The Routledge Handbook of Public Transport

Corinne Mulley, John D. Nelson, Stephen Ison

Flexible transport services

Publication details

John D. Nelson, Steve Wright
Published online on: 13 May 2021

Accessed on: 14 Sep 2023

Full terms and conditions of use: https://www.routledgehandbooks.com/legal-notices/terms

This Document PDF may be used for research, teaching and private study purposes. Any substantial or systematic reproductions, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The publisher shall not be liable for an loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
Introduction

There is considerable experience with flexible transport services (FTS) gained over several decades, yet much uncertainty remains around the most effective way to deploy FTS. This chapter explores the diversity of FTS which embraces a variety of public transport services covering a broad range of mobility products. Examples are drawn from schemes which have been deemed both successful and less successful with the intention of identifying those factors which contribute to good service design.

The chapter is organised as follows. The first section discusses what is meant by flexible transport services and includes a brief consideration of the historical development of FTS. This is followed by discussion of common approaches to evaluation of FTS schemes. The less-documented case of rural FTS is highlighted in terms of experience before overall conclusions are drawn.

What is a flexible transport service?

From their origins in Dial-a-Ride transport services in the 1960s, demand responsive and flexible transport services have grown in popularity. Such services are public transport services which cover a broad range of mobility products – usually operated with small-capacity vehicles (Brake et al., 2006). The key differentiating factor from conventional public transport is that one or more dimensions of the service can be adjusted to meet the actual needs of the user. Typically, this may involve adjustment to one or more of: the route, timing, vehicle, operator, passenger type (e.g. by eligibility) or payment system. The flexibility of each element can vary along a continuum of demand responsiveness from services where all elements are fixed for a considerable time before operation (e.g. a conventional public transport bus route) to services where constituent variables are determined close to the time of operation.

A review of the literature reveals that the terminology used to describe flexible transport services has often been used variously. Dial-a-Ride (and its US counterpart paratransit or specialist transport services [STS] in Europe) is well understood in the literature. In a developing-world context (see also Chapter 18), the term paratransit is used to describe the informal transport sector. As STS opened up to a wider user base from the mid-1990s onwards and services were characterised by small bus operations, the term demand responsive transport (DRT) was
Flexible transport services

popularised (Mageean & Nelson, 2003). Later, the term flexible transport services was coined to recognise the wider variety of transport services beyond bus-based solutions to include taxis and private hire and on-demand car services (such as Uber and Lyft) (Nelson & Wright, 2016). More recently, the term on-demand transport (ODT) has entered the literature, particularly in an Australian context (Currie & Fournier, 2019). Whilst this chapter primarily adopts the terminology of FTS (while retaining a focus on bus-based services), DRT (and other related terms) are used according to (historical) context and the preference of other authors.

A survey of the FTS landscape has revealed a diverse range of applications. A fundamental distinction in the definition relates to the type of user which traditionally was restricted to certain categories of eligible traveller via dedicated/special transport services (from the late 1960s). This was then broadened to embrace general use services which gained popularity with the development of telematics-based applications, many supported by European funding, from the mid-1990s onwards (Ambrosino et al., 2004). Operationally, it is common to distinguish between local and feeder FTS to trunk haul services (examples are considered subsequently) and FTS as a replacement for low-frequency conventional services or as a replacement for fixed-route services in the evening or weekends. FTS have been deployed in low-density rural areas and in niche urban markets.

Enoch et al. (2004) proposed what they termed four composite cases of DRT, distinguishing between:

- Interchange DRT, which provides feeder links to conventional public transport;
- Network DRT, which enhances public transport either by providing additional services or by replacing uneconomic services in a particular place or at certain times;
- Destination-specific DRT, a form of network DRT that serves particular destinations (such as airports or employment locations); and
- Substitute DRT, where a DRT system replaces a fixed-route service.

The first three cases are shown in Figure 17.1, which depicts a flexible feeder for interchange DRT, a flexible rural service accessing a small town for network DRT and a flexible service to a specific location for destination specific DRT.

