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Using personas to understand potential uptake of tourism MaaS bundle offers in regional destinations

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Abstract

This paper investigates the preference for a bundle and its options for tourists visiting Townsville. There has been a growing interest in Tourism MaaS in Australia and beyond. Designing the most suitable bundle choice for Mobility as a Service is an important topic for the development of this new frontier in transport services innovation. However, the extent to which potential users are willing to contribute to MaaS bundles is not well understood, especially if non-transport options, such as shops and attraction tickets, are included.

A stated preference survey of 841 potential visitors from five key tourism markets (Australia, New Zealand, Singapore, the UK, and the USA) was conducted. The survey included a choice experiment using the adaptive choice-based conjoint (ACBC) approach to assess bundle preferences including six transport and two tourism offers. A set of MaaS customer personas based on ethnographical principles was used to assess the preferences.

This study is explorative and serves as a proof-of-concept for the MaaS personas approach in tourism settings. The next steps would require additional analysis of the survey variables and the use of statistical models to further understand the interactions between socio-demographic factors and user preferences.

1 Tourism MaaS – the need for it and an outline of current research

Mobility as a Service (MaaS) is being developed and has been experimented in Australia and overseas. MaaS does not have to be transport centric – it can be a feature for other non-transport service platforms (Hensher and Hietanen, 2022). There have been calls to extend MaaS to other non-transport domains, such as tourism (Aapaoja et al., 2017; Leung et al., 2023; Leung and Burke, 2021; Pihlajamaa et al., 2022). Understanding what bundles can be appealing to users is an important question for MaaS development. While such work has been explored more adequately in conventional transport-focused MaaS, the understanding of tourism-related offers is relatively scarce (Table 1). There is also limited guidance on how bundle acceptability can be tested, with a multitude of methods and variables that have been tested. Reck et al. (2020) have provided some useful guidance regarding the considerations related to MaaS bundle design and how choice surveys can be best developed to elicit stated preferences from potential users. While most studies have included transport modes, only a few have included ancillary features such as parking and coupons (e.g., shopping, accommodation, restaurants), and non-transport services (e.g., food delivery). Further, how these offers can be provided and the measures are highly differentiated, which may include (i) travel-related metrics (e.g., time/distance-based offers), (ii) geographic coverage (e.g., number of transport zones), (iii) market segment (e.g., for public transport- or car-lovers), (iv) level of discounts offered, (v) maximum use caps, (vi) customisability (how flexible the bundles can be customised), (vii) subscription period length (daily, weekly, or more), and (viii) whether the credits may roll over to the next period. However, not all of these are applicable to tourism

travel, as tourists are usually not commuters – bundles suitable for tourists involve a much shorter period, typically less than two weeks.

Table 1: Selected stated preference surveys with MaaS bundles (green shading denotes study considered tourism)

Source	Location	Sample size	Transport	Non-Transport	Values tested
(E.-J. Kim et al., 2021)	Jeju Island, South Korea	331 (Jeju visitors)	Bus Shared Van Taxi Bus	N/A	Price/Time/Sharing of cost
(Li et al., 2022)	Beijing, China	1524 Panel	Bike share PT Tour Bus Taxi Car rental/share Credit rollover	Discount on admission ticket	Cost/Quantity PAYG vs Day plan vs Month plan Habit effects (home travel vs destination)
(H. Kim et al., 2023)	South Korea (multi-regions)	500 (Chinese and East Asians living in Korea)	Bus Normal Rail High Speed Rail (focuses on inter-regional travel)	N/A	Price/Quantity/Waiting time/Transfer/Language available Matched with actual travel behaviour (RP)
(Zhao et al., 2023)	Hangzhou, China	1000	PT Ride-hailing/Taxi Bike-share (separated into Airport drop-off and Hotel to venue for a major event) Discounts	Hotel choice	Mode choice (Modality) Hotel choice Length of stay Group size Education Household composition Income Discount
(Chen et al., 2023)	Kaohsiung, Taiwan	491	Public transit (metro, light rail or bus) Rental vehicle Shared motor vehicle Shared bike Other	Shops (discount) Attraction (discount)	Tourists classified by socioeconomic variables (gender, age, education, employment, income, household composition) and latent variables (hedonic motivation, attitude toward MaaS and mobile application factor)
(Matyas & Kamargianni, 2019a)	London, UK	1046 (desktop) 111 (app)	Bus only All PT (incl. bus) Cab Bike share Taxi Car sharing	N/A	Includes a BYO Links to RP data (Mobility Record)
(Matyas & Kamargianni, 2019b)	London, UK	3769	PT Bike share Taxi Car share	N/A	Price, quantity Tested with age and Travelcard ownership
(Ho et al., 2018)	Sydney, Australia	252 (public intercepted at shopping centres)	PT (trips/days) Car share (hours/km) Taxi (discount) UberPool (discount) Credit rollover	N/A	Price/Discount/Km
(Ho et al., 2020)	Tyneside, UK Sydney, Australia	290 (UK) vs 252 (AU)	PT Shared car	N/A	Test with RP mobility type (high/low car use) PAYG vs Monthly vs Status quo (no MaaS) Similar to Ho et al. 2018
(Vij et al., 2020)	Australia	3985 Panel	Bike share Local PT Taxi Ride share Car share Car rental Long distance PT	N/A	Price, PAYG vs unlimited MaaS service features (e.g. real time info?) Type of MaaS (govt or private)
(Caiati et al., 2020)	Amsterdam and Eindhoven, The Netherlands	1078 Panel	PT E-bike share E-car share Taxi Car rental Ride share On demand bus	Real time alerts App sync with calendar Parking (as add-on) Mobility tracker (Co2/cal)	Price (monthly) Quantity (unlimited or limited by time/trips) Length of bundle Service review (pos/neg) % of sharing Geographical scope Free period Cancelation penalty
(Feneri et al., 2022)	Rotterdam, Amsterdam, and Utrecht, the Netherlands	1010 Panel	PT Car share Bike share Taxi	N/A	Price vs bundle discount Links with RP data from a 4-day travel diary
(Guidon et al., 2020)	Zurich, Switzerland	1000 Panel	PT Car share Park and ride Bike share E-bike share Taxi	N/A	Cost Zones (PT) App (yes/no)

