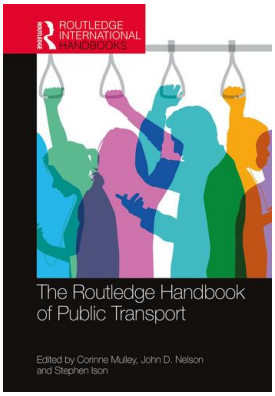

The Routledge Handbook of Public Transport

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The provision of service information for public transport

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THE PROVISION OF SERVICE INFORMATION FOR PUBLIC TRANSPORT

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Introduction

The provision of information is of great importance for public transport. It can help to achieve objectives related to creating awareness; informing target markets; influencing attitudes and behaviour; and encouraging preference, repeat business, and loyalty. Depending on the objectives, information can be about the service or the brand. Service information primarily relates to the journey (e.g. to inform target markets about routes, schedules, pricing), while brand information can also be non-journey related (e.g. to raise the profile or image of the service, persuade passengers to switch from alternative transport, encourage loyalty). The main focus of this chapter is on the provision of service information. This is closely linked to marketing communications, which is concerned with the messages and media used to communicate with target markets. Messages are essentially the information that is provided, while media are the tools used to store and deliver information. In a public transport context, service-related messages typically include information on travel planning, routes and schedules, tickets and prices, service changes, disruption and delays, and customer services and practical information such as Wi-Fi access and onboard entertainment; food and drink; accessibility and assistance; and travelling with animals, baggage, or special items. Media typically includes signage, printed materials, information kiosks or displays, television, radio, telephone, newspapers, newsletters, exhibitions or visits, help points, information offices, call centres, ticket offices or machines, public address systems, websites, social media, and mobile technologies. This is by no means an exhaustive list of messages and media. However, it provides an indication of the many options available.

In the past, service information was only really provided to broad audiences via traditional messages and media, for instance, printed route maps and published timetables and fares. This is static information because it is only updated occasionally and when changes to the service are made. Traditional messages and media are still widely used. However, they have been increasingly replaced with new approaches. For instance, Mulley et al. (2017) explain how Sydney trains have increased the use of digital versus printed messages and media. This is because the communications landscape has changed dramatically during the last few decades and continues to do so for two main reasons. First, prior to the COVID-19 pandemic, there were growing levels of mobility in society and a greater focus on the use of public transport, for instance, as a more sustainable alternative to the car. Many countries and larger cities in particular world-wide

have experienced increased demand for public transport and from a greater proportion of the population. There are now greater demands on service quality, and markets are more fragmented (e.g. in terms of their needs and expectations). Second, the digital revolution continues to impact society and change the way people consume information. It provides opportunities for public transport operators to invest in new messages and media such as real-time information (RTI) systems. More recently, there has been growing interest in user engagement where operators seek to target more narrow audiences, or even specific individuals, with customised information and interact with users, for instance, via experiential initiatives or digital media rather than treating them as passive recipients of information.

This chapter reviews current knowledge and key trends on the provision of service information for public transport. The next section considers the traditional approach of providing static information and the importance of standards. The growing interest in RTI is then considered. This is followed by a look at user engagement – interactive and more personal approaches to the provision of information. The chapter concludes by highlighting several areas of interest for future research.

User information

Static information

Users of public transport require clear and accurate service information that is readily available and easy to understand (EMBARQ, 2011). To achieve this, public transport operators develop user information systems that offer messages via a range of media located throughout the transport network, for instance, consisting of signage, displays, maps, timetables, information kiosks, ticket offices and machines, and help points. This has traditionally consisted of static information that rarely changes. It may be viewed by users (e.g. at a station or stop, on board the vehicle or in the street), or it may be printed and available to users to take away, as is the case with a printed timetable. Information should be located where users need it most, for instance, where decision-making is most likely to take place. The information should be simple yet informative. It should also be meaningful, intuitive, and easy for all to use, taking into account the needs of people with disabilities, and the need to be presented in multiple languages.

