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Mode-agnostic mobility contracts: Identifying broker/aggregator models for delivering mobility as a service (MaaS)

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Abstract

Mobility as a service (MaaS) promises a bold new future where bundled public transport and shared mobility options (carsharing, ridesharing and bikesharing) will provide consumers with seamless mobility on par with and exceeding that of private vehicle ownership. Whilst there is a growing body of work examining the market and end user demand for MaaS, there remains a limited understanding of the supply-side around new business models for delivering these integrated mobility services. Mobility broker/aggregator models have been proposed, but to date there exists no quantitative evidence to empirically test the conditions around which interested businesses might invest or supply in this new entrepreneurial model. In this paper, we propose the idea of mode-agnostic *mobility contracts* as the interface for bringing together specialised businesses as part of the new MaaS ecosystem. We identify the relevant attributes and attribute levels defining these contracts through an extensive interview and participatory research program with key stakeholders including MaaS operators, conventional transport operators, public transport authorities and consultancies, with a focus in the Nordic countries where such schemes are presently well advanced. These mobility contracts were then incorporated as part of a stated choice survey, and we document the face-to-face pilot used to finesse the survey instrument prior to the main survey. A preliminary mixed logit choice model (including willingness-to-pay estimates) based on collected data (n=121) is presented to showcase the potential of our stated preference survey to reveal what the market is willing to deliver in terms of MaaS and how the future service delivery ecosystem might look.

Keywords: mobility as a service (MaaS); intelligent mobility; service delivery; broker/aggregator; public transport contract; stated choice experiment; willingness-to-pay

1. Introduction

In recent years, a burgeoning literature has emerged on the mobility as a service (MaaS) concept—a popular interpretation of future collaborative and connected urban transportation, centred on a changing society embracing a sharing culture which can satisfy our mobility needs without owning assets such as a car. MaaS emerges because of opportunities afforded by digital information platforms to plan and deliver multimodal mobility options in point-to-point trips and/or first-and-last mile travel to public transport journeys. MaaS packages will provide consumers with seamless mobility options with integrated payments through a single application in much the same way as unified mobile plans provide users with a choice of calls, text and data options.

The premise for MaaS is to transform mobility based on asset ownership (usually, in the form of a private vehicle) to one where it may be consumed *as a service*. Central to this proposition is the move from outright purchase of mobility provision to a subscription-based model with a higher marginal cost of consumption, as compared with vehicle ownership where much of the cost is borne initially upfront and thereby regarded as 'sunk'. Accompanying this challenge of acceptance is the public's ideological attachment towards cars (Mulley, 2017), but changing demographics offer encouraging signs for (at least in the younger generation in the West) embracing this cultural shift. Already, some versions of MaaS have been implemented, with UbiGo[*] in Gothenburg and Whim[†] in Helsinki (now also Birmingham) as promient examples, and core characteristics of MaaS schemes also beginning to be defined (Kamargianni et al., 2016, Jittrapirom et al., 2017).

The design and implementation of MaaS may be related to the *three Bs* "budgets, bundles and brokers" initially proposed in Hensher (2017: 91). **Bundles** relate to mobility packages which customers purchase, granting them a defined volume of access to each included mode (usually quantified by kilometres, hours or a percentage discount). Stated choice studies on end user preferences for bundled mobility products have thus far been conducted in London (Matyas and Kamargianni, 2017), Sydney (Ho et al., 2018), Newcastle upon Tyne (ITLS, forthcoming), as well as in work commissioned by industry bodies (e.g., Intelligent Transport Systems Australia) and consultancies (e.g., SYSTRA) as a way of revealing potential user preferences. Market testing MaaS is related to the **budgets** concept in terms of the need to elucidate the preferences of all stakeholders including demanders and suppliers in the MaaS supply chain. Far less work has to date been undertaken on the supply-side, particularly around potential business models and the likely emergence of mobility **brokers** (also known as aggregators) which bring together specialised businesses and value-add by offering that integrative function. Brokers form the conduit for connecting demanders of transport service and suppliers of the transport asset/capacity by facilitating the delivery of physical transportation (Wong et al., 2017).

In this paper, we focus on the *second and third Bs* in terms of mobility brokers and the budgets (preferences) of suppliers by identifying the conditions around which interested businesses might invest or supply in the MaaS entrepreneurial model. An empirical program of work based on interviews and participatory research helps inform the candidate attributes for inclusion in business investment utility models we are developing for MaaS. Our qualitative research focuses on key stakeholders including MaaS operators, conventional transport operators, public transport authorities and consultancies, especially those in Sweden and Finland where such schemes are presently well advanced. Through this, mobility contracts are designed and incorporated as part of a stated choice experiment to test supplier buy-in to the entrepreneurial model or broker interface for delivering MaaS. A face-to-face pilot with experts and industry stakeholders is then undertaken to finesse the survey instrument. Preliminary results based on data collected to date are then presented. MaaS as a concept is moving fast, but we believe we have begun the first formalised study to test some of the ideas behind service delivery—this paper presents our starting position on the journey to fill this important research gap.

The remainder of this paper is structured as follows. Section 2 reviews urban passenger transport developments with a focus on Australia before introducing our framework for the MaaS ecosystem, including brokers and the idea of mode-agnostic mobility contracts. Section 3 presents the method used to help us design these contracts and test our survey instrument. Section 4 discusses candidate attributes like how modal mix, risk and return, business size and equity contribution, branding and government support might influence respondents' propensity to invest/supply in these new business models. Following this, Section 5 presents the experimental design, including decisions around

[*] See http://ubigo.se (soon to be active in Antwerp and Stockholm)
[†] See https://whimapp.com (operated by MaaS Global and based on the SkedGo platform)

the sampling frame and what respondent characteristics or contextual variables to collect. Initial results are presented in Section 6 by applying a mixed logit choice model on data collected thus far. Section 7 concludes and describes next steps in our effort to identify the structure of mobility broker models for delivering MaaS.

2. Delivering mobility as a service

A number of service delivery models have been proposed for MaaS, with a range of different actors and varying degrees of government involvement. With a special focus on Australia and our region, we consider collaborative efforts between public transport operators, transportation network companies (TNCs) and local authorities, as well as new ventures by non-mobility businesses adapting to stay relevant. A likely model is then proposed based on mobility brokers/aggregators and defined by mode-agnostic mobility contracts which form the basis for the empirical program of research.

