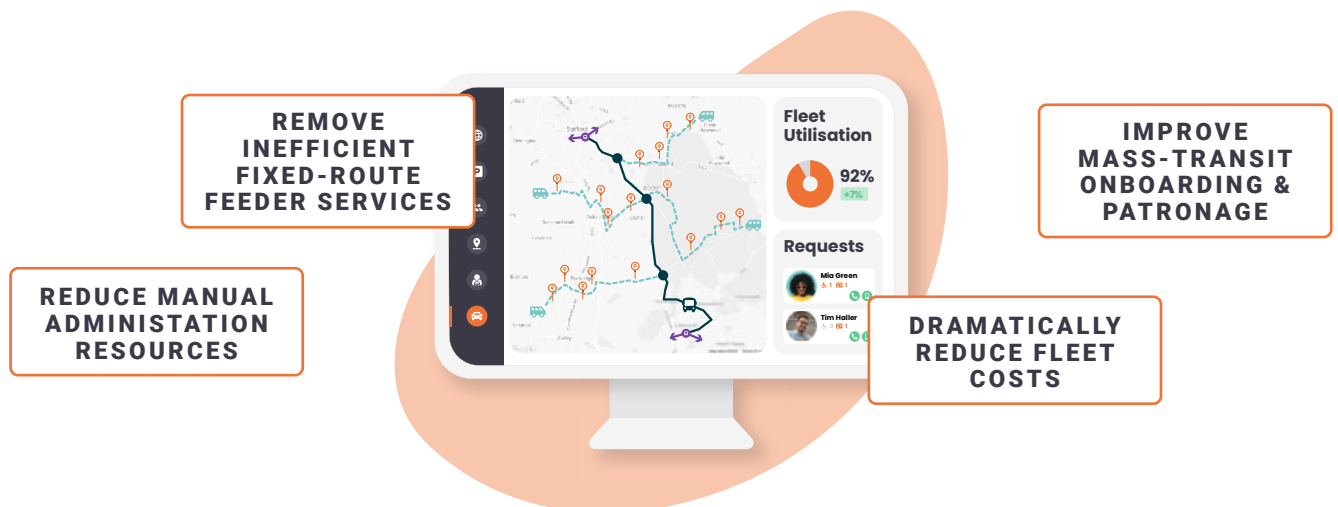
Each Mobility Hub is a strategic node allowing passengers to access a range of transport modes in one place. Therefore, their location must be carefully planned through simulation and feasibility work to ascertain their effectiveness.

Replacing fixed-route for demand-responsive feeder services

► **By aggregating passenger demand across a greater geographical area, temporary nodes can be created dynamically, when and where they are needed.**

This means transport Operators are less dependent on fleet size when it comes to the creation of network nodes, which is a constant struggle for traditional fixed-route fleets when balancing operational costs.

It also means the relationship between route, location, and node creation (ridership vs coverage) can improve and inefficient fixed-route feeder services have an opportunity to service passengers more efficiently.



As an example, two clusters of passenger demand may no longer require two vehicles to service it. Rather, one vehicle can be dynamically routed to all passengers at various times and satisfy all requests on time. This results in increased service efficiency and cost savings.

This not only has great implications for rural transport Operators and Agencies, but for residents who have had to manage their transport needs with infrequent and inconvenient low-cost public options, or expensive personalised/private transport options.

How to service low-density passenger demand (and help fix rural mobility)

Improving rural mobility has been a topic of discussion for many decades. With the introduction of sophisticated routing and matching algorithms, bus Operators can improve the opportunity for transport equality.

By improving the task of scheduling and routing bus movements, the economics of servicing a sparsely populated geography start to make sense.

Previously this would come at the expense of passenger experience. Technology platforms now make it possible to produce a passenger-centric service while balancing the cost of convenience.

What is network effect?

A 'Network Effect' is the benefit found from connecting nodes, with the result of the sum being greater than the individual parts. These effects can be found in communications, social media and even transportation systems. By increasing the amount of nodes in a network, it provides a greater opportunity for individuals to access the benefits of the system, leading to a greater benefit to the service overall. In a transportation network, the result is an increase in patronage and improved vehicle utilisation. This is exactly what Dynamic Demand-Responsive transport systems enable.

By having a systematic approach to identify and assess potential services for DDRT feasibility work, opportunities are unlocked to rebalance the challenging 'ridership vs coverage' equation and tip the scales in favour of rural mobility.

PART

06

Who are the DDRT stakeholders?



There are four main stakeholders when it comes to operating successful DDRT services. These are:

1. Local Government / Transport Agencies
2. Transport Operators
3. Technology Providers
4. Passengers

Local Government / Transport Agencies:

There's no illusion to the fact that public transport is not a feasible mode of transport without government support. While large 40-plus-seater buses are some of the most efficient ways of servicing peak demand, they often run underutilised outside of peak periods.

In rural communities, public investment in transport infrastructure can have a significant impact. Connecting the 'last-mile' through adequate transport infrastructure can dramatically reduce the cost of goods or improve one's ability to access employment opportunities.

Unfortunately, funding decisions are usually based on a contribution to GDP. This typically leaves rural communities with less funding to improve transport infrastructure when compared to their urbanised counterparts.

Therefore, it is the role of Local Area Authorities to provide cost-effective, safe, convenient and affordable transportation. Typically seen as slower moving than that of the private sector, local government must be able to facilitate innovation through public-private collaboration. Giving ratepayers access to current technology that can enhance their ability to move around their local area, facilitate trade, and connect to amenities.