Design considerations are important (EMBARQ, 2011). These typically include choices regarding the font and colours to be used, how the information should be presented (e.g. in terms of layout), whether it should be provided in visual and/or audio format, what type and quality of materials should be used, whether it needs to be illuminated (e.g. at night), how it will be kept clean (e.g. from graffiti or bird droppings), and whether it will have a modern or more traditional feel to it. Standards should therefore be applied throughout the system. This is important for maintaining a clear and consistent brand. To achieve this, many operators publish guidelines. For instance, Transport for London (TfL) is responsible for public transport in Greater London. TfL publishes a set of design standards that are essential to maintaining a high level of quality and consistency in its provision of information (see Transport for London, 2020). The standards allow TfL to ensure the correct positioning of branding elements, the correct use of corporate typefaces, and compliance with the UK Equality Act 2010 (UK Government, 2010). They also aid in promoting safety by making sure the messages help passengers use the transport network with ease and confidence. TfL is responsible for various modes of transport across Greater London, so it produces a range of design standards for each mode. These can be used by staff, suppliers, and design agencies. While the guidelines for each mode vary, there are also some common standards.

Real-time information

The provision of RTI has been made possible by advancements in technology during the last few decades and is increasingly provided by public transport operators. It allows users to make more informed decisions about their trip and is recognised as a necessary component of major public transport networks, for instance, in Europe (Politis et al., 2010) and the United States (Harmony & Gayah, 2017). The latter found that almost 70 percent of the 58 public transport operators they surveyed in the United States offer RTI.

RTI is typically delivered via any electronic media with display screens and automated public address systems being common choices at stations or stops, or onboard vehicles. Information provided typically includes expected departure or arrival times based on data collected from automatic vehicle location systems and is often combined with data collected from systems that capture other information, for instance, on traffic congestion, weather conditions, or incidents. Data allows the information system to compare the real-time situation with the published timetable. Information provided typically includes the next available service but also several later ones, providing both published and expected times. The cause of any disruption or delays and advice on connecting services or alternative travel arrangements may also be provided. As with static information, the needs of people with disabilities or the need for multiple languages should be considered when deciding how to present the information. Increasingly, systems are used to provide a wider range of RTI such as a list of stops, vehicle length or number of carriages (e.g. of a train) and therefore the expected location of it on the platform, vehicle type and capacity, and seat availability. However, the most valued types of information tend to be related to the location and subsequent departure or arrival time of the vehicle (Harmony & Gayah, 2017).

Investment and maintenance costs for RTI systems can be high, and lack of funding is typically the main constraint for operators seeking to introduce or improve such systems (Harmony & Gayah, 2017). It is therefore important to understand the value of them. Dziekan and Kottenhoff (2007) conduct a mind-map exercise on possible effects of RTI displays at public transport stops. They identify seven possible effects:

> reduced wait time; positive psychological factors such as reduced uncertainty, increased ease of use and a greater feeling of security; increased willingness to pay; adjusted travel behavior such as better use of wait time or more efficient travelling; mode choice effects; higher customer satisfaction; better image.
>
> (Dziekan & Kottenhoff, 2007, p. 1)

Furthermore, the availability of RTI and the quality of information provided has been found to enhance perceived usefulness and ease of use of public transport, which subsequently influence use intentions (Kaplan et al., 2017). Politis et al. (2010) found that the provision of RTI increases bus usage by 1.8 percent or approximately 320,000 new passenger trips with an estimated total value of €160,000, which goes some way towards offsetting the investment and maintenance costs for the system. Brakewood et al. (2015) report an increase in weekday bus usage of 1.7 percent as a result of the provision of mobile-based RTI. However, the increase is concentrated to larger routes. Tang and Thakuriah (2012) found that the provision of RTI increases bus usage; however, the average increase is rather modest, so while the provision of RTI is generally found to have a positive effect on use of public transport, there is some uncertainty over how great an impact it has.