Tourism passes are already being offered by many transport agencies, although they typically take the form of physical tickets. In South East Queensland, an example of such is the unlimited travel *Go SeeQ* card introduced in 2012 (available for 3 or 5 days) or the more flexible *Go Explore* card, which costs $10 a day and is reloadable for up to 8 days. Outside Australia, Japan has experimented with integrating incumbent tourism passes into the MyRoute MaaS platform developed by Toyota Motor Corporation (2019) with some success, and it is still operational. Stronger intergovernmental efforts and vertical integration of transport and tourism businesses in Japan have helped spur the growth of MaaS platform (Ministry of Land, Infrastructure, Transport and Tourism, 2019). In Europe, there are already destination cards or periodical tickets for unlimited transport use that can be bundled with the purchase of accommodation. An example of this is the Trentino Guest Card. However, seamless and effortless integration as envisioned by Lyons et al. (2020) is still not fully attained, as most 'tourism MaaS' are merely digitising existing paper passes into an app or a QR-code ticket.

Despite such limitations, extending MaaS to include tourism should improve the appeal of MaaS. While tourism MaaS offerings have been experimented with, most of them were short-lived, and only a few remain operational (Anttila, 2018; Ilieva, 2017; Leung et al., 2022; Tokyū and JR East, 2021). This raises an important question: how can MaaS for tourism applications be sustained? This would require a better understanding of how tourists travel in new destinations and what features they would most like to see in a MaaS platform that offers integration of both transport and tourism-related offers, which could be packaged as a bundle. This research attempts to answer these questions by testing a set of MaaS personas embedded with a stated preference survey with real-world pricing and location parameters.

2 Methodology

2.1 The survey

A survey was conducted in a less-visited regional destination in Queensland to test whether MaaS can be applied in areas that are less familiar to tourists. Townsville was chosen as the case study because it offers a variety of modes (e.g., bus, ferry, e-scooter/bike sharing, taxi, car rentals) that could be integrated into a MaaS platform. The city also aspires to attract visitors from neighbouring popular destinations, such as Cairns and the Whitsundays.

Figure 1 outlines the geographic setting and key attractions in Townsville (which was also shown the survey respondents to provide context). Visitors often embark on an excursion to Magnetic Island, where buses, car rentals, and e-scooter sharing are available. Townsville Airport (TSV) is located only 3.7 km from the city centre. Despite a relatively good level of bus service for a regional town with a population of approximately 200,000 (2023), the frequencies remain not ‘turn up and go’ levels. E-scooters have become popular and are preferred when other modes are not available. There is also some evidence that higher e-scooter usage corresponds to higher spending at local businesses (Leung et al., 2021).

The research was assisted with input from various government and tourism stakeholders (n=16) obtained from a workshop held in June 2022 in Townsville. Based on these inputs, a panel survey provider was engaged to invite potential visitors from five major tourism markets (Australia, New Zealand, Singapore, the UK, and the USA) to participate in a web-based survey designed and hosted via the Sawtooth survey platform. The Griffith Human Research Ethics Committee approved the survey protocol under GU ref no: 2023/162. The survey ran from 25 to 27 September 2023.

Figure 1: Key attractions and the transport options in Townsville

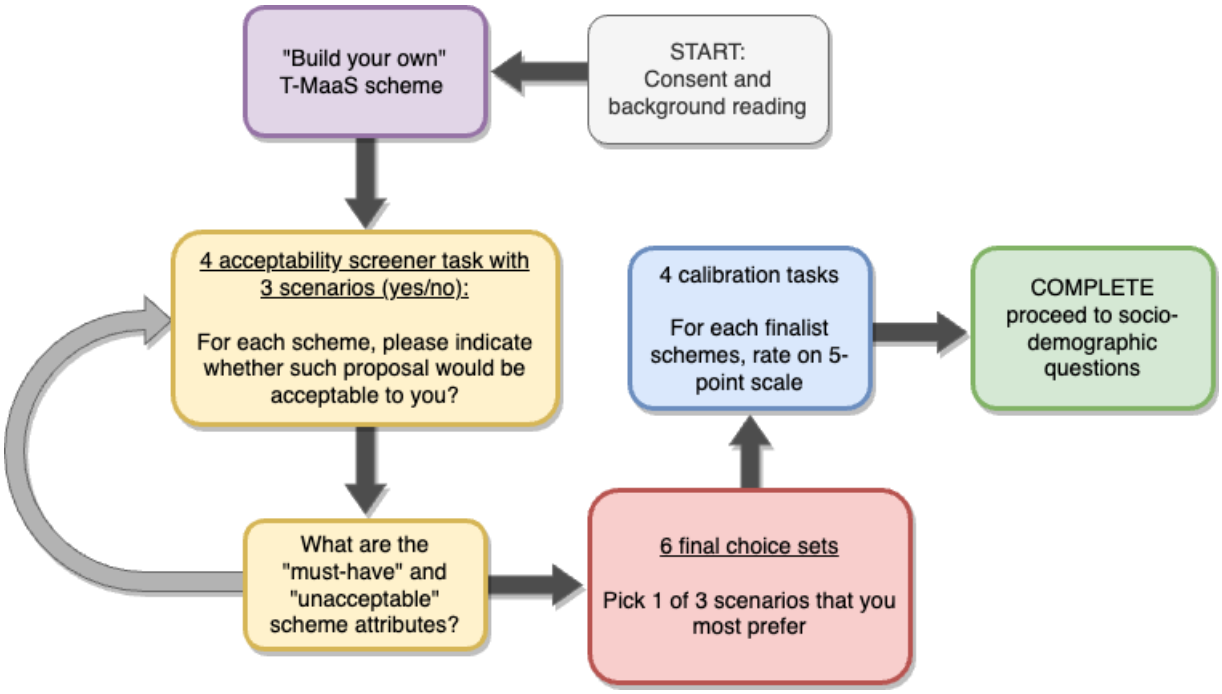
The study design was informed by a review of tourism MaaS studies listed earlier in Table 1. During the design process, six transport and two tourism offers were shortlisted for a potential MaaS bundle design, allowing for up to eight options. Due to the complexity and large number of combinations, an Adaptive Choice-Based Conjoint (ACBC) survey approach was used. This approach allows respondents to first provide their most preferred option for the choice experiment. ACBC has also been used in transport studies (Nickkar et al., 2023), urban planning (Lima et al., 2020; Veitch et al., 2017), and environmental policy appraisal (Curtin et al., 2019; Hille et al., 2018; Hunka et al., 2021; Petrovich et al., 2019). Brand and Baier (2020) offer a detailed explanation of ACBC and compare this method with the conventional DCE, also referred to as 'choice-based conjoint' (CBC) in marketing fields. ACBC is suitable for more complex products or services (Cunningham et al., 2010) and provides a more interesting and