Transport Operators:

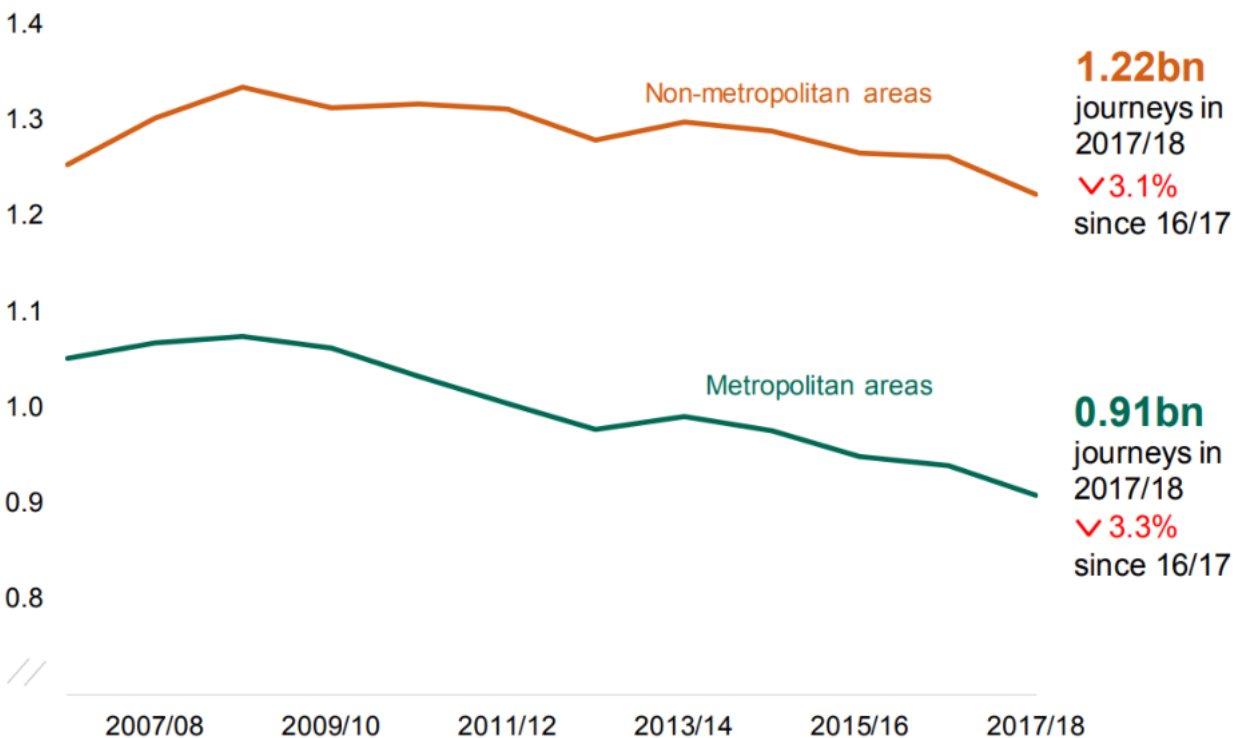
Rural transport Operators have always been faced with the challenge of servicing large geographical areas characterised by a low density and wide population dispersion. There has been a consistent decline in rural transport over the years which has only compounded the pressure on increasing the availability of Unitary Authority (UK Council) funds. Increased service costs with declining patronage and reduced government support is creating the perfect storm for rural transport deserts. Non-metropolitan areas

have seen a 3.1% decline in passenger journeys since 2016.¹¹

A sharp decline in bus mileage can be correlated to the declining level of local authority supported mileage. Supported mileage has dropped 49%¹¹ in non-metro areas. This represents a divergence in supported mileage and actual commercial mileage driven, placing greater pressure on Operators to efficiently service their disparate, rural demand.

ANNUAL BUS STATISTICS ENGLAND 2017/18

Passenger journeys on local bus services (billion)



Technology Providers:

Technology is only as good as its ability to adapt to the unique needs of a localised population. Dynamic DRT is no different, and nowhere is this more evident than in rural and dispersed communities.

► **This role has evolved the most, and a technology provider's remit is to provide efficient fleet economics whilst balancing sustainability requirements with an improved passenger experience.**



Previously, solutions delivered DRT by aggregating dispersed demand into efficient clusters. To do this, services may only run on specific days or times. By condensing requests into an efficient schedule, a vehicle is then routed to passengers to fulfill their requests. This provides Operators and Agencies with a somewhat acceptable ledger of unit economics yet still leaves communities underserved and reliant on infrequent options.

This role has evolved the most, and a technology provider's remit is to provide efficient fleet economics whilst balancing sustainability requirements with an improved passenger experience. The two ends oppose each other—convenience vs affordability / ridership vs coverage—but platforms that provide the configurability to get this right are reshaping the transport landscape.

Passengers:

More than ever, the passenger is becoming the focal point and catalyst of change. Technology has provided an unparalleled convenience and scalability for the distribution of services. For those living in rural communities, private car owners are the least mobility constrained across all social groups.¹²

For residents without access to a vehicle there are typically two options:

- Inexpensive low-frequency fixed-route bus service
- Expensive personalised taxi service

In contrast to urbanised developments and high-density regions, the lack of services amplify challenges faced by specific cohorts of the community. Given the preference for private vehicle use, the cost of vehicle affordability plays a significant role.

Those who are young and entering the workforce and the elderly who may need access to transport for essential services represent cohorts that face mobility challenges. With the infrequent nature of rural transportation systems, these two demographics require a better transport system. However, applying a new technology solution will simply not suffice.

A comprehensive communications strategy is imperative to educate, familiarise and facilitate the transition to new service structures.



PART

07

Factors influencing a shift to DDRT



The following is a list of factors for making a shift to Dynamic Demand-Responsive Transport services.

Cost

The cost of traditional hub-and-spoke models can make equitable transport untenable in certain areas, especially rural settings. Rather than placing additional burden on taxpayer dollars, dynamic feeder systems or 'free-roam' dynamic services can unlock patronage through additional nodes without the cost of additional vehicles.

Demand

Whilst it is common to design for peak demand, the very nature of Demand-Responsive Transport means the technology can adapt the system to meet the needs of a growing population or changing demand profile by onboarding passengers in a flexible manner. In this case it's important to be cognizant of the 'potential' of the system if convenience is introduced and to plan accordingly for growth.

Topology

This refers to the arrangement and connectivity of nodes and their links within the transport network. With modern-day DDRT service design, topology plays a major role in uncovering the capabilities and limitations of the technology that underpins the service.



Patronage profile

Understanding the behavioural characteristics of the target patronage ensures service design matches the capabilities of the technology powering the service. There is no point deploying a service that is suited to last-minute requests if the majority of passengers travel within peak demand periods and need the assurance of advanced bookings and guaranteed pickup / drop off times.