The provision of RTI does, however, seem to have a significant effect on waiting time. Watkins et al. (2011) conducted a study on the impact of real-time next bus countdown information. Their study found that perceived wait time is greater than actual wait time for those without RTI. However, those using RTI did not perceive their wait time to be longer than their actual wait time. RTI users reported an average wait time of 7.5 minutes versus 9.9 minutes for those using traditional arrival information – a difference of about 30 percent. Brakewood et al. (2014) also quantify the benefits of RTI for bus users, comparing users of RTI with non-users. Wait times are almost 2 minutes less for users of RTI compared to non-users (this is similar to the time difference observed by Watkins et al., 2011). In addition, users of RTI have lower levels of anxiety and frustration when waiting for the bus compared to non-users. They also have higher levels of satisfaction with perceived waiting time and frequency of the service. The findings therefore suggest that RTI improves the passenger experience of waiting, which is a common pain-point for bus journeys.

The provision of RTI also plays an important role in times of service disruption or delay (Papangelis et al., 2016). Public transport services do not always run exactly to their published timetable. Disruption and delays can occur that affect the user's journey not only in terms of when they depart or arrive at their destination but also in terms of whether they make any planned connections with the same or other modes of transport. Disruption and delays can be a great cause of frustration and affect the user's confidence in using the service, which may subsequently reduce the likelihood of their repeat business and loyalty. This is supported by Brakewood et al. (2014, p. 1) who state that: "Public transit agencies often struggle with service reliability issues; when a bus does not arrive on time, passengers become frustrated and may be less likely to choose transit for future trips". The constraint of funding RTI systems was mentioned earlier. However, if the provision of RTI can combat perceptions of unreliability, it may be a cheaper alternative to other efforts to improve on-time performance (Watkins et al., 2011).

User engagement

Sarker et al. (2019) mention how the traditional approach to providing public transport information involves operators as active communicators of information, while users are passive recipients. However, the changed communications landscape means that it is no longer enough to simply communicate to users of public transport. Instead, operators need to interact and engage with them at different stages of their journey. This represents a shift from mass to niche communications and is based on a more continuous approach that seeks to nurture long-term relationships. It compares to traditional approaches discussed so far in this chapter that are characterised by disconnected, point-in-time communications. By interacting and engaging with users, operators can encourage reciprocity and active involvement by enabling them to share information which may subsequently increase information quality, use, and loyalty.

Experiential initiatives

Engagement may be encouraged in offline spaces, for instance, via experiential initiatives that provide live interactions. These are sometimes used by operators to inform users about new public transport systems or changes to existing systems as part of a user education programme (see EMBARQ, 2011). The House of the Tramway and Major Projects provides a good example of this. It was launched in 2017 to inform target markets of work related to the 2019 tramway project in Caen la mer and of other major projects in the city of Caen, France. The house was a physical place of information and exchange and allowed the public to access practical

information and find out more about planned works. A large space in the house was dedicated to a permanent exhibition about the future tram service. In addition, ambassadors were present to interact and engage with the public (Communauté urbaine Caen la mer, 2017).

Prototypes are also used to show how new infrastructure or services might work in practice. For example, the city of Umeå in Sweden commissioned a prototype bus stop to be featured at the EU Arctic Forum, which was held in the city in 2019. The bus stop was designed to improve waiting conditions for passengers using public transport in the Arctic regions where adverse weather conditions are common. The stop has lights and sounds to alert passengers about approaching buses, thus allowing them to relax and take shelter rather being exposed to the elements while waiting for the bus (Ravenscroft, 2019).

Websites

In terms of engagement in online spaces via digital media, the main options used by public transport operators are websites, social media, and mobile applications. Websites are commonly used, but there has been little coverage of them in the literature. One exception is EMBARQ (2011), who mention how websites can be used to feature important information, for instance, route maps and schedule information, including potential disruptions or other factors that may affect journeys. However, they note that the information itself is not enough and that websites also need to be user friendly and well designed and conform to brand standards.

Although rather outdated, Transportation Research Board (2002) provides a synthesis of best practice on the effective use of websites by public transport operators. The report has a chapter on next directions for public transport websites where it lists trip planners, RTI, customer relationship management (e.g. through subscription to and mailing of e-newsletters with a variety of information), and e-commerce (e.g. sale of tickets or other services or merchandise) as key trends for the future. All of these are focused on by public transport operators today. In addition, websites increasingly offer links to social media for two-way communications, and there is growing interest in the provision of live online chats with staff or chatbots – the latter being an artificial intelligence that customers can communicate with.

