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Developing a Brisbane 2032 MaaS Solution: Learnings from a narrative review

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Abstract

Managers of mega events are continually looking for ways to improve visitor experience and to encourage repeat visitation to their venues and their events. Mobility as a Service (MaaS) could help integrate the planning, booking, and payment for different transport (and non-transport) options to get to and from events. Research about event-MaaS is limited, warranting a review of the ideas, practices and application of this emerging sector of MaaS. The aims of this paper are: i) to explore how event travel is moving towards Mobility-as-a-Service (MaaS); ii) to categorise the different types of event transport integration that have emerged thus far; iii) and to identify a research program that will advance this sector. This is important for governments preparing for mega events, including the 2032 Brisbane Olympics and Paralympics, to understand how services like MaaS could play a role in bettering user experience and delivering passenger transport services. To achieve these aims, first, a narrative literature review on MaaS in tourism and events was conducted, using academic and grey literature. This revealed scant scholarly literature on tourism/event MaaS and very few applications of the concept in practice. Second, this material was used to develop a framework for events-MaaS, including a typology applicable to events ranging from local football games to mega-events such as the Summer Olympics. Key initiatives already used in Australian cities that take us part-way towards event-MaaS are outlined. Next, the remaining gaps are identified and a research program that would help fill out our knowledge and build the necessary integrations is provided. The paper provides practitioners with a clearer understanding of what might be needed for event-MaaS, the business case for such initiatives, and the ways forward.

Keywords: Mobility as a Service; MaaS; mega-event; event-MaaS, Brisbane 2032 Olympic Games

1 Introduction

Transport planning organisations are adopting new methods to encourage more responsible travel behaviours. Mobility as a Service (MaaS) is a cutting-edge concept to reduce reliance on private cars (Alyavina et al., 2020). Essentially, MaaS is a digital tool available through an app that offers door-to-door travel solutions using various modes of transport, accessible via pay-as-you-go or subscription models (Smith et al., 2022). This concept is a natural progression from earlier digital integration efforts providing travel information, building on systems like Advanced Traveler Information Systems and Integrated Multimodal Traveler Information (Lyons et al., 2019). MaaS has primarily evolved within the sub-fields of intelligent transport systems (ITS), public transport, micro-mobility, and transport policy.

A practical definition of Mobility as a Service (MaaS) should encompass three key aspects (Leung et al., 2021):

1. It should be user-centric, meaning it should cater to the specific travel needs of an individual by offering a customized mobility package (Hensher, 2017);

2. It involves "co-modal" services, where the travel needs are met by combining the most appropriate modes of transportation for a particular activity (Jittrapirom et al., 2018).
3. MaaS should be accessible through a user-friendly digital interface, typically a smartphone app, which serves as a gateway to a broader range of services (Pangbourne et al., 2018).

MaaS aims to integrate transport booking, travel information, planning and payments, and service-offer systems on a single digital platform (Kim et al., 2021). It has been effectively applied in various countries, with Finland, Denmark, Japan, and Germany cited as notable examples. Key insights from these implementations include overcoming accessibility barriers, providing integrated multimodal mobility, achieving smooth transitions between different modes of transport with a focus on the user, reducing traffic congestion and emissions, and fostering strong partnerships between public and private sectors (Mitropoulos et al., 2023).

The previous studies have chiefly discussed the applicability of MaaS in people's daily travels (e.g.,(Matyas and Kamargianni, 2019, Ho et al., 2018, Caiati et al., 2020)). However, there has been relatively few research of MaaS in the tourism sector, particularly for special events. Yet, recent studies are beginning to explore the role of MaaS in enhancing tourism sustainability, noting its potential to improve the environmental sustainability of tourist destinations through better transportation solutions (Eckhardt and Haanpää, 2022, Almeida-Santana et al., 2022, Leung et al., 2023, Pihlajamaa et al., 2022). Accordingly, there is a great potential for MaaS to be realised in terms of events. Travel during special events differs significantly from daily travel as it often involves navigating unfamiliar traffic conditions, the absence of transport cards, concentrated trip origins and destinations, and the presence of companions, which can influence traveller acceptance and preferences. event-MaaS can resolve such spatial and cognition challenges, substantially supporting sustainability and profitability during special events. As will be shown, many gaps remain in knowledge, especially in the more limited sub-field of tourism or events. Instead, MaaS could evolve to become a 'Mobility as a Feature' from the viewpoint of a non-transport service since mobility alone is rarely able to generate enough users to sustain itself financially (Hensher and Hietanen, 2023).

How passenger transport is planned, booked and paid for events has not been researched comprehensively. In Brisbane alone, eventgoers are encouraged to use public transport as an option for travel, with the inclusion of public transport tickets within their event ticket. This is intended to reduce private car use to events. They may also pay their own way on shared e-scooters for part or all of a journey to a stadium with discount incentives offered by e-scooter operators. These transport offerings feature different levels of service quality in terms of how one plans, books and pays for their travel, and there are issues of fairness and equity in terms of who pays and how. To move toward higher-order, improved MaaS system for events, these gaps in knowledge, the technical integrations, and the equity and fairness tensions, need to be resolved. The main contribution of this paper is providing the theoretical/conceptual framing for this effort and identifying a research program that will take our field forward.

The structure of the paper is as follows: Initially, we outline the methods employed in this study and describe the processes of the narrative review. Following this, we present the results, which focus on the typologies of MaaS and identify the types of events where MaaS could be applied, supplemented by examples from real-world practice. We then identify existing gaps in the research and propose related research questions. Finally, we discuss the limitations of the study.