relevant choice experiment for participants. The screening phase mimics non-compensatory decision-making—respondents first eliminate less preferred alternatives and only make choices among products that are likely preferred.

This approach can capture more information at the individual level than traditional, non-adaptive conjoint methodologies (Heinzle et al., 2013) and still provide reasonable results even with small samples; it can work well even with fewer than 100 respondents. ACBC also prevents respondents from focusing solely on paramount attributes and neglecting others, as it recognises such attribute levels and then focuses on the remaining ones in subsequent questions (Lüthi and Prässler, 2011). Figure 2 outlines the respondents' decision stages used in this study. The ACBC survey design includes three phases to more closely approximate how consumers make choices and trade-offs in the real world:

1. Build-your-own (BYO) – respondents can configure their ideal combination by indicating their most preferred options (levels) in each attribute with the indicative pricing shown in parallel. In this survey, these were computed in consideration with the intended number of tourists (adult or minors) as reported by the respondent;
2. Screening – respondents are presented with a series of full 'product' configurations and are required to choose of 'accept' or 'not accept'. Depending on the screening results, optional questions can be added to allowing the respondents to indicate which attribute level is considered as a must have (levels that are commonly chosen) or unacceptable (levels that are commonly not chosen); and
3. Choice tournament – this part reassembles to the traditional discrete choice modelling (DCE), the respondents are presented with the configurations identified as most likely options, and to choose one option out of a few.

Figure 2: Indicative flow chart of the ACBC survey process



2.2 Attributes and levels used in the survey

Initially, respondents were provided with a set of build-your-own (BYO) attributes and were invited to configure their own preferred Tourism MaaS bundles for visiting Townsville. The BYO attributes and pricing assumptions are summarised below in Table 2.

Table 2: Attributes, attributes levels and pricing assumptions

Levels: Offer for bundling	**Attributes:** Options for each transport/tourism offers	**Cost** for adding this option to the bundle (referenced from real-world prices*)
Bus	Pay-as-you-go (Base) ($2.40 one way, not included)	0 (Base)
	Unlimited city trips (Zone 1)	+ $4.80
	Unlimited city and Magnetic Island trips (Zone 1)	+ $6.00
	Unlimited city, suburbs and island trips (Zones 1 to 3)	+ $7.20
Magnetic Island ferry	Pay-as-you-go ($20.5 one way, not included)	0 (Base)
	Return trip (2 trips)	+ $36.00
	Flexi (10 trips)	+ $124.50
	Frequent (7 days unlimited trips)	+ $113.00
E-scooter sharing (***Neuron*** is available in City only; (***Beam*** is available in both City and Magnetic Island)	Pay-as-you-go ($1 unlock, 45c per min, not included)	0 (Base)
	Includes ***Neuron*** subscription (for City only) for up to 90 minutes every day (45c per minute afterwards. Unlocking fees ($1) waived)	+ $15.00
	Includes ***Beam*** subscription (for City and Magnetic Island) for up to 90 minutes every day (45c per minute afterwards. Unlocking fees ($1) waived)	+ $14.95
	Includes ***Neuron*** and ***Beam*** subscription for up to 90 minutes every day (45c per minute afterwards. Unlocking fees ($1) waived)	+ $20.00
Hotel e-bike rental	Pay-as-you-go ($2 unlock, 25c per min, not included)	0 (Base)
	For up to to 240 minutes every day (25c per minute afterwards)	+ $35.00
	Day pass (unlimited use)	+ $55.00
Taxi	Pay-as-you-go ($2.9 base fare, $2 per km, not included)	0 (Base)
	5% discount	+ $5.00
	10% discount	+ $7.50
Car rental	Pay-as-you-go ($95 per day up to 120km, not included)	0 (Base)
	5% discount	+ $5.00
	10% discount	+ $7.50
Shops and restaurants (Up to 70 partnering businesses)	No discount	0 (Base)
	5% discount	+ $5.00
	10% discount	+ $7.50
Attractions (tickets to museums and tourist attractions)	No discount	0 (Base)
	10% discount	+ $7.50
	All inclusive	+ $45.00

