Drivers and barriers towards Mobility-as-a-Service (MaaS) in Regional and Rural areas: Insights from service providers and end users

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1. Introduction

Mobility as a Service (MaaS), defined most simply as 'a one-stop travel management platform digitally unifying trip creation, purchase and delivery' (Hensher et al. 2021), is often associated with urban and suburban areas with a variety of different mobility options available. In contrast, this paper investigate drivers and barriers towards MaaS in a regional and rural setting, highlighling the potential of MaaS to enhance transport accessibility and social inclusion for disadvantaged populations. Mulley et al. (2023) provide an up-to-date perspective on the critical elements of MaaS in the rural context through a review of the evidence and examine the recent "on the ground experience". Key exemplars are documented from Finland (Eckhardt et al.,2018), the Netherlands, (Philipsen, 2021), Sweden (Hult et al., 2021), the USA (Schweiger, 2020), and Japan (Tran and Hashimoto, 2022). As in an urban context much of what is currently promoted as MaaS should really be described as an enhanced journey planner or (at best) a scheme with MaaS-like qualities[1]. Mulley et al. (2023) show that Rural MaaS is mostly characterised by short-lived pilots. They also highlight the contrast between locations that have attempted to create a "MaaS experience" from the outset (e.g., The Netherlands) and those schemes that are attempting to put in place and build on the elements of a MaaS scheme (e.g., the USA).

Several commentators have proposed definitions of "Rural MaaS". For example, Eckhardt et al. (2020) describe urban MaaS as multimodal and built around public transport. Rural MaaS, by contrast relies on integrating a more diverse range of services and user groups with an emphasis on car-based modes. In a rural context reducing transport disadvantage will come to the forefront as an important objective for MaaS (Mulley et al. 2023). While local public transport is unlikely to be the backbone of regional and rural MaaS, long-distance public transport, accessed by shared modes, is likely to be a vital component of the MaaS offer.

Drawing on lessons learned from these prior studies this research investigates how MaaS might be delivered in a rural and regional context in Australia with a focus on reducing transport disadvantage. Data collection has involved in-depth interviews with key service provider stakeholders and end-user group discussions with end users. Three regional towns in New South Wales (NSW) were selected for detailed study (Dubbo, Nowra, Coffs Harbour). Findings from the data collection have been used in the development of a "blueprint" for Rural and Regional MaaS focussing on regional towns and their hinterlands.

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[1] The debate over what MaaS is and isn't continues. Hensher, Mulley and Nelson (2023) suggest the ideal MaaS framework involves a tendering authority that is responsible for a common access platform into which competitive tendered MaaS consortium bids are assessed with multiple 'winners' selected to ensure coverage of all multi-modal and multi-service products across the successful bid.

2. Methodology

2.1 Data collection and description

To highlight the complexity of mobility issues and to begin to identify the characteristics of a mobility framework that will meet users' needs, in-depth interviews with 17 stakeholders were conducted. These included both non-transport providers (e.g., government authority, peak bodies, health, and Aboriginal organizations) and transport providers (e.g., bus operators, train operators, and Community Transport (CT) operators) in three locations. All interviewees were drawn from the management level in their organizations, including Managers (8), Senior Officers (3), CEOs (3), Peer Support Partner (1), and Senior Directors (2). The work city and organisation type of each participant have been summarized in Table 1. The 6 end-user group discussions involved 45 participants in Coffs Harbour, Dubbo, and Nowra, and characteristics of participants are summarized in Table 2.

Table 1: List of interviewees

ID	Work City	Organisation Type
P01	Sydney	Non-Transport provider (NSW Government)
P02	Sydney	Non-Transport provider (peak body)
P03	Nowra	Transport provider (CT)
P04	Dubbo	Non-Transport provider (Federal Government carer support program)
P05	Dubbo	Non-Transport provider (Hospital)
P06	Nowra	Non-Transport provider (NSW Government)
P07	Dubbo	Transport provider (CT)
P08	Dubbo	Transport provider (Bus)
P09	Dubbo	Transport provider (Bus)
P10	Nowra	Transport provider (Train)
P11	Dubbo	Non-Transport provider (NSW Government)
P12	Coffs Harbour	Transport provider (Bus)
P13	Coffs Harbour	Non-Transport provider (NSW Government)
P14	Sydney	Transport provider (Bus)
P15	Coffs Harbour	Transport provider (CT)
P16	Coffs Harbour	Non-Transport provider (First Nations not for profit corporation)
P17	Sydney	Transport provider (CT)