2.1 Recent developments in urban passenger transport

Aided by digital technologies, TNCs have ushered in a new era of carsharing, ridesharing and bikesharing around the world. As of May 2018, there are already 35 (and rapidly growing) shared mobility providers active in the Australian market (Wong, 2018). Depending on geographic context and market demographic, these TNCs simultaneously compete with and complement public transport (Sadowsky and Nelson, 2017, Hall et al., 2017). There exists few instances of public transport operators cooperating with TNCs to deliver integrated service, particularly in providing first/last mile connections (see Boone et al. (2018) for a summary of cases in the US), and indeed only one such example in Australia—Canberra’s Night Rider+Uber[‡] initiative, backed by government. As part of the Future Transport 2056 agenda, the NSW government has funded on demand, microtransit-type trials in Greater Sydney (and soon to be rural and regional NSW). Bus operators have worked in conjunction with technology providers like Via, Routematch and TaxiCaller[§] (though some have developed in-house products) to deliver some very innovative service offerings. In a way, this can be considered a primitive aggregator model of two specialised businesses—a public transport operator (the broker plus supplier) and a platform provider (supplier)—a precursor to what we propose for MaaS. The NSW government has now launched a MaaS Innovation Challenge[**] which is an incubator process to bring eligible and interested parties together as part of a government-led MaaS trial (where government acts as the broker).

There is active interest across market sectors (in Australia) to partake in the future MaaS ecosystem. Public transport operators (at least those privately-owned) are looking to the future including more on demand service models plus incorporating autonomous technologies as they come online. TNCs like Uber are transforming into multimodal mobility platforms through acquisitions[††] and partnerships. There is even interest in the community transport sector for MaaS (Mulley et al., 2017). Digital disruption is also occurring within non-service operators like vehicle manufacturers (concerned with future buyers as cars become autonomous and pooled, so are venturing into the service provision space), motoring associations (e.g., NRMA and RACV acquiring transport operators), insurance companies (future of liability with autonomy and also their customer base under shared mobility models), energy providers (wholescale electrification of the transport sector) and even property developers (future of parking and opportunities to bundle mobility as part of rental agreements).

[‡] In this instance, the ACT government has withdrawn their demand-responsive late-night buses from the suburbs and replaced them with more frequent service on their trunk (Rapid) network. Using promotional codes, customers benefit from a $10 discount off their Uber connection from a public Night Ride service—of which the government contributes $5 with Uber subsidising the other $5. Taxi operators have lost out (despite being initially approached for this partnership) and evidence points to Uber driver-partners making better money from higher passenger turnover and shorter trips

[§] Note that these all exist as B2B businesses in Australia (although Via operates in the B2C space in the US), and despite bus operators initially involving larger players like Uber, these proposals have not proceeded for a variety of reasons (see Section 4.4)

[**] See https://maaschallenge.transport.nsw.gov.au

[††] For example, Uber’s recent purchase of bikeshare startup JUMP, which took many (even) industry insiders by surprise

Wong (2017) conducted an extensive interview program with industry leaders which identified the key ingredients for forward thinking businesses in future mobility. Innovation off-shoots and cross-sector collaboration emerged as the most effective for transforming an infrastructure and assets industry into a future services-oriented industry. What is evident is the increasing blur of sector boundaries as businesses collide and collaborate on new ventures (McKinsey and Bloomberg, 2016)—indeed a precursor to our idea of mobility brokers. Major unknowns, however, remain in the candidate actors (see Section 5.3) which we categorise under **mode-specific operators** (incumbent providers of *passenger* service) and **non-mobility providers** (new entrants) interested in partaking in the MaaS business model. The conditions around their involvement (and in what form) is also a major question, together with how incumbents might play strategic games (issues of bias) in an effort to maintain the status quo. These are amongst the unknowns we wish to test in this study.

2.2 Defining the broker: New business models

Despite these developments, fully-fledged MaaS brokers/aggregators remain few and far in between. Part of the reason is because the design and institutionalisation of such business model is particularly demanding given that innovations occur outside the exclusive control of traditional firm boundaries (De Reuver et al., 2013). Romanyuk (2018) argues that MaaS is not a traditional business model but rather a networked business model co-created in a network of actors where the development process is continuous and iterative by nature. Kamargianni and Matyas (2017) propose seven candidate actors including transport operators (plus mobility service providers like parking operators), data providers, technology and platform providers, information and communication technology infrastructure, insurance companies, regulatory organisations and universities/research institutions. Government is an active player amongst these actors which even as an interface magnifies the aggregation challenge. In their work, Kamargianni and Matyas (2017) advocate for a government agency or quasi-government entity (including a public transport authority) to assume this broker role. Jittrapirom et al. (2018), however, in a Delphi study of 46 experts found transport operators as the preferred service integrator, followed by a third-party mobility provider and then local authorities.

We believe a government broker is a particularly challenging proposition since they might not only lack the incentive to innovate but also cause a potential conflict of interest[‡‡], especially where both public and private operators exist as is the case in Australia. In Australia (and most other Western economies[§§]), government is increasingly removing themselves from service provision but rather only involving themselves at arm's length (Wong and Hensher, 2018). They are better positioned playing a regulatory function to ensure a 'level' playing field (including setting common standards) for different MaaS operators to compete. Government might still provide seed funding or act as a catalyst for innovation as is the case in NSW through their Future Transport agenda. We have hence assumed a private entity broker in our proposed model of the MaaS ecosystem for this research.

2.3 Situating the broker: Mode-agnostic mobility contracts

Having defined the broker, it is now necessary to situate it within a framework of demanders, suppliers and government (Figure 1). Brokers bring together suppliers of the transport asset/capacity, as well as other specialised businesses (like platform providers and financial enterprises), with this interface defined by mobility contracts. Opportunities exist for suppliers to also take up this broker role, as is the case with the aforementioned on demand trials in NSW (hence the blue shading). The broker in turn packages these raw services as bundles to demanders (end users), who purchases these products under a subscription or pay-as-you-go model. Given the new MaaS focus, government (who previously dealt directly with transport operators/suppliers) would now also interface with the MaaS broker/aggregator. Whether the broker(s) operate in an economically deregulated or a contracted environment (defined

[‡‡] Though there is a view in the UK that this might be appropriate in an economically deregulated market
[§§] The US might be a sole exception

by what we term *accessibility contracts* as explored in Wong et al. (2017)) is beyond the scope of the present discussion. There is merit, however, in considering a framework without government interference initially to determine what the market is willing to provide before an institutional overlay is applied to ensure alignment with broader societal objectives. This is the approach we are assuming and has been supported by our fieldwork.

Our primary interest in this paper, however, is in the broker/supplier interface as governed by mobility contracts. Various forms of involvement are possible from these constituent suppliers ranging from mere financing (**investing**) of the service provider to **supplying** intellectual knowhow or tangible assets like vehicles and depots. These binary options form the basis for the choice variable responses in this study—see Section 5.1. We have further considered at length what MaaS might mean for the future of public transport contracts (Hensher, 2017). In Australia, there is a move from area-based, mode-specific, *output*-based contracts (in effect, to deliver kilometres on defined vehicle types), to mode-agnostic, *outcome*-based contracts where the MaaS operator has the flexibility to deliver services using any mode of their choosing. This suggestion aligns with public transport institutional reform over the past 30 years, including the increasing desire for a hybrid model which brings together the best of a contracted regime with the benefits and incentives inherent under economic deregulation (Wong and Hensher, 2018). This serves as the context and theoretical underpinning for our empirical program of research to design the broker/supplier interface that is the mobility contract.