*Price of single adults are shown in this table. In the survey, prices were adjusted based on group size and number of accompanying minors

2.3 Statistical analysis approach

Using the observed choices obtained from the ACBC exercise, the individual-level part-worth utilities of the respondents were estimated using Hierarchical Bayes (HB) estimation (Orme, 2014). Part-worth utilities are a measure of the relative desirability of an attribute level. To ensure the results are comparable across individuals, part-worth utilities were transformed into several metrics, such as relative importance. These can be further analysed alongside other individual characteristics that were obtained in other questions of the survey. The HB estimation was completed using Sawtooth's built-in modelling and simulation tool, which is comparable to multinomial logit approaches. R was also used for further statistical analyses and visualisation.

2.4 Survey quality control

A total of 1,257 respondents entered the survey. As they were from a panel and were incentivised monetarily to complete the survey, a stricter threshold was used to ensure data quality and reliability. Responses submitted in less than 8 minutes were removed based on a Root Likelihood (RLH) fit statistic. This statistic can be used to estimate how well a choice model fits the data set. RLH values range from zero to one, with a higher value indicating a better fit of the model. An individual RLH of 0.51 was chosen as the threshold for acceptance. 841 samples were accepted for further analysis, with a mean RLH of 0.6.

2.5 MaaS customer personas

During 2021 to 2022, the *MaaS Market Scan – Customer* research project was commissioned by the Queensland Department of Transport and Main Roads (TMR) (Chinnock et al., 2022). The work was undertaken by Mott MacDonald, including sub-consultants Symplicit and Ipsos. The personas were developed using a bottom-up approach, based on the UK Design Council's (2004) double diamond design process. The personas are derived from contextual interviews in the MaaS Market Scan that identifies and allocates customers into groups based on their attitudes towards attributes including trust, value, sharing, community, and commitment. Personas serve as a storytelling tool that aids designers, planners, and engineers in considering the needs of the people they are designing for. Developing personas is a useful way to understand the different types of users, their needs, aspirations, and how they might behave and respond to situations. A set of 25 Likert statements was used to segment respondents with these 'down-to-earth' questions regarding their experience and views on purchasing services. The combination of responses classifies the person into one of seven personas, which are summarised in Table 3.

Table 3: MaaS persona attributes and their Indicative allocation

#	Personas	MaaS Attributes Allocation			
		Trust: 5 = Carefree 1 = Conservative	**Value:** 5 = Experience driven 1 = Budget driven	**Commitments:** 5 = Time to explore 1 = Busy bee	**Sharing:** 5 = I'll take what's available 1 = I want my own things
1	Mover and Shaker	4	4	2	4
2	Maverick	1	3	3	4
3	Achiever	1	1	1	1
4	Quartermaster	2	1	1	2
5	Anchor	2	4	4	4
6	Coaster	4	4	5	4
7	Lighthouse	3	4	3	4

The TMR MaaS personas were not initially developed with tourism as a specific use case. This study tests their applicability in tourism-specific contexts and explores whether the tool could aid in creating tourism-focused bundles. As a market segmentation tool, these personas are envisioned to assist in developing tailored products that address the unique needs of different segments. After completing the survey, the personas were assigned to the 841 respondents based on their responses to the 25 Likert statements.

3 Results and discussion

3.1 Respondents' profile and personas allocation

Table 4 outlines the respondents' profile and the MaaS personas allocated. Gender balance was achieved in most markets (53.49% females to 46.75% males). Participants aged 35-44 years old (22.59%) were the most represented. The gender and age profile varies slightly across the markets. Most respondents have never visited Townsville (59.33%), and, if they do visit, the most common purpose is for a holiday (83.23%), followed by visiting friends and relatives (VFR). The most likely group size is two persons (41.62%), followed by solo travellers (26.16%). Up to 72.77% of the respondents do not intend to bring children, and the most likely lengths of stay are three (35.55%) or five days (31.03%). The respondents generally possess a driver's licence (89.88%). Cross-tabulation with residence (not shown in this paper for brevity) found that less car-dependent areas such as Singapore (15.67%) and the UK (12.43%) were less likely to possess a driver's licence. Most respondents held a bachelor's degree or a higher level of educational attainment (64.23% in the survey).