Additionally having a service optimise fleet movements the day before a service won't account for 'last-minute' or 'on-the-day-of' requests. This only results in inefficient routing of vehicles, additional miles driven and a higher cost of operations.

Better access to passenger and vehicle data

By introducing a real-time reservation and live bus location, it opens up opportunities to enhance night services, improve contact tracing, and socially distance in vehicles through seat allocation.

For rural transport planners

With the growth of on-demand bus services or Demand-Responsive Transportation, rural transport planners have a new tactic in their arsenal.

Rural DRT services are now capable of providing the convenience of a personalised taxi service with a comparable passenger cost of public transport. The main difference between previous systems and newer technologies is the speed and ability to continuously optimise fleet movements. This not only provides greater coverage and an improved passenger experience, it also gives Operators a better way to ensure operational efficiencies and reduce dead miles driven by empty buses.

► **The challenge of servicing sparsely populated areas with infrequent vehicle routes or archaic dispatch platforms are a thing of the past.**

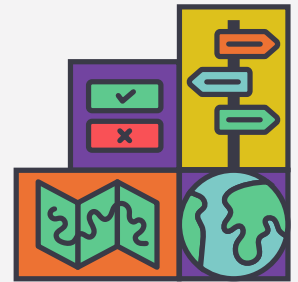
In collaboration with technology providers, transport planners can now simulate real-world outcomes with the same innovative technology powering live projects across the world. Bringing with it much needed improvements and a data-driven service design. Rural areas can now benefit from the same complex solutions urbanised areas typically have access to much earlier.



PART

08

Defining the spectrum of DDRT



The following characteristics define where the technology platform sits on the DRT spectrum. Abilities are characterised by:

Complexity:

Does the system aggregate passenger demand then spread this across a fleet of vehicles and account for travel times and route efficiency?

Flexibility:

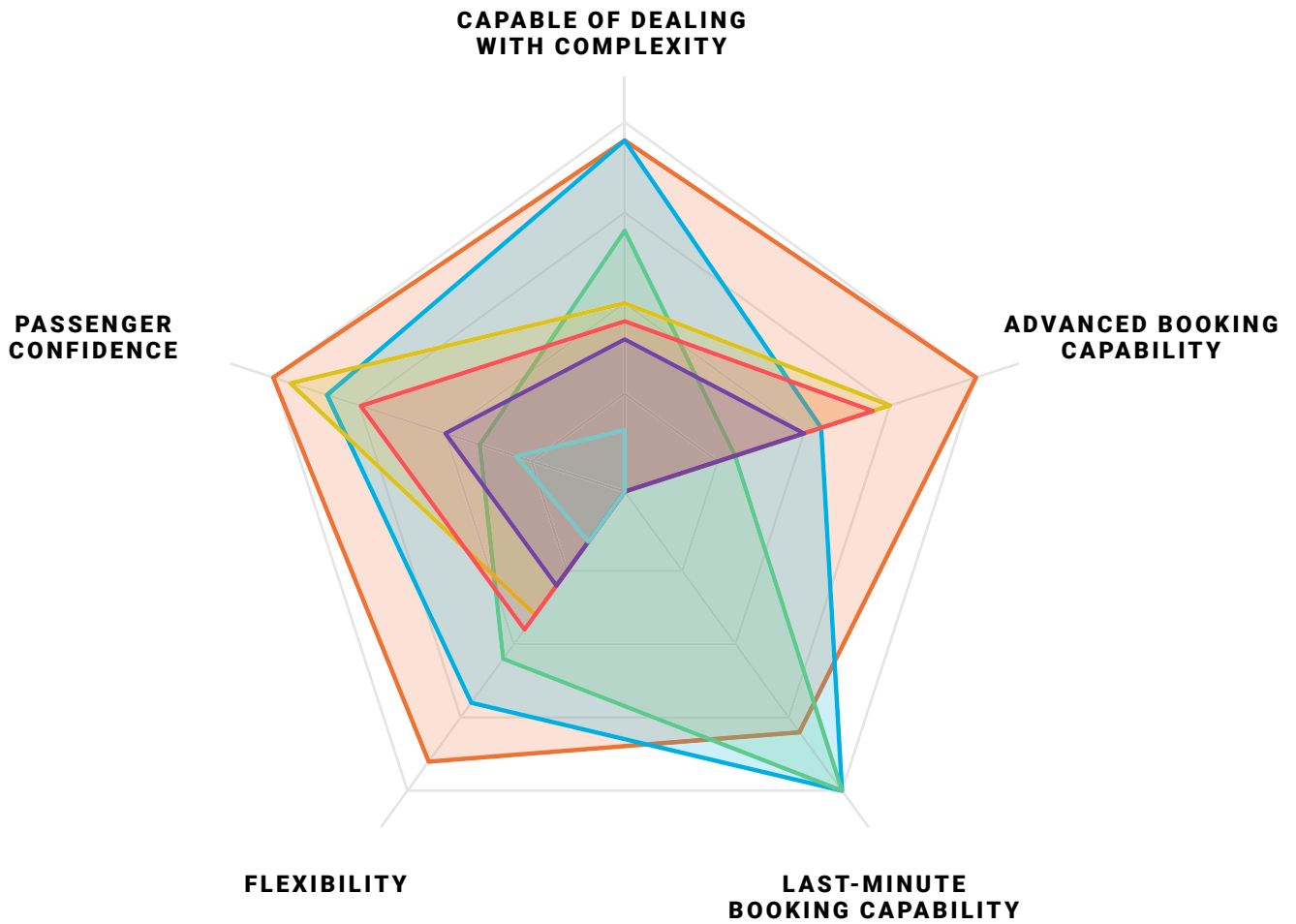
Will the system adapt to changing demand or is there a set of constraints in place forcing it to operate in a less efficient manner?

Passenger confidence:

Does the system instill a level of confidence that allows the passenger to reach their destination on time?

