WORKING PAPER

ITLS-WP-19-05

Collaboration as a service (CaaS) to fully integrate public transportation – lessons from long distance travel to reimagine Mobility as a Service

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March 2019

ISSN 1832-570X

INSTITUTE of TRANSPORT and LOGISTICS STUDIES
The Australian Key Centre in
Transport and Logistics Management

The University of Sydney
Established under the Australian Research Council's Key Centre Program.

NUMBER: Working Paper ITLS-WP-19-05

TITLE: **Collaboration as a service (CaaS) to fully integrate public transportation – lessons from long distance travel to reimagine Mobility as a Service**

ABSTRACT: Integrated mobility aims to improve multimodal integration to make public transport an attractive alternative to private transport. This paper critically reviews extant literature and current public transport governance frameworks of both macro and micro transport operators. Our aim is to extent the concept of Mobility-as-a-Service (MaaS), a proposed coordination mechanism for public transport that in our view is yet to prove its commercial viability and general acceptance. Drawing from the airline experience, we propose that smart ticketing systems, providing Software-as-a-Service (SaaS) can be extended with governance and operational processes that enhance their ability to facilitate Collaboration-as-a-Service (CaaS) to offer a reimagined MaaS 2.0 = CaaS + SaaS. Rather than using the traditional MaaS broker, CaaS incorporates operators more fully and utilises their commercial self-interest to deliver commercially viable and attractive integrated public transport solutions to consumers. This would also facilitate more collaboration of private sector operators into public transport with potentially new opportunities for taxi/rideshare/bikeshare operators and cross geographical transport providers (i.e. transnational multimodal operating companies) to integrate.

KEY WORDS: ***Mobility-as-a-Service, Collaboration-as-a-Service, Smart ticketing systems, Integrated public transport, Transnational multimodal holding companies***

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Acknowledgements: We acknowledge the comments of David Hensher on a previous version of this paper and are grateful to Metro Trains Australia for supporting the PhD project of one of the authors.

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DATE: March 2019

1. Introduction

As a concept, integrated mobility looks to better integrate different transport providers, across the same or different modes, to provide a better and more seamless transportation ecosystem for consumers. Consisting of a 'micro' transport network such as is provided within cities and adjacent regions and a 'macro' network which may include air, rail and sea transport which operate booked, longer distance services, both play a joint role in moving people to the places they want to be. Whilst journeys on the micro network make up perhaps a larger volume of the mobility task, the macro network plays a significant role in connecting people to places (Amtrak, 2017; IATA, 2018a). In this paper, we argue that institutional arrangements and strategies used in the macro network may provide insight into improving integrated mobility in the micro network. Through better collaboration between transport operators, the potential to enhance the attractiveness (i.e. options to consumers), competitiveness and commercial viability of transportation value chains may be increased. This includes enhancing current delivery mechanisms such as Mobility as a Service (MaaS).

The use of alliances (and also joint ventures, interline agreements, and other cooperative agreements between airlines) and their impacts have been extensively studied in the macro airline sector (Park & Zhang, 2000), and their continued use as a coordinative strategy is indicative of their benefit for operators, most notably via better service to consumers (Rindfleisch & Moorman, 2003). These mechanisms also provide a framework between the operators in which they can focus on all aspects of their joint relationship and act, which if not overly costly to the operators, may lead to further investment to improve the consumer experience, and in doing so enhance their own operational and financial performance. This may include a range of services (e.g. more destinations) or quality of services (e.g. smoother connections).

Underlying this collaboration is a system of rules, processes and procedures that create a homogenous and standardised playing field. On this field, these contracts can be written, agreed, and once executed, they can be settled. This reduces the cost of transacting to participants and makes it easier for agreements to be entered into, which we suggest increases the likelihood that they are entered into in the first place. In the macro transport sector, particularly airlines, this system involves the International Air Transport Association (IATA) as a central and neutral coordinating body, as well as a number of other bodies such as Global Distribution Systems (GDS) which provide information technology services, all of which aid in the smooth operation of the airline macro transport sector. Notably, some tentative steps by the rail sector to use these frameworks have been taken, with rail operators such as Deutsche Bahn joining IATA and entering into codeshare and/or interline contracts with airlines (Givoni & Banister, 2006).

We argue that current approaches in the coordination of public transport, notably Mobility as a Service, could be improved, or reimagined, through incorporating features of coordinative mechanisms in the macro sector. The reimagined Mobility as a Service, being $\text{MaaS}_{2.0}$, is equal to a combination of CaaS and SaaS, where CaaS represents Collaboration-as-a-Service, working through SaaS, or Software/platforms-as-a-Service (SaaS) to fully integrate public transportation chains (conceptually, $\text{MaaS}_{2.0} = \text{CaaS} + \text{SaaS}$). By this, we mean that the current MaaS concept, which is focused on the use of a centralized broker (Sochor et al., 2015), may be instead formulated by providing operators with mechanisms through which to collaborate with other operators. Based upon technological mechanisms such as smart ticketing systems, it would also include various system rules, governance processes and operational procedures to standardise the contracting environment and facilitate cheaper cooperation between operators.

Flexibility, optionality, governance and efficiency that these mechanisms entail require further investigation and understanding from a firm perspective to understand how the features of these mechanisms lead to the development of cooperative agreements that are mutually acceptable and beneficial to collaborating parties. This multimodal collaboration may be within a geographical area, for example a transport agency within a city, across geographical areas, such as two or more transport agencies in adjacent cities (or even countries) and could include the transport modes that connect the two.

Such an environment may also provide a useful framework of coordination for private sector and public sector integration, leading to improvements in the ability of individual operators to coordinate to offer better services (especially taxi, rideshare and bikeshare operators which compete with public transport), and in doing so harnessing their inherent commercial mindedness for the benefit of the consumer. As an extension, this could include multi-jurisdictional operators that span many transport modes (for example Deutsche Bahn Group, MTR and First Group) which may look to implement company-wide transport options for consumers that serve longer distance journeys, (such as providing global payment cards or multi system information for tourists and business travelers that integrates their whole journey).

This paper aims to provide an overview of transport management systems in the macro (long distance) transport context and how intermodal collaboration may be a useful strategy to pursue for the coordination of the total public transport sector. Understanding more about how key features of these systems and how they may be implemented in a public transport context (particularly micro but also macro), may provide useful insight as to how collaboration and cooperation between operators in the micro transport sector can be facilitated/enabled. This includes being able to enter into alliances (or other coordinative contracts) with other operators, the management of the consumer journey when using transport options provided by these contracts, and how to settle the transactions that arise from those contracts.