2 Methods

The current article aims to use the narrative approach to uncover the underlying meanings and interpretations embedded within the event-MaaS subject. Narrative reviews provide theoretical insights into important topics and are regarded as valuable educational tools (Jahan et al., 2016). We can contribute to and create new insights on the MaaS topic using this method. This review will add value for future research (De Vos and El-Geneidy, 2022). To achieve this goal, a search was conducted at academic databases such as Google Scholar and Web of Science. We supplemented these with grey literature from TRID and general searches on Google to capture reports, white papers, and government documents not typically included in academic databases. Key search terms such as "Mobility as a Service," "MaaS," "mega-event," "mega-events," "transportation," "tourism-maas, “tourist," "visitor", "attendee," "eventgoer," and related variations are used to retrieve relevant literature. The researcher reviewed through all abstracts of papers and examined them whether MaaS applications for events is be mentioned. We found almost no papers, and then concluded that narrative review would be the best option for identifying future research gaps in this area.

The selection of this methodology is particularly appropriate for understanding the potential of MaaS for events, offering a flexible, integrative approach that helps identify gaps and opportunities for future research and practical applications.

This review aims to offer insights and strategic guidance for policymakers, event organizers, and urban planners tasked with developing a MaaS solution for the Brisbane 2032 Olympics.

2.1 Typologies of MaaS

Different typologies have been developed to help identify the key elements of MaaS. One of the more applicable systems approaches of MaaS, as proposed by (Lyons et al., 2019). In a car-dependent society, we also utilize the user-oriented pyramid named the "mobility system beyond the private car" (MaaS ecosystem) adapted from Lyon et al. (2019) to make a comparison between local and mega-events. This can be as seen as pyramid that puts users at the top, with different levels of MaaS integration taxonomy based on the following indicators at the bottom:

1- Infrastructure and vehicles: This layer forms the foundation, providing the physical means to get from origin to destination. Accordingly, the transport and land use asset and infrastructure base supports and encourages public, active, and shared transport use.

2- Mobility services: refer to the actual transport offerings, such as buses, bikes, and ride-shares, which users can select to craft their journey. This layer aims to provide efficient, reliable, and interconnected transport options to facilitate seamless travel from one point to another.

3- Information services: This layer is a means through which users can interrogate the availability of mobility services, plan journeys and access support in journey execution. Real-time multi-modal trip information and support should be available to all customers.

4- Transaction: this layer serves as the financial gateway, allowing users to seamlessly book, pay, and acquire tickets for transportation through a unified platform. It integrates various payment methods and ticketing across multiple transport providers to simplify the user experience.

5- Mobility intermediary: This provides the interface between those layers necessary for journeys to take place and the *user* who undertakes the journeys. MaaS operators should be aligned with the main broker vision in this phase.

6- Users: Users are able to book, pay, and obtain tickets for door-to-door multi-modal transport options through a single platform and across multiple providers.

Table 1 adapts such systems view of MaaS to be made applicable for events as well.

Table 1: Levels of MaaS integration Adapted from Lyons et al (2019)

Mobility system	Events/ Tourism	Definition
user		Who is using MaaS in events
intermediary (MaaS platform)		What is connecting the user and other transport or non-transport services
transaction		How users can pay (via the MaaS intermediary)
information services		How users get information (via the MaaS intermediary)
mobility services	Non-mobility services (Events, tourism services)	How users access the service (via the MaaS intermediary)
Infrastructure, vehicles, venues, attractions		The physical component of the services offered (via the MaaS intermediary)

As this study focuses on event-MaaS, tourism-MaaS is also applicable since events can serve as an important attraction – a context that is still understudied and motivates the present investigation. Leung et al. (2023) have summarized how various tourism MaaS platforms, but not all of these, have event integration. Even if there is event integration (e.g., Toyota's MyRoute), it is usually limited to information and does not build multiple services.

For large-scale events such as the Olympics, achieving a higher level of MaaS integration is crucial to deliver a seamless, comprehensive visiting experience. This not only facilitates smooth access across various transportation modes but also includes additional services. Level 5 also offers longer distance journeys, which is highly compatible with supplying transport and non-transport services during the Olympic games of Brisbane 2032, as these mega-events will be hosted not only in Brisbane but also in other regional cities such as Gold Coast, Sunshine Coast, and Townsville.

Event-MaaS systems for the 2032 Olympic Games must be designed to manage the surge of international visitors by seamlessly integrating international and local transportation options within a user-friendly platform. This platform should not only facilitate transportation but also provide event-specific services, including plane or train tickets, accommodations, dining options, and city attraction maps. Tailoring the MaaS to the unique demands of the event it supports is crucial. Successful implementation will depend on several key factors: the system's ability to handle multiple modes of transportation (multimodality), the existing local infrastructure, the relevant regulatory frameworks, and the objectives and willingness of users to adopt and financially support such comprehensive services (Caballini et al., 2023). Achieving a successful event-MaaS system demands a collaborative approach among public and private sectors to address regulatory, infrastructure, and economic challenges, setting a precedent for future event planning and mobility management.