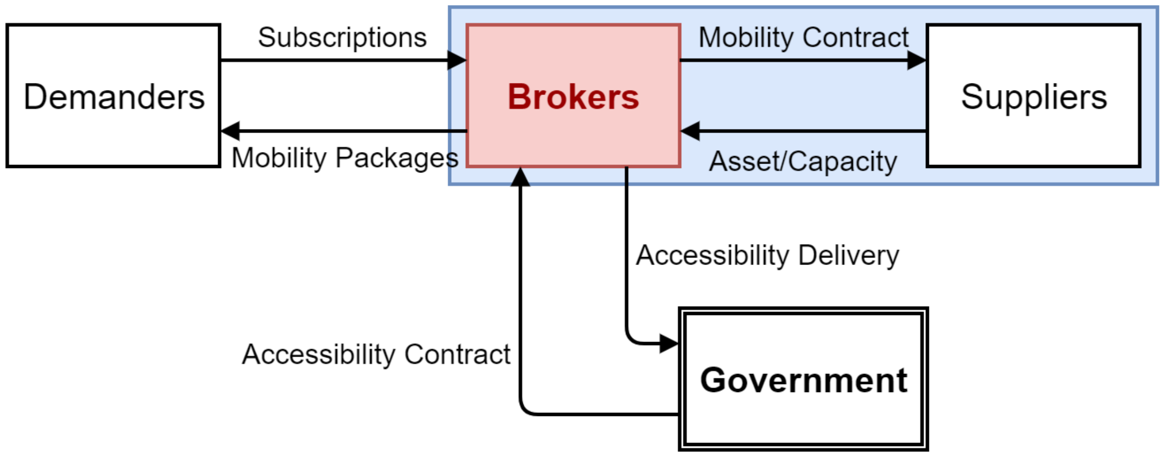


Figure 1: Proposed framework for the MaaS ecosystem, comprising the new function for a mobility broker aggregating different suppliers and delivering integrated service to demanders—excerpt from Wong et al. (2017)

3. Methodology

To design mobility contracts, we embarked on a qualitative program of interviews and participatory research with key stakeholders during August 2017. Informal interviews (structured around a study visit) were held with senior decision makers of two incumbent MaaS operators active in Helsinki and their regional public transport authority HSL. The conversations included broader MaaS and public transport topics which continue to inform related work at ITLS. Our participatory research took place at the 15th *International Conference on Competition and Ownership in Land Passenger Transport*[***] (known as the Thredbo series) in Stockholm where we ran a workshop over four days on the "'uberisation' of public transport and mobility as a service (MaaS)" (documented in Mulley and Kronsell (2018)). Twenty-seven participants representing academia, government and industry (including transport operators and consultancies)[†††] came together in this Thredbo workshop (henceforth, the *Workshop*) to consider the objectives of

[***] See http://www.thredbo-conference-series.org
[†††] Participants hailed from Australia, Brazil, Finland, Germany, Japan, the Netherlands, Norway, Singapore, South Africa, Sweden, UK and US

MaaS, regulatory challenges, policy recommendations and research priorities (amongst other issues). We took these opportunities in Helsinki and Stockholm to test which attributes ought to be included in mobility contracts, the units they should be specified in (and levels), as well as candidate contextual influences on choice outcomes.

With mobility contracts defined, we then designed them as hypothetical choice scenarios and incorporated these choice tasks and other contextual variables as part of a stated choice experiment (using the Confirmit platform). Given the novelty of the MaaS concept and limited application of stated preference methods on supply-side issues in *any* market, a face-to-face testing process was required to finesse and validate the survey instrument (conducted in February to April 2018). An internal pilot (n=9) within ITLS was undertaken with experts in both the choice methodology and transport policy to test the use of language, layout, presentation and suitability of questions for those less initiated. Data was not collected in this instance. This was followed by an external pilot (n=14) with industry leaders (including bus and rail operators, technology providers, vehicle manufacturers, consultancies and a government authority) with a focus on commercial sensitivity and the suitability of contextual variables. Data was collected from this external pilot to validate the model and confirm priors. The pilot results and qualitative research inform Sections 4 and 5.

4. Mobility contract design

Informed by fieldwork, a mobility contract was built around five attribute categories and thirteen design attributes. Table 1 outlines the list of attributes and attribute levels whilst Figure 2 situates them within an example choice task design. We now discuss the rationale for including each attribute.

Table 1: Attribute levels (See Appendix Figure A3 for a more thorough description offered to survey respondents)

Attribute category	Attribute	Attribute levels[‡‡‡]
Mobility offering (Revenue mix)[§§§]	Fixed route public transport	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%
	On demand public transport	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%
	Carsharing	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%
	Taxi-like services	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%
	Shared ridehailing services	0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%
Government support	Appeal to government through strategic/regulatory support	Enthusiastic, Lukewarm, None
	Monetary support for fixed route public transport	N/A[****], Yes, No
Return on investment	Expected average annual return on investment	-10, -5, 0, 5, 10, 15, 20%
	Possible range for annual return on investment	±2, 4, 6, 8, 10% *applied additively to above attribute*
Business branding	MaaS business and service branding	[Own company][††††]-branded, New company branding, Partner company branding
Equity contribution	Total value of the MaaS business[‡‡‡‡]	**Small:** USD 0.7, 1, 2.5, 4.5, 7, 10 million
		Medium: USD 7, 10, 25, 45, 70, 100 million

[‡‡‡] The reference/base level is underlined for dummy variables (as defined in the experimental design)
[§§§] Sum of attribute levels in this category is 100%
[****] Nested attribute level—only displayed if fixed route public transport=0%
[††††] Respondents' actual organisation name is displayed within the choice task
[‡‡‡‡] Segmentation by value—see Section 4.5

		Large: USD 70, 100, 250, 450, 700, 1000 million
	Proportion equity and voting rights in the MaaS business	10, 20, 30, 40, 50, 60%
	Equity contribution to the MaaS business	*Product of above two attributes*

4.1 Mobility offering (Revenue mix)

Mobility offering defines the mix of modes operated by a mobility broker and in turn offered as part of integrated packages to end users. Five modes were selected as part of the potential set: (1) fixed route public transport, covering urban mass transit options; (2) on demand public transport, the microtransit-type (like in NSW) operated as part of the contractual framework; (3) carsharing, including peer-to-peer, fleet-managed, return-to-base, one-way and roaming models[§§§§]; (4) taxi-like services, including point-to-point services operated by TNCs; and (5) shared ridehailing services, microtransit led by private enterprise such as uberPOOL. On demand public transport differs from shared ridehailing services in that there is an underlying contract being serviced by a subcontractor (often a TNC and heavily subsidised). Mode labels and descriptors were refined (particularly this distinction) and the way values were presented tweaked (now with coloured bars) based on pilot feedback. The proportion of revenue from the five modes total 100%. Sole modal offerings (i.e., 100% of one mode and 0% of the rest) can thus be interpreted as a status quo mode-specific contract.