Booking type:

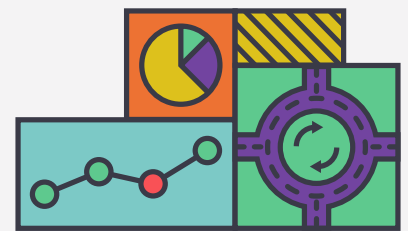
Does the system allow for bookings and if so, can the passenger request a last-minute trip or schedule their trip a day in advance?



SERVICE TYPE	CAPABLE OF DEALING WITH COMPLEXITY	ADVANCED BOOKING CAPABILITY	LAST-MINUTE BOOKING CAPABILITY	FLEXIBILITY	PASSENGER CONFIDENCE	TOTAL
Public Transport / Fixed-Route	3	0	0	4	7	14
Dynamic Fixed Stops	8	10	0	6	10	34
Telematics / Auto-Dispatch DRT	9	14	0	9	15	47
Dial-a-Ride	10	15	0	8	19	52
Leave-Now On-Demand	14	6	20	11	8	59
Ridehail / On-Demand	19	11	20	14	17	81
DDRT	19	18	16	18	20	91

PART

Types of DDRT service models



Fleet size, geography and passenger demand are some of the main factors that will influence network topology. There are various service models to choose from with modern-day DDRT technology.

A capable technology provider should be able to simulate different models and deliver a data-driven approach to service design.

Models:



• **POINT-TO-POINT:**

This is the most flexible service offering and will allow for the creation of many temporary nodes within a service zone. A passenger can choose to be picked up and dropped off at any point within the service zone. Fleet movements are based on the most efficient route to service a known passenger manifest.



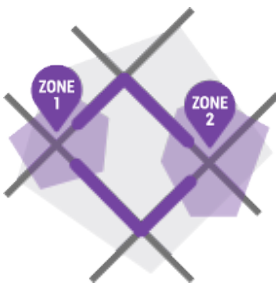
• **POINT-TO-HUB (FIRST-MILE, LAST MILE):**

Similar to a hub-and-spoke fixed-route model however, a vehicle has the ability to create temporary nodes or pickup locations anywhere within a service zone and connect passengers to a central hub. This model makes a case for replacing existing underperforming fixed-route feeder services. With DDRT feeders, they can cover a larger area more efficiently than a fixed-route 40-seater bus and personalised service.



• **MEETING POINT-TO-HUB (FIRST-MILE, LAST MILE):**

This type of design consolidates multiple pickup requests into one 'meeting point' thus onboarding multiple passengers at the one location. This allows for a fleet to service a high demand period more effectively as onboarding capacity is doubled or tripled resulting in efficiency gains and a higher passenger per vehicle hour ratio. It requires additional understanding from the rider, but leads to more efficient services during high demand times.



• **ZONE-TO-ZONE:**

Allows for passengers to transfer from one geographical service zone to another without the need to change modes or vehicles. This is effective and can dramatically improve the passenger experience. However, if the technology is not configured correctly this can cause inefficiencies as vehicles miles driven may increase.



• **DYNAMIC FIXED-STOPS:**

This allows for frequent pickups typically on a loop or feeder service, where buses will have visibility to the demand at each stop and only setdown if a passenger is waiting. This model can be configured to take advantage of walk-up demand to certain stops or take pre-booked trip requests.

PART

10

What does a DDRT technology platform look like?



While technology providers may have different names for them, a modern-day Dynamic DRT platform consists of three major interfaces:

1. The passenger application
2. The driver application
3. The operations portal



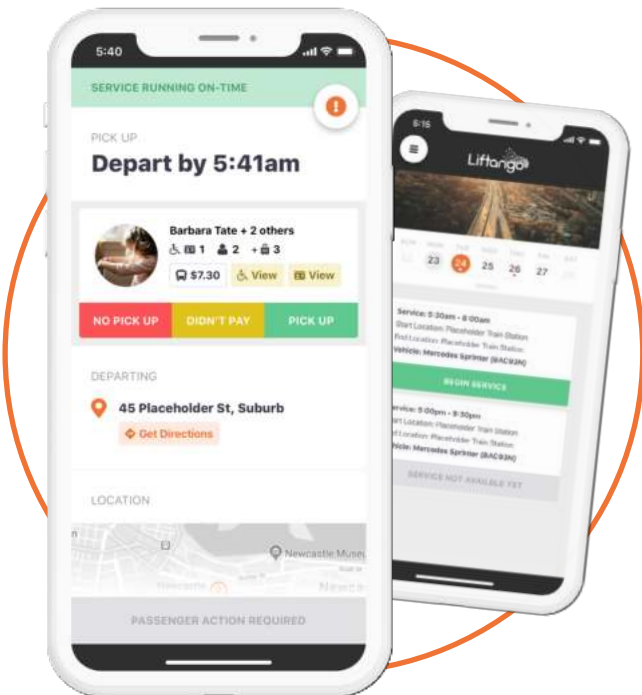
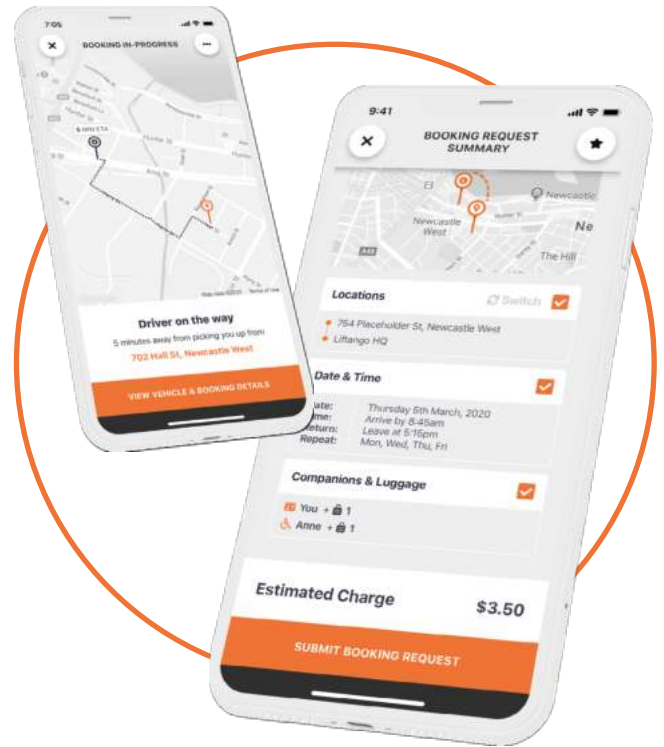
Behind these three user interfaces lies a complex system enabling seamless, real-time services and provides Operators, passengers, and drivers with a way to optimise fleet movements and improve passenger experience.