![Figure 17.1 DRT service typologies](image-url)
Enoch et al. (2004) also proposed a typology for the operational characteristics of DRT, highlighting the importance of the origin and destination relationship in addition to the scheduling, route and vehicle type characteristics mentioned earlier. A variety of operating models based on the origin and destination relationship may be identified and include many-to-one, many-to-few and many-to-many. A more detailed analysis of service typologies is provided by Engels and Ambrosino (2004).

**Operating contexts for flexible transport services**

Historically, FTS have provided dedicated or specialist transport solutions to improve social inclusion for particular groups such as older travellers (see also Chapter 28), often in parallel with the conventional public transport network (e.g. Dial-a-Ride services). Since the 1960s, these services have provided transport for those who could not use conventional public transport services due to vehicle access barriers or difficulties accessing stops. They provided door-to-door service for restricted groups of users. Often duplicating public transport routes, they were very expensive to provide. With no technology to support the booking and vehicle communication process, trips required booking by phone, often days in advance, with no on-day booking capability. Westerlund (2016) notes that some STS achieve large passenger volumes such as in New York City (6M+ pa) and Stockholm (5M+ pa).

Since the early 2000s, in numerous countries across Northern Europe, there has been a discernible trend towards ‘equitable access for all’ policies for public transport, resulting in vehicles and stops becoming fully accessible, especially in urban areas. To support this ‘inclusion for all’ policy outside urban areas and to integrate STS users into the public transport network, open access or public FTS started to replace dedicated Dial-a-Ride services. These offered services for whole communities, including previous Dial-a-Ride passengers, often feeding the conventional public transport network to provide wider access and opportunities (Nelson et al., 2010). Well-documented examples from a mix of urban or low-density areas include Belbus in Flanders, which provides local and rural services; Regiotaxi in the Netherlands, which is a regional service; the former Linkup service in Newcastle upon Tyne (UK), which operated across the metropolitan area (Nelson & Phonphitakchai, 2012) and the CallConnect DRT service in rural Lincolnshire.

Public FTS are often criticised for being small scale and expensive to operate. Indeed, most public FTS (i.e. those that do not have specific eligibility criteria for use) have been introduced with a single vehicle or small number of vehicles serving large areas to plug gaps in conventional public transport services. This is common in rural and peri-urban areas with low densities and these are seen as ‘lifeline’ services fulfilling essential trips for those without access to a private car in areas with no alternative public transport. Recognising that bus services can be difficult to provide in the urban fringe, Mulley and Daniels (2012) discuss the issue of reallocation of resources to demonstrate the role of flexible transport services in improving access to public transport within an existing subsidy budget.

Over the last few years, facilitated by the rapid growth in smartphone ownership and use, a more dynamic form of larger-scale public FTS, operating mainly in suburban areas of cities, has gained momentum. Increasingly termed ‘Microtransit’, this form of FTS operates with sufficient vehicles in the same area to enable almost instant response to booking requests (Volinski & Raton, 2019; Lewis, 2019). It is much closer to a taxi than a bus in terms of convenience. Local authorities in North America, Scandinavia and the United Kingdom are tentatively beginning to experiment with these services to solve public transport challenges in suburban areas (e.g. ArrivaClick in Liverpool and Leicester, UK; PickmeUp in Oxford, UK; (the former)
Flexible transport services

Kutsuplus in Helsinki, Finland; SmarT Ride in Sacramento, US and technology platform providers such as Via, BestMile and Spare Labs which support services in North America, Europe and Australia).