One variable that was tested extensively is how best to define the mobility offering mix. An alternative to revenue, as eventually selected, is service quantity, defined by some capacity measure like vehicle or passenger/seat kilometres. The complication in this case arises from clouding the internal cross-subsidisation potential within the broker business. Further, respondents might hold an implicit bias on the financial return or revenue potential from each mode (evidenced especially from the non-mobility pilot participants). Our approach ensures a level of transparency, but we recognise some limitation by excluding other revenue streams like advertising. Government subsidies or the lack thereof is explored in a separate attribute.

The need for this mobility offering attribute category is to test how different modal mixes might alter the propensity for respondents to invest/supply in the mobility broker. In the [Thredbo] Workshop, participants felt overwhelmingly that public transport ought to be at the core of any MaaS model. Whether public transport will naturally dominate, or must government play a role in directing the market through regulation and subsidies, is an unknown worth testing. We believe respondents from different sectors will be more inclined to support contracts with a particular modal bent (e.g., TNCs will support those with more taxi-like services). We further considered adding some demand variables for each mode (as informed by our end user survey in Ho et al. (2018)) but this proved problematic due to a likely endogeneity issue.

4.2 Government support

Two types of government involvement have been selected as attributes defining each mobility contract, both of which exist as dummy variables. First, strategic/regulatory support refers to government in-principle support for MaaS, which may be exhibited through general policy direction (government masterplans, etc.) and further operationalised through the regulatory environment. Private investors are likely to avoid entry where there is only lukewarm government support or great market uncertainty. In pilot testing, this attribute was deemed even more important for publicly-owned transport operators. The Workshop recognised great tension between policy formulation and operator viewpoints, with regulatory support for MaaS which attempts to control for market failure thought to have the unintended consequence of stifling innovation (Mulley and Kronsell, 2018).

[§§§§] Not all of these are presently available in Australia

The second attribute refers to monetary support by government in terms of any subsidy adjustment for fixed route public transport (the status quo) given a greater MaaS focus in the future. This constitutes a nested attribute since it will not feature for mobility contracts without a fixed route public transport component. There are important links here with whether MaaS can evolve in the absence of government financial support, and also the possible need for community service obligation payments to the broker. The question of whether these subsidies will be passed on as a profit margin to the private enterprise is also relevant.

4.3 Return on investment

Potential return on investment is a critical part of any business decision. Two attributes are included in this category—the expected average annual return and the potential variance in this return, the latter capturing risk and uncertainty. The expected return (linked to profit margin) varies in 5% increments between -10% and +20%. Negative return levels are included given the ubiquity of TNCs making short term losses in an effort to gain (effectively 'purchase') market share, backed by venture capital investors. Negative returns can also be used as tax losses to write off tax liabilities from other businesses/ventures, as practiced by Australian toll road operators. The Workshop revealed Australian bus operators exhibiting a strong desire to enter the on demand market regardless of cost in order to showcase themselves as entrepreneurial, and hence help them win future tenders (particularly given government interest in on demand of late). We also found return expectations to vary considerably between businesses, with 8-30% having been touted (the upper end not uncommon with the community transport sector).

Return on investment might be a dominating attribute, but it is equally important to consider how this figure might vary. Realistically, the return might be based on some form of distribution (e.g., normal), but for simplicity we have not placed a probability for how this return might vary. Instead, a possible range for this return is defined, based on applying a number (2-10%) additively to the expected return. This is in contrast to applying risk multiplicatively as initially tested which caused great confusion amongst pilot respondents. True return on investment will hence range between -20% to +30%, though a much smaller range will be displayed within each mobility contract.

4.4 Business branding

Branding, bidding power and ownership of the customer emerged as important issues during the interview program and Workshop. On one hand, businesses are keen to maintain their brand since customer loyalty is part of the value proposition they bring to any relationship. This is especially the case with Australian bus operators, who pointed to their loss of livery and brand identity as part of recent changes to the contracting regime. In partnering with technology providers (for instance, for on demand trials in NSW), bus operators found it difficult to proceed with larger players like Uber who were adamant in maintaining their brand, control of data and their digital platform. In the Helsinki case, the regional authority HSL expressed an element of regret in partnering with a MaaS provider since it meant a loss of control of their product, including marketing and ticket distribution channels.[*****]

Sometimes, businesses might prefer to introduce an entirely new brand for a product or service, usually as a risk management strategy in case the venture is unsuccessful. Other reasons may include the existing branding is too localised (e.g., Punchbowl Bus Company[†††††]), to implement region-specific branding (e.g., Go-Ahead[‡‡‡‡‡]), and when the parent branding is perceived to lack strength (e.g., FirstGroup rail business[§§§§§]). Rarely will companies desire a

[*****] The partnership was also instrumental in helping the MaaS operator secure a large investment from a vehicle manufacturer which was not viewed upon kindly by HSL

[†††††] Operates as PBC in recent Goulburn (NSW) acquisition

[‡‡‡‡‡] Usually operates city/region-specific brands in UK bus and rail businesses

[§§§§§] FirstGroup has been steadily unbranding their rail operations—e.g., First Great Western now Great Western Railway, First TransPennine Express now TransPennine Express competitor's brand on their product (though this is not the case in acquisitions—e.g., Transit Systems and BRIDJ), but we have designed three dummy levels to capture and test the realm of possibilities.