Table 4: Respondent profile and MaaS Personas classification

Characteristic	Mover and Shaker	Maverick	Achiever	Quarter-master	Anchor	Coaster	Lighthouse	ALL
Sample size	234	93	111	105	98	137	63	841
(share %)	(27.82%)	(11.06%)	(13.2%)	(12.49%)	(11.65%)	(16.29%)	(7.49%)	(100%)
Country of residence								
Australia	17.5%	25.8%	23.4%	24.8%	25.5%	20.4%	12.7%	21.2%
New Zealand	11.1%	20.4%	27.0%	29.5%	26.5%	27.0%	27.0%	22.1%
Singapore	23.9%	16.1%	15.3%	12.4%	5.1%	11.7%	20.6%	16.1%
United Kingdom	17.9%	25.8%	21.6%	20.0%	23.5%	21.9%	20.6%	21.0%
United States	29.5%	11.8%	12.6%	13.3%	19.4%	19.0%	19.0%	19.6%
Gender								
Female	56.7%	35.9%	46.8%	74.3%	56.1%	46.7%	53.2%	53.4%
Male	43.3%	64.1%	53.2%	25.7%	43.9%	53.3%	46.8%	46.6%
Age								
18-24	9.8%	6.5%	5.4%	5.7%	1.0%	1.5%	9.5%	5.9%
25-34	23.1%	17.2%	18.9%	20.0%	4.1%	9.5%	23.8%	17.1%
35-44	38.5%	17.2%	16.2%	17.1%	8.2%	18.2%	23.8%	22.6%
45-54	10.3%	24.7%	18.0%	32.4%	13.3%	15.3%	12.7%	17.0%
55-64	9.0%	16.1%	16.2%	15.2%	23.5%	22.6%	14.3%	15.8%
65 or over	9.4%	18.3%	25.2%	9.5%	50.0%	32.8%	15.9%	21.5%
Purpose								
Holiday	82.9%	83.9%	84.7%	84.8%	80.6%	83.2%	82.5%	83.2%
Events	6.4%	4.3%	3.6%	3.8%	2.0%	4.4%	4.8%	4.5%
Business	3.0%	1.1%	2.7%	0.0%	1.0%	0.0%	1.6%	1.5%
Visiting friends & relatives (VFR)	6.0%	10.8%	6.3%	9.5%	9.2%	8.8%	7.9%	8.0%
Other	1.7%	0.0%	2.7%	1.9%	7.1%	3.6%	3.2%	2.7%
Intended travel group size								
1 person	20.9%	34.4%	23.4%	30.5%	31.6%	24.8%	25.4%	26.2%
2 persons	31.6%	35.5%	49.5%	39.0%	54.1%	51.1%	38.1%	41.6%
3 persons	27.4%	21.5%	15.3%	15.2%	8.2%	11.7%	14.3%	17.8%
4 persons or more	20.1%	8.6%	11.7%	15.2%	6.1%	12.4%	22.2%	14.4%
No. of minors intended travelling together								
0 (none)	52.1%	83.9%	77.5%	77.1%	87.8%	81.8%	74.6%	72.8%
1	35.9%	12.9%	15.3%	15.2%	7.1%	13.1%	14.3%	19.4%
2	11.5%	3.2%	6.3%	5.7%	3.1%	5.1%	7.9%	6.9%
3 or more	0.4%	0.0%	0.9%	1.9%	2.0%	0.0%	3.2%	1.0%
Intended length of stay								
1 day	4.7%	2.2%	8.1%	1.9%	8.2%	5.8%	6.3%	5.2%
3 days	29.9%	47.3%	30.6%	44.8%	33.7%	31.4%	44.4%	35.6%
5 days	35.0%	31.2%	30.6%	24.8%	26.5%	35.0%	25.4%	31.0%
7 days	26.5%	14.0%	27.9%	22.9%	25.5%	19.0%	20.6%	23.1%
14 days	3.8%	5.4%	2.7%	5.7%	6.1%	8.8%	3.2%	5.1%
Times visited Townsville								
Visited during 2022 or 2023	33.3%	4.3%	3.6%	5.7%	3.1%	10.2%	17.5%	14.3%
Visited during 2020 or 2021	12.8%	3.2%	2.7%	1.0%	2.0%	0.7%	6.3%	5.2%
Visited during 2018 or 2019	7.7%	3.2%	5.4%	1.9%	3.1%	3.6%	4.8%	4.8%
Visited longer ago	16.2%	10.8%	11.7%	17.1%	24.5%	19.7%	12.7%	16.4%
Never visited	29.9%	78.5%	76.6%	74.3%	67.3%	65.7%	58.7%	59.3%
Household composition								
Single	11.6%	25.6%	18.2%	21.2%	27.8%	18.4%	16.4%	18.6%
In a relationship/Married	27.6%	27.8%	29.1%	26.0%	41.2%	39.0%	26.2%	31.0%
Family with child(ren)	50.0%	24.4%	34.5%	29.8%	15.5%	29.4%	39.3%	34.5%
Single parent with child(ren)	1.3%	3.3%	4.5%	9.6%	4.1%	5.1%	4.9%	4.2%
Mixed household	9.5%	18.9%	13.6%	13.5%	11.3%	8.1%	13.1%	11.8%
Has valid drivers' licence								
Yes (Full)	95.9%	96.2%	97.2%	96.8%	96.7%	98.4%	93.1%	88.7%
Yes (Learners or Provisional)	4.1%	3.8%	2.8%	3.2%	3.3%	1.6%	6.9%	3.2%
None	5.6%	16.1%	4.5%	11.4%	7.1%	8.0%	7.9%	8.1%
Education level attained								
Postgraduate degree or above	20.8%	16.3%	18.3%	13.3%	8.2%	19.3%	35.5%	18.4%
Bachelor's degree	60.2%	44.6%	50.5%	45.7%	25.5%	37.0%	38.7%	45.9%
Completed high school only	16.9%	30.4%	22.9%	36.2%	51.0%	33.3%	17.7%	28.4%
Less than high school	1.3%	1.1%	6.4%	1.9%	6.1%	3.7%	4.8%	3.2%
Other	2.2%	8.7%	3.7%	2.9%	9.2%	8.1%	4.8%	5.2%

As for the personas, 'Mover and Shakers' (27.82%) were the most represented; they vary when compared across origin markets. Respondents from Singapore and the USA were more likely to be 'Mover and Shaker'. This group can be considered the most receptive to MaaS and tends to be younger. 'Coaster' is another group that views MaaS more positively but is older. New Zealanders (19.89%) are more represented as 'Coasters' than others on average.

To illustrate how the persona questions are represented, Figure 3 presents a series of stacked bar charts divided by the corresponding personas. Respondents generally value independence and consider themselves 'tech-savvy'. This might explain the high rates of 'Mover and Shakers'. In contrast to 'Mover and Shaker', 'Anchor' and 'Achiever' are the groups that can be seen as least open to trying out subscriptions or bundles. They are less trusting of new things, are less inclined to study the options available, and prefer the simplicity of pay-as-you-go.