2.2 Event scales

To analyze potential MaaS applications for events, it is imperative to understand the typologies of events. Events are typically classified by their scale. In the tourism literature, the scale of events has been an important impact in the event management subfield of tourism. There is much attention on very large-scale events, or 'mega-events', but smaller events are also important for local economies as they provide an ongoing stream of activities for locals or visitors alike. Then, the size of an event, mega, major, or minor, has been subjective and vague. For instance, the definition of "mega-events" differs across various theoretical frameworks and disciplines, and similar terms are used interchangeably in both scholarly and popular contexts. Some researchers categorize Expos, political summits, conventions, and festivals as mega-events (Hiller, 1995, Ritchie and Yangzhou, 1987, Rose and Spiegel, 2011), while others restrict the term to major sports events (Horne and Manzenreiter, 2006, Maennig and Zimbalist, 2012). Additionally, opinions differ on whether

events like the Winter Olympics are considered mega-events or are seen as second-tier events (Andranovich et al., 2001, Coates, 2012). Other scholars extend the category to include single-sport events such as the Rugby World Cup or the Super Bowl (Fourie and Santana-Gallego, 2011, Gold and Gold, 2008).

One of the definitions of mega-events refers to Kassens-Noor as he describes mega-events as: “Large-scale spectacles attracting at least one million visitors and global media attention while causing urban transformations and associated costs to the hosting community (Kassens-Noor, 2019)”. Differences in scale or size are the key characteristics of mega-events that differentiate them from major events. Table 2. highlights the main differences between mega-events and other events.

Table 2: Comparison between mega-events and other events

Aspects	Mega-events	Events
Scale	High, with worldwide media coverage	mainly local, and regional
Duration	Significant, can lead to increased tourism and global recognition	Low, primarily impacts local economy
Global Attention	Often requires substantial new infrastructure or upgrades	May utilize existing infrastructure with minimal new developments
Environmental Impact	Can be substantial, with concerns about sustainability	Not so considerable
Cultural Significance	Often enhances national pride and cultural exchange	Contributes to local culture and community spirit
Frequency	Typically occur every few years or are one-time events	Can occur annually or multiple times a year
Examples	Olympic Games, FIFA World Cup, World Expos	Marathons, national sports leagues (e.g., Super Bowl, NBA Finals), large concerts

Source: (Müller, 2015, Gruneau and Horne, 2015)

Other differences such as visitor attractiveness (i.e. number of sold tickets, at least one million visitors for mega-events, number of unique visitors), mediated reach (number of front-screen watchers, worldwide media coverage, value of broadcasting rights), cost, urban transformation, Capital investment etc. have also been mentioned (Marris, 1987, Preuss et al., 2007, Shin, 2014).

There has been considerable recent interest in MaaS. When it comes to designing MaaS for events, different settings and configurations from the usual known MaaS should be taken into consideration. There should also be distinct variations in the design steps for different scales of events. Given these considerations, MaaS development and implementation are notably complex (Karlsson et al., 2020), particularly for mega-events. It is challenging to determine how the objectives of MaaS can be effectively translated into specific requirements for different events. These requirements encompass the essential functions and features to design, implement, and operate a user-focused system.

To have a clear understanding regarding the required settings for different scales of events and for the sake of simplicity and better clarification, we adapt both concepts of local events (bottom of the pyramid) and mega-events (top of the pyramid) from *"the portfolio approach to event-tourism"* (Getz, 2005). It is important to emphasize that this event typology is grounded in functionality, specifically the extent to which certain economic, tourism, or political objectives can be achieved through the hosting and marketing of events.(Getz and Page, 2019).

Combining the earlier MaaS systems typologies and the dichotomy view of events by their scale, Fig 1, and Table 3 map the differences between mega-events and local events within the MaaS ecosystem.

Fig 1: "Comparative Framework of MaaS Configurations for Local and Mega-Events" adapted from Lyons et al. (2019)

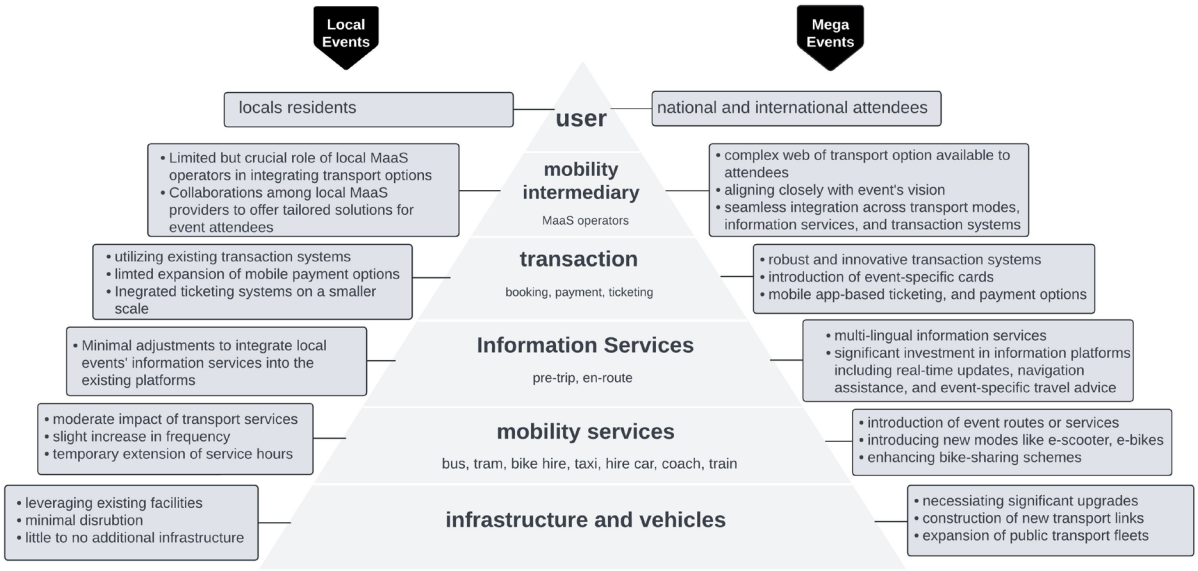


Table 3: MaaS ecosystem differences for local and mega-events.

