Shared (Smart) Mobility, MaaS and Public Transport – A new Future!

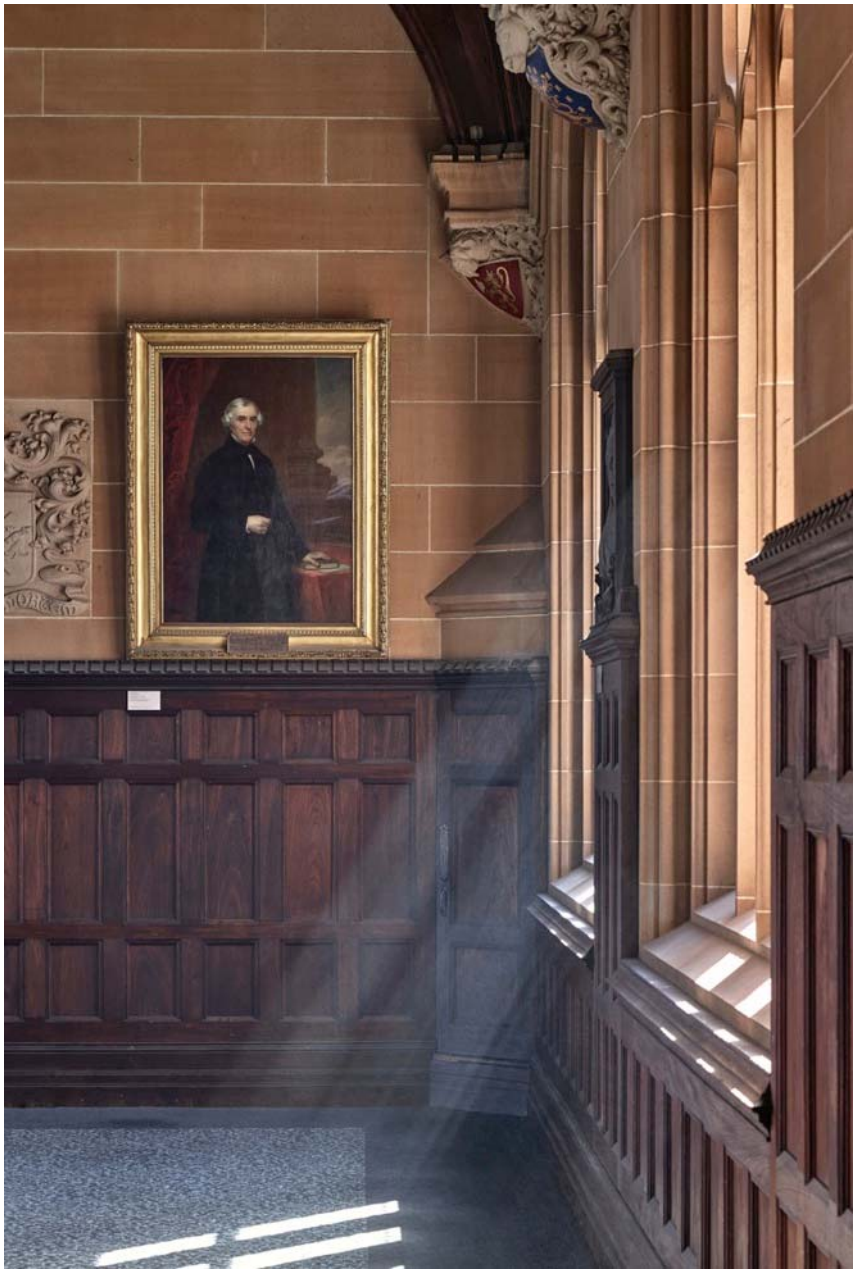
David A. Hensher

Founder and Director of the Institute of Transport and Logistics Studies (ITLS)

The University of Sydney Business School

The University of Sydney NSW 2006 Australia

http://sydney.edu.au/business/itls



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DIVERGENT FUTURES IN URBAN TRANSPORT

Emerging Technologies and Trends, and their Related Challenges

Technology Push	Challenges
Emergence of intermediate modes like ridesourcing and microtransit	Competition with conventional public transport (PT)
Onset of autonomous and connected vehicle technologies	Potential explosion in VKT, substitution towards less spatially efficient modes

Demand Pull	Challenges
Growing prominence of sustainability agenda	Reducing automobile dependence and redefining mobility ('societal revolution') – sharing and connecting
Continual reforms in PT provision	Introducing greater contestability
Trend towards route consolidation	Addressing first/last mile problem
Changing demographics and shift towards collaborative economy	Developing new models of ownership and service

Hensher plus ENOCH, M. P. 2015. How a rapid modal convergence into a universal automated taxi service could be the future for local passenger transport. *Technology Analysis & Strategic Management*, 27, 910-924.

The Smart mobility and Smart Transition Agenda and MaaS

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Smart Transition (ST) in a Smart Mobility Agenda – clarifying my use of ST

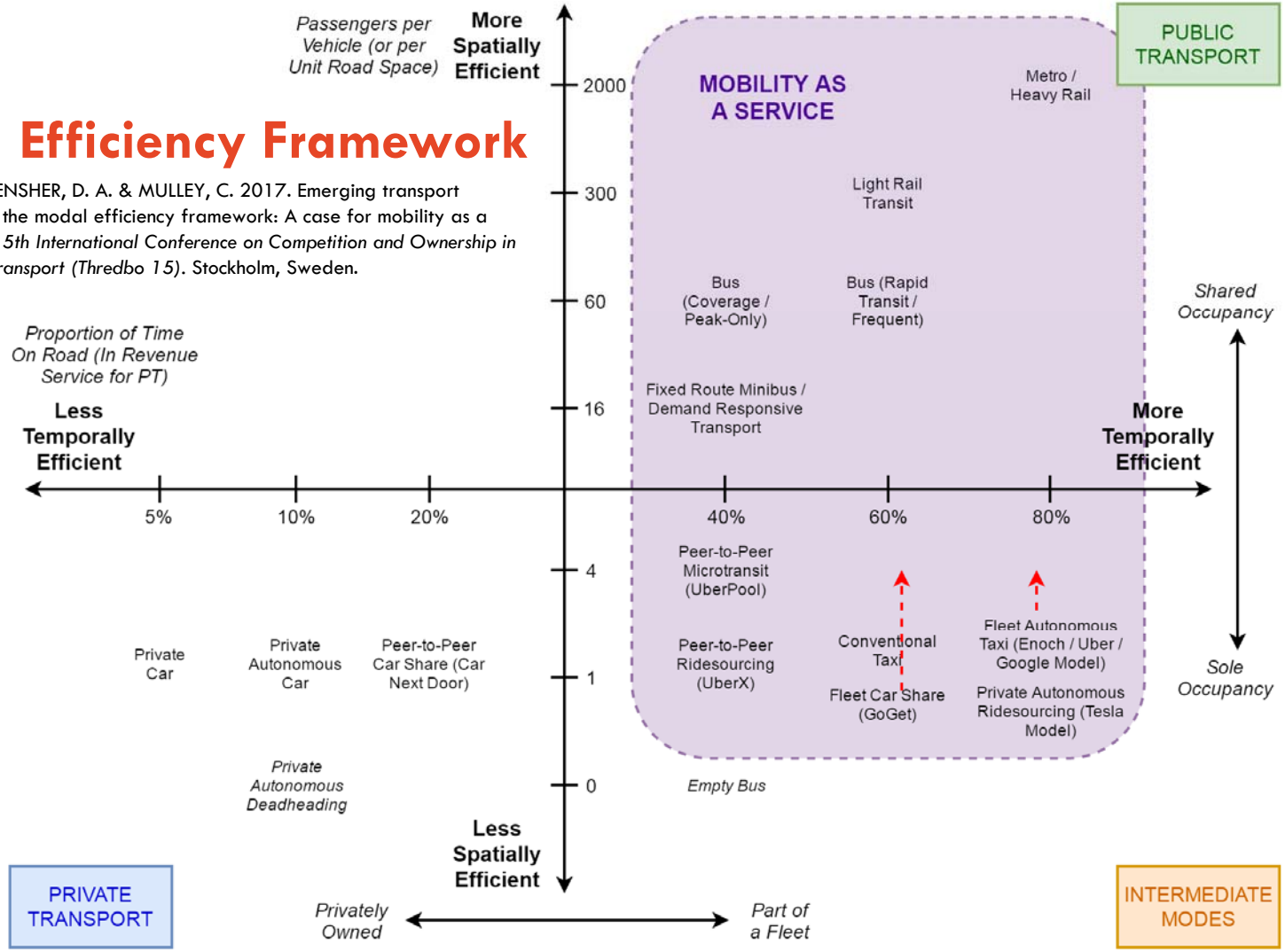
- Smart Transition involves Autonomous (electric) vehicles, greater sharing, and less owning by private individuals
  - The Collaborative and Connected Society (CCS)
- Such an ST is simultaneously creating the "promise" of a multimodal system that "can" reduce vehicle demand (congestion), but at the same time fulfilling previously unmet demand, and creating new demand.