3.2 Attribute importance and level utility values

Further to the descriptive results, the survey also obtained the utility (a measure of willingness to pay) for the components of MaaS bundles. Table 5 presents the results of the HB model based on the ACBC survey, showing the relative importance of each attribute and the average utility of levels within the attributes.

The attribute with the highest relative importance was the Magnetic Island Ferry (24.54%), followed by hotel e-bike rental (19.17%), e-scooter sharing (11.12%), and then the total price of the bundle (10.34%). As for the levels, generally, PAYG has the highest utility level but with some exceptions—the return ferry bundle is well received (79.23), as is the 10% discount for attraction tickets (18.38) and the one-zone bus ticket inclusive bundle for the Townsville city centre area (5.33). These results indicate that these offers are more likely to be chosen by the respondents as their most preferred bundle options.

The MaaS personas were then used to compare with the utility estimation. The utility levels for each level based on the segments are visualised in a series of box-plots in Figure 4. Overall, the results correspond to those presented in Table 5 above, but there are some variations across personas. Generally, ‘Movers and Shakers’ (in orange) demonstrate higher utility towards the more inclusive or unlimited offer components and have lower utility towards PAYG options. On some occasions, ‘Coasters’ and ‘Lighthouse’ also show high utility towards the non-PAYG options, as they too likely possess pro-MaaS attributes, particularly being open to new experiences and being less budget-conscious. ‘Achiever’ is the least pro-MaaS persona and they often prefer PAYG options as these appear less complicated and do not require 'forced consumption' for higher volume services.

3.3 General ranking of transport and tourism offers to be included in bundles

After the choice experiment, the survey also included a simple ranking exercise to elicit the overall preference of all possible transport modes and tourism options in general. The options were asked in the 2022 stakeholder workshop so that both sets of responses could be compared.

Regarding transport services (Table 6), e-scooter/bike share emerged as the most preferred mode, followed by air travel, taxi/rideshare, and car rental/share. Stakeholders did not prefer air travel and car rental/share but favoured the bus.

For tourism services (Table 7), respondents would like to see accommodation incorporated into MaaS, but stakeholders least preferred it. Events were preferred by stakeholders (3rd ranked) but were only the 7th ranked option by respondents. Wi-Fi locations and service stations/EV chargers were also mismatched options. The options that were preferred by stakeholders included considerations of feasibility for inclusion in MaaS. However, respondents preferred options that could be convenient but are not easy to integrate, notably air travel or accommodation.

Figure 3: The 25 Likert questions and the response by the allocated MaaS personas