Advances in mobile communications technologies allowing real-time communication with vehicles have supported the development of these new public FTS (see also Chapter 41). Figure 17.2 shows how advances in technology have changed the manner in which FTS can be provided in terms of both the user booking and the communication to the vehicles (see also Wright et al., 2014). The first four columns show a rather slow incremental change as mobile communications to the vehicles bring the response times down, resulting in the need for users to book an hour before travel rather than days before. A decade ago, Mulley and Nelson (2009) identified that telematics-based FTS had the scope to bring public transport closer to the flexibility and convenience of private transport whilst retaining a fare structure more in line with public transport journeys as opposed to the most flexible—a but costly—private hire and taxis. However, the barrier to this remained the vehicle supply, as most areas continued to operate with single vehicles or very small numbers of vehicles so the service could not be immediately available to all users at all times. It is only in the last 5 years with smartphone ownership that anytime/anywhere booking has become a realistic possibility for the wider population, resulting in the demand and need for almost immediate vehicle availability to provide a real-time response. This is ‘Microtransit’ and represents a step change in service delivery for urban and suburban areas where potential demand can justify the larger-scale operation and critical mass of vehicles required for real-time response.

As highlighted previously, a real divergence in the operating models for FTS in rural areas and FTS in urban/suburban areas is emerging, and this represents an important stage in the development of flexible transport services. In more urban and suburban areas, this model is based around providing a viable and convenient alternative to car use rather than providing a socially inclusive service for essential trips. In order to achieve this, the responsiveness and reliability of the FTS need to compete with the private car or at least be close to a taxi in terms of

![Figure 17.2  DRT service typologies](image-url)
availability and convenience while being more affordable. This can only be achieved through provision of sufficient vehicles in the same area to enable almost instant response to booking requests. In purely commercial operations, back office overhead costs for these services are minimised by providing only app-based booking, which also removes operating constraints associated with call centre opening hours. The result is a dynamic FTS that is flexible enough to go to destinations required by suburban residents in their everyday trips (to the shops, school, work, visiting family and friends or for an appointment), as well as feeding the public transport services into the city centre, and responsive enough to be available as and when needed without long wait times or advance booking requirements. The drawback is that many of the policy goals for public FTS relating to inclusive access are being compromised through use of cheaper non-accessible vehicles and lack of a non-digital booking system. To avoid these limitations, several cities are partnering with Microtransit providers in the financing and delivery of services to ensure the service provided remains accessible for all and avoids digital exclusion. The tendency in more rural areas has been to replace poor patronage conventional fixed-route services with a single-vehicle public FTS, often providing connections to intercity conventional bus services (e.g. Lincolnshire CallConnect, which is discussed subsequently). Despite advances in mobile technologies and web-based and smartphone app booking capability, passengers are still required to book at least an hour, often more, in advance of travel. This is due to the single-vehicle nature of these rural services constraining the ability to respond to requests in a more dynamic way.

One of the largest contemporary programmes of on-demand transport trials that explores these different models of operation is currently taking place in New South Wales (NSW), Australia. The trials form a core component of the Transport for New South Wales Future Transport 2056 strategy (Transport for NSW, 2018), which has a focus on managing a more integrated transport network with a strong emphasis on customer experience. A series of ODT services (mostly trials) are offered across Greater Sydney, Central Coast, Illawarra and Newcastle (11) and NSW Regional services (9) (Transport for NSW, 2020). The trial objectives are to identify and test new service delivery models, identify technology requirements, improve customer outcomes and achieve better value for money. As of July 2020, the Metro and Outer Metro services of NSW have delivered >1,012,000 passenger trips (from October 2017) with an average of >37,000 passenger trips/month. The corresponding figures for the Rural and Regional services are >148,000 passenger trips delivered (from November 2018) with an average of >7,000 passenger trips/month. It is acknowledged, though, that such services are expensive to provide, with an average reported cost per trip of $180 (at June 2018) and farebox recovery of 3% compared to 24% for fixed route services.2