The paper is structured as follows. We define the micro and macro transport approaches and the competition between the private car-based and public transport systems in Section 2. In Section 3, we contrast institutional integration in the micro transport sector and macro transport sector. In Section 4, we discuss a reimagined Mobility-as-a-Service to incorporate Collaboration-as-a-Service, and how it may lead to better integration opportunities for operators, which in turn may lead to better public options for consumers to choose. Section 5 provides conclusions and suggestions for further research.

2. Comparing micro and macro transport systems

Public transport (that transport provided for use to all, without the ability of one person to restrict access to others) and private transport systems (including taxis, rideshares and bikeshares) are in competition with each other to move people around (Errampalli et al., 2018). The public system is seen to be more resource efficient (despite it potentially involving a range of discontinuities or seams), whilst the private transport system is more flexible, time and effort efficient (Bovy, 2002) but also incurs a range of externalities, particularly congestion which the public system, by and large, avoids. Micro[1] transport systems and macro transport systems are two broad approaches in which the public transport system appears to be organized, albeit whilst performing the same broad task in moving people around efficiently. In this paper we consider micro transport as a descriptor for the large part of the traditional (urban) public transport network (May et al., 2006). It is contrasted to the macro transport network which is more a descriptor for longer distance services. The key features of both types and examples of each are shown in Table 1.

[1] Not to be confused with the small bus or large car of the same name

Table 1. Characteristics of Micro and Macro Transport Networks

	Micro Network	**Macro Network**
Service area	Intra urban – single geography	Inter urban – multiple geographies (domestic and international)
Passenger volume	Higher	Lower
Ownership	Largely public, some private and some franchised	Largely private sector or managed consistent with private sector practices
Usage	Commuter traffic, day travel within area	Overnight or longer travel
Ticketing	Turn up and go	Bookings required
Pricing	Fixed	Flexible (using revenue management techniques)
Frequency	Many repeated services – low timetable focus	Few repeated services – high timetable focus
Capacity utilisation	Lower	Higher
Farebox subsidy level	Higher	Lower or none (or cross-subsidies e.g. rail track)
Degree of commoditization	Higher	Lower
Private network journeys can be shorter than public network?	Mainly yes	Mainly no
Examples	Metros, urban rail, light rail, trams, busses, ferries	Airlines, long distance rail, sea, and coaches

The above descriptors are broad and generic and whilst there may be exceptions to this such as high volume and frequency air or rail routes (which may be interesting in themselves in that their exceptionality may provide separate insight as to how these could be differently conceptualized and therefore managed), these should give a general view of what the difference between the services are. Notably absent from our examples of these services includes items such as taxis, rideshare and bikeshare (TRB). Not ordinarily considered part of a public transport network, they are however increasingly being incorporated into (or self-claiming to be part of) public transport systems, particularly to solve first/last mile problems (Shaheen, Zhang et al., 2011) and so warrant consideration, particularly from a coopetition perspective.

The need for the micro transport system to better integrate is becoming more important, as the public transport sector becomes increasingly more fragmented with the rise in activity of TRB options, as well as the entry into the market of other private sector organizations (including bus and ferry services), means that public transport is being provided by more and more operators, and ones with different incentives and objectives to traditional, government owned/funded operators. Private operators are also operating more like macro sector operators, in that they take advance bookings, which lowers business risks to the operators. In many cases, particularly taxis and rideshares (e.g. Uber, Lyft), these operators may fall directly into the private transport network and add to the already present externalities. In others, however, they may be led towards a level of coopetition with the public transport system. It is important that public transport systems include appropriate measures to facilitate integration of a range of operators to work together and ensure that the total system delivers options that balance resource and time efficiency. We therefore suggest that focusing on strategies and features of coordination in the macro network may be a viable strategy and policy direction for the micro transport network.

3. Concepts of institutional integration in transport systems

In this paper, institutional integration in transport systems refers to the management, planning and governance of integrated mobility. Whilst institutional theory has a broader definition of what an institution is (North, 1990), we focus on these applied areas to discuss what integration of these concepts in institutions may mean for the public transport function, with a particular focus on institutional integration from a management, operational and policy perspective. Previous studies have concentrated on a broad framework of integration (Chowdhury & Ceder, 2016; Chowdhury et al., 2018). Emphasis has been largely on physical integration, considering features such as terminal co-location, terminal facilities and other physical attributes that impact consumers when making the transfer from one mode to another (Rietveld, 2000; Givoni & Rietveld, 2007; Halldórsdóttir et al., 2017). Network integration has also been widely considered, largely from a tactical perspective as more and more attention is paid on how networks integrate, and services are provided across operators (Hidalgo & King, 2014; Zhao et al., 2017). Informational integration (Grotenhuis et al., 2007) and fare and ticketing integration are also focus areas for integration studies, particularly given technological advancement and the implementation of smart ticketing systems in many public transportation systems and the raft of data they generate (Pelletier et al., 2011).

Integration at an institutional level (Luk & Olszewski, 2003), be it from a micro or macro perspective, has had a comparatively lower focus in transportation and arguably warrants further research. The underlying institutions in public transport are the mechanisms which establish frameworks, processes and systems upon and within which operators build their businesses (North, 1990). They are important drivers of the other elements of integration at a very base level and improvements in the institutional landscape may lead to better integration at other levels. Institutional cooperation has been noted as important for total sector performance, for example for achieving sector wide environmental targets (Hull, 2008). While there are many studies analyzing policy integration in transport systems (May et al., 2006) only a few focus on the impact of institutions on collaboration and cooperation (e.g. Desmaris, 2014). Building on research into integration of supply chains (Briscoe & Dainty, 2005), we posit that the institutional environment in which cooperative agreements are reached across modes and beyond the urban context is an important factor for successful public transport integration to improve its competitive position against the private network.

Research into integrated management, planning and governance of transport is somewhat split between a micro focus and a macro focus although there are some examples of overlap (Merkert & Beck, 2017; 2018) but in general, integrative focuses have been different across the micro and macro systems due to their differing characteristics.

3.1 Integrating micro transport systems in practice

Institutional integration is present in many overarching examples in the micro transport arena. Governments develop master transport plans to document coordination of city/ region wide policy in transport operations and infrastructure development (Ülengin et al., 2007). A significant integration measure at the institutional level in some jurisdictions has been the grouping of all transport agency functions and operations under one administrative roof, for example Transport for London (Luk & Olszewski, 2003). However, the different institutions within those transport agencies still remain somewhat separate, maintaining their own strategic directions and responsibilities for overall transport policy outcome achievement, or where operating on more commercial basis, the achievement of commercial goals without reference to other parts of the public transport system and sometimes competing with one another. Compared to the macro transport sector, institutional integration measures have perhaps been lower in priority than other integrative measures given the substantial role that government plays in delivering micro transport services. In general, publicly funded and volume endowed transport operators have been more focused on enhancing passenger journeys and thus have focused more on the physical, informational, network and fare and ticketing aspects of integration.