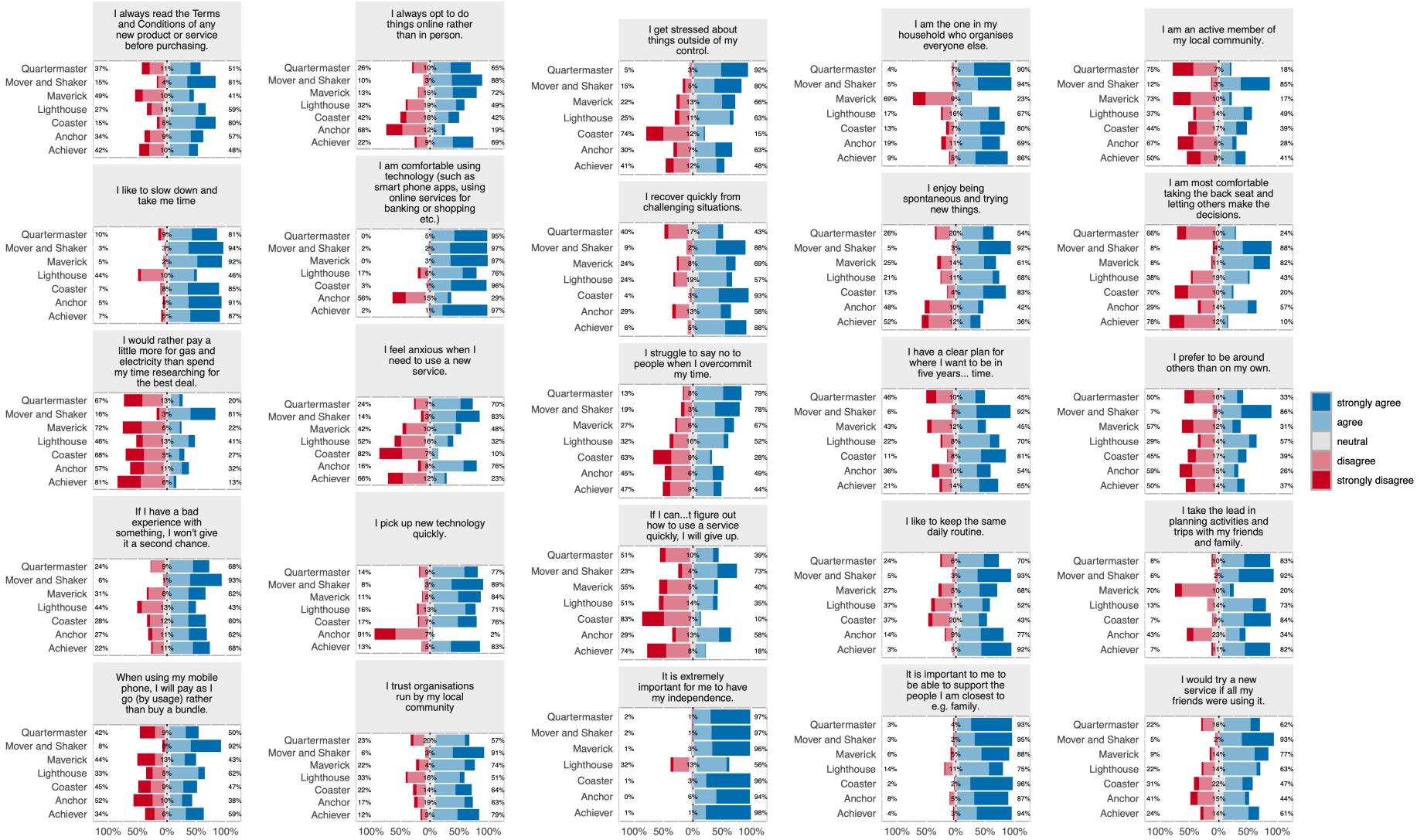


Table 5: Main results of the ACBC model using HB estimates

Attributes and levels	Attribute Importance (%)			Average level utilities		
	Value	SD	Lower/ Higher 95% CI	Value	SD	Lower/ Higher 95% CI
Bus	6.44	2.84	[6.25, 6.63]			
PAYG				10.42	(29.2)	[8.44, 12.39]
Zone 1 only (City)				5.33	(18.68)	[4.07, 6.6]
Zones 1 & 3 (City & Island)				-3.21	(17.5)	[-4.4, -2.03]
Unlimited				-12.54	(24.14)	[-14.17, -10.91]
Ferry	24.54	4.51	[24.23, 24.84]			
PAYG				101.60	(32.1)	[99.43, 103.77]
Return (2 trips)				79.23	(31.54)	[77.1, 81.36]
Flexi (10 trips)				-102.07	(28.03)	[-103.97, -100.18]
Frequent (7 days unlimited)				-78.76	(22.13)	[-80.25, -77.26]
E-scooter sharing	11.12	3.30	[10.9, 11.34]			
PAYG, any operator				62.93	(25.85)	[61.18, 64.68]
Neuron (City only)				-13.34	(17.01)	[-14.49, -12.19]
Beam (City and Island)				-18.04	(15.01)	[-19.05, -17.02]
Neuron + Beam				-31.56	(14.42)	[-32.53, -30.58]
Hotel e-bike rental	19.17	4.64	[18.86, 19.48]			
PAYG				94.02	(27.35)	[92.17, 95.87]
4 hour				-19.78	(24.46)	[-21.43, -18.12]
Day pass				-74.24	(28.08)	[-76.14, -72.34]
Taxi	7.59	2.67	[7.41, 7.77]			
PAYG				32.10	(24.87)	[30.42, 33.78]
5% discount				-9.63	(19.85)	[-10.97, -8.28]
10% discount				-22.47	(18.43)	[-23.72, -21.23]
Car rental	7.11	2.80	[6.92, 7.3]			
PAYG				28.32	(22.96)	[26.76, 29.87]
5% discount				-10.54	(20.77)	[-11.94, -9.13]
10% discount				-17.78	(21.16)	[-19.21, -16.35]
Shops and restaurants	5.58	2.53	[5.41, 5.75]			
No discount				12.42	(25.64)	[10.69, 14.16]
5% discount				-4.91	(17.93)	[-6.12, -3.69]
10% discount				-7.52	(22.17)	[-9.02, -6.02]
Attraction tickets	8.12	3.31	[7.89, 8.34]			
No discount				10.37	(26.66)	[8.56, 12.17]
10% discount				18.38	(21.53)	[16.92, 19.83]
All inclusive				-28.74	(29.89)	[-30.76, -26.72]
Price	10.34	9.42	[9.7, 10.97]			