WHAT IS MAAS?

Mobility as a Service is a combination of public and private transport services within a given regional environment that
provides holistic, optimal and people centred travel options, to enable end-to- end journeys paid for by the user as a single charge, and which aims to achieve key public equity objectives. (Cubic definition)

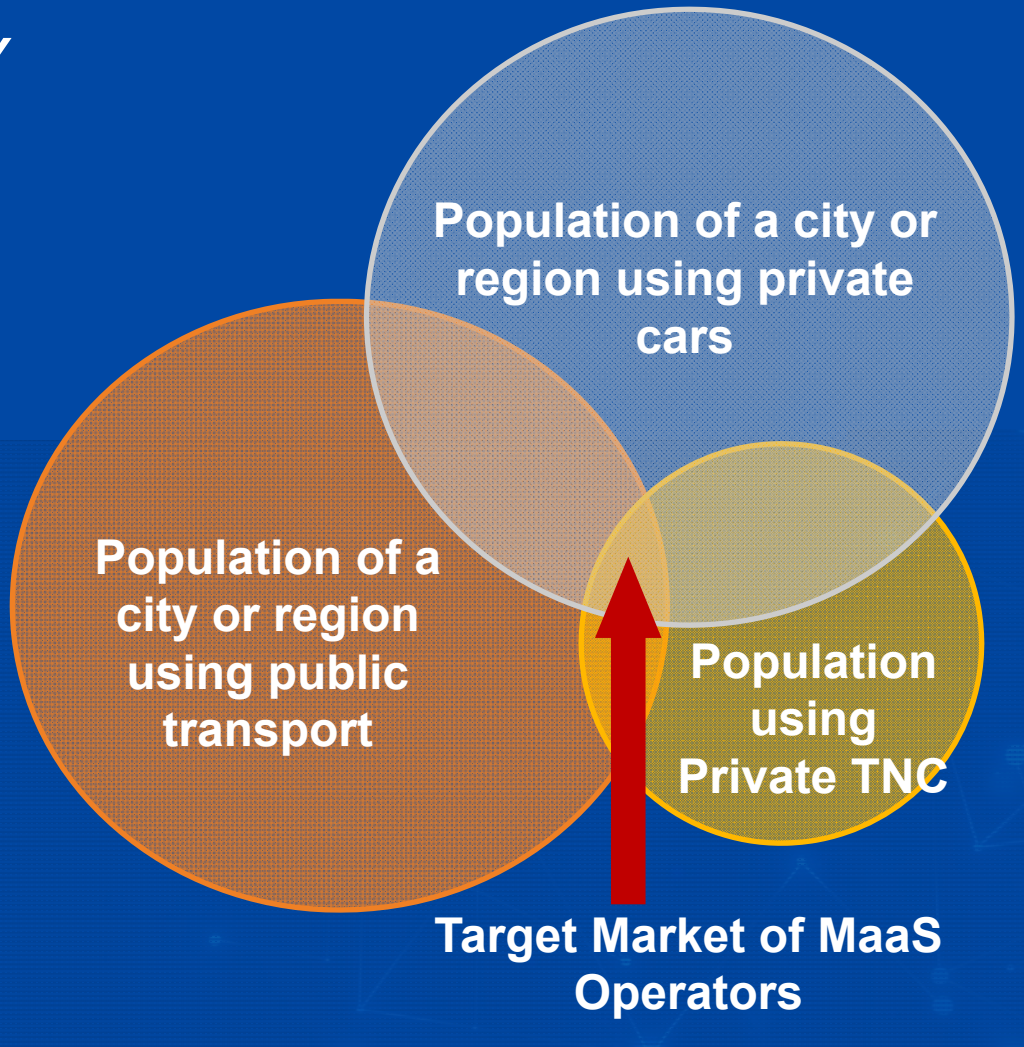
Modal Efficiency Framework

WONG, Y. Z., HENSHER, D. A. & MULLEY, C. 2017. Emerging transport technologies and the modal efficiency framework: A case for mobility as a service (MaaS). *15th International Conference on Competition and Ownership in Land Passenger Transport (Thredbo 15)*. Stockholm, Sweden.