Integration of institutions in transport is really about removing the impacts of organizational boundaries on the transport system, leading to its function as one system rather than a fragmented system of systems. Public transport systems, which use the services of many micro transport providers, are really systems of systems that interact with each other. Some of these interact with each other well, such as different train lines operated by the one operator to coordinate arrivals and departures on each line. Bus and train interfaces are often coordinated to arrive and depart in a similar manner. Even though they are operated by different organizations, they are both in turn required/procured by government/ public transport agencies which can require them to improve connectivity. The presence of an overarching coordinating entity has been central to driving this change. Others do not (yet) interact as well, for example taxis often currently wait for many minutes at train stations for an uncertain volume of passengers. Indeed, many of the interfaces with the core passenger networks may have no intermodal collaboration among the operators.

The private sector has recognsied the importance of centralized/overarching coordination and organizations have sought to become this coordinative entity in different sectors. Taxi control networks like as Cabcharge in Australia manage fleets of taxis across brands and ownership forms. In the freight transport sector, operators (such as SCT Logistics in Australia) use both road and rail modes in order to deliver goods from the consumers' origin to the consumers' destination. More recently, transport network companies (TNCs) like Uber have sought to build a range of transport options for consumers across the car transport system by coordinating a multitude of small operators, and have begun to expand into other forms of transport such as bicycles for short distance trips and larger vehicles for larger groups of passengers.

However these institutional changes have happened on what might be described as an internal basis, with TNCs, taxi networks and single companies controlling a substantial proportion of the business decisions of the participating operators (or owning them outright). TNCs, like Uber with its platform of offerings (including its broad range of car based travel options such as X, Pool, Lux, XL, Select, Black, Taxi and more recently the bicycle based Jump (Uber Technologies Inc., 2018) is forming the beginnings of an integrated service platform, however its strong brand may prevent it from forming any meaningful relationships with other larger transport companies, who value their own brand and consumer base (refer below for further discussion on this). Moreover, TNC platforms may look to entrench the role of the private network and TRB options. Despite their claim to be part of the sharing economy, many journeys by these TRB providers do not actually share vehicle space in any meaningful way (Currie, 2018), and despite their claims, nor do they (in the majority of cases) connect to the public transport system institutions in any organised fashion.

There is little in the way of cross modal, or external, collaboration where these services integrate with modes outside of the control of the coordinative entity. Indeed, unless it is in the commercial interest of the coordinative entity, or their operators, there is little incentive to work with other transport modes in the public transport sector to create more holistic, end to end journeys for consumers. This leads to situations where these modes compete with public transport for journeys.

3.2 Mobility as a Service

For the micro transport context it has recently been recognised that a more widely integrative solution across modes and operators may lead to better transport options, a key movement in this area being the construction of integrated mobility systems by brokers, operating under the broad concept of Mobility as a Service (MaaS) (Mulley, 2017). With no strict definition, and many interpretations, MaaS is presently reasonably well understood to be "a user-centric, intelligent mobility distribution model in which all mobility service providers' offerings are aggregated by a sole mobility provider, the MaaS provider, and supplied to users through a single digital platform." (Kamargianni & Matyas, 2017). Core to MaaS has been the use of information technology (Brendel & Mandrella, 2016; Kamargianni & Matyas, 2017) which lowers the cost of coordination and information transfer (including the risk of error). Public transport is seen as being complemented by private transport options in delivering this service (Hensher, 2018). Institutionally, MaaS looks to integrate transport provision through a broker that coordinates the service as one system rather than many. Different forms of MaaS have been suggested, coursing between privately managed and publicly managed (Wong et al., 2017; Smith et al., 2018). A key feature of these forms is the central broker who sources transport services from operators, and then goes onto bundling these services for consumers to buy, subject to their own budget (Hensher, 2017). It is designed to improve access to public transport options, removing the need for consumers to own their own car and to reduce consumption of the private transport network (Jittrapirom et al., 2017).

This broker is the nexus between the passenger journey and services provided by the operators that are arranged by the broker often on a subscription or package basis (Matyas & Kamargianni, 2017) which may be pre-paid or post-paid. A range of MaaS systems exist, with perhaps one of the more documented examples being the Ubi-Go system as explored in Sweden (Sochor et al., 2015) which brought together consumers and operators through a technology enabled subscription service. More recently MaaS has been applied as a label to the range of other smartphone applications, (for example Rome2Rio, Easy2Go, Mobicascais and Qixxit), however a distinction may need to be drawn between MaaS systems and information aggregators, which these apps may be more correctly described as given they play no role in the journey other than developing journey options and then connecting users through to the booking engines of the service providers.

Nevertheless, MaaS has not (yet) led to long-term, meaningful and sustainable transport solutions. The MaaS model is yet to be proven, with a number of schemes not proceeding past pilot stage or struggling to prove their business model is successful (Sochor et al., 2015; Jittrapirom et al., 2017). It may be that the structure of broker centric MaaS prevents it from being able to successfully act as a coordinative mechanism at the institutional level for public transport systems. These conflicts arise mainly out of the role of the broker, in particular the intermediary role of the broker. Operators in other sectors have been moving away from a broker model and are instead looking to interact and connect directly with their consumers. In the case of airlines, travel agents and others are being bypassed by airlines who want direct relationships with their consumers (Fiig et al., 2015) in order to better understand their needs and develop solutions to meet these needs.

Being inserted (or inserting themselves) into the relationship between passengers and transport providers, MaaS brokers are taking an opposite approach, apparently assuming that they are needed to discern consumer needs and send these signals to operators (who are therefore assumed to be unable to do this themselves. Whilst some public transport service operators may be more interested in operating their allocated timetables than relating to consumers and providing them with their required level of service (perhaps warranting broker involvement), this is not the same for private sector operators (including taxi services and the rise of on-demand transport providers, and also franchised bus and rail operators aiming for profits) who have a vested interest in knowing their consumer well in order to better serve their needs and generate profits from these actions (Hensher, 2017).

Other conflict exists in that both brokers and transport providers are looking to develop their own brands to further their commercial identity (Sochor et al., 2015), with both organizations trying to develop brand value but competing to do so with the same consumers. In addition, MaaS brokers often develop their own subscription packages or bundles for travel which changes the risk relationship between consumers and operators by distorting pricing signals and modifying investment decisions (for example service levels, capacities). This assumption of pricing by the broker may also distort the level of interorganizational innovation achieved which may also reduce the integration with, and therefore effectiveness of the public transport system (Smith et al., 2018).