Approaches to the design and evaluation of flexible transport services

As already noted, FTS can be found in a variety of operating contexts, and there is a substantial body of literature on the evaluation of such services (see, for example, Ambrosino et al., 2004; Brake et al., 2007; Davison et al., 2014; Mulley & Nelson, 2016; Nelson & Wright, 2012; TCRP, 2008). A recent international evaluation of FTS schemes is provided by Pettersson (2019). Brake et al. (2006), in their DRT Good Practice Guide designed to assist in the provision of the (then) newly emerging telematics-based FTS, identify three key factors to be aware of. The first requirement is to develop an economic framework. This is an aspect of planning for FTS that has been frequently overlooked (see Mulley and Clifton (2016) for further discussion). A robust
Flexible transport services

Economic framework is useful, as it provides a clear method for thinking about the nature of costs and a rationale for linking revenues to costs. FTS are frequently described as being not ‘viable’, which is usually taken to mean that they cost too much (see the example of Kutsuplus in Helsinki below). It is important, however, that the service provider have a clear picture of the costs and revenues associated with a particular operation as well as an appreciation of avoidable costs associated with different time horizons.

Appropriate service design is a critical stage ideally developed with the key stakeholders involved in a FTS scheme. These usually comprise the travelling public, the transport service operator, the transport authority and the funder. Experience shows that there needs to be a willingness for key actors to be flexible; the completion of comprehensive user requirements (Finn et al., 2004), which is a fundamental yet often overlooked stage, and an awareness of the constraints involved in a FTS (space, time, type of vehicle, payment method). Clear guidance on a range of possible service typologies is given in Engels and Ambrosino (2004) and discussed further in Currie and Fournier (2019).

The third key factor for successful FTS provision is awareness raising. The fact that the more flexible a service becomes, the less visible it is to the end user poses an additional challenge from the perspective of service operation. Most customers like the familiarity of bus type and route branding and the way that a service is available (even if they do not use it regularly). It is important that conventional marketing techniques be supplemented by aggressive marketing of the FTS product, for example, through community awareness-raising activities. Strong branding and a willingness to spend money on marketing have been shown to be important contributors to success.

Evaluation methods

There have been numerous FTS evaluation exercises. The EC-funded SAMPO (1996–97) and SAMPLUS (1998–2000) projects developed an evaluation framework composed of three main components (Mageean & Nelson, 2003):

- Assessment objectives and priorities should be identified for the user groups at each site/location;
- An estimate of the impact and effectiveness of the service on the user groups should be completed at each site. To achieve this evaluation, indicators for three assessment categories were defined:
  - economic viability (considering operational efficiency and financial performance);
  - service provision (behavioural evaluation and distributional costs and benefits), and
  - technical performance.
- Assessment of future markets by analysing the benefits to service providers and operators following the implementation of FTS, for example, expected increase in patronage and cost effectiveness of operations.

The importance of good service design and robust evaluation is briefly illustrated in the following through consideration of three FTS scheme cases.

CallConnect is an example of a well-designed successful DRT service which was established in 2001 and has operated on a continuing basis since then. Interconnect (of which CallConnect is an integral component) is a quality network of connecting local bus services designed to improve transport links to destinations throughout rural Lincolnshire in
England. It comprises 10 main fixed-route services and 6 DRT feeder services, which are branded as CallConnect. The feeder services help secure the viability of the fixed-route services. Connections are guaranteed to give passengers confidence, and a taxi is offered as a last resort. A second component of the flexible service is 14 area-based DRT services. Since inception, the service has resulted in the level of unmet need in the communities served being reduced by 90%. Today, the subsidy required for DRT is approximately the same as that required for the former much less effective fixed-route services. This has been achieved by the lower costs of operating eight-seater buses, making this type of operation much more affordable for the level of service provided than conventional services, though the low volume of passengers generated from a deeply rural area means that the subsidy per passenger is always going to be high.