Social media

One of the first social media sites was the social networking site Six Degrees, launched in 1997. There are now 2.5 billion people worldwide using Facebook alone (Statista, 2020a). Public transport operators have responded to the growth in social media by joining key sites, and some of the largest operators now have an impressive number of followers. For instance, TfL has 2.5 million followers on Twitter, 425,000 on Facebook, 163,000 on LinkedIn, 125,000 on Instagram, and 47,000 on YouTube. Liu et al. (2016) examine social media site use at 43 of the top 50 public transport operators in the United States. The three most popular are Twitter (used by 100 percent of operators), Facebook (93 percent), and YouTube (81 percent). Other popular sites are Instagram and LinkedIn.

Uses of social media are covered extensively in National Academies of Sciences, Engineering, and Medicine (2012). The report is based on a survey of 34 public transport operators in the United States and Canada. According to the findings, public transport operators adopt social media for five main reasons: (1) to provide timely updates (e.g. with RTI and advisories), (2) to provide the public with information (e.g. about services, prices, and planned works), (3) citizen engagement (to take advantage of the interactive nature of social media to connect with users in an informal way), (4) employee recognition (for recognising existing employees

and the recruitment of new employees), and (5) entertainment (to display a personal touch and entertain users). Similarly, Liu et al. (2016) find that social media is most commonly used by public transport operators to respond to comments and to notify people about transport system changes and transport options available.

Social media is cheap, quick, and easy to use. This means that even operators with small networks and limited finances can set up social media accounts. The speed and ease of using social media, along with its potential reach, means that it is particularly useful during disruptions or emergency situations when messages need to be communicated to target markets as quickly as possible (e.g. see Cottrill et al., 2017 for an example of how Twitter was used to manage disrupted services during a major sporting event). However, the relative speed and ease of use means that messages can be posted too quickly by staff without proper control over facts and quality of content (see also Chapter 24). Managing staff access to social media is also difficult given that the distinction between personal and professional lives is increasingly blurred. In addition, it is not possible to control comments from users that may be misleading to others or negative about the brand. Indeed, in their sentiment analysis of posts on Twitter, Collins et al. (2013) find that users are more inclined to post negative as opposed to positive messages. Any negative messages can spread quickly and damage the brand, especially if managed poorly. But at the same time, quick and effective responses from management can turn negative situations into positive ones. Social media can also be time consuming to manage and maintain, especially for operators that have a large following on multiple sites, such as TfL, with approximately 3.3 million followers on five different sites.

According to National Academies of Sciences, Engineering, and Medicine (2012), other issues associated with social media include accessibility (e.g. for people with disabilities or for those that do not use social media), security (in terms of added exposure to cyber threats), personal privacy (which is a challenge given that social media is typically governed by the privacy policy of the platform rather than the public transport operator), archiving and records retention (to comply with rules that apply to other electronic or paper records), and keeping up with change in what is a dynamic environment. There are also challenges associated with integration – coordinating activities and information on social media with other platforms and activities, identifying revenue opportunities associated with social media, and developing metrics to evaluate the costs and benefits associated with using social media. Regarding the latter, Liu et al. (2016) find that public transport operators commonly use metrics such as the number of subscribers; number of people that receive RTI; number of people that provide feedback; and the perceptions and sentiments of people, for instance, regarding reliability of service and perceived environmental friendliness. However, more advanced social media metrics are needed that provide a deeper understanding of the benefits.

Mobile applications

There are approximately 3.5 billion smartphone users worldwide, with penetration rates of 76 percent for advanced economies and 45 percent for emerging economies (Statista, 2020b, 2020c). In line with this, many public transport operators, at least in developed economies, have launched dedicated and branded mobile applications, many of which are now among the most popular travel applications in their respective countries. The example of Norway is shown in Table 25.1, where several public transport applications feature among the top 30 travel application downloads in 2019. This includes Vy, Ruter, Flytoget, Lime, Skyss, Entur, Kolumbus, AtB Mobillett, and Brakar Billett. Note that some have separate applications for travel planning (e.g. RuterResie, Skyss Reise, Kolumbus Reise) and ticket purchases (e.g. RuterBillett, Skyss Billett, Kolumbus Billett).