MaaS ecosystem	Event types	Definitions
Infrastructure and Vehicles	local events	tend to use existing facilities with minimal disruption and no extra infrastructure, making it an economical choice.
	Mega-events	often require significant upgrades to transport infrastructure, possibly including new paths and expanded public transport fleets.
Mobility Services	local events	may only slightly affect transport services, with minor increases in frequency and extended hours for event timings.
	Mega-events	may introduce special event routes, additional services, and innovative mobility solutions like e-scooter rentals, while enhancing shared mobility options like bike-sharing.
Information services	local events	typically require minimal adjustments to include event details on existing platforms, leveraging familiar information channels.
	Mega-events	require significant investment in advanced information services, including multilingual options and real-time updates. These services offer detailed navigation and tailored travel advice for a diverse audience.
Transaction	local events	typically use existing infrastructure, with minor expansion in mobile payment options. Ticketing systems are integrated but on a smaller scale
	Mega-events	Call for robust transaction systems with event-specific payment cards and mobile apps for ticketing and payments, emphasizing digital, contactless engagement.
Mobility intermediary	local events	MaaS operators play a limited but vital role, integrating transport options and partnering with local providers to offer tailored solutions for attendees
	Mega-events	Need a complex transport network aligned with the event's vision, integrating transport modes and information systems for seamless experience.

These comparisons highlight how the scale of an event influences the complexity and integration level of MaaS components, and it creates a basement for conceptualizing MaaS for different events, and to ensure all attendees have smooth and efficient transport experiences tailored to the unique demands based on scale differences.

2.3 How MaaS can work for events at different scales, and example for sports events

- ***Mega-events (e.g. Olympics)***

Travelling in tourist destinations or during events like the Olympics often involves navigating unfamiliar conditions. Challenges include foreign languages, unknown transport modes, complex networks, different payment methods, and foreign currencies, which can complicate mobility for tourists and eventgoers (Matyas, 2018).

The core innovation of MaaS is its ability to provide customized service bundles that meet the specific needs of users, ensuring a comfortable and stress-free travel experience. This adaptability is crucial during the Olympics, bringing together a diverse international audience and creating a significant demand for efficient and flexible transportation solutions. The strict event schedules and geographic spread of venues necessitate a transportation solution that seamlessly connects multiple locations across a city or region. Other than that, incorporating non-transport functions such as event ticket booking, real-time language translation, and digital payment solutions significantly enhances the appeal and utility of MaaS (Leung et al., 2023). These features simplify logistical aspects and enrich the user experience by providing an integrated service platform, creating a robust market for MaaS operators.

Moreover, the Olympics allow host cities to demonstrate their commitment to innovation and sustainability. The deployment of MaaS aligns with these goals by offering sustainable travel options that minimize environmental impact, promoting eco-friendly travel choices, and integrating advanced data analytics and AI to optimize transportation services (Zhao et al., 2023).

The Olympics' unique complexities and high visibility make it a compelling case for MaaS, showcasing its capability to manage diverse transport and non-transport demands, enhance the user experience, and support sustainability objectives. This sets a precedent for implementing smart city initiatives and improving urban mobility infrastructure, providing valuable insights that can be applied beyond the context of mega-events.

Despite the potential benefits, the application of MaaS in such contexts has been underexplored in academic research. Limited practical examples of MaaS applications during events indicate a significant knowledge gap. Future studies should focus on how MaaS can be utilized in events, especially mega-events.

In the next section, we will explore the practical applications of MaaS in smaller events, offering insights and lessons learned that could inform broader implementations in future mega-events like the Olympics.As already mentioned, the application of MaaS in different events has not been investigated in academia. There are very few examples of using MaaS in events. However, MaaS has great capabilities that can be utilized in various events and venues. In view of the above, this section aims to explore the potential use cases of MaaS in the spectating context with a few examples and the learned lessons.