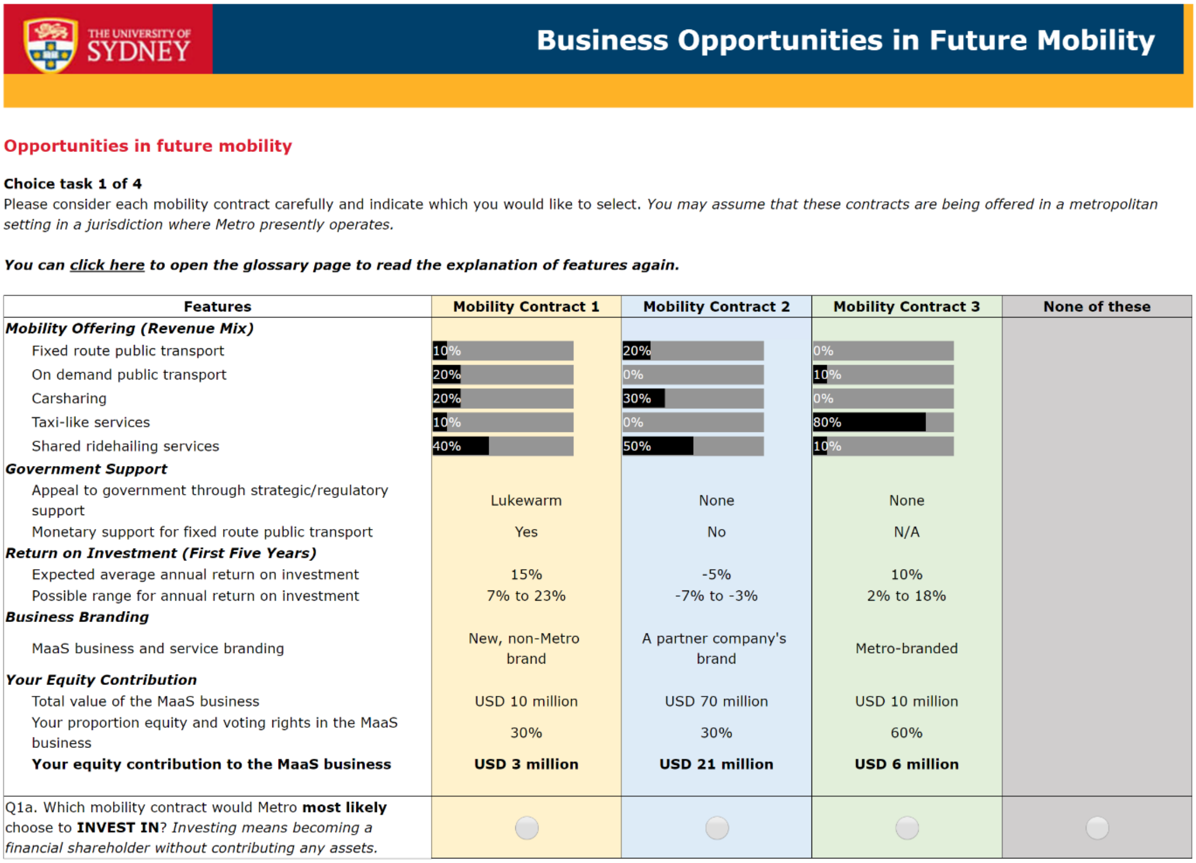
4.5 Equity contribution

The three equity contribution attributes devised are important in that they define the scale of the MaaS business and also the size of respondents' stake in the broker. The first of these attributes relate to the size of the broker business by total value in USD—selected as a global currency of trade. It is crucial to include a dollar item to estimate willingness-to-pay for individual attributes. Originally designed as a percentage of respondents' present turnover (e.g., 40% of your stated annual turnover of AUD 50 million), we found through the pilot that many respondents had difficulty providing this information. Another reason is that for a given percentage, larger organisations would see a significantly greater proportion of funds invested in what may be perceived to be a very small activity. For these reasons, a fixed range of dollars were devised, and segmentation by value in terms of organisation size implemented to ensure that the contracts remain relevant (almost a pivot design in effect). After thorough testing, we settled on using number of employees (collected as an earlier contextual variable) as a proxy for capturing organisation size, recognising the limitation in terms of labour intensity differences across sectors. The three respondent segments are:

- **Small enterprises:** ≤999 employees
- **Medium enterprises:** 1,000-9,999 employees
- **Large enterprises:** ≥10,000 employees

The second attribute relates to respondents' proportional equity contribution in the MaaS business, which range in 10% increments from 10-60%. Voting rights in the business are understood to be directly correlated with their equity investment, though in reality this may not always be the case.[******] We propose to test how different broker sizes might affect interest in the business. For some companies, they may want a dominating share (and be monopolists) whilst others might be more risk averse and prefer a smaller starting stake. The actual contribution by respondents in USD is the final attribute and displayed in bold type—a function of the previous two values. Actual contribution captures either the value of respondents' financial investment or investment in-kind, thereby monetarising assets to their equivalent amount in equity (capturing the two choice response variables *investing* and *supplying* in the contract). This may be more difficult for transport operators in the case where government owns the assets (e.g., management contracts in Singapore, and increasingly even in Sydney and Melbourne), but there exists the opportunity for operators to use contracted assets in private work—charters are one example (Hensher, 2015). The actual contribution range varies between USD 0.07-6 million for small enterprises, USD 0.7-60 million for medium enterprises, and USD 7-600 million for large enterprises. We ensured a degree of overlap to cater for organisation sizes at the margin.

[******] Consider Softbank and their ridesharing ventures around the world



Business Opportunities in Future Mobility

Opportunities in future mobility

Choice task 1 of 4

Please consider each mobility contract carefully and indicate which you would like to select. *You may assume that these contracts are being offered in a metropolitan setting in a jurisdiction where Metro presently operates.*

You can click here to open the glossary page to read the explanation of features again.

Features	Mobility Contract 1	Mobility Contract 2	Mobility Contract 3	None of these
Mobility Offering (Revenue Mix)				
Fixed route public transport	10%	20%	0%	
On demand public transport	20%	0%	10%	
Carsharing	20%	30%	0%	
Taxi-like services	10%	0%	80%	
Shared ridehailing services	40%	50%	10%	
Government Support				
Appeal to government through strategic/regulatory support	Lukewarm	None	None	
Monetary support for fixed route public transport	Yes	No	N/A	
Return on Investment (First Five Years)				
Expected average annual return on investment	15%	-5%	10%	
Possible range for annual return on investment	7% to 23%	-7% to -3%	2% to 18%	
Business Branding				
MaaS business and service branding	New, non-Metro brand	A partner company's brand	Metro-branded	
Your Equity Contribution				
Total value of the MaaS business	USD 10 million	USD 70 million	USD 10 million	
Your proportion equity and voting rights in the MaaS business	30%	30%	60%	
Your equity contribution to the MaaS business	**USD 3 million**	**USD 21 million**	**USD 6 million**	
Q1a. Which mobility contract would Metro **most likely** choose to **INVEST IN**? *Investing means becoming a financial shareholder without contributing any assets.*	○	○	○	○

Figure 2: Screenshot of a choice task programmed in the survey instrument, for a hypothetical medium-sized mode-specific operator *Metro*

5. The survey instrument

Having identified relevant attributes for mobility contracts, we then designed them as stated choice tasks and incorporated these, together with contextual variables, into a state-of-the-art survey instrument. The qualitative research informed the survey structure as well as candidate respondents.

5.1 Choice tasks and choice responses

The mobility contracts were incorporated within a hypothetical setting using best practice design principles to define alternatives associated with designed levels of attributes (Louviere et al., 2000). Using Ngene, we generated D-efficient choice tasks of four alternatives (three mobility contracts plus one no choice/reference status quo—see Figure 2) in a six block, four sets per block design. We state that the choice scenario is situated within a jurisdiction where the respondent presently operates so as not to introduce an institutional dummy variable (representing country, for instance). Further, we had initially designed a Create-It-Yourself mobility contract scenario but found during pilot testing that it added no value. One major issue was the lack of a constraining variable (like a cost parameter) unlike what is usually present in demand-side studies.

The [Thredbo] Workshop explored a suite of partnership issues looking at market relationships in the MaaS era and the development of collaborations beyond standard procurement procedures (Mulley and Kronsell, 2018). Recognising this, we offered choice responses to either *supply* in or *invest* into the new MaaS business. The difference herein lies between contributing physical assets and assets in-kind (e.g., buses, depots, personnel) or becoming solely a financial shareholder in the broker business. A range of ranking systems were tested and we settled on a first choice *only* for the mobility contract (even when no choice was initially selected). To better understand how respondents might supply, we asked which assets they would contribute (technology, vehicle, bricks and mortar, right-of-way and personnel), what partners they might like to work with (other transport operators, platform providers and financial enterprises—all of which we regard as crucial), as well as how involvement will affect their present service offering (in the case of mode-specific operators). These three factors were originally incorporated as choice task-specific questions, but pilot testing found these responses not to be conditional on attribute levels.