Table 25.1 Top 30 iPhone travel applications in Norway 2019

Rank	*App*	*Main sector*
1	Vy	National rail and bus
2	RuterBillett	Public transport for Oslo and Viken
3	RuterReise	Public transport for Oslo and Viken
4	SAS	Airline
5	Norwegian	Airline
6	Booking.com	Lodging search engine
7	Airbnb	Online marketplace for lodging
8	Flytoget	Oslo Airport Express Train
9	Skyss Billett	Public transport for Hordaland
10	Lime	Electric scooter and bike sharing
11	Google Earth	Mapping
12	TripAdvisor	Reviews
13	Entur	Public transport journey planner
14	Flightradar24	Flight tracker
15	Uber	Ride sharing
16	Hotels.com	Lodging search engine
17	Kolumbus Billett	Public transport for Rogaland
18	Norwegian Customs	Customs quota and payments
19	Ving Norge	Tour operator
20	Skyss Reise	Public transport for Hordaland
21	Europeiske App	Travel insurance
22	Widerøe	Airline
23	Google Street View	Mapping
24	AtB Mobillett	Public transport for Trøndelag
25	UT.no	Norwegian Trekking Association
26	Wizz Air	Airline
27	Trivago	Travel search engine
28	Kolumbus Reise	Public transport for Rogaland
29	TUI Norge	Tour operator
30	Brakar Billett	Public transport for Buskerud

Source: Leading iPhone travel applications by downloads in 2019 on the AppStore in Norway

Mobile applications of public transport operators typically allow users to set up a profile where they can personalise settings. This also allows for customer relationship management (e.g. through loyalty programme activities) and gamification (e.g. with competitions and social activities) (Yen et al., 2019). The main function of mobile applications tends to be for travel planning (e.g. to access departure times and mode) (Jamal & Habib, 2019). It is also common to provide information on prices, trip duration, platform number, vehicle type, maps, and other wayfinding services. The integration of RTI has become a key feature on most applications with the provision of status updates and information, including whether there is seating or standing room only on the vehicle. The integration of RTI is important because mobile applications have been found to be the preferred option for receiving such information (see Harmony & Gayah, 2017). Furthermore, mobile-based RTI has been found to reduce perceived and actual wait time for public transport and improve the travel experience by making information available to users before they reach the stop (Watkins et al., 2011). Additional features allow users to personalise applications such as with saved or preferred journeys to get one-click travel suggestions, widgets

to see updated RTI or saved journeys without opening the application, comparisons and filters for transport mode preferences (e.g. bus, walk, bike), and the option to set how fast you walk and to receive push notifications (e.g. regarding disruptions or delays).

A key development in recent years is in ticketing, with opportunities for mobile-based purchases, ticketless travel, purchase history, and receipts. Coinciding with this is the trend for more payment options. For instance, RuterBillett (listed in Table 25.1) allows ticket payments using Visa or MasterCard (that can be saved in the application), Vipps (that connects card payments to phone numbers), Apple Pay (that uses payments from an e-wallet), PayPal (an online payments system), and AfterPay (a buy now and pay later service). Mobile applications may also offer e-commerce and merchandising opportunities and feedback and/or customer service functions (including contact details for help and information or live chats). However, a key to their success seems to be in keeping it simple and focusing primarily on travel planning and/or ticketing. The service provider's website can then be used to provide more detailed information, so it is useful to provide a link to the website from the mobile application.

Previous studies have investigated success factors for and outcomes of mobile applications in public transport. For instance, Schmitz et al. (2016) investigate how application usefulness and usability can influence perception of the service provider and quality of service. Their study analyses data from 197 public transport mobile application users in Germany. Results indicate that information fit to task, convenience value, and speed of transaction affect perceived usefulness. Moreover, ease of understanding, intuitive handling, and reliability were found to drive perceived ease of use. Their findings also identified perceptions of overall service quality, firm innovativeness, and subjective firm knowledge as outcomes of mobile application use, therefore emphasising the benefits of developing company owned mobile applications and encouraging customers to use them.