Sochor et. al. (2015), Mulley (2017) and Hensher (2017) note that service providers may consider MaaS to be merely another distribution channel for service operators to use. If this channel is not sufficiently significant in terms of revenue or profit to the service operator, there will be little incentive to use it and therefore there may be a lack of buy in by the service operator. Conflicts also arise in terms of 'ownership' of customers, or more accurately the data they generate which is a valuable resource (Mulley & Kronsell, 2018). With this data held by either the broker or consumer without an effective sharing platform, brokers and operators are unable to use this data to effectively manage future system development and management. MaaS is generally considered to be a demand oriented, user centric concept (Jittrapirom et al., 2017) and whilst it develops consumer favored solutions, they may not consider optimization from an operator perspective.

Conflict outside of the consumer/broker/operator relationship also arises due to the broader environment in which public transport operates in. Transport agency actions, such as actions to procure may place constraints on operators in which case extant MaaS solutions fail to incorporate effectively (Smith et al., 2017). Procurement may not be the most appropriate solution for public transport networks in the first place (Merkert et al., 2018). The role of transport agencies and their government leaders is important but may also impact on how effective MaaS can be. This includes government regulated pricing of services which may not allow MaaS systems to be sufficiently flexible to recover costs (Sochor et al., 2015).

As an intuitional integration measure, therefore, the conflicts underlying broker led MaaS and the resultant impacts on transport system and management may have prevented MaaS as it currently exists from achieving the desired level of integration that public transport planners, operators and consumers would like to see. Rather than allowing operators and consumers to connect, the imposition of brokers may create additional inefficiencies in an already imperfect market. Other models of cooperation may be required, or the concept of MaaS may require adjustment. In particular, incorporating mechanisms to better utilize operator skills and objectives in service design and delivery.

3.3 Integrating macro transport systems in practice

Operating with a lower frequency and across different jurisdictions, macro transport operators such as airlines, rail (and for that matter sea) operators encounter a higher risk of travel cost increase due to disruption compared to their micro network counterparts. The risk of the journey cost increasing, due to say a flight delay and resulting missed connection for air travelers, is significantly higher due to the lower frequency of service. A city bus passenger can often get another service within the hour, however there are many cases where airline passengers may need to wait more than 24 hours for the next flight to a destination. Macro transport systems (by and large) therefore work on different commercial footings to micro transport systems and therefore have developed in different ways. Two key differences between micro and macro transport are the volume that the former carries, and the ownership of the latter (whilst we note that legal and regulatory restrictions are also constraints). These differences expose the two transport systems to different risks and have led to different integration management approaches to those risks.

Common to these approaches is the need to work more closely with other operators to deliver services. Underlying the drive for institutional collaboration and integration in the macro transport sector is the assumption that the operators are more aware of consumer travel needs and wants, and design transport options/solutions, for consumers on that basis. Integration has therefore been driven by different forces and has taken a different path for the macro transport sector compared to the micro sector. Operators have reached mutually beneficial agreements, such as alliances and joint ventures between airlines (Kleymann, 2005; Wang, 2014), that simultaneously offer more or better options to consumers, to the benefits of those operators involved. But whilst these collaborative activities attract substantial attention in the literature (for a recent review see Castiglioni et al., 2018), the literature is remarkably silent on the role played by the environment in which these cooperative mechanisms have been formed. In this section we consider how this coordination is originated, facilitated and managed through institutions in the macro transport sector and understand what these may mean for public transport.

3.4 Integrated air transport networks as a case study

Institutional integration has been a necessary process in aviation for it to work in a heavily regulated environment, with national air route and airline ownership regulations acting to deny airlines the ability to freely trade on any international route they desire and favoring national carriers in their 'home' markets. However, in most jurisdictions airlines have been allowed to collaborate with other airlines (and more recently rail operators) to deliver services, through a raft of cooperation mechanisms (such as codeshares and interlines) to manage broad and varied, but consistent, contracts. Due to the coordinative environment in which these contracts are managed, new contracts are more easily facilitated given their broad understanding within the industry, at strategic, tactical and operational levels within organizations and throughout the industry. Importantly these mechanisms also facilitate a coopetive environment where, while in competition with each other, operators cooperate in instances where it is in the interest of both parties to do so (Chiambaretto & Fernandez, 2016).

One of the key, if not the key institution within air travel is the International Air Transport Association (IATA). Established in 1945, IATA is an industry association with over 280 airline members who account for 83 per cent of air transport around the world (IATA, 2018b). IATA's activities span across the industry that aim to develop globally applicable solutions for all members. Of particular interest for transport system management purposes is the role that it plays in the development of processes and procedures that make air travel more integrated. IATA primarily sets transaction and cooperation standards across airlines, governing a range of issues across airlines, airports and the broader aviation industry. These set general terms and conditions, concepts and operating procedures that individual operators do not need to define, providing them with a common 'language' to interact with other operators.

Once agreements are operational, it manages financial support services for airlines such as the IATA Clearinghouse, and the Billing Settlement Plan (amongst many others) to settle inter-airline transactions between airlines post coordination, allowing the smooth and efficient processing of revenue transactions. For example, when a passenger takes a flight from Sydney to Denver, using Qantas from Sydney to Los Angeles, and American Airlines from Los Angeles to Denver, they often book one ticket with one airline who has a collaboration agreement with the other airline. The Clearing-house serves to allocate revenues and remit payments to each airline as agreed between the airlines, based on commercial negotiations held, and subject to the standards as set by IATA. These contracts have been extended to allow operators to better coordinate ancillary products and services, such as baggage transfers and lounge access. In the event of disruptions these contracts and the IATA network can also provide mechanisms to help manage their passenger's journeys to be less disruptive, more seamless and therefore less costly (Wu & Truong, 2014).

More important to the coordinative role that IATA plays is the level of operator commitment to the use of the organization. As an industry led association, IATA is managed and operated by a management group which is governed by a board that consists of rotating airline CEOs. This significant level of commitment from the airlines that use the services of IATA translates into endorsement of the organization and its overall legitimacy.

In addition to IATA, there are other organizations within the air transport sector that support cooperation. The International Civil Aviation Organisation (ICAO), a United Nations agency, operates to standardise national legal regulation of air transport. Various Global Distribution Systems (GDS) operate to standardise ticketing, pricing and fare information from airlines to other airlines, travel agents and online booking platforms. The Airline Tariff Publishing Company (ATPCo) is a stand-alone company owned by a number of airlines that collects fare data for promulgation to GDSs. Each of these systems is a stand-alone institution, operating for all participants, and setting standardized operating procedures and rules. The relevant features of the air transport system applicable to are shown in Table 2.