Passenger app

This is the primary means for a passenger to request a trip. The app must be intuitive, easy to use and booking should be a simple and quick process.

Technology providers should provide alternative means to allow booking through approved surrogate profiles for carers or by phone through a call centre if needed.

Passengers should be able to customise their profile and add luggage, concession or accessibility requirements as needed to ensure a personalised service.



Driver app

The driver application is the primary communication device used to dictate driver movements. It is used to confirm pickup and drop off locations and aid as a navigation tool to route vehicles in an efficient manner.

The app should minimise screen time interaction required by the driver and have minimal steps to view, confirm a booking, and navigate to a destination.

A sophisticated driver application is pivotal for allowing high quality customer service from drivers to riders.

Operations platform

The operations portal is the heart of the service. This is where administration and customer service teams can assess performance, book trips and communicate directly with drivers and passengers.

Providing a real-time, 360-degree view of fleet and passenger movements, the 'ops' portal allows you to monitor, manage, and optimise all DDRT operations.



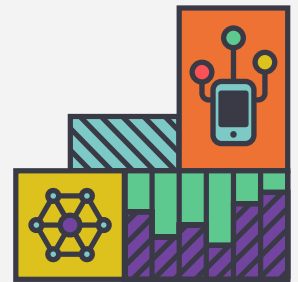
ONE PLATFORM TO RUN YOUR DEMAND-RESPONSIVE COMMUNITY, CORPORATE OR PUBLIC TRANSPORT.



PART

11

Why should you consider DDRT?



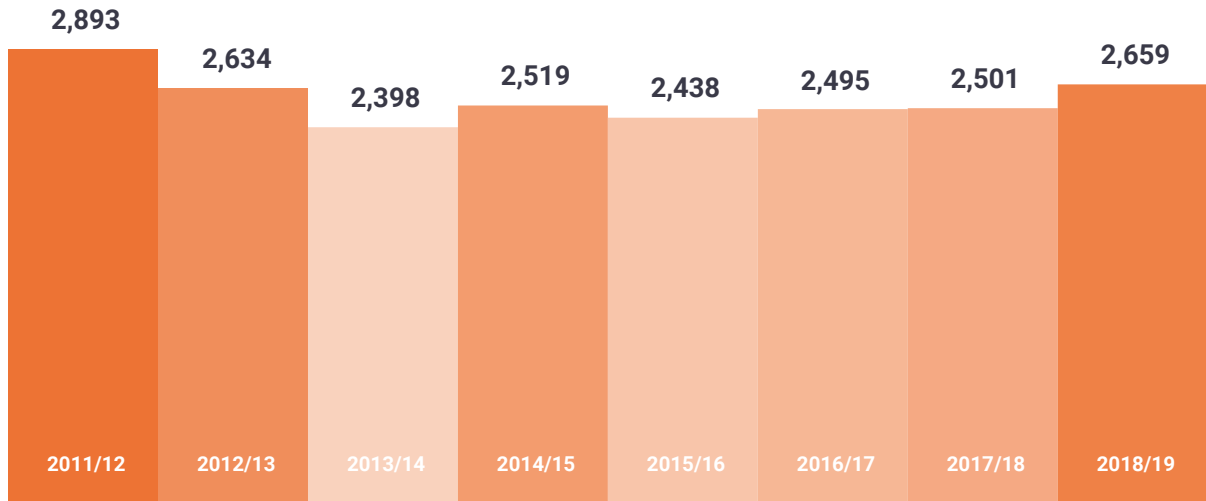
Public transport is expensive

As the algorithms that power Demand-Responsive Transport improve, fleet operators are realising greater savings. Public transport can be expensive and in the race to secure funding, rural areas generally come off second best.

By using complex algorithms to adapt fleet movements and reduce deadheading, transit systems can reduce the cost of operations whilst improving coverage and improving patronage.

Expenditure on public transport in the United Kingdom (UK) 2011-2019

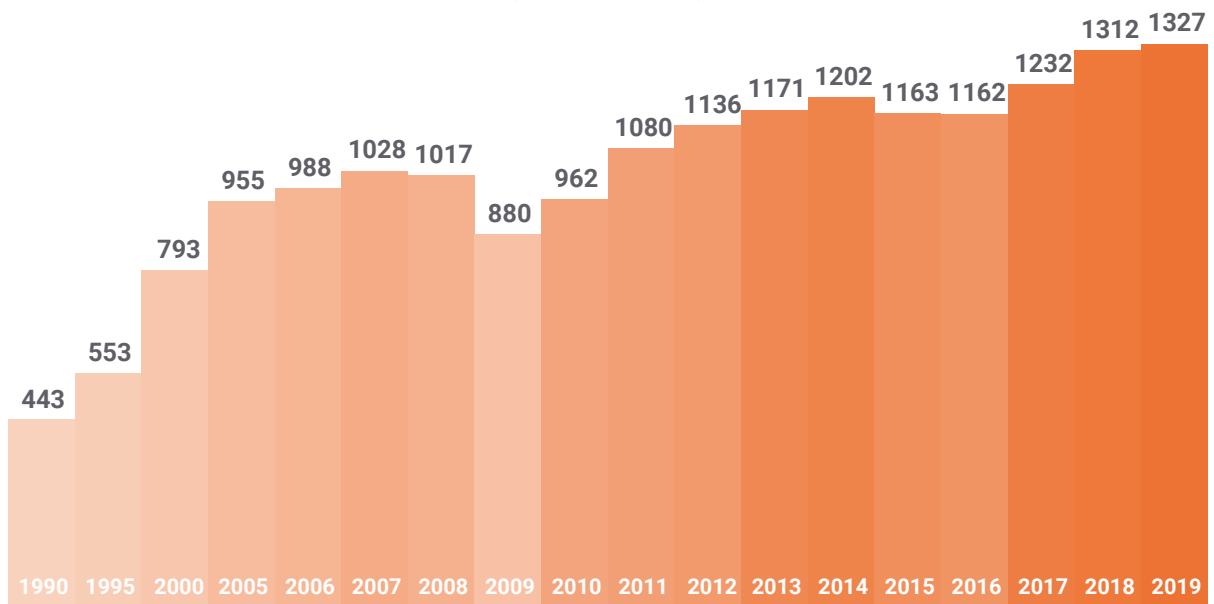
(MILLION GBP)