There are also claims that mobile applications influence travel behaviour. For instance, Shaheen et al. (2016) identify 11 potential impacts: (1) cognitive impacts – because their powerful search capabilities can alleviate cognitive burdens; (2) improved actual and perceived control for users over their journey; (3) privacy safeguards to encourage and shape use; (4) improved trust in the service provider; (5) enhanced user experience and therefore greater use of public transport; (6) reframed norms and defaults about transportation choices, for instance, regarding the ease of mobile ticketing; (7) cheaper public transport and changed perceptions of value; (8) availability of information in a way that shapes behaviour; (9) social pressures that shape desired travel behaviour; (10) mitigated risk and therefore influence over travel choices and behaviour; (11) the offer of incentives in favour of one behaviour over another. Shaheen et al. (2016) also discuss current challenges associated with mobile applications, for instance, regarding privacy concerns, the provision of open data and interoperability among different services and transport modes, the authorisation of third-party applications, and accessibility (e.g. for those with special needs, non-users, users in rural and less urban areas, or those affected by the digital divide such as low-income groups or the elderly).

Key trends in recent years have seen a growth in third-party developers of mobile applications for public transport, especially in the areas of open source, sharing, and gamification. One open source application that has been referred to several times in the literature is OneBusAway (e.g. see Camacho et al., 2013; Ferris et al., 2010). This is open-source software that offers RTI for public transport. It is maintained by a non-profit organisation called Open Transit Software Foundation. It uses GPS feeds and therefore does not require an automated vehicle location solution. The open-source nature of the application means that public transport operators or other partners can contribute to and update the application. It has traditionally been used to provide RTI for bus services. However, it can be used for multiple modes of transport. In 2019,

a feature was added to enable users to receive notifications (e.g. via vibrations, alerts, or audio) on how far they are from their destination, when they are approaching their stop, and where the vehicle is located in relation to streets and landmarks. This is particularly useful for people with disabilities.

With regard to trends in sharing, Tiramisu Transit is a mobile application for bus users in Pittsburgh, United States. It crowdsources RTI for bus services. Information includes estimated arrival times, how full the bus is, and rider experience, and it is based on a combination of GPS data and information that is crowdsourced in real time from users of the mobile application. As a result, the application is able to provide RTI for parts of the service where users have the application active on their phone without requiring an automated vehicle location solution. When crowdsourced RTI is not available, the application shows the published schedule information or provides estimates based on historical data.

Sarker et al. (2019) examine willingness to share travel information via a public transport mobile application. Their study is based on data from over 1300 people from Innsbruck and Copenhagen (cities that differ in size and level of social trust). Their findings show that the most important motivations for sharing are pro-sharing social norms and self-actualisation weighted against expected effort (e.g. of using the application). Trust in the information provided and social network engagement are secondary motivations, while perceived information quality and need of communication are less influential. There is then a positive relationship between motivation to share information and interest in service level and RTI and also in the use of public transport. Residents of Copenhagen in Denmark (with relatively high social trust) were found to have a higher level of motivation for information sharing compared to residents of Innsbruck in Austria. The likelihood of users to recommend a service is expected to be related to satisfaction with the service. For instance, Diab et al. (2017) find that satisfaction with the service increases the likelihood of recommending it to others. The most important service attributes in their study are satisfaction with waiting time, travel time, and onboard experience.

Gaming is another key trend, and Di Dio et al. (2018) provide an example of the mobile application-based game called TrafficO^2. It brings together local businesses as sponsors in the application. Commuters are informed of the options available to them when making mobility choices and are rewarded with "O^2 points" when they opt for more sustainable choices (e.g. by foot, bike, public transportation, vehicle pooling, or car sharing). In line with Filsecker and Hickey (2014), the aim is to decrease congestion and pollution through an educational game that rewards sustainable choices.