Table 2. Features of air transport integration

Feature	Impact
Standard rules and processes	Sets common ground rules for all operators to design their interactions with others within
Pricing flexibility	Dynamic pricing through a fixed number of fare products, with individually tailored pricing by operators to consumers soon to be implemented (Wittman & Belobaba, 2018)
Cooperation flexibility	Allows any airline to in principle cooperate with any other airline, (subject to antitrust) to develop cooperation agreements
Information ownership and sharing	Airlines retain ownership of their own information and agree to share with other airlines that operate services for their passengers

The above institutions have allowed the airline industry to enable very strong collaboration within three large global airline alliances and even deeper integration between two airlines deciding to join in an joint venture (usually limited to a route or region) but also slightly looser forms of collaboration such as bilateral code share agreement of which there are thousands, even between airlines who are members of competing global airlines (such as Qantas which is a member of One World and KLM-Air France which is part of SkyTeam). The majority of airlines (and an increasing number of railways, hotels etc.) not only collaborate but use institutions and IT backbones/platforms (such as IATA as a clearing house or the GDSs for ticketing and distribution) that they have jointly set up to further integrate and better the customer experience and industry performance. Supported global and local collaboration is in our view the key success factor of the airline industry.

3.5 Smart ticketing systems as an enabler of integration

Initially introduced to streamline the cost of ticketing, including reduced fare evasion, smart ticketing systems (STS) have (possibly unintentionally) lead to other benefits, including externalities such as improved environmental outcomes (Dlamini, 2011). Smart ticketing systems utilize technological solutions to allow electronic ticketing and payment of fares instead of paper ticketing for passenger journeys. The number of smart ticketing systems has been growing significantly with hundreds across the world. In many cases, public transport authorities have developed the platforms to operate across a number of different public transport operators that are owned by the public sector. For example, in Sydney, Opal is used as the ticketing mechanism by Transport for NSW (TfNSW) on Sydney Trains, intercity trains run by NSW Trains, State Transit Authority buses (both government and franchise operated), Harbor City Ferries, Sydney Light Rail. It is also now available on some privately-owned public transport operators such as Manly Fast Ferry. These private users access the Opal network through a payment gateway called Opal Pay, an extension of the Opal System into a payments clearance system.

Taxis, rideshares, bikeshares and other private on demand providers still remain outside of most systems, however there are examples, for example bikeshare (Shaheen et al., 2011) where these services have also been integrated into the smart ticketing platform and have seen an increase in use of public transport systems. These platforms have allowed these TRB options to form coopetive relationships with the public transport system, rather than competitive ones.

From an institutional integration perspective, the use of smart ticketing technology may have had other unintended consequences. Both direct and indirect network effects (Shapiro & Varian, 1999) may have led to broader acceptance of the public transport network as a viable alternative to private transport options. The convenience of the tap-on-tap-off approach to ticketing may offer a streamlined and more seamless travel experience to consumers. Marketisation effects (Mason et al., 2017) may have also made it clearer that smart ticketing is available for use on particular services, enhancing their perception of the operators that are accessible through smart ticketing platforms. Some agencies have offered discounts for travel across modes (and across different operators within their portfolio) when using smart ticketing systems, which has increased patronage (Transport for New South Wales, 2017). In presentations by transport agencies and meetings with operators in New South Wales, indications have been given that consumers have turned away from services when they found they could not use smart ticketing services, and that they prefer using car parks that integrate and co-brand with public transport.

As an institutional integration mechanism, smart ticketing systems may have some ability to address the identified shortcomings of the framework of current MaaS systems as identified earlier. By allowing consumers to use the same ticketing systems that they use on other systems, consumers' perception of their available network may have broadened, including where public transport options provided by the private sector operators are more visibly incorporated into the network. When combined with the integration of these fares and services through smart phone apps, a broader view of the transport system may have been created in the minds of users; a network that includes all busses, trains, and ferries irrespective of who operates them and easily accessed via one mechanism; the smart ticket. A change in the institutional integration arrangements therefore may have led to a change in the other integrative aspects of the system. What we see here is in our view a start of micro transport systems learning from macro systems in terms of IT platform integrations and also collaboration.

4. Collaboration as a Service in integrated public transport systems

The discussion in the previous sections has highlighted how institutional integration, in terms of management, operation and governance differs between the micro and macro transport sectors. In our view, the key difference in the two sectors that is driving these differences is the level of operator interaction (and cooperation/collaboration), given operators operate commercially and are exposed to greater risks. Operators in the air transport sector have, as an industry, developed a mechanism that allows them to collaborate at the same time as competing, and also one which allows them to maintain their own commercial identity, goals, and objectives. Whilst this mechanism has been developed in the face of trade restrictive air services agreements, it has nonetheless provided a pathway for two or more operators to deliver more together than they were able to when working alone. And while there are also fears that mobility systems and smart cities may be dominated by profit driven corporate interests (Hollands, 2015; Lyons, 2016), they allow air transport markets to function effectively and may do so in the micro transport system. Indeed, the use of commercial principles by transport operators may well achieve equity goals of public transport systems (Högström et al. 2016).

Research into MaaS deployments (as currently formulated) has appeared to be somewhat focused on the consumer-broker relationship, and the development of optimal bundle pricing for consumers (Hensher, 2017). The introduction of a broker who is implied to know more about the consumer than the operator that carries them introduces tension into the transport system and may discourage full and enthusiastic participation from operators, who may view that they know their customers better and derive little value through working with a MaaS broker. Pricing of journeys on a basis that is different to that derived by the operator may send false price signals into the transport market, and may indeed not be accepted by operators. Future transport systems need to resolve these conflicts and allow operators to operate freely to deliver innovative solutions.

With advancement of technological platforms offering solutions to many of the informational integration issues (see section 3.5), the focus should now move onto opportunities that could arise from operator collaboration.

4.1 Transport management systems to support collaboration and integration

The adoption of a cooperation/collaboration model such as is adopted in the airline sector may create an environment in which public and privately-owned operators, in both the micro and macro transport systems, can work together. By allowing operators to develop relationships and through these, transport solutions for consumers, a more collaborative ecosystem in public transport may be developed. The success of the airline coordination model in increasing the utility derived by air travel consumers has been observed, and similar activities are proposed for the broader transport network though concepts such as Seamless Integrated Mobility Systems (SIMS) (World Economic Forum, 2018). These may play a role in coordinating operators and allowing them to deliver more seamless transport options to passengers. Recognizing the discontinuities and inconveniences of transport systems experienced by consumers, proponents of SIMS argue that current levels of technology may allow for new, lower cost means of coordination between operators, consumers and government that will lower the costs to consumers of the inherent inefficiencies in the transport system.

SIMS are described as a ‘system of systems’ that moves people (and goods) more efficiently by creating interoperability across physical assets like cars and buses, digital technologies like dynamic pricing and shared data exchanges, and the governance structures, standards and rules by which they operate” (World Economic Forum, 2018, p. 9). Through better connecting operators, more may also be done by operators to better understand their passenger’s complete journey and how they may work together to better integrate in other contexts (e.g. physically).