The Kutsuplus DRT service, Helsinki, Finland, is an example of a high-profile failure. The service started in October 2012 with ten microbuses, with an additional five vehicles added in November 2013. It was discontinued at the end of 2015. It used a combination of technologies (automated vehicle location, trip combination optimisation, vehicle routing, and travel time estimates). Users received trip offer(s) by requesting a trip via browser-based interface or via SMS. The service was stop-to-stop, with about 1,000 bus stops in the area and an additional 50 virtual stops. The operating time was 06:00–24:00. The average fare was around €5.5/trip (compared to an average public transport trip of €3). The service was subsidised by the member municipalities of the Helsinki Regional Transport Authority (HSL) region (€16/trip). There were several “service classes” across the pilot period. Trip pricing was based on the fixed starting fee and the km price calculated as the direct distance between origin and destination. The service classes differed in flexibility (economy, fast, “happy hour”), and group discounts were offered.

The ArrivaClick Microtransit service has operated in South Liverpool, UK, since August 2018. There are no fixed routes, with journeys determined by where passengers want to go within an area running from Liverpool city centre to John Lennon Airport in the south of the city. The bus company Arriva worked with the regional transport authority, Merseytravel, to roll out the app-based on-demand public transport service, initially with six 15-seat buses, increasing to 25 vehicles by summer 2019. Passengers can ‘order’ and track a vehicle from the app, which provides them with a guaranteed fare (£2 or less) and allows them to choose their pick-up point and reserve a seat. Computer algorithms match passengers travelling in the same direction, dynamically routing vehicles in real-time to find the optimal route for their trip. The response time is between 5 and 15 minutes. Early indications show that up to 40% of passengers are switching from cars to use the service, and younger passengers are more likely to adopt this form of public transport.

Weckström et al. (2018) identify a number of lessons that can be learned from the Kutsuplus experience in terms of things that could have been done better, and these are strikingly consistent with the factors identified by Brake et al. (2006). End-user analysis (i.e. understanding the requirements of the target market) is essential, and significant effort is required if it is to be done well. Also, the lack of targeted marketing was identified as one of the main failures. Another shortcoming was in terms of service usability and integration with a key recommendation that DRT should use both web, SMS and app-based booking systems, as well as enabling pre-ordering more than 45 minutes in advance. From a user perspective, Kutsuplus contained a range of positive features, and these include a service that was complementary to public transport in areas of low public transport accessibility, low cost for the end user, faster travel compared to public transport, comfortable vehicles and an overall innovative feel to the service.
Flexible transport services

The case of rural flexible transport services

This section considers the particular case of FTS provision in rural areas. As reflected by previous studies (e.g. Ambrosino et al., 2004), FTS has long been considered a key part of the solution for rural mobility; the door-to-door nature of many services can be critical for certain users such as elderly and disabled people. The demand-responsive element means that it can be more economically viable to operate in areas where conventional transport services are unsustainable and, as noted earlier, FTS can also successfully act as a feeder to other services.

The EU SMARTA project (SMARTA 2020) has explored the role of frameworks in the provision and regulation of rural mobility, including how the various frameworks contribute to rural mobility provision (including DRT) and how frameworks can also create barriers to rural mobility. The SMARTA project identified and analysed a number of demand responsive transport ‘good practice’ cases (Table 17.1) with a focus on identifying factors contributing to their success.

A common success factor is collaborative working (e.g. Flexitec, Belgium; DRT Tejo, Portugal; Regiotaxi, The Netherlands; flexible mobility services, Bulgaria and DRT Castilla y Leon, Spain). Successful operations in these cases were commonly dependent upon close working between municipalities, service providers and public transport operators. In the case of DRT Castilla y Leon, Spain, conventional public transport services were redesigned to optimise connections with DRT services. Flexible mobility services, Bulgaria, demonstrated strong public/private co-operation between the local municipality and SMEs operating services. For DRT Tejo, Portugal, co-operation was exemplified by a common administration and booking centre for a range of different mobility services to optimise operational costs. Flexitec, Belgium, similarly, pointed to the benefits of combining resources to deliver services in a rational and creative way, in this instance through partnership working between social services, municipalities, public transport operators and DRT service providers.