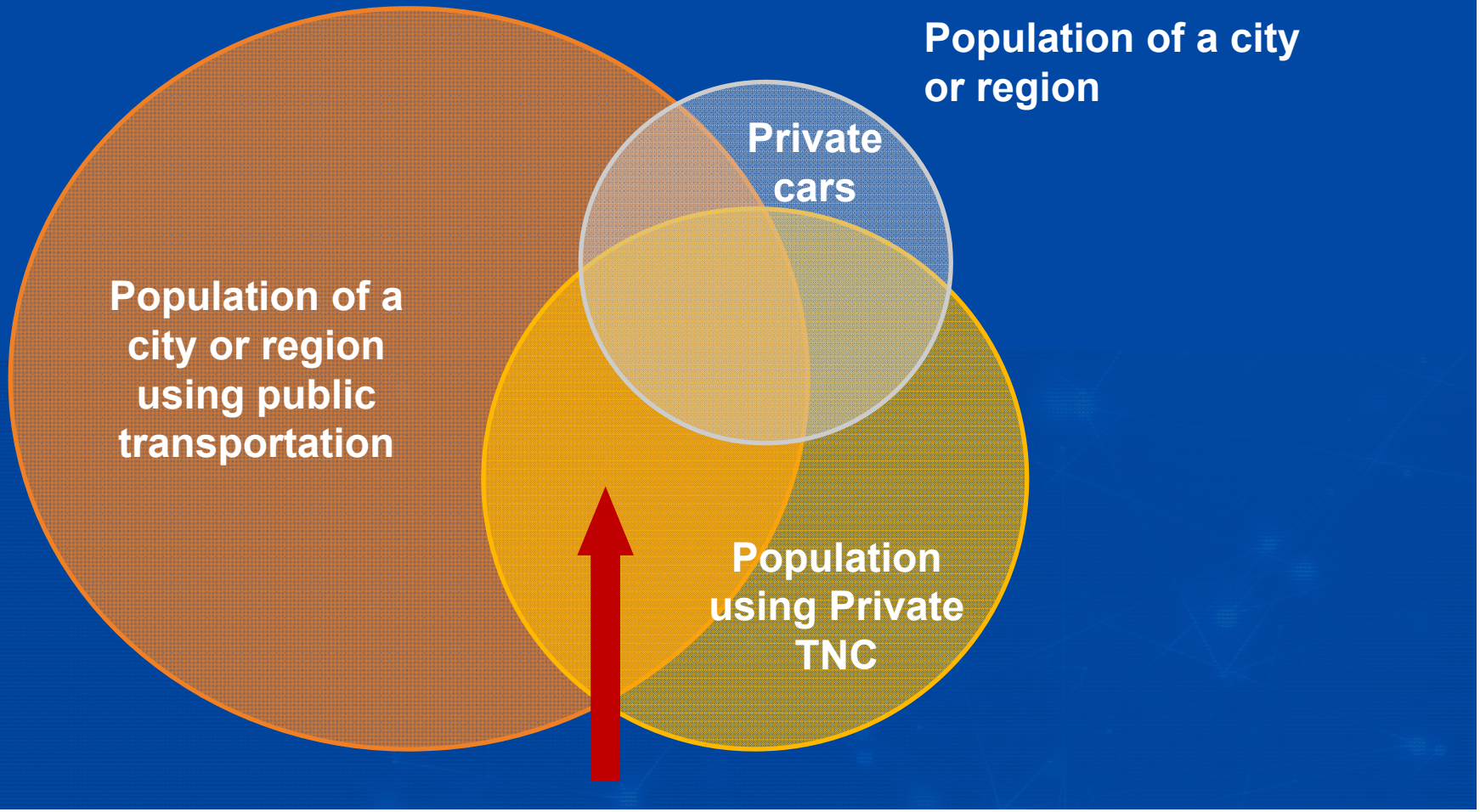


TNC=Transport Network Companies

TODAY

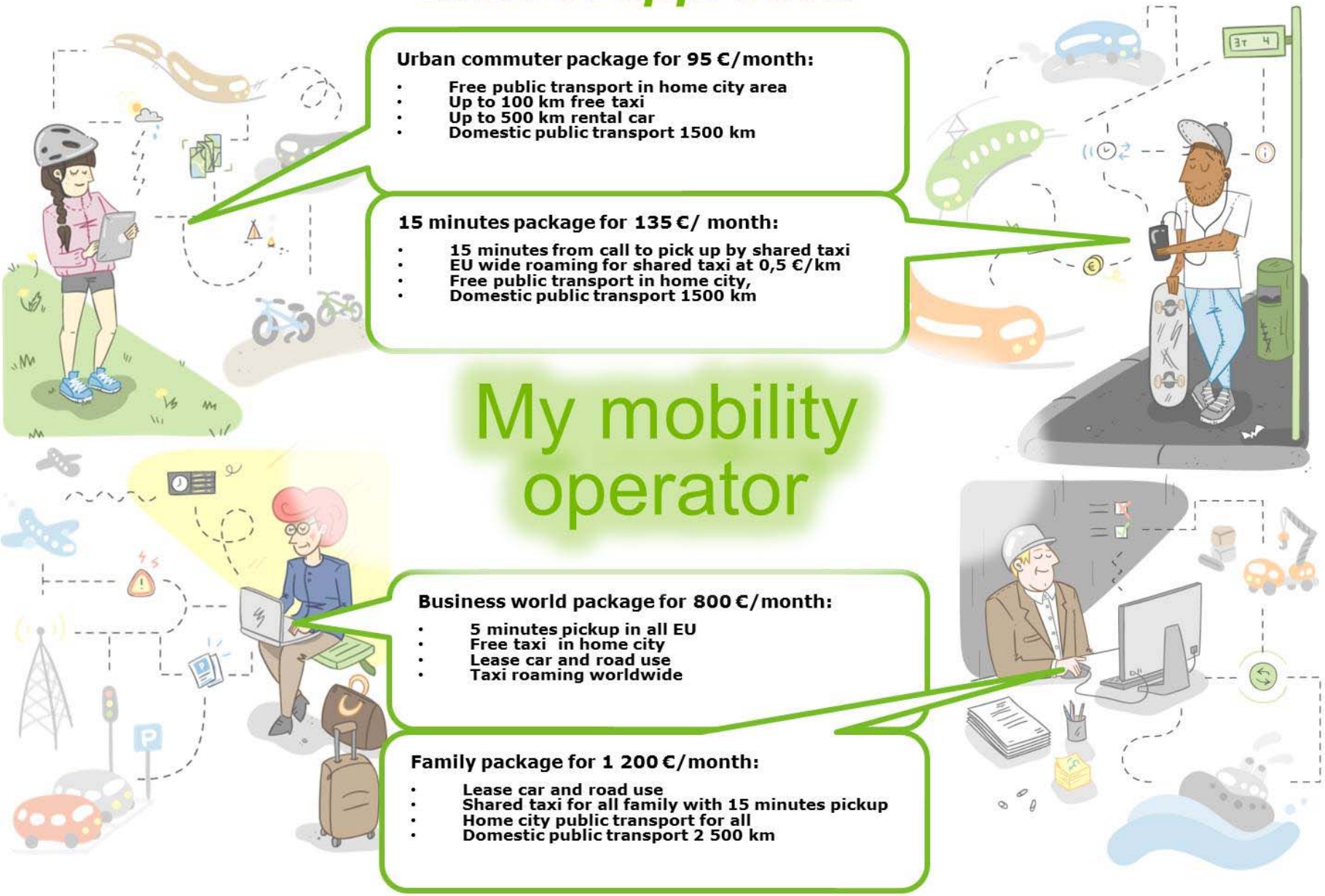


MAAS TOMORROW?