5.2 Contextual variables and survey structure

The survey instrument included a range of contextual questions to further embellish the stated choice data—see full survey structure in Table 2. The survey begins with objective questions collecting respondent characteristics (Part B), including market sector, ownership structure, jurisdiction of operation and number of employees. The survey then branches and for mode-specific operators (C1), we ask for the modes they operate and for a vehicle count of each mode (as another measure of organisation size). This part initially included extensive contract-specific questions (around market arbitration, award mechanism, asset ownership, contract design, risk allocation and contract management) which were removed after the pilot round. Non-mobility providers (C2) are asked for their transport-related activities and interest in future transport initiatives. Both groups are requested to provide their return on investment expectations and perceived risk-free rate. Remarkably, industry respondents in the pilot exhibited no qualms in sharing this information (despite concern from academic experts).

Experience-conditioned discrete choice models constitute a recent advancement in the choice modelling literature, which to date has seen only limited applications—in transport modelling contexts (Hensher and Ho, 2016, Ben-Elia et al., 2008), healthcare (Neuman et al., 2010, Ryan and Ubach, 2003) and recreation (Wirtz et al., 2003). Each of these studies have found that respondent preferences are heavily influenced by their experience or familiarity with attributes and alternatives in the choice task. In the case of products or services not yet available on the market (like MaaS), then the conditioning agent can be considered as the respondents' awareness of an idea or experience. To account for heteroscedasticity conditioning in the analysis, we ask for respondents' (and their organisations') familiarity with the MaaS concept in Part H.

Hoeffler and Ariely (1999) makes a distinction between 'hard' and 'easy' choice tasks. Respondents in hard tasks exhibit greater preference stability but lower confidence in their choice, whilst those in easy tasks show lower preference stability, but with (a potentially misled) greater confidence in their decision-making. In Part I, we ask respondents to rate (on a Likert-scale) their decision-making confidence so as to allow us to validate the data whilst making a methodological contribution. The survey concludes with questions about respondents' position title, responsibilities and years active in the industry to see whether these factors might carry particular biases in their responses.

Ethics approval was obtained (protocol number 2017/1020) for our final survey design [††††††] titled **Business Opportunities in Future Mobility**. We generated unique URLs for online distribution to help us track progress and ensure that respondents need not finish the survey in one sitting. The final survey takes an estimated 15-20 minutes to complete, compared with up to 45 minutes in the pilot version.

[††††††] Test link for final survey design: https://survey.confirmit.com.au/wix/8/p2506968.aspx (data not captured)

Table 2: Structure of the survey instrument and function of each section

Page	Title	Function
A	Introduction	Introduces survey to respondent, including ethical information and contact details of researchers
B	Your organisation	Preliminary information on respondents' organisation characteristics
C1	Mode-specific	Questions tailored for mode-specific operators relating to their present contract
C2	Non-mobility	Questions tailored for non-mobility providers relating to their present operations
D-G	Choice tasks	Four choice tasks with alternative mobility contract options defined by a range of attributes
H	MaaS experience	Experience conditioning questionnaire on familiarity with the MaaS concept
I	About you	Questions relating to the respondents' individual characteristics

5.3 Candidate respondents

A candidate sampling frame was defined in terms of jurisdiction, market sector and position level. We desired an international survey from the outset to obtain a global view, but recognise that some level of comparability between contexts is important, given the vastly different institutional and governance arrangements between countries. Hence, the jurisdictions of Australia, Hong Kong, Singapore, Japan, Western Europe and the United States[‡‡‡‡‡‡] were selected as the sampling frame due to similar perspectives on risk and investment, and a level of dialogue and engagement between these economies. A number of neighbouring countries within these regions (e.g., Canada for US) were also selected where there is a high level of cross-cultural interaction.

The organisations selected were categorised under mode-specific operators (incumbent providers of *passenger* service) and non-mobility providers (new entrants) interested in partaking in the MaaS business model. Mode-specific operators include public transport operators, taxi operators, transportation network companies, carshare operators and bikeshare operators. Non-mobility providers comprise of vehicle manufacturers/suppliers, technology providers/startups, financial enterprises, infrastructure operators, property developers, telecommunications providers, consultancies, insurance companies and industry bodies. As mentioned, we decided that governments (i.e., transport regulators/authorities) would not form part of the candidate sample (unless they were an *operator* of transport service) since we deemed it unlikely they would partner within a mobility broker model (see Section 2.2). In pilot testing, logistics companies were excluded from the sample due to concerns about relevance.

One of the most important issues and major challenges in the study of business is identifying relevant decision makers within an organisation since preference responses are highly dependent on who provides the data (Balbontin and Hensher, 2018). Our specific focus is on *senior executives making investment decisions* within companies in the market sectors of interest. These include Managing Directors, Executive Directors, Chief Executive Officers, Chairmen and Strategy Directors but the actual respondent's position is difficult to control for due to different organisational structures between companies (hence the importance of capturing respondent-specific data, together with firm-specific data). It was also decided to allow capture of additional data points from within the one organisation (in many cases either part of the executive team, or Head of a different division/jurisdiction), collected as independent observations but to be pooled in subsequent analysis. In terms of recruitment, we considered hiring a business-to-

[‡‡‡‡‡‡] South Africa was later added given the emergence of a broker model associated with digital platform interfaces for minibus taxi (informal transport) operators

business panel[§§§§§§], but enquires indicated that they might be less effective in our target (and somewhat niche) market sectors. Instead, we engaged our partners in academia and industry (bus associations being particularly helpful) to assist with outreach as part of the respondent recruitment process.

6. Preliminary results

Data collection on the live survey instrument has been in progress since May 2018. 121 responses have been collected as of mid-July 2018 (Table 3), with a roughly equal mix of mode-specific operators and non-mobility providers, as well as Australian and non-Australian organisations. Small enterprises, however, account for 56% of the sample, as compared with 26% medium and 18% large. We believe this is representative of the potential mix of interested businesses. Our contextual Likert-scale questionnaire revealed smaller organisations to be more receptive towards MaaS initiatives than larger organisations amongst all stakeholders—board of directors, employees, shareholders and customers. Based on design levels, the mean attribute levels (Table 4) for mobility contracts which respondents chose to invest or supply in were determined. These reveal a large public transport component amongst MaaS businesses which garnered the highest level of support. A higher return on investment expectation is also evident when respondents were asked to invest rather than supply. Larger business propositions are preferred by non-mobility providers, more than double the size of those selected by mode-specific operators. Finally, the average preferred stake in the broker business is a little more than one third, with implied voting rights to the same extent.