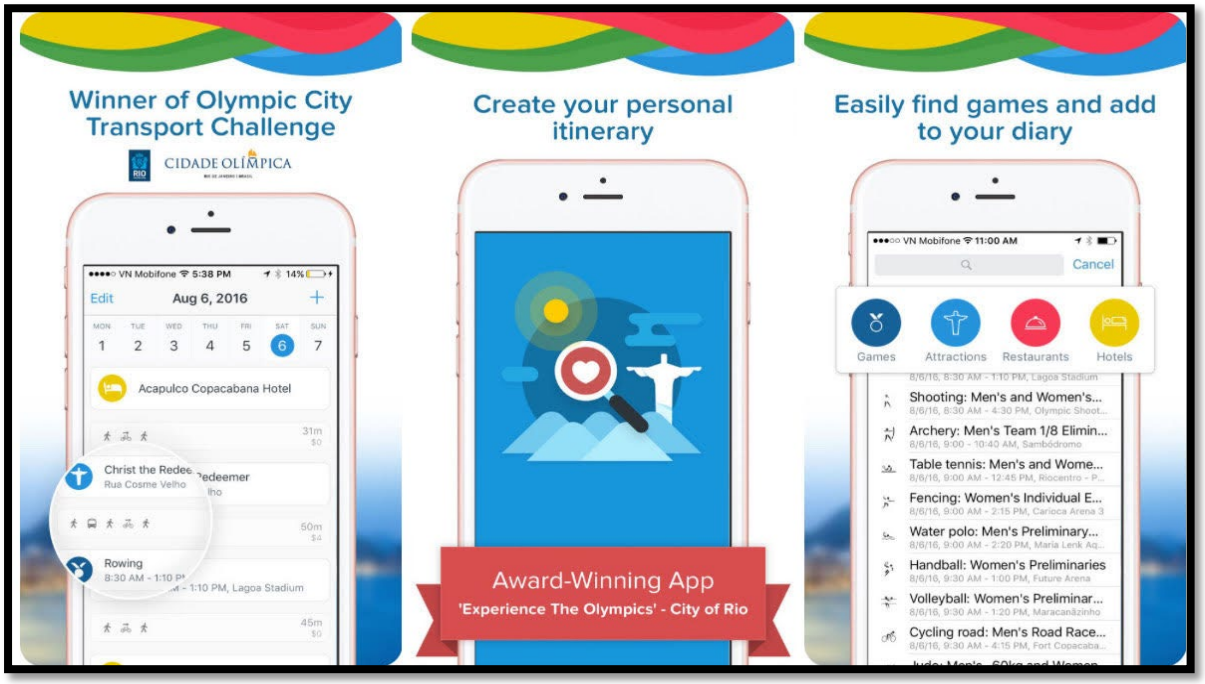
The event-MaaS app can serve as a valuable instrument for attendees in sports events, whether they are delegates, exhibitors, sponsors, or organisers. The essence of an event-MaaS app lies in its ability to foster engagement, share critical event information, and enable networking opportunities between participants before, during, and after an event. The utility of event apps extends beyond mere schedules; they encompass the full spectrum of audience interaction, providing a one-stop event solution for all things event-related. From accessing detailed information about exhibitors to real-time updates on sessions, event apps are transforming the event-going experience into something more efficient and interactive.

Rio Olympics (2016)

Navigating transportation during major events like the Olympics can be challenging, and specifying meeting points may pose additional difficulties. For example, in a big venue like the Maracanã Stadium. The custom-developed RioGo app was created by Sydney-based

start-up SkedGo and won the “Experience the Olympics” category of the Olympic City Transport Challenge in Rio (www.spatialsource.com.au).

Fig 2: RioGo MaaS app for Rio de Janeiro Olympic Games 2016 (SkedGo, 2016)

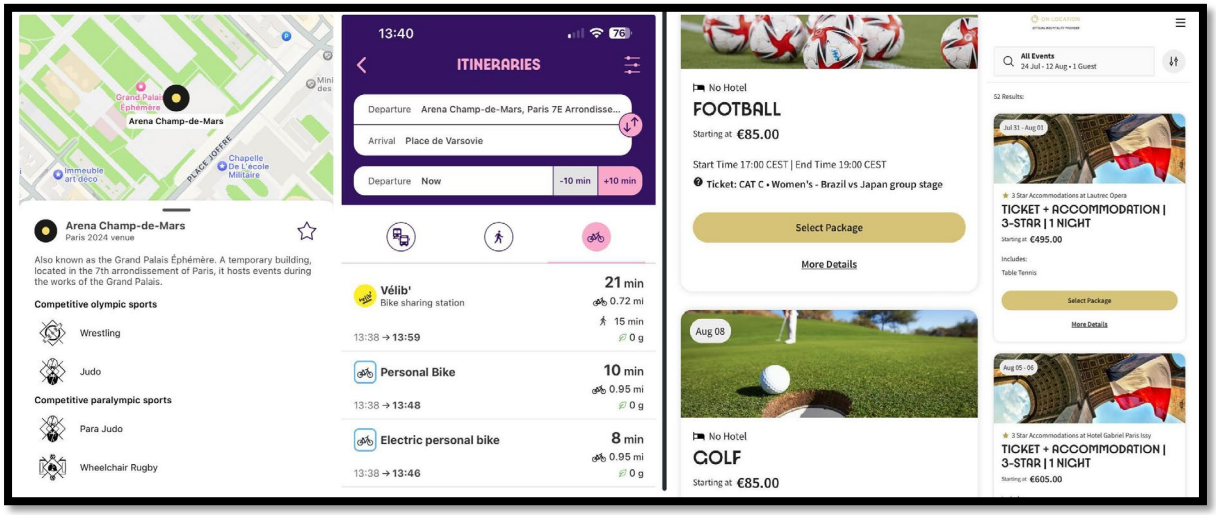


RioGo integrated with **what3words**, an innovative tech solution. What3words divided the world into **3m x 3m squares**, each assigned a unique three-word address (e.g., “require.extreme.bikers” for the Velodrome entrance). Unlike traditional postal addresses, what3words provided precise location information, making it easier to navigate during the Olympics. With RioGo’s integration, visitors could have detailed information about Olympic events, including their three-word addresses, simplifying their travel during the bustling Olympic season. Android and iOS users could benefit from this user-friendly app, which combines convenience, accuracy, and local insights. This app, with the slogan of ‘Move like a local’, was the first attempt to utilize MaaS in mega-events such as the Olympic games. This multi-modal app comprises services such as accommodation, events, sights, restaurants, and the visitors' itinerary. By providing the possibility of combining different modes of transport such as public transport, bike hire, and walking into the destinations based on the visitors’ preferences, RioGo aimed to provide the fastest, most affordable, or environmentally friendly means of navigating the city. However, it’s not clear from the information provided how extensively the app was adopted, or what user satisfaction levels were, but the app’s features suggest it was designed with user convenience in mind.