Expenditure on public transport in the United Kingdom (UK) 2011-2019, Statista 2019

U.S. personal expenditures on transportation 1990-2019

(BILLION USD)



U.S. personal expenditures on transportation from 1990 to 2018, Statista 2020

PART

12

Learnings from DDRT projects across the globe



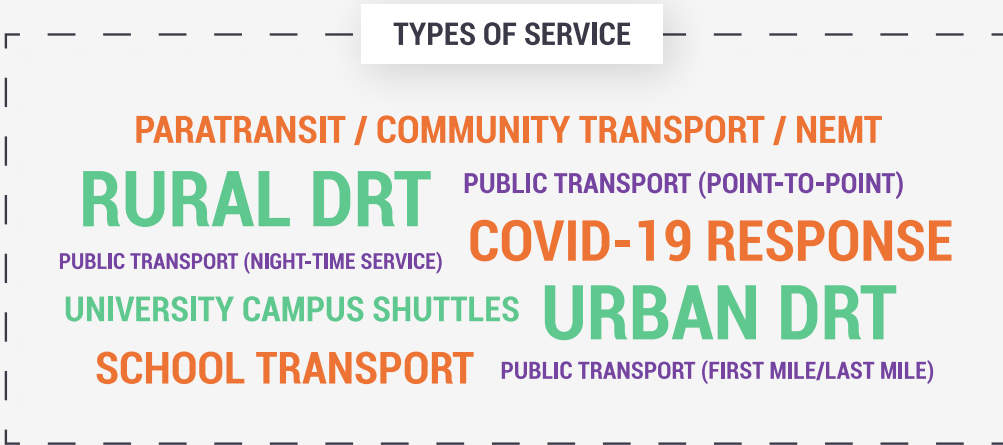
More than 250 projects launched, and still learning

► **A report from Frost & Sullivan predicts the DRT market will be over half a trillion dollars by 2030.¹³**

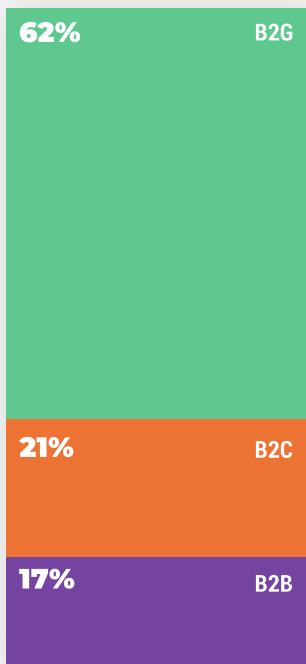
In the space of three short years, there have been more than 250 new Demand-Responsive Transport projects launched across the globe. Some have been discontinued yet over 180 continue to operate in their communities.

One clear learning from these successes and failures is that one size does not fit all. DRT is a customised experience and must be configured to suit the localised conditions of the service zone.

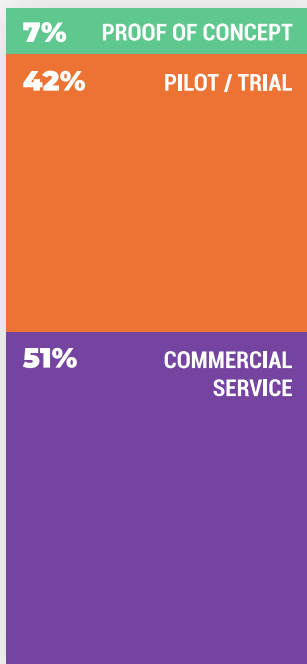
The following information was shared by a Senior Manager City Partnerships, Lukas Foljanty of Moia and showed a world map of all on-demand ridepooling projects at the time. First published in July 2020, the extensive data collection provides an insight to breadth of project types and specific models adopted across the globe.



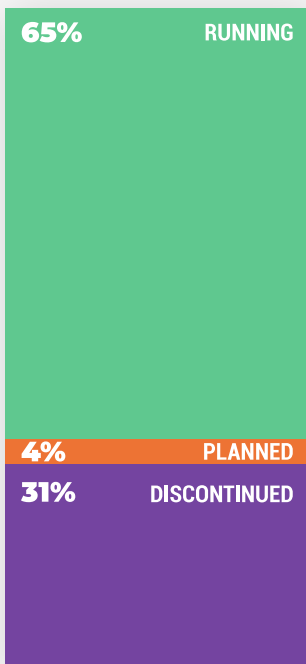
BUSINESS MODEL



PROJECT TYPE



PROJECT STATUS



PART

13

What to look for in your technology partner



A close working partnership between technology provider, fleet Operator, and transport Agency must exist in order for a Rural DDRT project to be successful. Transport networks have been around for centuries in one form or another and local Agencies know their locations best.

The latest 'kid on the block' is the technology platform provider, acting as a partner to help transport Agencies improve their services. The role of technology provider is ultimately responsible for the passenger experience and fleet orchestration, acting as the glue holding the service together. Using the right technology will have a major impact on the success of any project.¹⁴

Recommended capabilities for DDRT technology providers

Live onboard capacity tracking

The ability to easily track onboard vehicle capacity gives you options. It allows you to assess existing services and is the starting point for feasibility work.

Simulation for service design

Allows for 'like-for-like' comparisons and simulations of real-world outcomes with the technology that will be used in the live project.

Configurable fleet operations interface

Increased control over operations allows for planning and communication like never before. Adjustments to shift times and fleet movements as well as direct communication with drivers and passengers in real-time unlocks efficiencies unheard of for fixed-route services.