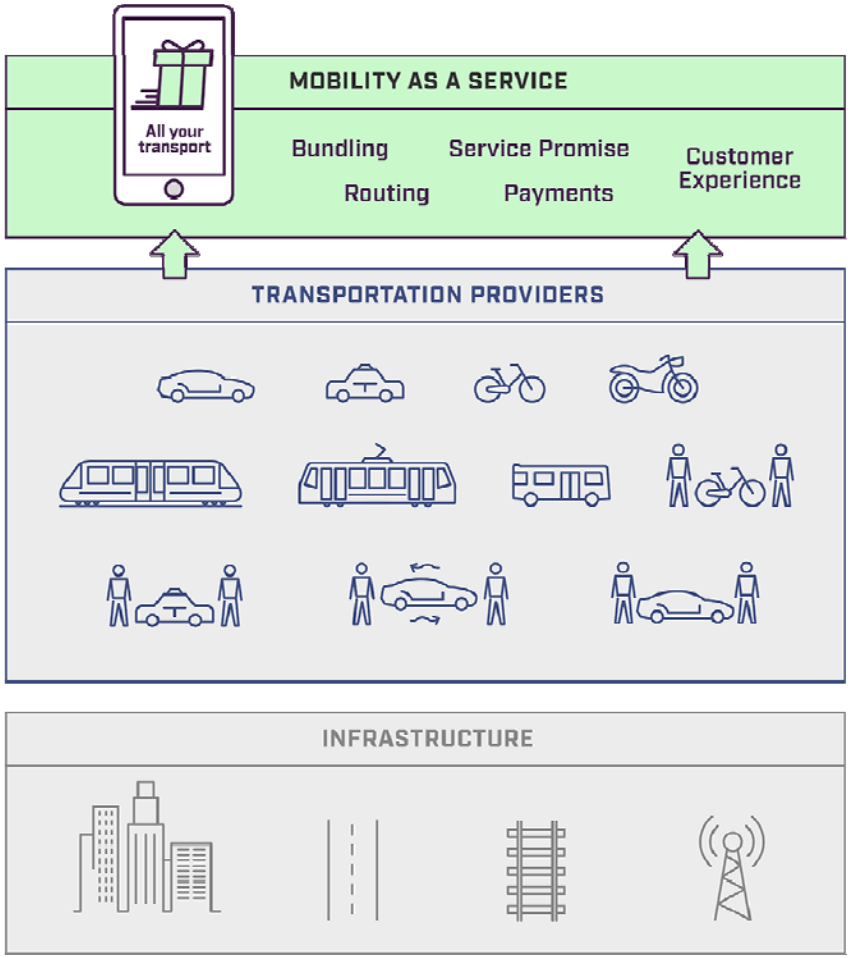
HIETANEN, S. 2014. 'Mobility as a Service' – the new transport model? *Eurotransport*. Brasted, United Kingdom: Russell Publishing Ltd.

Mobility as a Service enables new market approach



Conceiving Mobility as a Service (MaaS)

- Total transport integration across public, private and intermediate modes
- User, provider and societal benefits
- Live trials around the world—Finland, Vienna, Hanover, ….
- **Bundles:** mobility packages
- **Budgets:** end user preferences and service provision possibilities
- **Brokers:** new contracting models and business interest



MAAS GLOBAL. 2016. *Better than your own car* [Online]. Helsinki, Finland. Available: http://maas.global/maas-as-a-concept [Accessed 10 September 2016].

We need to take a step back - Pre-Conditions for MaaS

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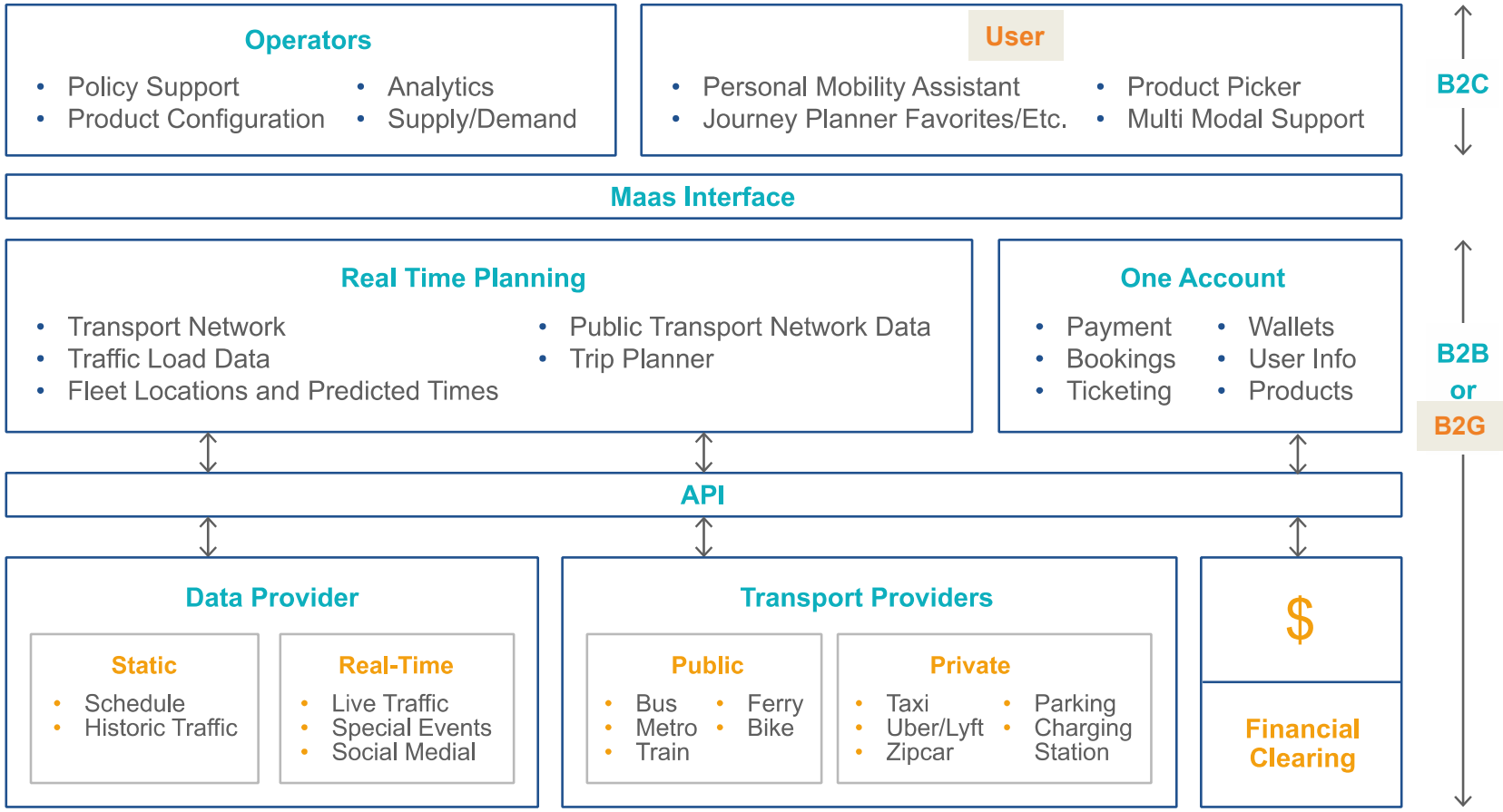
Some Pre-Conditions for MaaS

- What has now made the difference?
- Smart Transition (ST) is already occurring
- Digital Technology delivering better information in real time
- Enabled by
  - Digital platforms
  - Journey planners
  - Integrated ticketing
  - The internet of things
- Not essential for MaaS but value adding in a non-marginal way:
  - Driverless road-based vehicles (car and bus)
  - Sharing culture
- Crucial to separate out these pre-conditions which in many ways are likely to be far more important to managing the transport network than the appeal of MaaS (time will tell!)