Paris Olympics

Although various applications and add-ins have been developed or will be developed specifically for the Paris 2024 Olympic Games to address hospitality, event ticketing for non-transport services, and accessibility to venues for transport services, these applications remain unintegrated. The "Olympics-Paris 2024" app, for instance, offers two primary package types: event + lounge and event + hotel, both excluding transport services. Conversely, the "Paris 2024 Olympics Travel Pass" app provides comprehensive information on venue locations, public transport services (e.g., tram, metro, bus), and active transportation options (e.g., walking and cycling).

Fig 3: Paris Olympic MaaS apps



The absence of integration between hospitality, ticketing services, and transport services prevents a cohesive MaaS solution. An integrated platform could enhance user experience by seamlessly combining event access, transport, and leisure services. However, this remains a significant knowledge and industry gap, as previous examples have not attempted to design an event specific MaaS platform that fully integrates transport, hospitality, and ticketing services. The lack of prior implementation underscores the need for innovative strategies and research to develop and standardize an effective event-MaaS model that addresses the unique complexities and high visibility of global events like the Olympics.

Norway (Hiking events)

The "Stronger Combined" project in Norway aims to make it easier for people to reach popular hiking areas by improving bus services. This project is part of a larger effort to introduce MaaS in rural parts of the North Sea Region, especially connecting public transportation with major hiking routes like Jotunheimen. It started in 2020 and continued through 2022, focusing on routes 2035 to Veodalen and 3033 to Eidsbugarden that help hikers travel at times when regular buses do not run.

Despite challenges from the pandemic, the project doubled its passenger numbers in its last year. In 2022, it worked together with other projects to encourage people to use public transport for mountain trips. This effort has made hiking spots more accessible, encouraged people to travel in environmentally friendly ways, and improved the overall experience for visitors.

Overall, the mentioned events are proven examples that show that the MaaS solution not only improves the satisfaction levels of attendees but also contributes to a positive reputation for the event and the destination itself. Moreover, as MaaS solutions often come with features like real-time updates and alerts, it helps organizers manage transportation logistics more efficiently, leading to smoother operations and reduced stress during the event.

Event-related features typically can act as a subset of these tourism apps, providing targeted services that enhance the experience of attending specific events by facilitating easy and pleasant access to transport and event services. However, there is no complete data to learn from them for the event-MaaS.

The international examples cited provide insightful lessons for event-MaaS, however, their relevance to the specific context of MaaS ecosystems designed for mega-events remains limited. In academic discourse and practical application, a consensus has yet to be established concerning the essential components of MaaS for mega-events, its management strategies, and the roles of stakeholders, including the extent of involvement by government entities or independent brokers. This gap underscores the need for a tailored approach in

developing MaaS solutions that are specifically optimized for the unique demands of mega-events.