Table 3: Respondent sample for data collected thus far

	Mode-specific operator				**Non-mobility provider**				**Grand Total**
Jurisdiction	**Small**	**Medium**	**Large**	***Total***	**Small**	**Medium**	**Large**	***Total***	
Australia	24	6	1	*31*	17	7	3	*27*	**58**
New Zealand	1	1		*2*					**2**
Hong Kong		1	1	*2*	3			*3*	**5**
China			1	*1*			1	*1*	**2**
Singapore	2	2	1	*5*		1		*1*	**6**
Japan							3	*3*	**3**
United Kingdom	1	1	1	*3*	3	1		*4*	**7**
Continental Europe					6	0	5	*11*	**11**
United States	1	3	1	*5*	8	2	2	*12*	**17**
Canada		3		*3*		1	2	*3*	**6**
Other		2		*2*	2			*2*	**4**
Grand Total	**29**	**19**	**6**	***54***	**39**	**12**	**16**	***67***	**121**

Table 4: Mean attribute levels for chosen alternatives (mobility contracts), stratified by organisation type and choice response

	Willing-to-invest		**Willing-to-supply**	
	Mode-specific operator	**Non-mobility provider**	**Mode-specific operator**	**Non-mobility provider**
Fixed route public transport	31.9%	20.8%	34.3%	25.2%

[§§§§§§] As an example, see B2B market research services offered by Survey Sampling International: https://www.surveysampling.com/services/data-collection/online-surveys/b2b

On demand public transport	19.1%	20.9%	19.9%	19.9%
Carsharing	15.2%	18.0%	13.5%	19.3%
Taxi-like services	19.4%	17.6%	16.8%	15.1%
Shared ridehailing services	14.5%	22.7%	15.4%	20.5%
Expected average annual ROI	8.9%	9.7%	7.0%	7.3%
ROI risk/variance	±6.4%	±6.2%	±6.3%	±6.5%
Total value of MaaS business	USD 53.9 million	USD 126.5 million	USD 59.5 million	USD 124.3 million
Proportion equity and voting rights	35.9%	34.3%	37.5%	35.30%
Equity contribution to MaaS business	USD 14.8 million	USD 43.7 million	USD 20.3 million	USD 42.3 million
Sample cases	*170*	*196*	*205*	*238*

A number of choice models were estimated using the econometric software package NLOGIT6, using generic utility functions for an unlabelled choice experiment. We began with a simple multinomial logit (fixed parameters) model to test the robustness of the model before moving to a more advanced, mixed logit (random parameters) model. Table 5 shows the statistical significance of the parameter estimates and how they contribute to the utility of a packaged alternative. It is clear again that public transport (both fixed and on demand) is an important part of the preferred modal mix. Return on investment and business size are also relevant attributes. Surprisingly, branding considerations proved to be statistically insignificant (and thus omitted from this model). It is worth noting that even if the parameters are not statistically significant at their mean values, their variance (standard deviation parameter estimate) may be significant, demonstrating preference heterogeneity across the sample that is not adequately accommodated through only having a mean estimate. We added an alternative-specific constant on contract A (ASCA) to investigate any possible left-right bias in terms of selected alternatives within the sample (noting that a constant has no behavioural meaning in a strictly unlabeled choice experiment except for directional bias). For the null (no choice) alternative, we tested contextual variables and found different effects between the invest and supply choice responses and respondents' organisation type and size.

Table 5: Mixed logit model parameters

	Willing-to-invest			**Willing-to-supply**		
	Parameter estimates (z-score)			**Parameter estimates (z-score)**		
Random parameters: Mean						
Fixed route public transport (%)	0.64176	***	(3.19)	0.80827	***	(4.15)
On demand public transport (%)	0.38134	***	(4.81)	0.23206	***	(3.48)
Carsharing (%)	0.11575		(1.19)	0.15338	*	(1.72)
Taxi-like services (%)	0.00879		(1.39)	-0.00383		(-0.52)
Shared ridehailing services (%)	0.01471	**	(2.46)	0.01229	**	(2.08)
Expected average annual ROI (%)	0.62552	***	(5.55)	0.33350	***	(3.44)
Total value of MaaS business (USD millions)	-0.25212	**	(-2.09)	-0.25431	*	(-1.87)
Proportion equity and voting rights (%)	-0.07551		(-0.45)	0.13359		(0.81)
Enthusiastic appeal to government (1/0)	0.63265	**	(2.40)	0.46035	*	(1.95)
Lukewarm appeal to government (1/0)	-0.07534		(-0.30)	0.31868	*	(1.66)
Fixed (non-random) parameters						
ASCA	-0.47208	**	(-2.37)	-0.34255	*	(-1.9)
Monetary support for public transport (1/0)	-0.76513		(-1.27)	-1.03658	*	(-1.84)
No choice constant (Null)	2.50282	**	(2.42)	1.15014		(1.12)

Mode-specific operator (For null)	-1.62726	**	(-2.53)	-0.53949		(-0.52)
Medium-sized enterprise (For null)	-0.45986		(-0.66)	-2.87332	**	(-2.35)
Large-sized enterprise (For null)	-1.01405		(-0.95)	-4.09931	***	(-2.63)
Australian enterprise (For null)	0.47674		(0.83)	-1.47531		(-1.56)
Random parameters: Distribution (Normal)						
Fixed route public transport (%)	0.39796	***	(4.12)	0.35050	***	(2.76)
On demand public transport (%) (Constrained)	0.38134	***	(4.81)	0.23206	***	(3.48)
Carsharing (%)	0.53666	***	(5.27)	0.22751	**	(2.14)
Taxi-like services (%)	0.00022		(0.02)	0.03227	***	(3.80)
Shared ridehailing services (%)	0.00544		(0.85)	0.01128		(1.09)
Expected average annual ROI (%)	0.63297	***	(4.93)	0.47854	***	(3.58)
Total value of MaaS business (USD millions)	0.53622	***	(5.04)	0.70923	***	(4.54)
Proportion equity and voting rights (%)	0.73798	***	(5.56)	0.60667	***	(3.95)
Enthusiastic appeal to government (1/0)	1.17987	***	(3.80)	0.87844	***	(2.82)
Lukewarm appeal to government (1/0)	0.96464	***	(2.89)	0.08101		(0.11)
Model fit						
Log-likelihood at zero	-670.96647			-670.96647		
Log-likelihood at convergence	-531.50862			-506.48087		
McFadden Pseudo R-squared	0.2078462			0.2451473		
AIC (Sample adjusted)	2.304			2.2		

Mixed logit (random parameters) model based on 484 observations from 121 respondents

****, **, * ==> Significanct at 1%, 5%, 10% level*

Using the mixed logit model, willingness-to-pay estimates (Table 6) were obtained with the Wald method (see Hensher et al. (2015)). The average willingness-to-pay for investing in a mobility contract is USD 11.8 million per 1% unit of public transport revenue, as compared with just USD 2.6 million per 1% revenue unit of carsharing. This again shows public transport to be an important part of the preferred modal mix, and the difference is even more profound when businesses consider the choice to supply. Interestingly, financial support is negative but strategic/regulatory support is positive, showing a preference for government involvement at arm's length only, without the possibility of undue interference. There are also signs of risk aversion evident with smaller equity contributions being preferred. As an application, our willingness-to-pay estimates can be used as inputs to determine the value of different MaaS business propositions. Table 7 prices the mean preferred contracts (based on a selection of attributes only), given the preference function of the sample. We note the higher value of investing in contracts, as compared with supplying—consistent with our earlier findings. The values presented are a lifetime figure so we divide by (say) 20 for a 20 year period (giving USD 40-50 million which is a reasonable sum).