Shift-change & ops validation

How many times have schedules been modified and not checked or something missed in the reconfiguration? Having the ability to check for any trip request changes means fewer missed trips and adjustments can be made straight away to ensure passenger satisfaction.

Configurable reporting

Access to a real-time dashboard and scheduled reports give you the best ability to make data-driven operational decisions.

One app for both drivers or riders

Removes the need to maintain multiple apps. Less time spent worrying, more time spent improving services and efficiency.

24-hour client support

Ensuring that any issues or enquiries are resolved within an agreed time is paramount. This not only improves services, but it increases trust within your riders.

PART

14

Implementation guide for rural DDRT



01 Goal setting

Goal setting can be broken down into two main categories:

Passenger experience: What types of journeys are you trying to facilitate and what outcomes do you want to ensure? I.e. You want to give more people the opportunity to access a service outside peak periods of the day.

Fleet orchestration: What problem is your DDRT fleet going to solve that is currently not being addressed? I.e. Providing transit to underserved area, replacing an expensive feeder service and saving money.

02 Start data collection

Having a baseline understanding of all patronage data is paramount. Being able to assess onboard vehicle capacity and utilisation of existing fleets makes it easier to commence feasibility work when required.

03 Confirm source of funding

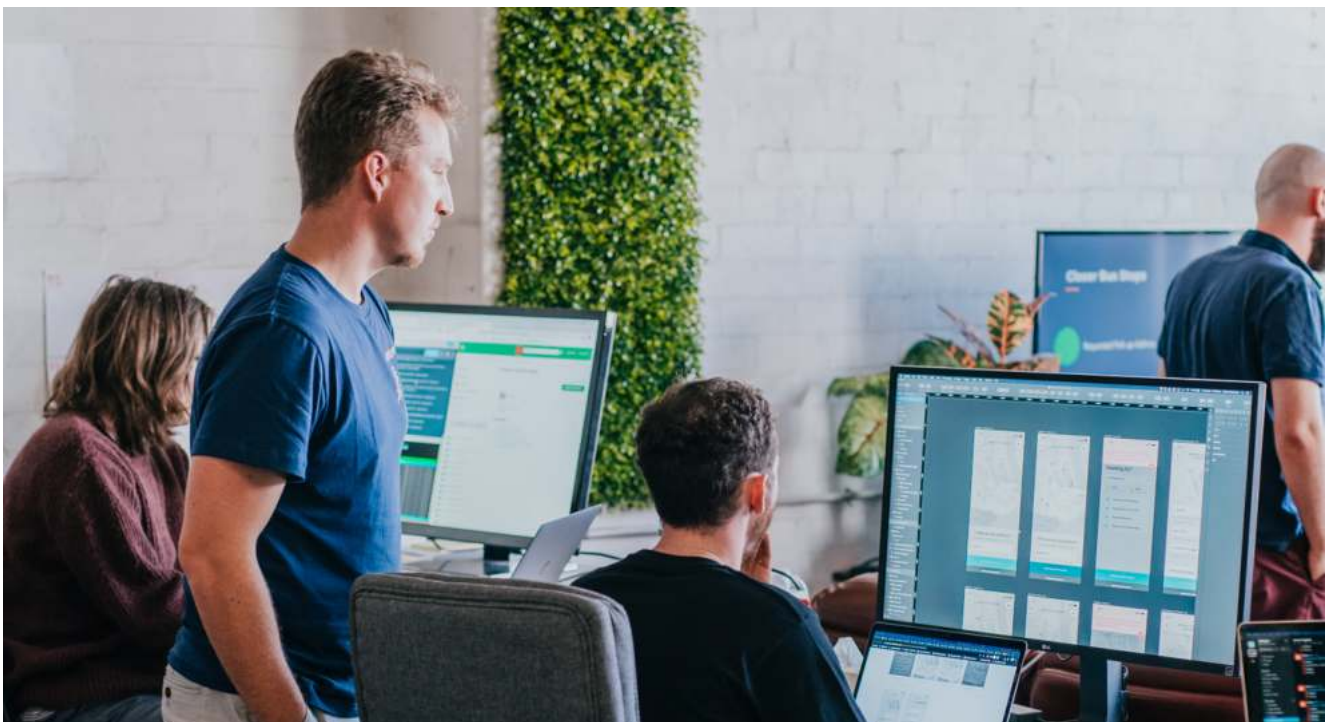
All the aspiration in the world can be for naught if suitable and sustainable funding cannot be sourced to maintain an effective DDRT service. The following questions should be answered before proceeding further:

1. Is there a clear understanding of the process for funding approval?
2. Will this be a government or Operator funded service?
3. What is the approval timeline for funding?
4. What milestones will be required to meet funding requirements?
5. How long is the funding available for?
6. What milestones if any, must be met to unlock additional funding beyond the initial term?

04 Short-list technology providers

Technology providers should be scrutinised and a preferred list formed for selection. Key questions to understand are:

1. Does the technology provider meet the specific localised needs of your proposed service?
2. What simulation and feasibility processes / systems does the technology provider have in place to assess the success of the proposed project?
3. What level of experience does the technology provider have?
4. What are the main differences between technology platforms?
5. What case studies have the provider demonstrated to establish a baseline of capabilities?
6. How flexible is the technology provider?
7. How is support structured to deal with technical and customer enquiries?



05 Vendor interviews

Vendors should be scrutinised with the same assessment criteria to ensure consistency. A live demo of the technology should be used to assess the following:

1. Passenger experience

- Passenger booking and pick up experience
- Number of steps needed to successfully book a ride
- Number and timing of passenger notifications (help queues)

2. Driver experience

- Ease of confirmation of passenger pick up / drop off
- Navigation support and driver directions
- Passenger communication methods
- Driver device distraction (can they do their job with minimal interaction with the device)

3. Operations

- Ability to customise shift times and fleet allocation
- Call centre / phone booking integration
- Manual booking process flow
- Availability of reporting metrics
- Operator, driver, and passenger communications capabilities

06 Feasibility & simulation

Start with a TransitScan

TransitScan™ is a simple way to gain clarity and understanding of the unique benefits Demand-Responsive Transport. We provide a visual representation of the level of access to public transport. This allows you to easily understand where DRT will work and make a strong case for further feasibility studies.