3 Towards a Brisbane 2032 MaaS Solution

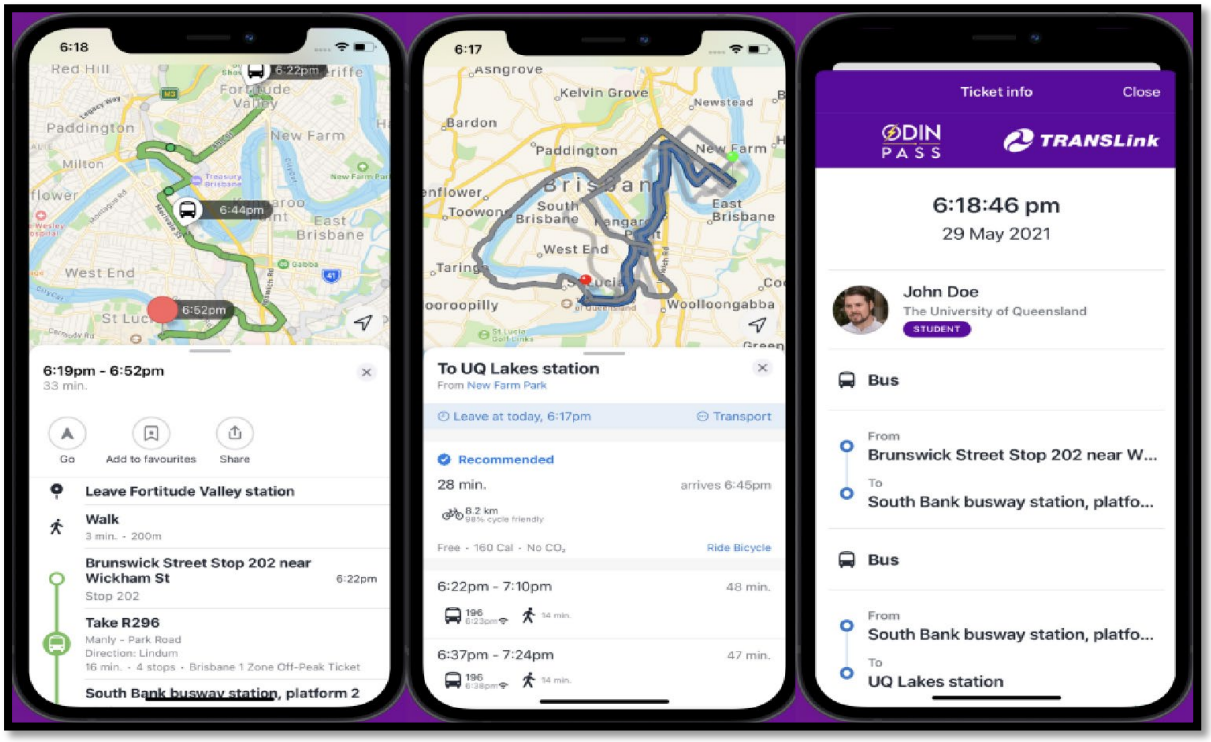
3.1 A Brisbane 2032 MaaS Solution

The 2032 Olympics are set to take place across three cities: Brisbane, Gold Coast, and Sunshine Coast, which are linked through current and future public transport networks. Brisbane will serve as the venue for twenty-one sports and both Lang Park's opening and closing ceremonies. Meanwhile, Gold Coast will host six sports, and Sunshine Coast will accommodate four sports.

Australian transport authorities in general and the Queensland Department of Transport and Main Roads in particular are increasingly interested in developing MaaS to improve the integration of various transport (or non-transport) services, which can also be utilised for events (Leung et al., 2023). In this regard, The TMR has conceptualised an “Open MaaS ecosystem” that encourages various MaaS operators, each designed for specific markets and locations (Department-of-Transport-and-Main-Roads, 2023). This model recognises tourism as a viable market for specialized MaaS services, promoting a comprehensive approach that integrates mobility with additional services regarding tourism events (Leung et al., 2023).

As an example of how MaaS is applied for events, in Queensland, the ITS Australia Summit 2022 offered conference goers the use of the MaaS trial, ODIN PASS.

Fig 4: ODIN PASS MaaS app



This trial was part of an ongoing project by iMOVE, the Department of Transport and Main Roads Queensland, and the University of Queensland, aimed at exploring the benefits of shifting from pay-as-you-go transport pricing towards fixed-cost mobility plans to influence travel behavior positively (iMOVE Aust CRC Transport, 2022). The Summit Mobility bundle, specifically designed for this event, offered attendees unlimited public transport travel on buses, trains (excluding Airtrain services between Eagle Junction and Airport Stations), ferries, and trams across Southeast Queensland. It also included unlimited Neuron e-scooter and e-bike trips for up to 90 minutes daily, along with access to pay-as-you-go mobility

services from Beam, 13cabs, and GoGet. This package was available for a one-week period, from Friday, 12 August until Thursday, 18 August, at a cost of $20, enabling travel before, during, and after the event. Attendees were directed to register for the package via the ITS Summit 2022 - ODIN PASS PAGE. They could find further assistance through the ODIN PASS onboarding tutorial for ITS Australia Summit 2022 Delegates (iMOVE Aust CRC Transport, 2022).

Creating an unforgettable experience for spectators is crucial for a successful Olympic Games. The MaaS typology should be highly integrated, with appropriate bundles that promote tourism, enhance destination image, and ensure smooth, safe, and dependable transportation across venues. The Queensland Government and TMR play a vital role in deploying MaaS and fostering this new ecosystem. The system should offer better travel choices, coordinating various travel options, including new and emerging services (e.g., e-scooters, e-bikes), allowing visitors to manage long-distance and local travel arrangements through a single interface for seamless planning and payment.

Additionally, it should include walkability assistance, foster collaboration among transport providers, and promote healthy competition for better services and innovation. Fairness and equity should be central to the MaaS framework, ensuring fair pricing, supporting equity, and meeting attendees' needs with multi-modal options. Bundled subscriptions and packages should complement pay-as-you-go options to enhance user experience.

Event-specific MaaS extends beyond transportation by integrating non-transport services, mainly related to tourism. This holistic approach provides seamless connections to local attractions, dining, events, and parks, enriching the event environment and simplifying logistics. By embedding these services within the MaaS platform, attendees can effortlessly access comprehensive information and booking options, making their event experience more enjoyable and convenient.

Event-specific MaaS should cater to diverse attendee groups, such as general ticket holders, athletes, and the Games family, by integrating a range of services into a unified platform. This ensures that each group can access tailored services for a seamless and convenient event experience.

- **For general ticket-holders**

MaaS can help to integrate various transport and non-transport offerings with better information. Packages may help to provide alternatives to different transport modes, including public transport, metro, ferries, cycling, e-bikes, e-scooter, and walking. Plus, incorporating non-transport packages (ie., dining, attractions, accommodations etc.) in the platform can lead to an outstanding experience for ticketholders. For example, track and field competitions could be sold in a package, which includes admission, accommodation, venue transport and associated dining for morning/evening. Packages may also offer long-distance travel options (i.e., plane tickets or airport transfers to the venue).

- **For athletes**

Athletes would have access to a dedicated section in MaaS platform designed to cater to their unique needs. Upon arrival in Brisbane, they’d receive personalised packages based on their competition schedules, training sessions, and recovery periods. The platform would consider factors such as event timings, warm-up requirements, and rest intervals. Additionally, the MaaS platform would facilitate the journey from their accommodation to athletic events, providing specific transport services tailored to their schedules. These services include dedicated shuttles or private transports that operate according to the athletes' event schedules, ensuring timely arrivals for competitions and sufficient time for pre-event preparations and post-event recovery.