Table 6: Transport options for MaaS as ranked by respondents and stakeholders

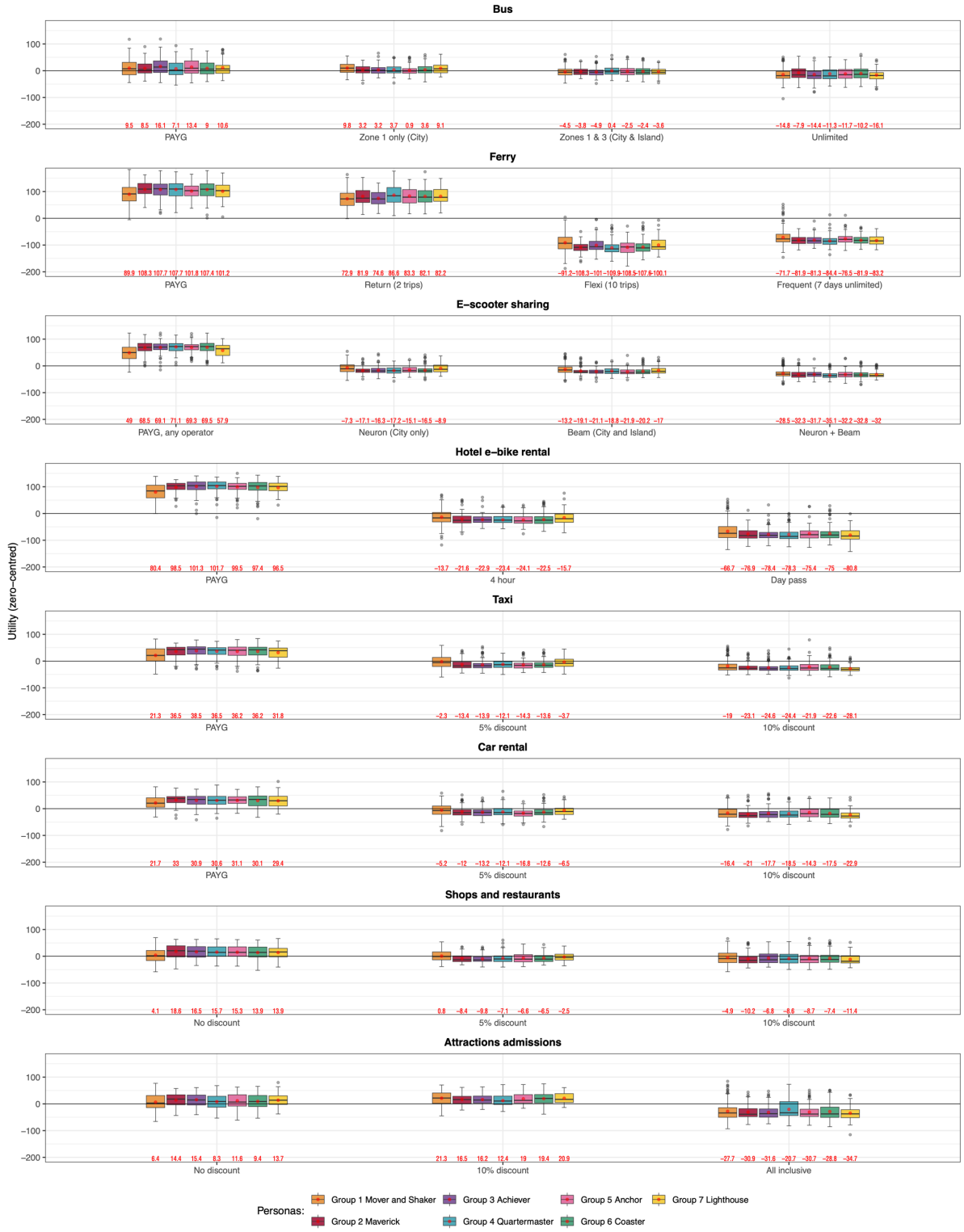
Mode options	*Survey respondent preferences**					*Top 5 selected (weighted)*			*Stakeholder preferences*
	1st	2nd	3rd	4th	5th	Total Score	Rank	%	Rank
E-scooter/Bike share	163	129	125	103	88	2000	1	15.9%	1
Air travel	207	73	75	71	64	1758	2	13.9%	10
Taxi/Rideshare	100	143	91	109	100	1663	3	13.2%	4
Car rental/share	102	111	99	74	105	1504	4	11.9%	7
Airport Shuttle	97	107	84	92	59	1408	5	11.2%	5
Ferry	49	74	89	97	98	1100	6	8.7%	3
Long distance rail	48	67	91	103	99	1086	7	8.6%	6
Bus	45	71	99	81	100	1068	8	8.5%	2
Long distance coach	13	34	57	66	76	580	9	4.6%	8
Walking (maps and guides)	17	32	31	45	52	448	10	3.6%	9
	841	841	841	841	841	12615		100.0%	

Table 7: Tourism options for MaaS as ranked by respondents and stakeholders

Tourism options	*Survey respondent preferences**					*Top 5 selected (weighted)*			*Stakeholder preferences*
	1st	2nd	3rd	4th	5th	Total Score	Rank	%	Rank
Accommodation	231	169	111	92	78	2426	1	19.2%	8
Attractions	175	158	159	128	90	2330	2	18.5%	1
Dining	103	144	146	142	125	1938	3	15.4%	2
Packages / Bundles with discounts	116	94	103	104	108	1581	4	12.5%	N/A
Parks / Amenities	58	88	96	108	144	1290	5	10.2%	4
Events	45	59	87	114	98	1048	6	8.3%	3
Itineraries suggestions	48	45	70	74	88	866	7	6.9%	7
Wi-Fi locations	48	65	46	44	74	800	8	6.3%	5
Service stations / EV chargers	17	19	23	35	36	336	9	2.7%	6
	841	841	841	841	841	12615		100.0%	

(*Note: 1st preference gives 5 score, 5th preference gives 1 score)

Figure 4: Boxplot showing the zero-summed utility values across MaaS persona segments



4 Concluding Remarks

This paper is novel in applying personas to help understand and compare user preferences towards offers that could be included as tourism MaaS bundles. The study confirmed the validity of the TMR MaaS Personas tool developed for Queensland settings and its applicability in tourism as well.

There are several limitations in this research, suggesting the need for further investigation. Firstly, the participants in the ACBC survey were obtained via a panel, and many have not visited Townsville. While realistic pricing and bundle options are presented, they are not based on actual experience. Stated preferences could be handy to gauge hypothetical situations, but revealed preference research remains important. To improve the response rate, the survey was designed to be completed in 15-20 minutes, and the home location transport habits were not included. As seen in the studies reviewed in Table 1, a combination of stated preference and revealed preference could complement the strengths and weaknesses of both survey options. Practically speaking, the analysis in this paper should help provide much-needed evidence and potential for tourism MaaS. However, the persona tool has caveats from the user guide that it is not designed to inform decisions about where to operate or consider operating, nor is it designed to inform decisions about what the MaaS product or service could or should look like. By comparing with the choice experiment outcome (utility values), it should provide some guidance—as we have seen, the return ferry option has proven popular, even though the ferry was not the highest-ranked mode in the general option question. Local context (e.g., Magnetic Island as a key attraction) does affect the acceptability of options to be included in MaaS.

The findings presented in this paper are exploratory, and further investigations into the reasons behind the initial findings will be conducted. The next steps would require additional analysis of the survey variables and the use of statistical models to further understand the interactions between socio-demographic and user preferences. Determining how to package these options in a realistic MaaS bundle would require further market testing. Nonetheless, this research is the first step to help design tourism MaaS schemes for regional cities.

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