Next level architecture

Mobility-as-a-Service



Transport Modes integrated - SkedGo

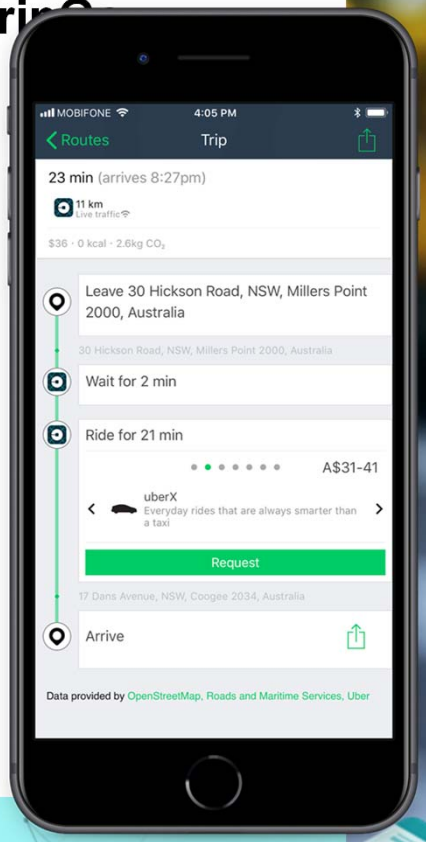
Walking	+	+	+	+
Driving	+	+	+	+
Cycling	+	+	beta	+
Public transportation	+	+	beta	-
Ride-hailing	+	+	beta	-
Car pooling	+	+	-	-
Taxis and limousines	+	-	beta	-
Shuttle services	+	-	beta	-
Pod-based car sharing	+	-	beta	-
Pod-based bike sharing	+	-	beta	-
Car rental	+	-	-	-
Demand-responsive transit	+	-	-	-
Free-floating car sharing	+	-	-	-
Free-floating bike sharing	soon	-	-	-

TripGo, Google maps, HERE maps, Open street maps

TRIPGO

- All public & private transport modes
- Multi and mixed modal trip planner
- Agenda, calendar
- Personalise
- Real-time
- Booking & tickets
- POIs & events

Book Uber in TripGo

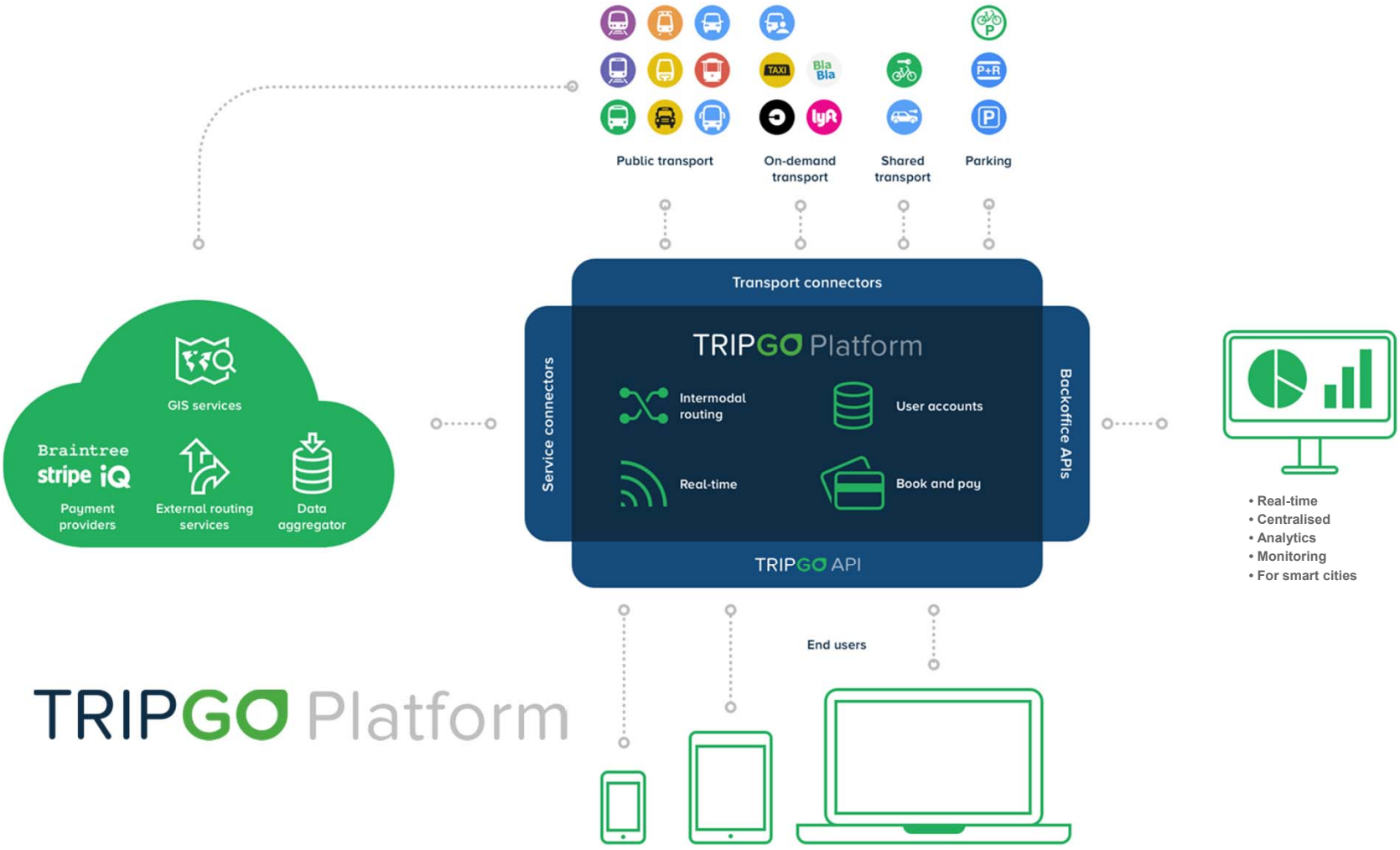


Buy bus ticket in TripGo

[Download on AppStore]

[Download on PlayStore]

[Launch Web App]



TRIPGO Platform

The Car and MaaS

- New service mobility models are expected (or 'would like')to make the need to use a car owned by a traveller significantly reduced,
  - even if the substitute is a point-to-point serviced car operated by the smart multimodal transport MaaS provider.
- Under MaaS, to be efficient and effective point-to-point, however, the car has to be a shared car (not privately owned in the main).
- If remains private, it may risk increased congestion:
  - Depends on whether autonomous or not
    - If autonomous and not made available to the pool, 2 one-way trips may become 4 one-way trips (to avoid destination parking)
    - If autonomous or non-autonomous, and made available to the pool, depends on use of car in between owner needs.

Potential Uptake and WTP for MaaS
Demand Side Preferences

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Introduction

- The question of how MaaS technology might alter urban transport systems and, in turn travel behaviour, is being highly debated with much speculation but limited insight to date (due to the relative lack of behavioural data and models)

- At ITLS we undertook a first study in 2016-17 to shed some light on a number of key unknowns around MaaS potential uptake and Willingness To Pay (WTP) for components of a Subscription Bundle (package). Since repeated by ITLS in the UK (funded by Catapult Transport Systems)

- These are important for bundling and pricing mobility plans that attract high level of uptake (i.e., commercially-viable)

MaaS Preference Research Design

- We summarised various MaaS models (Whim, Ubigo, Smile, EMMA, Hannovermobil, etc.) and the broader literature into stated preference (SP) study.