As an example for a national volleyball team, a variety of considerations ranging from match packages to sightseeing packages (optional) would be made. Once their completion was finished, they could also stay in the venue to support their compatriot athletes in other

athletic completions. This also necessitates including some bundles or packages to these types of visitors. In this scenario, the MaaS platform aims to enhance the overall experience for athletes and coaching staff. The package can also include admission for players and coaching staff, access to team-specific facilities (such as warm-up courts and recovery zones), information about nearby practice facilities, and an optional sightseeing package for post-competition exploration of Brisbane. The MaaS solution optimises logistics, enhances performance, and contributes to an unforgettable Olympic experience for athletes.

- **For Games Family (media, IOC, officials, sponsors, VIPs, etc.)**

An ideal experience for game family may consider some important points. Dedicated VIP Lanes lanes would prioritise the movement of media, IOC members, officials, sponsors, and VIPs. These lanes would ensure swift access to venues, hotels, and other key locations. Moreover, high-end shuttles equipped with comfortable seating, Wi-Fi, and refreshments would transport the Games Family. These shuttles would operate on optimised routes, minimising travel time. Each Games Family member would have a dedicated concierge available via single mobile app. The concierge would assist with itinerary planning, moving, dining and any special requests. Furthermore, a personalised app would provide real-time updates on event schedules, traffic conditions, and venue changes. This would help the Games Family make informed decisions. For environmentally conscious Games Family members, electric vehicles, carpooling, shared rides, or hybrid options would be available. would further reduce the carbon footprint. Dedicated drop-off points and VIP entrances at each venue would ensure hassle-free access. Games Family members would bypass regular queues. The MaaS system would offer multilingual services to accommodate diverse nationalities. Real-time translation and language assistance would enhance communication. Beyond the Games, the MaaS legacy would continue to serve the Games Family during their stay in Brisbane.

By now, we have explored the multifaceted considerations for MaaS during mega-events such as the Olympics, it has become evident that these services need to be comprehensive, inclusive, and efficient to meet diverse requirements. This review has illuminated a range of needs and configurations that facilitate effective MaaS operations. However, further investigation into the remaining gaps and nuances is essential to optimize MaaS frameworks for large-scale events comprehensively. There are many gaps regarding using MaaS in mega-events ranging from designing one single platform to implementation strategies to achieve the ideal MaaS which serve different stakeholders as best as possible. In the next section, the remaining gaps will be discussed.

3.2 Focused Inquiry

Some of these gaps and integrations warrant close attention in the near future.

Accordingly, three research questions are to be answered:

1- How does the travel behaviour of eventgoers using MaaS differ from other eventgoers?
2- What features and services do eventgoers prioritise in a MaaS bundle?
3- How does the integration of shared mobility into event transit pass schemes affect transportation efficiency and user experience?

Answering these research questions will contribute significantly to the optimization of event mobility solutions, offering vital insights for insights for enhancing the effectiveness and sustainability of MaaS implementations in event contexts.

3.3 Limitations

Several key limitations should be acknowledged in this research framework. First, the scope of the literature review was intentionally limited due to constraints in time and resources, leading to the omission of broader issues related to MaaS. Second, the research relied solely on a desktop review method, without primary data from field experts or practitioners,

which could have enriched the insights drawn from secondary sources. Third, the literature review was limited to English-language sources, potentially excluding significant contributions from non-English-speaking regions.

As the research progresses, these limitations will be addressed by expanding the review to include non-English MaaS initiatives, such as those in Japan and Germany, and by incorporating attendee and expert interviews for deeper insights into MaaS at mega-events. This iterative approach will provide a more comprehensive analysis of global MaaS implementations.

3.4 Remaining gaps

It is crucial to address several identified research gaps to approach an ideal framework for MaaS in the context of mega-events like the Olympics. These gaps encompass areas that necessitate further investigation to ensure that MaaS systems are effective and tailored to large-scale events' specific dynamics and needs.

Firstly, there is a lack of understanding regarding how the travel behaviors of eventgoers using MaaS differ from those who do not utilize such services. Insights into these behavioral differences would be invaluable for customizing MaaS solutions better to meet all attendees' diverse preferences and needs. Furthermore, analyzing pre- and post-travel behaviors represents a crucial phase that must be thoroughly addressed.

Another critical research gap is the development and configuration of MaaS platforms for large events. Research is needed to determine which service bundles—combining transportation, accommodation, and event access—are most attractive to users. This knowledge would assist in designing more appealing and functional MaaS packages. Clearly, what matters is that the planning for event MaaS shouldn’t be optimal, but the best solution is to avoid some problems such as high congestion during big events. Accordingly, it is important to divert attendees’ attention to different services by providing critical information and configurations.

Additionally, exploring effective nudge interventions that can promote the use of MaaS among eventgoers is necessary. These interventions could include incentives for using embedded public transport options within the MaaS system or deploying real-time updates and alerts to encourage behaviors.

Furthermore, integrating shared mobility options such as e-bikes and e-scooters within MaaS for mega-events has not been thoroughly investigated. Detailed studies on the effectiveness of these integrations could provide critical insights into how various transport modes impact the overall transportation ecosystem at large events, particularly in terms of reducing congestion and enhancing the participant experience.

Lastly, the scalability of MaaS across different types of events remains underexplored. Understanding how MaaS solutions can be scaled and adapted for various event sizes and types is crucial for broader application and sustainability.

Filling these gaps is essential for developing MaaS solutions that are not only functional but also flexible enough to adapt to the dynamic environments of large-scale events. This comprehensive approach aims to create more efficient, user-friendly, and sustainable transport (or non-transport) solutions, ensuring an optimal experience for all event attendees.

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