Table 6: Willingness-to-pay estimates for contract elements

Willingness-to-pay estimates	**To invest (USD million)**	**To supply (USD million)**
1% additional fixed route public transport revenue	11.8	13.8
1% additional on demand public transport revenue	8.2	4.5
1% additional carsharing revenue	2.6	3.0
1% additional taxi-like services revenue	3.5	-1.5
1% additional shared ridehailing services revenue	5.9	4.6
Presence of government subsidy	-303.3	-385.1

Lukewarm appeal to government	-21.6	118.3
Enthusiastic appeal to government	260.9	170.0
1% additional return on investment	41.8	20.3
1% additional equity contribution	0.7	-1.4

Table 7: Example mobility contracts and pricing (based on mean attribute levels in Table 4)

	Mobility contract			
	1	**2**	**3**	**4**
Fixed route public transport	31.9%	20.8%	34.3%	25.2%
On demand public transport	19.1%	20.9%	19.9%	19.9%
Carsharing	15.2%	18.0%	13.5%	19.3%
Taxi-like services	19.4%	17.6%	16.8%	15.1%
Shared ridehailing services	14.5%	22.7%	15.4%	20.5%
Expected average annual ROI	8.9%	9.7%	7.0%	7.3%
Contract value to invest (USD million)	**1,123.16**	**1,088.62**	**1,045.28**	**989.66**
Contract value to supply (USD million)	**790.04**	**710.02**	**791.13**	**715.05**

7. Conclusion and next steps

MaaS is a nascent topic which has emerged only in the past several years. Quantitative and empirical evidence on the design of supply-side subscription plans remains virtually non-existent and in this paper we begin the process of tackling the challenge to identify the conditions around which businesses might invest or supply in the mobility broker/aggregator model. The interview and participatory research process helped define the potential attributes to include in the mobility contract whilst pilot testing (n=9+14) helped us refine the survey instrument used in this novel application on MaaS. In retrospect, we underestimated the amount of work required for what is typically a straightforward experimental design process. Data collection has thus far been smooth but not without its challenges. We have received encouraging feedback including that the survey is interesting and helps respondents organise their thoughts. Many participants, however, also found the choice scenarios a little difficult with a few dropping out and others raising concerns of sensitivity over some of the questions asked (an issue which did not emerge in pilot). Some non-mobility providers invited to participate (e.g., logistics companies) also felt that the survey was not relevant, though this is a finding in itself for us about likely market interest as investors and/or suppliers. Analysis of preliminary data (n=121) confirmed the robustness of our approach and offered some useful initial insights.

We have commented on some of the challenges inherent and have prepared this paper with a view of streamlining future stated preference research on the supplier interface for MaaS. Our present focus is to continue data collection, with an aim to increase the present sample. As additional data is obtained, we will be further finessing our model, including interacting the attributes with the many (more than 50) contextual variables in the survey. This will become an innovative *first* view on the topic and the beginning of greater interest in identifying the commercial, market-led equilibrium for MaaS. We plan to identify this by mapping the present results onto consumer preferences we have determined in our MaaS demand-side studies (Ho et al., 2018). Government can then evaluate whether it finds these results acceptable, aligning with the broader societal and urban efficiency goals of cities, or whether an institutional overlay will be required to ensure that these objectives are met (Wong et al., 2017). Our research agenda is a first step towards informing these unknowns.

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Appendix

THE UNIVERSITY OF SYDNEY

Business Opportunities in Future Mobility

Opportunities in future mobility

The transport and mobility sector is rapidly evolving. New transport futures based on shared mobility and bundled offerings have been proposed, often known as **mobility as a service (MaaS)**. MaaS describes a personalised, one-stop travel management platform digitally unifying trip creation, purchase and delivery. A number of new, collaborative models have been suggested for how these services may potentially be delivered. Central to this are what we call **MOBILITY CONTRACTS** which form the interface for bringing together interested businesses as partners under a new entrepreneurial model. Each mobility contract is defined by a range of features which are explained in the example below.

This is an information screen to help you complete the next part of the survey.

Features	Explanation	Example Mobility Contract
MOBILITY OFFERING (REVENUE MIX)	The proportion of total revenue which will originate from each mode. At the extreme, this may be: • *100% indicating a sole modal offering in the mobility contract* • *0% indicating the absence of a particular mode in the mobility contract*	
Fixed route public transport	Conventional public transport including buses, light rail, trains and ferries	20%
On demand public transport	Road-based public transport without fixed routes, stops and schedules, usually operated with minibuses and other bus-based vehicles	30%
Carsharing	Short term car rental, either from a dedicated fleet, or from other members of a car club	30%
Taxi-like services	Conventional taxis and point-to-point ridehailing like UberX, that are not shared with other customers	20%
Shared ridehailing services	Shared ridehailing like UberPOOL, usually operated with cars and minivans	0%
GOVERNMENT SUPPORT		
Appeal to government through strategic/regulatory support	Non-financial support for innovative transport services like MaaS	Enthusiastic
Monetary support for fixed route public transport	Financial subsidies for fixed route public transport	No
RETURN ON INVESTMENT (FIRST FIVE YEARS)		
Expected average annual return on investment	Profit margin you can expect to receive, on average—note that the motivation to expand market share may make this negative *in the first five years*	-10%
Possible range for annual return on investment	Range in which the above profit margin figure may vary between, capturing risk and uncertainty	-12% to -8%
BUSINESS BRANDING		
MaaS business and service branding	How the new MaaS offering will be branded. In this example, the MaaS business will take on a new, non-company specific brand	New, non-Metro brand
YOUR EQUITY CONTRIBUTION		
Total value of the MaaS business	Measure for the size of the MaaS business in USD	USD 10 million
Your proportion equity and voting rights in the MaaS business	Proportion of equity you own in the whole business, reflecting your voting rights	30%
Your equity contribution to the MaaS business	**Amount in which Metro will contribute to the MaaS business. This may be in terms of a financial outlay (*invest in*) and/or assets which you provide in-kind (*supply in*), to the value of this amount**	**USD 3 million**

You will now be asked to consider a series of hypothetical mobility contracts where you will have the opportunity to:

- **Invest in** the contract, meaning Metro will become a financial shareholder only in the MaaS business; and/or
- **Supply in** the contract, meaning Metro will run the MaaS business by contributing assets like technology, vehicles, property, infrastructure or personnel

Next

Figure A3: Explanation of attributes offered to respondents as part of the choice task introduction in the survey instrument, for a hypothetical medium-sized mode-specific operator *Metro*

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