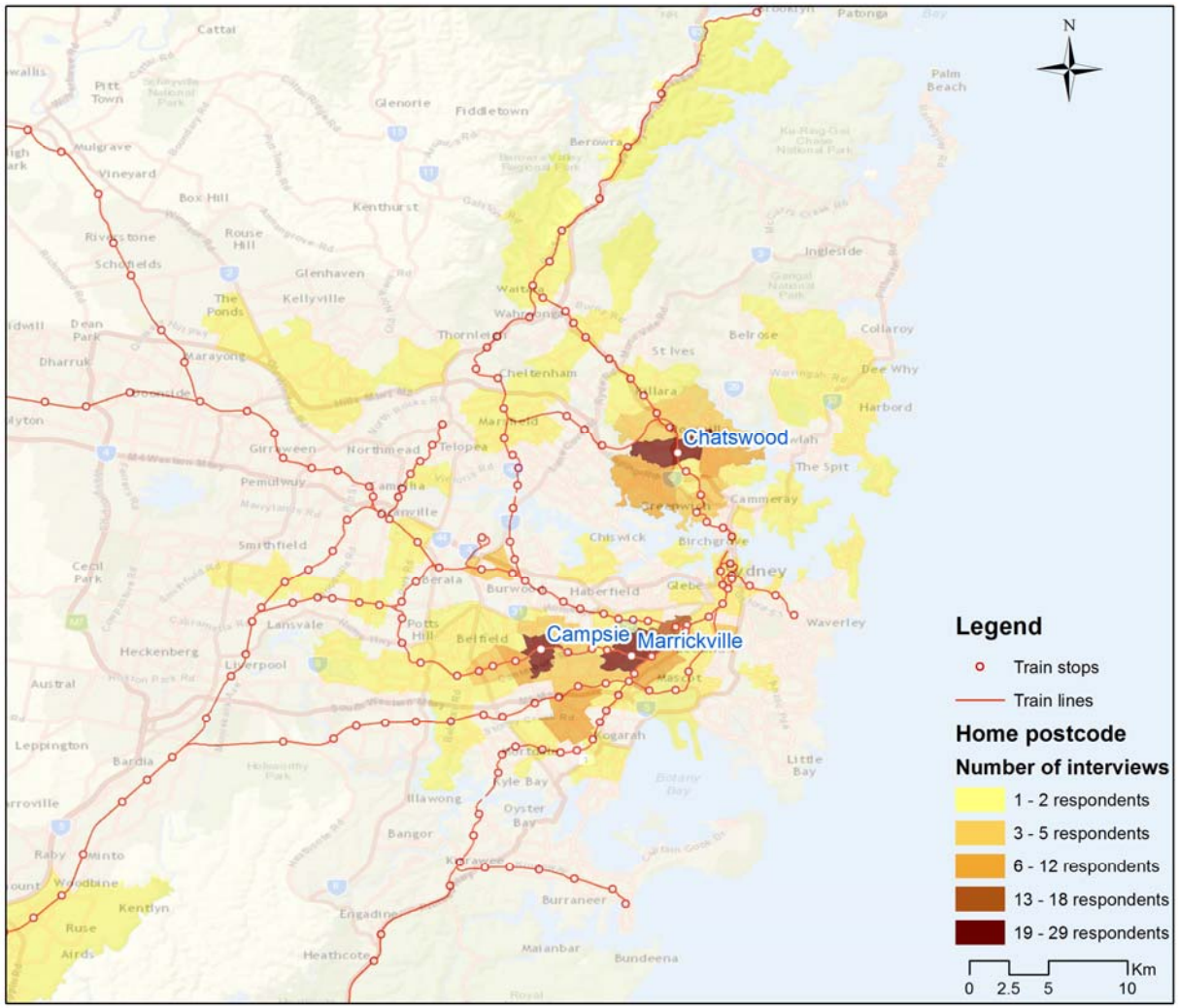
- SP design based on the 3*B*s future coined by Hensher (2017)
  - Bundles: granting customers a defined volume of access, with a specified LOS
  - Budgets: matching customer needs/WTP more closely with service supply
  - Brokers: choosing the business models around which MaaS will be delivered

- Bundles and budgets form the core focus of this study with Sydney used as an empirical setting

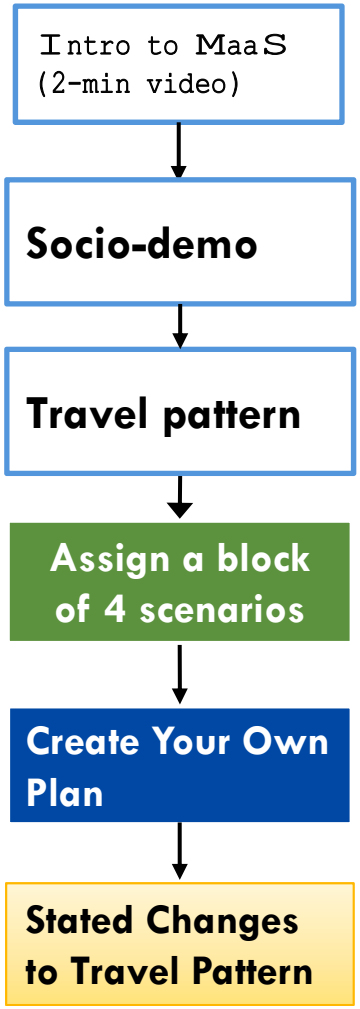
- Designed using Ngene© (our own developed software for choice experiments – Bliemer, Hensher, Rose and Collins)

The Survey

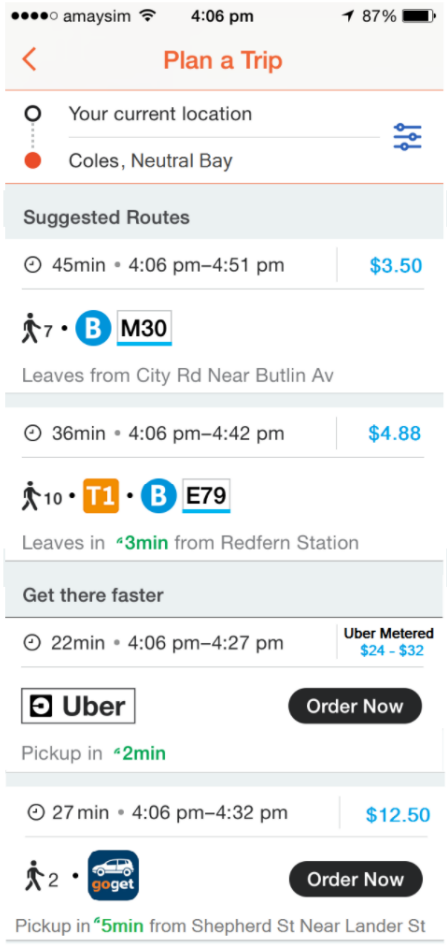
- CAPI face-to-face
- 252 interviews from Mar to Apr 2017
- Took 17 mins on average with sd = 5
- All people 18+ are eligible with no quotas



The Survey Flow



Here is a short introduction into how MaaS works.
When you subscribe, you would download the app and enter the place where you want to go - such as Coles, Neutral Bay, Sydney. The App would locate where you are and suggest the best ways to get there, together with information on time and cost.
The screenshot below shows the sort of screen you might see as an example.