For three cases, technology was identified as a key success factor (Village Bus, Sweden; Prontobus, Italy and on-demand pooling services, Spain). For the Village Bus initiative, web-based booking and management of operations was a key enabler and benefitted both end users and operators. The on-demand pooling services in Spain identified app-enabled booking for the

<table>
<thead>
<tr>
<th>Table 17.1 Factors contributing to successful rural DRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility service</td>
</tr>
<tr>
<td>Demand responsive transport</td>
</tr>
<tr>
<td>Technology</td>
</tr>
<tr>
<td>Addressing social exclusion</td>
</tr>
<tr>
<td>Close attention to local needs</td>
</tr>
</tbody>
</table>
user and the efficiency of the software algorithm for planning services as being important factors in ensuring customer satisfaction and operational efficiency respectively. The Prontobus initiative was essentially a technology upgrade for an existing DRT operation. The new software allowed for real-time information provision and booking services for users by app or web. The software also enhanced back-office operational efficiency, enhanced service monitoring opportunities and enabled communication with the driver via a tablet.

A number of cases identified addressing social exclusion as an important success factor (Suffolk Links, UK; Western Region DRT [WRDRT], Australia; Regiotaxi, The Netherlands); indeed, social inclusion is a motivation behind many FTS schemes. For WRDRT in Australia, services were targeted towards socially disadvantaged groups to enhance their mobility and level of social inclusion. This approach yielded social, health and safety benefits – the latter due to the reduction in the requirement to drive for people who were losing confidence in their driving abilities. Similarly, for Suffolk Links, the focus of operations was on households in areas overlooked by public transport. In both cases, a focus on low-cost fares was deemed important to ensure patronage by low-income groups.

Close attention to local needs was a success factor for all DRT good practices. Of particular note in this regard was the Bummelbus in Luxemburg, where services were extended to support participation in after-school activities by children. The Village Bus in Sweden utilised volunteer drivers with clear understanding of local needs. For DRT Castilla y Leon in Spain, effective design and planning of services was deemed a critical success factor and involved close community engagement in identifying gaps in public transport service provision and ensured shared services responded directly to local needs.

For the majority of rural services, funding the service remains the biggest barrier to implementation and long-term sustainability. The cost of provision far exceeds the revenue generated. In rural environments, there is little scope to increase revenues significantly, since the passenger numbers are relatively low and fares are often equivalent to conventional bus, as these services are often bus replacements serving essential trips. This differs from the Microtransit emerging in urban/suburban areas, which offer a more responsive service and which can be viewed as closer in nature to a taxi. In rural areas, total fare revenue frequently does not cover driver wages, and subsidy requirements are often required for 60% of operating costs. Integrating statutory health and education transport demands into the design of the flexible service can bring in extra funding for the service from these public-sector budgets (Mounce et al., 2018). Where this is not possible, it becomes necessary to reduce operating costs through use of smaller vehicles (Wright, 2013) and lower-cost providers (Mulley et al., 2012). In particular, there have been an increasing number of rural FTS services delivered by community transport providers, often using volunteer drivers and volunteer booking staff.

In evaluating good practice, it is important to capture the ‘hidden’ social benefits, for example, for health or wellbeing. Rural mobility solutions are often more about meeting social needs rather than just providing transport. Indeed, it is the activity that the transport supports which is important, such as accessing a service. The cost to society of not providing such services is many times higher than the cost of transport. A missed hospital appointment due to a lack of transport is valued at around £126 (at 2015 prices). If people are unable to leave their homes, services especially for elderly and disabled may be required to be brought to their home: For example, in rural Scotland, a doctor home visit is £100 more than a surgery appointment; a nurse home visit is £52 more than a surgery consultation; Meals on Wheels costs £20 per meal, and home help costs are £15 per hour (Nelson et al., 2017). Much of these costs could be avoided when people have transport to access services provided in their communities.
A rural mobility solution which is successful in one context cannot be assumed to be replicable in another (different) context with the same level of performance (Buchanan & Partners, 2003). The objective of a transferability analysis is to use the results of a “system” or solution implemented at one location to assess the validity of that system if implemented at an alternative site. An understanding of market environments (e.g. deregulated or not) is important and should be taken as a precondition in terms of knowledge required by those assessing the potential for transferability. Current market demands and objectives of local authorities and operators should also be established at the location in question. Finally, it is expected that the effectiveness of the current mobility offer, and the extent to which market demands will be met by the proposed new intervention within available funding streams, will be considered. Hence, it is better to think about ‘best fit’ rather than a literal transfer of solutions and to focus on adapting solutions to different local contexts.