The systems used in airlines, (including both IATA and GDSs), being part technological, part operational and part governance, are a form of SIMS, albeit one that has been until recently almost exclusively focussed on air transport. It is a proven mechanism that has led to increased rates of cooperation between airlines and therefore has increased destination choice for consumers. It has also facilitated operational management of transport, with information flowing between operators and ancillary service providers to manage disruption events in the consumer's journey. The airline SIMS helps by standardizing a range of processes and systems that allow operators to cooperate to deliver more optionality to consumers whilst at the time reducing consumer effort in making transactions and completing travel journeys. It also provides a common environment on which contracts can be developed that contain generally accepted standard terms and conditions between operators. This standardized understanding has led to the plethora of alliances, joint ventures and bilateral agreements that govern behaviors and mean multiple operators can function as one, at least from the perspective of the consumer. The centralized management of this system means that operators can function in a relatively equal playing field.

This solution may provide solutions to some of the issues encountered in MaaS systems to date. As noted above, MaaS offerings to date have been consumer centered creations of brokers, viewing transport operators as input providers rather than partners in a journey. Hensher (2018) notes that operator collaboration is needed albeit in the presence of a broker. We are of the view that transport operators, as businesses in their own right and using their own commercial interest and skills, and given mechanisms and avenues for cooperation, may be able to arrive at public transport solutions that consumers will be willing to use, without the need of a broker. These options may be preferable to those options that a mobility broker will be able to generate. We suggest that a more inclusive cooperation framework, which we call Collaboration-as-a-Service, needs to be incorporated into MaaS and requires further research.

4.2 Reimagining MaaS to integrate public transport systems: Collaboration-as-a-Service (CaaS) and Software-as-a-service (SaaS) through smart ticketing systems

To date, MaaS has been a consumer centric proposition. Through the service, consumers are presented with travel options to choose from. MaaS is supported by SaaS, or Software/platform-as-a-Service. Clearly, the missing element in our reimagined MaaS is the operator interface and management system, Collaboration-as-a-service (CaaS). We therefore can represent a reimagined $MaaS_{2.0}$ as follows:

$$Maas_{2.0} = CaaS + SaaS \quad (1)$$

The term "as-a-service" plays a key role to the MaaS concept. Following a global trend of servitization in many industries (e.g. Jovanovic et al., 2016) including transportation, there are now many examples and industries who have adopted this concept (see Table 3). Originating from cloud computing and the IT sector, "as-a-service" has recently become a descriptor for innovation, entrepreneurship and strong (revenue and profit) growth businesses.

Table 3. Anything as a Service (XaaS) in practice

XaaS variation	Acronym	Example actor
Software as a service	SaaS	Oracle Corporation
Infrastructure as a service	IaaS	Microsoft Azure, IBM
Platform as a service	PaaS	Salesforce.com, Inc
Lighting as a Service	LaaS	Vivid Technology Ltd
Carbon Offsets as a Service	COaaS	Buddy Platform Ltd
Mobility as a Service	MaaS	Ubi-Go

Accenture (2018) have defined this current trend in the literature and management practice who describe the (Anything) as-a-Service model (XaaS) as providing companies "with plug-in, scalable, consumption-based services supported by analytics, cloud and automation and to deliver business outcomes". That is, a standardised platform, to which operators can connect easily and cheaply, that supports cheap transaction costs and therefore service delivery. On top of this, the use of information systems to facilitate data analysis allows operators to learn more about their consumers than ever before, using this information to develop better solutions for them, and in turn generating higher returns for themselves. In that sense we argue that the SIMS/STS concepts discussed above can be seen as similar to SaaS, PaaS and IaaS and as such a fundamental component of a revised MaaS.

The second, and in our view more important extension of the current MaaS system stems from our idea of Collaboration-as-a-service (CaaS) for fully integrating transport systems. As evidenced in the macro context (airlines), by providing operators in the micro public transport system with a low cost, standardized approach to interacting with each other, new cooperative and collaborative behaviors may be formed. This could include the development of coopetitive behaviors, where private transport modes (including the TRB modes) begin working more directly with the traditional public service operators. The level of cost in such a system can be lowered through a common understanding, and common expectations about the actions of other actors, and increased trust in the actions of other participants. To achieve this, a central organizing function may be required, such as is the case for airlines, to foster the processes and systems required in a neutral, non-favored manner.

SIMS are predicated on using a combination of technological solutions and institutional frameworks to standardise interactions and transaction between participants and reduce the costs of those interactions. It may be the case that smart ticketing systems (STS) may already demonstrate some of the features of such a coordinative mechanism that may improve institutional integration and the delivery of CaaS. One of the more recent mechanisms to be broadly introduced to the transport system and literature, STS have technological similarities to the SIMS discussed above.

To perform their new role, STS functions may be augmented in terms of governance and operation (key elements that would allow collaboration), to enhance the institutional environment in which public transport integration occurs, leading to a better functioning overall system. The role of IATA in facilitating cooperation underpins the ability of airlines to form alliances and other cooperative mechanisms to meet their consumer's needs, but unlike GDS' and IATA, this is something that STS' have not yet been given the functionality to facilitate. STS' therefore may form the basis of SaaS in and further integration in the micro context of public transport. Further work is required to understand more about how such a system might function, and what it needs to consider and include to do so (refer to Section 5 below).

As a policy direction, it has been noted that transport policy makers may be better off by trying to build connectivity at the institutional level, rather than trying to procure the services and build the connectivity themselves through directly addressing network and other integrative measures through their operating agencies (Smith et al., 2017). STS may be a vehicle through which to investigate creating such connections and at the same time incorporate extant transport providers more comprehensively into the public transport system.

We will conclude this section by demonstrating briefly some of the use cases that may be possible with the reimagined MaaS 2.0. These are detailed in Table 4.

Table 4. Potential uses of CaaS systems in public transport provision

Use Case		Comments
1	Micro area	Micro-operators within a geographic area (e.g. a city) collaborate to deliver more integrated transport options
2	Micro to macro	Macro-operators that bring consumers into the city from outside directly integrate their services into the micro-operator services in the city for first/last mile for example partnering with a land transport provider to get people to and from airports (Qantas Airways Limited, 2017)
3	Integrated holding company	A transport operator (either micro or macro) with operations across geographies may interface with itself, or other operators to manage journeys of identifiable consumers across different geographies (refer to Appendix 1 for the spans of the MTR, First Group and DB Arriva groups for example)
4	Micro-micro	Similar to extant macro-macro coordination in the air transport sector, micro transport operators may integrate two different geographies, which may be close to each other and visited regularly by consumers from either area
5	Whole of system	All transport operators, both macro and micro, public and private, integrate together to provide transport solutions to consumers.