Enter where you want to go (eg Coles, Neutral Bay)

Here the app is suggesting 4 different ways to get there

This route takes 45 minutes and costs $3.50

You need to walk 7 mins from current location to a Bus stop M30

on City Road near Butlin Avenue

This route takes 36 minutes and costs $4.88

You need to walk 10 mins to Redfern Station, wait for **3 mins**

to catch a train on line **T1**, and transfer to Bus **E79** at some point

You can get there faster by using **Uber**, a taxi-like service or **goget**, a car-share service

Uber will take 22 minutes and you pay an **Uber** Metered fare,

which is estimated to cost between $24 to $32

If you order now, **Uber** driver will pick you up in **2 mins**.

You can drive yourself using a **goget** car. This will take 27 minutes and cost $12.50

You need to walk 2 mins to pickup a **goget** car on Shepherd Street

near Lander Street. You can pickup the car in **5 minutes** if you book it now.

Whatever route is taken you will not need to worry about money - it will be managed as part of the App.

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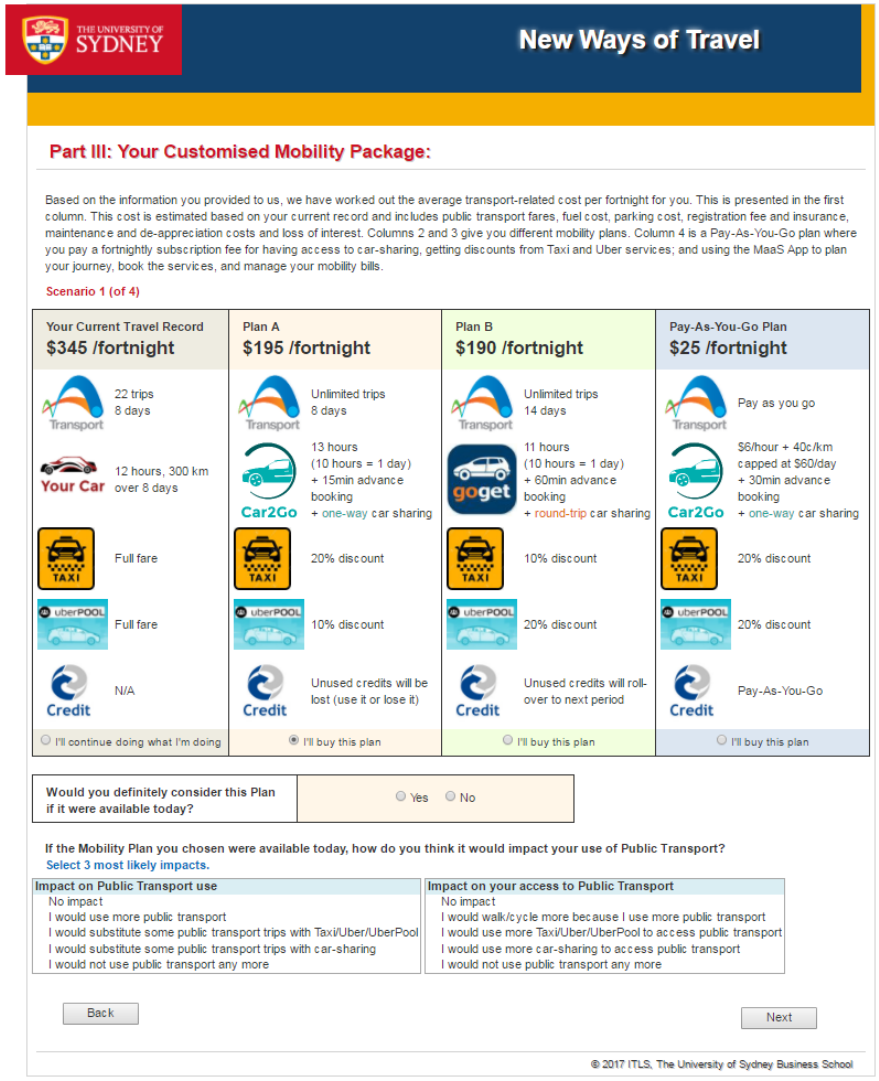
Next

Ho, Hensher, Mulley & Wong



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Prospects for switching out of conventional transport services to mobility as a service subscription plans – A stated choice study

Chinh Ho[a,b], David Hensher[b], Corinne Mulley[b] and Yale Wong[b]

[a] *Corresponding author*
[b] *Institute of Transport and Logistics Studies, The University of Sydney Business School, NSW 2006, Australia; +61 418 992 227; chinh.ho@sydney.edu.au, david.hensher@sydney.edu.au, corinne.mulley@sydney.edu.au, yale.wong@sydney.edu.au*

Classification codes:

R410, R49

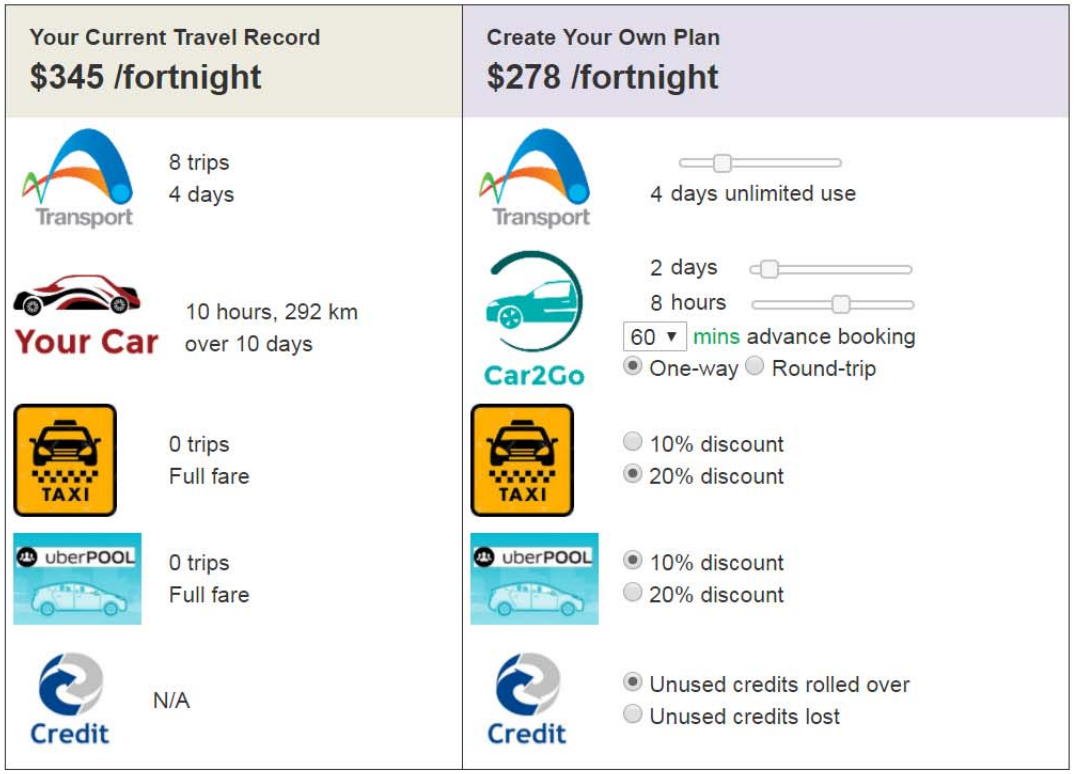
Keywords

Mobility as a Service (MaaS), choice experiment, service bundles, willingness to pay, nonlinear choice model