We developed interview guides to inspire open discussion with the participants as they discussed their customer base, the services and products they provide, the role of technology in enhancing mobility service provision, the potential for a MaaS-like subscription system and the challenges of implementing MaaS. After receiving Ethical approval one-on-one interviews with key stakeholders were conducted by an independent research and community engagement consultancy company. Each interview lasted 60 minutes ~ 90 minutes, depending on the participants, and were conducted either in person or virtually. Interview transcripts were coded following a thematic analysis approach to identify thematic categories grounded on the stakeholders' views and experiences of rural mobility.

For the end-user group discussions a guide was developed to explore issues such as how people find out about, book and pay for mobility services, the impact of transport disadvantage on vulnerable groups, users' response to MaaS and the expected "gold standard" in regional and rural transport. A short survey at the end of the discussion group investigated participants likely interest in integrated mobility plans.

Table 2. Characteristics of 45 participants across 6 group discussions in the selected locations

Gender	35 x Female; 10 x Male
Age	2 x 20-34 years; **16** x 35-54 years; **24** x 55-74 years; **3** x 75-83 years
Socio-Economic Status (SES)	**13** x In paid work (FT, PT, S/E, casual. N.B. Low-income) **9** x Unemployed; **8** x Retired; **1** x Student **14** x Did not answer (likely a mix of volunteers + unemployed)
Cultural Association	**26** x Australian born, not as First Nations **12** x Australian born, as First Nations **4** x Born overseas; **3** x Not answered
Location	**12 x** < 5kms from town centre **24 x** 5-10kms from town centre **9 x** 11-30km from town centre
Drivers/Non-drivers	**26 x** Drivers**:** **15** x Also provide lifts to non-household contacts >1 x pw **11 x** Also use PT **19 x** Non-drivers**:** **14** x Private car passengers + PT Users **4** x PT only **1** x Walking only **1** x e-bike rider
Concession Cards	**Number:** **22** x Multiple**;** **10** x Single; **13** x None **Type:** **21** x Seniors card/travel voucher **19** x Centrelink (**18** x Health care card) **13** x RED Ticket **5** x TTSS **2** x NSW Companion card **5** x Mobility Parking Permit
Disabilities	**24** x None / undisclosed **21** x Single / multiple **9** x Physical **7** x Mental **4** x Sensory **1** x Unspecified

2.2 Thematic analysis

The interview transcripts were coded using Nvivo 12, a qualitative analysis software, to identify salient themes which were then reviewed and organized to identify frequently cited and important issues within broader categories. For this analysis, a mixed inductive deductive thematic analysis was conducted. The coders initially became familiar with the content and meaning of the interview transcripts. Once uploaded in Nvivo, the interview transcripts were 'open-coded' (line-by-line labelling of respondents' statements) without any pre-defined codes. From here, the coded pieces of information were grouped together based on commonality and similarity. This process was continued with each emerging theme. This method has been successfully applied to develop a psychological understanding of drivers' motives and experiences (Sandelowski 1995; Anfara Jr, 2002).

3. Results

3.1 Highlighted results from the in-depth interviews

Figure 1 provides a summary of results based on the in-depth interviews. Each theme has distinctive dimensions, expressed via their sub-themes. For example, the operational barriers faced by various suppliers/organisers are expressed in terms of funding limitations, cost of service provision and digital literacy of users. Factors influencing the ability to meet user needs (such as lack of awareness) are also identified. The study assesses the attractiveness of MaaS for stakeholders in terms of sponsorship, business opportunities and key success factors.

Stakeholder responses are categorized as positive, neutral, or negative, with issues like subscription fees, technology usage, and digital payment being major concerns among those with negative attitudes.

Policy implications imply a role for a car-based, flexible, and on-demand framework for Regional and Rural MaaS, incorporating carsharing, ridesharing, and community transport, along with flexible forms of public transport like on-demand buses. Traditional booking methods should be maintained alongside digital options for Regional and Rural MaaS. Findings also underscore the significant role of government in promoting MaaS through activities such as policy regulation, infrastructure investment, funding and subsidy, technology assistance, collaboration and co-ordination, data management and education and awareness initiatives.