The above shows that there are a number of different ways in which integration may occur across the public transport system. As an aside, we view the potential institutional integration dimensions as shown in Figure 1. This does not suggest that the dimensions are optimized in any direction (this will be a topic for future research), but just that these dimensions exist on a continuum. The three dimensions involve geographic spread, firm/organizational integration, and public/private sector modal choice. These examples and dimensions show the range of opportunities available for better collaboration within and integration of public transport.

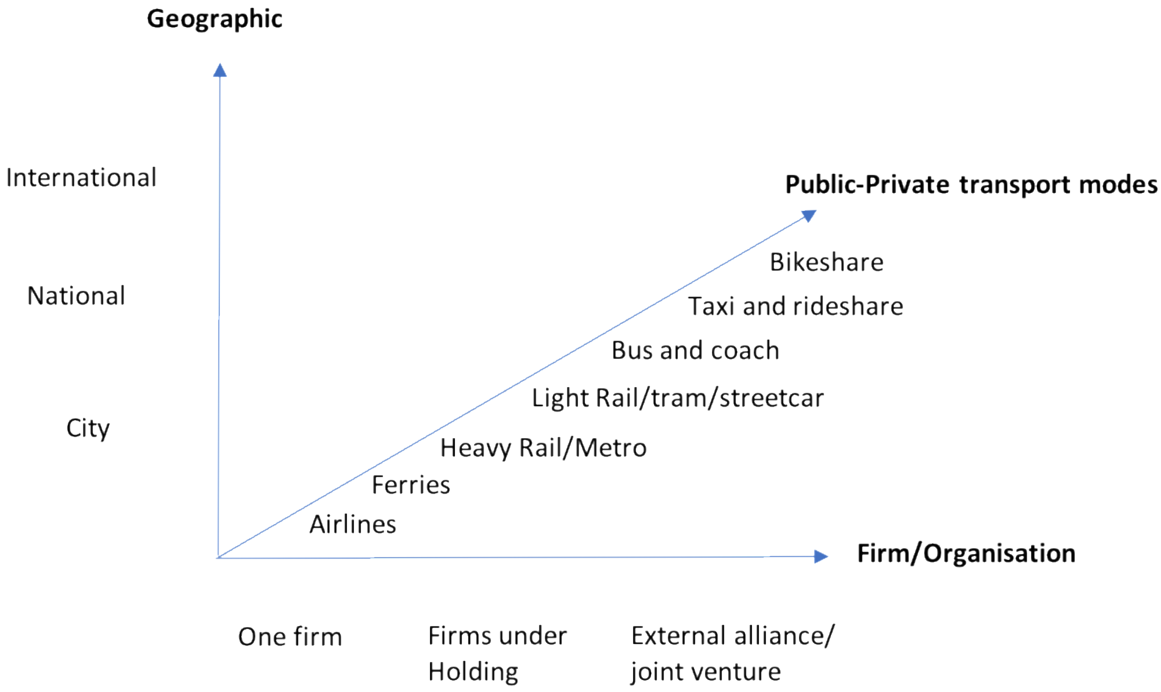

Figure 1. Potential dimensions of collaboration and integration

5. Conclusions, limitations and future research areas

In this paper, we have critically reviewed the institutional landscape in which public transport operates, comprised of two types of operators (micro and macro operators) as it competes with private transport modes. We have discussed the importance of collaboration and integration between these operators and that private modes need to be incorporated into the public modes more effectively. We have looked at the current institutional integration within public transport systems and consider that some of the mechanisms used in long distance, macro transport (using the IATA system in the air transport sector as an example) may lead to useful mechanisms for coordination in shorter distance, micro transport scenarios, and other situations including where operators work across jurisdictions. These mechanisms go beyond, and complement, current MaaS thinking and bring operators into the discussion more holistically through the concept of Collaboration-as-a-Service. We are of the view that smart ticketing systems may form the basis of a mechanism which may allow for airline style coordination to be managed, combining technological, operational and governance elements to develop a system to facilitate operator interaction and manage ongoing transactions with consumers. A number of different areas have arisen as areas for future research as a result of our review. These are in many cases testing assumptions made in our analysis and constraints on the system which we detail below.

Much of the current research has been focussed on consumer preferences (Sochor et al., 2015; Chowdhury et al., 2018), with some consideration of the operator views provided in paper discussions. Accordingly, current solutions and direction may not be well informed by operator perspectives. Further consideration of institution integration should perhaps focus less on consumer preferences for integration and consider preferences of operators in more detail.

We have assumed that STS have the technological ability to enable this coordination, however the operational and governance elements are just as important to consider in its successful adaptation. Further research is required to determine how operators and transport agencies may design institutional elements to add to current STS and develop $MaaS_{2.0}$. Indeed, this research will need to consider the management and governance of such a system, allowing it to serve operators effectively and deliver to consumers. Part of this, and a significant one at that, will be the system rules including for example who owns and controls the data in this system. Data ownership assigns property rights to the data and therefore value (Hensher, 2018), and so at a minimum, operator and agency preferences for data ownership and their impacts on integration need to be better understood. On the other side of data collection, research consideration needs to be given to the role that data privacy plays and how consumers may react to more data collection.

Given the funding required by government to run public transport, consideration of political risks is also required in order to understand their impact on the degree to which government operated systems can be used to perform this integration function. In certain jurisdictions, certain transport operations are not favoured by the political majority (e.g. dock-less bicycles) and in others, some operations have been technically illegal (e.g. Uber in states of Australia prior to 2016). Despite their usage in transportation, government owned and operated systems may be unable to connect with them and therefore to other operators. In the broad area of political constraints, the continued drive for state transport agencies to urge their transport delivery agencies to become more commercially minded. An STS in the style of IATA requires that operators are more than timetable runners and that they begin to think more commercially about their operations to be able to work with other operators in both the public and private sector. Research into management styles, approaches, preferences and processes within state owned agencies will identify any limitations that these may impose on the development of $MaaS_{2.0}$ and how these may be reduced or managed.

Also in this area is the need to consider flexible pricing mechanisms in public transport. Many public transport systems are regulated in what they can charge, and this charge is usually below the cost recovery price. These regulated pricing mechanisms may need to consider how flexible pricing might operate between a regulated operator and a non-regulated one, so as to allow them to use price to attract ridership. The private sector generally also views pricing flexibility as part of their strategic options to generate sustainable returns. Whilst part of a broader fare equity subsidisation discussion, this pricing discussion could also include a move from subsidising operators to subsidising users (Hensher, 2018), or at least subsidising operators based on usage which would heighten focus on service delivery by operators to make them attractive to consumers and therefore lead to revenue generation. From a regulatory perspective, antitrust/competition researchers may also wish to consider the impact of such regulation on the ability of monopoly like service providers (like heavy rail operators) to cooperate with other participants in the market, and the impact that the public benefit may have on the approval (or not) of such cooperation by regulators.