Feasibility and simulation provides a framework for data collection, service design, and simulation of demand. Being able to 'stress test' service demand with the actual technology proposed to power the service provides valuable insight into performance at peak loads. Critical metrics to assess in this stage are:

- Total vehicle-miles travelled during service hours
- Number of rejected passengers that do not get allocated a trip during service hours
- Total passengers per vehicle service hour



07 Confirm service design

Once you have assessed the feasibility report you can make data-driven decisions leading to final service design and configuration. At this point, you should have all the data needed to make a confident, commercial 'go/no-go' decision and move into the configuration and deployment of your service.

08 Service configuration

Service configuration is the most complex stage of any project. This usually involves cooperation across multiple departments to ensure the following is completed within a defined timeline.

- Brand guidelines established
- App design
- Service zone configuration
 - Passenger stop types
 - Fleet sizing and configuration
 - Zone geo-fencing
 - Service hours
 - Operations platform access
 - Farebox / payments configuration
- Configuration or support Service Level Agreements (SLA)
- In-house testing
- App store deployment

09 Marketing & communications

It is vital to have a comprehensive communications and marketing plan outlined prior to launch. It goes without saying that the best service will undoubtedly fail if no-one knows about it.

It is important to ensure a balanced mix of offline and online marketing tactics and use communications channels that align to the consumption preferences of your target audience. The device a person uses to consume their media plays a major role now more than ever. So, it is important to ensure your content is optimised for mobile devices and can be consumed across multiple device types.

Marketing plan considerations

- Define marketing goals
- Target audience research (this is a must)
- Competitive Analysis / Identify points of difference
- Define brand persona and positioning
- Define marketing strategy & key messages
- Identify risks and mitigation strategies
- Marketing channel considerations (not an exhaustive list)
 - Organic Social
 - Web / SEO
 - Advertising (digital/print)
 - Content syndication
 - Email
 - Events
 - Radio / TV
 - In-app notifications
 - Text Message
 - Public Relations
 - Vehicle Branding
- Define a marketing budget
- Have a clear understanding of how you measure success (critical success factors)

Understand what capabilities you have in-house and what you will need to outsource. Will an agency develop this plan for you and execute it?

It's important to ask your technology provider what capabilities they can provide in this space as they will have expertise in marketing a DDRT service. This presents a significant cost saving opportunity when compared to engaging a full-service Agency to develop and execute the marketing and communications plan. This will be key to the deployment of a successful service and reaching your goals.

10 User acceptance testing & training

A technology provider must be able to provide a full program for user acceptance testing and training for drivers and administration staff. Ensuring there is adequate time to familiarise oneself with the platform prior to going live is an important milestone and will ensure smooth customer experiences upon launch.

This may be the first opportunity to experience the platform by many that will be using the service every day (drivers). This is the first time the app and operations platform will get to circulate outside the project team so it's important that there is adequate time to train staff and respond to all enquiries prior to launch.

11 Launch

Realistically the launch should just be a formality. All the hard work and planning will have occurred months earlier as a collection of executables within the marketing & launch plan.

Launch considerations include:

- Launch event and PR opportunities to market the service
- Complete go-live launch or soft launch with a controlled group of passengers?
- Launch promotional program

12 Quarterly performance reviews

Performance or service reviews should focus on a retrospective analysis of the previous period and review all short, medium, and longer-term objectives. The critical success factors identified in the marketing plan should be used to assess performance.

Performance should always focus on two main areas. Below is a series of examples:

Passenger experience

- On-time pick up / drop off
- Rejected passenger volumes and reasons
- Passenger ratings / reviews

Operational efficiency & fleet utilisation

- Passengers per vehicle hour
- Admin operator efficiency index
- Vehicle miles-driven

13 Service adjustments

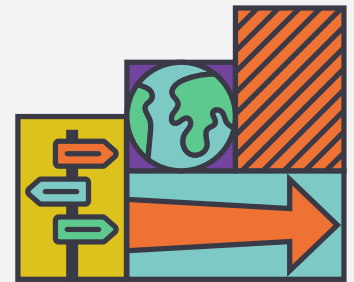
There will always be room for improvement. **If a technology provider tells you they have a “set and forget” platform then steer clear!** As the service adapts to changing demands over time so should the technology platform.

Whilst frequent ‘fixes’ suggest an inadequate technology, strategic and periodic data-driven modifications means your service can adapt to the needs of your service zone. This will ensure you have a sustainable model with a passenger-centric focus.

PART

15

Summary



The transport landscape is changing and the technology that powers these complex networks is too. Dynamic Demand-Responsive Transport is an emerging technology capable of creating savings for Operators and improved service coverage giving members of society more access to much needed services.

Jumping straight into DDRT is not necessary. Start by improving access to data through improved transit tracking, then assess whether DDRT is viable by performing feasibility studies.

The transition to DDRT should be structured, minimise risk and predictable.

Picking an experienced technology provider who can help you accomplish the many tasks required will be key to the successful launch and growth of your DDRT service.

PART

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About Liftango



We believe access to transportation is a fundamental right to members of modern society and connecting people is at the core of what we do. By providing a single technology platform for optimising fleet movements, rural and regional fleet operators have a data-driven approach for enhancing their existing bus services and unlocking the efficiencies of Dynamic Demand-Responsive Transport. The result is one platform for all operations delivering better coverage through convenient and equitable transport for passengers.

If you are looking for a partner to help guide your journey to realise the benefits of dynamic demand-responsive transport systems, [talk to one of our mobility strategists today.](#)

PART

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GET YOUR TRANSIT HEALTH CHECK TODAY!

We'll use our proprietary simulation platform to provide you with a service simulation and feasibility report to kickstart your DRT strategy.

Take the first step and position yourself for success today.

Increase ridership

Increase ridership by knowing exactly where to extend your coverage.

Understand the cost

Understand the cost implications of replacing fixed-routes with DRT.

Get a blueprint for success

Get a blueprint for success by simulating real-world outcomes with the same technology powering multiple projects across the globe.

We guarantee our feasibility results will provide actionable insights for the implementation of DRT or we'll happily provide our technology to run your next project free for a year!

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