Conclusions

This chapter identified the considerable experience with flexible transport services gained over several decades. Nevertheless, there is still uncertainty around the most effective way to deploy FTS. This chapter has explored the development and impact of FTS across a variety of applications and concludes in this section with a summary of key findings and some suggestions for further research.

An important finding for service design is that the most appropriate service type for an area depends on many factors – but mainly the demand or potential demand. This means that different business models are required in rural and urban/suburban areas. Importantly, the social value of FTS is high in rural areas (e.g. lifeline services), yet this is a factor often overlooked by many assessment and evaluation studies. There is evidence of commercial opportunities for FTS being pursued in urban/suburban areas where it can be positioned as an alternative to car use.

For both the urban/suburban and the rural model of FTS delivery, there are several important considerations. It is advisable to build upon a core of existing services (i.e. to use FTS to complement, not supplement). It is noticeable that Microtransit start-ups have often been in direct competition with public transport rather than complementing it, offering a higher-quality service for slightly higher fares. This reinforces the need for partnership with local transport authorities to promote integration with public transport services or replace poorly performing public transport services and to compete with the private car rather than duplication that competes with public transport services. To achieve this, it is important to design a flexible service that responds to identified community needs (this requires the need to earn community support and involve community leaders and to communicate to all stakeholders). Another requirement is to choose the most appropriate vehicles (taking account of size and need for wheelchair access, environmental considerations and cost). Finally, it is essential to ensure that the technologies adopted are suitable for the local context and user requirements and do not create barriers (travellers do not appreciate having to download and book using a different application for adjacent trials).

Despite the lessons learned from the great wealth of experience with FTS, there are a number of open questions which would benefit from further research. Prominent amongst these is the need to design a network which truly integrates FTS and fixed-route services (some of which in future may be operated by autonomous vehicles). In this respect, achieving fare integration between FTS and fixed-route services remains important, as does the need to raise awareness about what FTS is and how it works. More research into the commercial viability of Microtransit services is required, including research into the best areas to implement such services...
services. Mobility as a Service (MaaS) systems might help overcome the fare integration issue, but more research is needed on how to best include non-timetabled (flexible) public transport services within MaaS. This is more likely for Microtransit solutions, where an ‘always available’ service exists. In the short term, these future requirements of FTS design and operation should be seen in the light of the impact of the COVID-19 pandemic, which is likely to make travellers more wary of travelling in smaller confined spaces, although the ability to book ahead may be considered an advantage. It will be necessary to consider the effect that COVID-19 will have on market demands and operator supply and whether this will lead to more or less interest/need for FTS solutions. For example, it may be that passengers spread in small groups across smaller vehicles (FTS) are better than larger numbers of passengers socially distanced on fewer large vehicles (conventional buses) – at greater cost of provision but with greater flexibility of operation.

Notes


2 These figures should be treated with caution, since they represent a snapshot within the first year of operation but are nevertheless indicative.

3 Available at: https://ruralsharedmobility.eu/good-practices/

References


Finn, B., Ferrari, A., & Sassoli, P. (2004). Goals, requirements and needs of users. In G. Ambrosino, J. D. Nelson, & M. Romanazzo (Eds.), Demand responsive transport services: Towards the flexible mobility agency (pp. 33–54). ENEA.
Flexible transport services