This is not to say that consumer preferences shouldn't be further considered. Given that consumers do value intermodal journeys (Chiambaretto et al., 2013; Merkert & Beck, 2019), and there is anecdotal evidence that consumers value smart ticketing systems and the access that they give, research should look to better understand what this perceived value represents to consumers. This includes how they choose transport options in the presence of a smart ticketing system, and what trade-offs they may make which lead to a public transport option choice instead of a private one. Understanding this, including the willingness to pay measured associated with smart ticketing systems for intra- and intercity travel may give additional information with which to better design CaaS / $MaaS_{2.0}$ systems. Smart ticketing systems may indeed be a marketisation device (Mason et al., 2017) by which usage of public transport may be encouraged. As such a mechanism, and with appropriate institutional integration with operators, smart ticketing systems may offer a raft of new opportunities for public transport standardisation, collaboration and coordination, across the range of operators and markets. While such a system may initially be trialled in the context of one particular city or geographic area, we argue (building on Merkert and Beck, 2018) that the concept would be useful to implement for intercity travel, for example a fully integrated trip between two cities connected by air, rail or water, with travel within and between both cities being coordinated for the consumer and encouraging greater use of more public transport systems. Ongoing research by the authors looks at this possibility.

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Appendix 1. Example of passenger transport transnational holding corporations

	Operation	Mode	City	Country
MTR Corporation	Mass Transit Railway (MTR)	Rail	Hong Kong	Hong Kong
	TfL Rail (incl. Heathrow)	Rail	London	UK
	South Western Railway	Rail	Intercity	UK
	Stockholm Metro	Rail	Stockholm	Sweden
	MTR Nordic	Rail	Stockholm region	Sweden
	MTR Express	Rail	Intercity	Sweden
	Metro Trains Melbourne	Rail	Melbourne	Australia
	Sydney Metro Northwest	Rail	Sydney	Australia
	Beijing Subway	Rail	Beijing	China
	Shenzhen Metro	Rail	Shenzhen	China
	Hangzhou Metro Group	Rail	Hangzhou	China
nDeutsche Bahn Group	DB Long-Distance	Rail	Intercity	Germany
	DB Regio (TOCs in 8 regions)	Rail	Intercity + urban areas	Germany
	S-Bahn Hamburg	Rail	Hamburg	Germany
	S-Bahn Berlin	Rail	Berlin	Germany
	S-Bahn Rhine-Neckar	Rail	Rhine-Neckar	Germany
	IC Bus	Coach	Intercity	Germany
	DB Arriva	Bus	Ratzeburg	Germany
	DB Arriva/Autotrans/Veolia CE	Bus	National	Croatia
	DB Arriva	Bus	Prague+ 2 cities + intercity	Czech R.
	DB Arriva	Rail	Vogtlandbahn, intercity	Czech R.
	DB Arriva	Bus	Copenhagen	Denmark
	DB Arriva	Waterbus	Copenhagen	Denmark
	DB Arriva	Rail	Intercity	Denmark
	DB Arriva	Bus	Budapest and intercity	Hungary
	DB Arriva	Bus/ coach	Intercity, Udine, Trieste	Italy
	DB Arriva	Bus/ coach	Intercity, Leiden, Limburg	Netherlands
	DB Arriva	Rail	Groningen, Leeuw., Limb.	Netherlands
	DB Arriva (Veolia Tran. CE)	Bus	Intercity	Poland
	DB Arriva	Rail	Kujawsko-P. Voivodship	Poland
	DB Arriva	Bus/ coach	Lisbon and intercity	Portugal
	DB Arriva	Bus	Niš	Serbia
	DB Arriva	Bus	Intercity	Slovakia
	DB Arriva	Bike Sharing	Nitra	Slovakia
	DB Arriva	Bus	Intercity	Slovenia
	DB Arriva	Bus	Madrid, Majorca, Galicia, Intercity	Spain
	DB Arriva	Rail	Malmö, H.borg,Trelleborg, Göteborg & Örebro	Sweden
	DB Arriva	Bus	Stockholm, Skåne, Halland	Sweden
	DB Arriva	Bus	London, several regions in England & Wales	UK

	DB Arriva	Rail	Arriva Rail London, Wales, Chiltern, CrossCountry, Grand Central, Northern	UK
First Group	First Aberdeen	Bus/ Coach	Aberdeen	UK
	First Berkshire & The Thames Valley	Bus/ Coach	Berkshire & The Thames Valley	UK
	First Essex	Bus/ Coach	Essex	UK
	First Glasgow	Bus/ Coach	Glasgow	UK
	First Greater Manchester	Bus/ Coach	Greater Manchester	UK
	First Hampshire and Dorset	Bus/ Coach	Hampshire and Dorset	UK
	First Leicester	Bus/ Coach	Leicester	UK
	First Midland Red	Bus/ Coach	Midlands	UK
	First East Anglia	Bus/ Coach	East Anglia	UK
	Ipswich Rapid Transit	Bus/ Coach	Ipswich	UK
	First Northern Ireland	Bus/ Coach	Northern Ireland	UK
	First Potteries	Bus/ Coach	Staffordshire	UK
	First Travel Solutions	Bus/ Coach	National	UK
	First Scotland East	Bus/ Coach	Central and Eastern Scotland	UK
	First South and West Wales	Bus/ Coach	South and West Wales	UK
	First South West	Bus/ Coach	Somerset and Cornwall	UK
	First South Yorkshire	Bus/ Coach	South Yorkshire	UK
	First West of England	Bus/ Coach	Bristol, Bath, Somerset, So uth Gloucestershire and West Wiltshire	UK
	First West Yorkshire	Bus/ Coach	West Yorkshire	UK
	First York	Bus/ Coach	York	UK
	Aircoach	Bus/ Coach	Dublin and intercity	Ireland
	First Student	School bus	Southern Ontario, British Colombia, Vancouver, Calgary, N.York, Winnipeg	Canada
	Greyhound Canada	Bus/ Coach	National	Canada
	Grey Goose Bus Lines	Bus/ Coach	Manitoba	Canada
	Vancouver Island Coach Lines	Bus/ Coach	Vancouver Island	Canada
	Voyageur Colonial Bus Lines	Bus/ Coach	Eastern Ontario, Western Quebec	Canada
	First Transit	Bus/ Coach	Nationwide - normally operating as local authority brands	USA
	First Student	Bus/ Coach	National	USA
	Greyhound Lines	Bus/ Coach	National	USA
	BoltBus	Bus/ Coach	Intercity, British Columbia	USA
	Great Western Railway	Rail	Intercity	UK
	Hull Trains	Rail	Hull to London	UK
	London Tramlink	Rail	London	UK
	South Western Railway	Rail	Intercity	UK
	TransPennine Express	Rail	Intercity	UK
	A-Train	Rail	Denton (Dallas Fort Worth)	USA