Initiatives like TrafficO^2 and OneBusAway are not led by public transport operators. However, the information or incentives provided by them are likely to increase demand for public transport, so there are clearly mutual benefits to be gained from getting involved and making sure that the correct information (e.g. on routes and schedules) is shared with them. Operators may also decide to share data with other third parties such as Google Maps or to collaborate with the mobile applications of other local, regional, or national partners. A good example of collaboration can be found in Norway, where a government-owned company called Entur has developed a mobile application for travel planning that aims to provide a national hub for public transport information in the country rather than being limited to individual modes or constrained by county boundaries as most public transport applications are. Entur's mobile application also offers sales and ticketing services for a growing range of transport modes. Collaboration is vital to the success of Entur's travel planner, because it operates the national registry for all public transport in Norway, collecting data from 60 public transport operators. The registry contains data from 4000 routing tables covering 60,000 stops and 110,000 boarding points (Entur, 2019). The travel planner, and the registry data that goes into it, allows the public to

plan door-to-door journeys across Norway and seems to have had a great deal of success, with 160,000 application downloads, 24 million tickets conveyed, and 4 billion Norwegian Kroner (approximately 390 million Euros) in tickets sales in 2018 (Entur, 2019). However, as with many public transport operators or other developers of mobile applications, a challenge is to gain a significant market share and to maximise value from their application when there are so many other applications available on the market.

Conclusion

This chapter shows how advancements in technology and changing needs and expectations of users have influenced the provision of service information for public transport. Three main approaches have been considered under the headings of static information, RTI, and user engagement. However, in reality, different users require different messages and media at different stages of their journey. There has been research undertaken on this (e.g. Harmony & Gayah, 2017; Mulley et al., 2017). However, the dynamics are not clearly understood, and a better knowledge and understanding of preferences is required in order to develop and prioritise future investments. This includes preferences regarding ticketing, which is increasingly mobile based, and also accessibility considerations (e.g. for people with special needs, low-income groups, the elderly, or those residing in rural areas). As shown in this chapter, the importance of accessible information is frequently mentioned in the literature. However, there are few studies that focus specifically on issues associated with accessibility. One exception is Papangelis et al. (2016), which explores the information needs of passengers in rural areas during public transport disruption. Given the range of media now available to public transport operators, it is also important to evaluate the costs and benefits associated with different options. The benefits of different media are frequently examined in the literature, as is shown in this chapter. However, cost-benefit analysis approaches (that subtract the costs associated with taking a decision from the benefits associated with taking it) are scarcely used.

This chapter also shows that while traditional messages and media are still important, they need to evolve and coexist with new forms of communication that encourage closer relationships in more narrowly defined markets, or even with individuals. Published timetables provide a clear example of this because they not only exist in static printed format, but they also provide essential data for RTI (at stations, stops, or onboard vehicles) and online travel planners (on websites or mobile applications of the operator or any third parties). Messages and media therefore need to be fully integrated across a range of offline and online spaces. The importance of collaboration (e.g. with other providers of transport or travel planning services) is also mentioned in this chapter. However, issues associated with integration and collaboration are scarcely examined in the literature and therefore provide interesting lines of enquiry for future research, for instance regarding issues associated with open data and interoperability among different services and modes of transport. Related to this are issues of cyber security and personal privacy. These are also often mentioned but scarcely examined in the literature. Avoine et al. (2014) provide an exception to this with their study on personal privacy and the use of anonymous ticketing in public transport. However, more research is needed.

This chapter has focused on the provision of service information for public transport, including the messages and media that are used and the trend of moving away from traditional approaches to the provision of static information to more interactive and personalised approaches to the provision of RTI. The current COVID-19 pandemic reinforces this trend and has several implications for the types of message and media that are used. First, messages need to be adapted to the current situation, as they would for other crises or disasters. In

particular, information is needed on changes to the service and any health measures that must be followed in order to minimise contact with others and avoid the potential spread of the virus. The situation for most operators is likely to be a dynamic one as a result of changing guidelines, for instance, from government or health authorities. Information therefore needs to be constantly updated and preferably available in real time. COVID-19 also has implications for the types of media to be used. In general, there needs to be a greater focus on providing information via contactless and touchless media so that information can be accessed online or via information screens rather than accessing it from staff, leaflets, published timetables, or touchscreens. Also, there needs to be less focus on providing experiential "in person" experiences, but otherwise, the developments mentioned in this chapter, for instance, with regard to the use of websites, social media, and mobile applications, are more important than ever due to the contactless and touchless solutions that they offer. This includes the use of mobile devices for ticketless travel.

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