Figure 1: Summary of results obtained from the in-depth interviews

3.2 Highlighted results from the end-user group discussions

Qualitative analysis was conducted on themes that were developed in the group discussions. As an example, Figure 2 highlights the three layers of impact that transport disadvantage can have on vulnerable groups including emotional, social and functional impact. Functional impact refers to the practical implications of transport disadvantage. People who face transport barriers may have difficulties performing essential tasks such as grocery shopping, reaching healthcare services, going to work, or attending educational institutions. This can limit their ability to fully participate in society and affect their quality of life. Emotional impact refers to the emotional distress or mental health issues that can arise because of transport disadvantage. For instance, individuals who are unable to easily access reliable transport may experience stress, frustration, or feelings of isolation. These feelings could be exacerbated if individuals have to depend on others for transport, leading to a sense of loss of independence. Social impact refers to the effects on a person's social life due to limited or no access to transport, such as social isolation, community involvement, relationship maintenance, and access to services. Lack of accessible transport can limit individuals' ability to participate in social activities, leading to social isolation. It might also affect their ability to maintain relationships or engage with community activities. Over time, these limitations can erode social networks and community involvement, leading to feelings of exclusion and negatively impacting the individuals' social wellbeing.
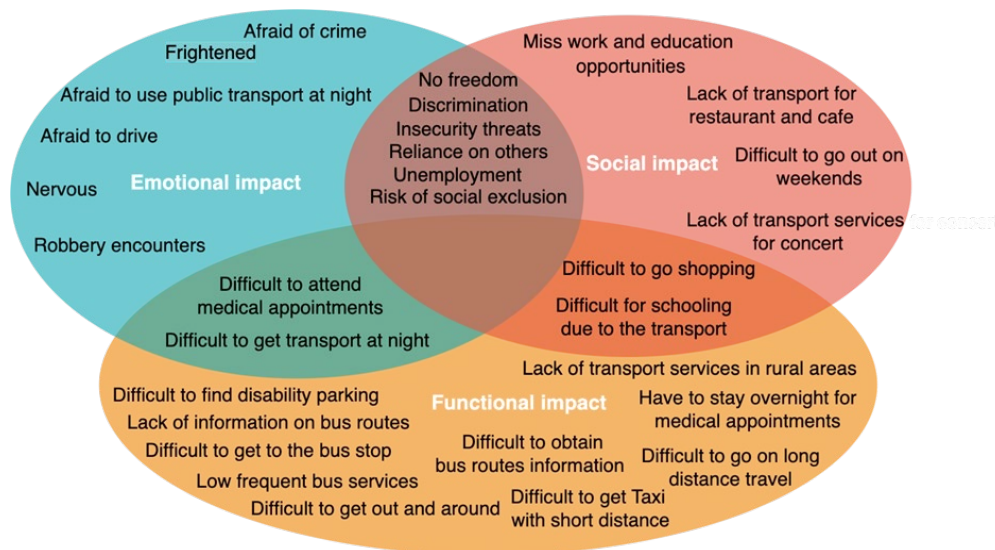
Figure 2: Impact of transport disadvantage on vulnerable groups

The expected "gold standard" in transport, as described by end users during an exercise completed as part of the group discussions, can be summarised into four categories: better infrastructure; integration; safety, comfort and convenience; and availability, affordability and flexibility.

4. Conclusion and policy implications

This paper has summarized the main findings from the results of in-depth interviews with supply-side providers/organizers and end user group discussions at three locations in regional NSW. The in-depth interviews show that users have experienced long-term transport

disadvantage while stakeholders have been facing barriers to meeting users' mobility needs. It is acknowledged that there is a gap between users' unmet mobility needs and the transport services and solutions provided by stakeholders. The group discussions provide insights into the "pain points" faced by NSW regional and rural residents (e.g., difficult to get to the train station, lack of available mobility services, cannot afford to long distance medical trips, waiting time is too long, timetable is inflexible, etc).

An additional NSW-wide online survey (not reported here) has been conducted with 916 respondents living in the 16 regional cities in NSW (which included stated preference choice games with both transport and other services designed for the respondents' reported local travel). Findings suggest that MaaS for rural areas could improve long distance travel via, for example, providing better connection to inter-regional transport hubs, particularly for social and medical purposes. Importantly, MaaS offerings for local trips should include a role for the private car.

5. Acknowledgment

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