Abstract

Mobility as a Service (MaaS), which develops plans that brings all modes of travel into a single mobility package, has received great attention from interested parties, including transport authorities, transport providers (public transport, car-sharing, bike-sharing, taxi, car rental), software developers, brokers, engineers, academics and environmental groups. Different business models have emerged in which it is planned for interested parties work together to provide integrated mobility services to MaaS subscribers, who in turn pay a subscription fee for the use of mobility services packaged into the MaaS plan. With such a smorgasbord of potential offerings, it is necessary to understand how large the market of MaaS would be if travellers are offered this one-stop access to a range of mobility services, and how much potential users might value each item included in a MaaS plan. To this end, this paper reviews the literature on the various MaaS models and synthesises their features into a choice experiment in which different mobility services are packaged into plans for respondents to select as a way of revealing their take-up and preferences for MaaS. An online survey is conducted in Sydney, Australia and non-linear experience conditioned mixed logit models are estimated to obtain willingness to pay for each item packaged in the MaaS plan. This also allows an investigation as to the extent to which MaaS could change the way Sydney residents travel in the future, including the impact on car ownership, modal shift and induced travel activity.

The Safety Net: CIY Plan



If the Plan you created above were available today, would you buy it? Yes No

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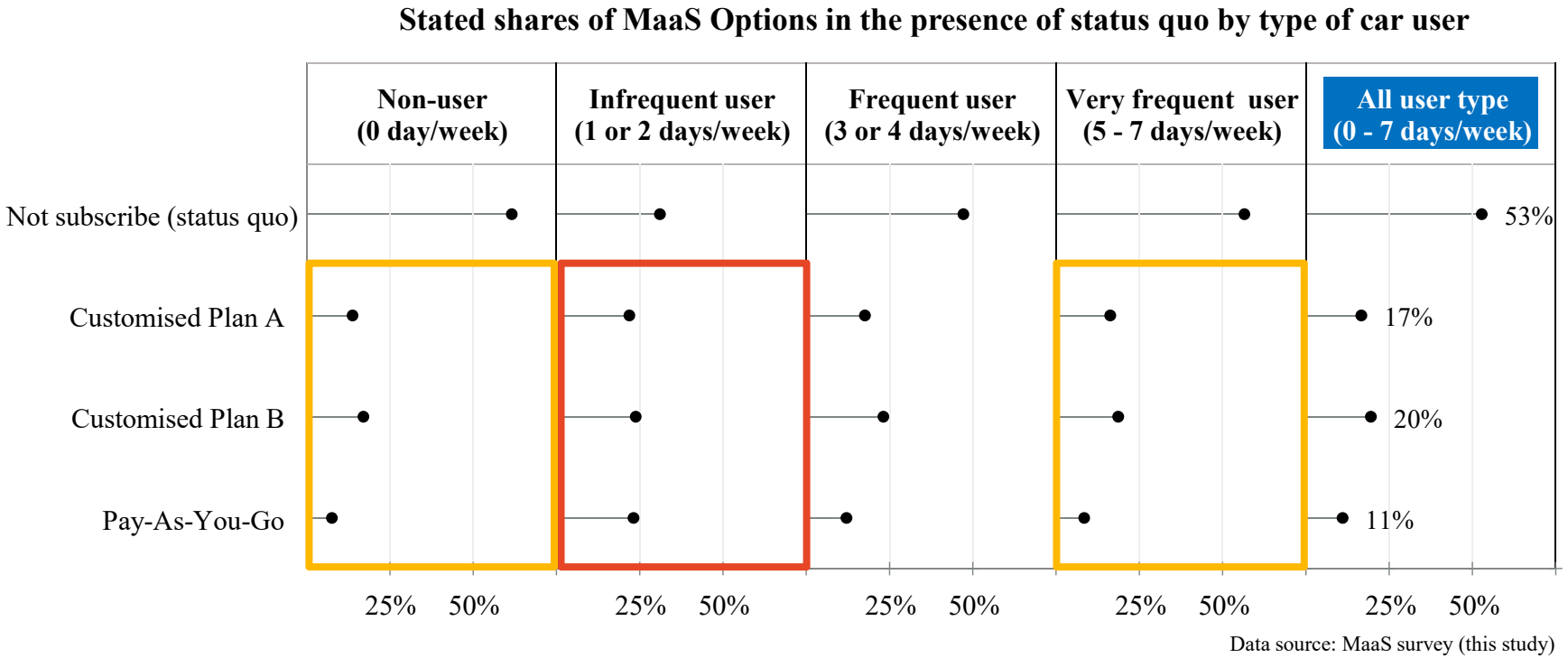
Car Use and MaaS Uptake



Comment

- The experimental design tends to be more complex than usual where complexity must be aligned with behavioural validity (eg. what are likely to be on offer, choice not to choose)

- **MaaS plans were not particularly attractive to existing PT users, suggesting the need for lowering PT fares or cross-subsidy**

- Current travel patterns are most important to MaaS uptake
  - Importance for packaging and pricing (i.e., bundles and budgets)
  - Implication for modelling: preference models need to be updated over time with on-going research capturing changing experience

- Future research:
  - MaaS plans designed for family, group, organisation
  - Include MaaS impacts on travel behaviour in strategic travel models for long-term planning

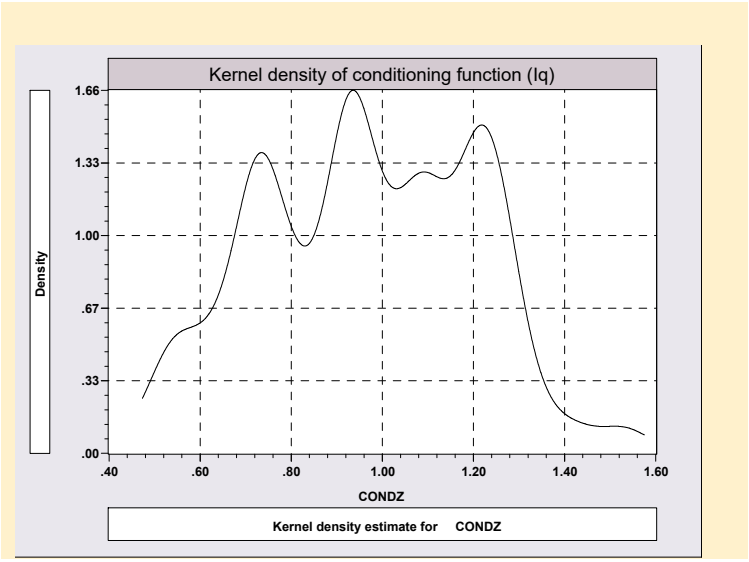
Model Specification and Results

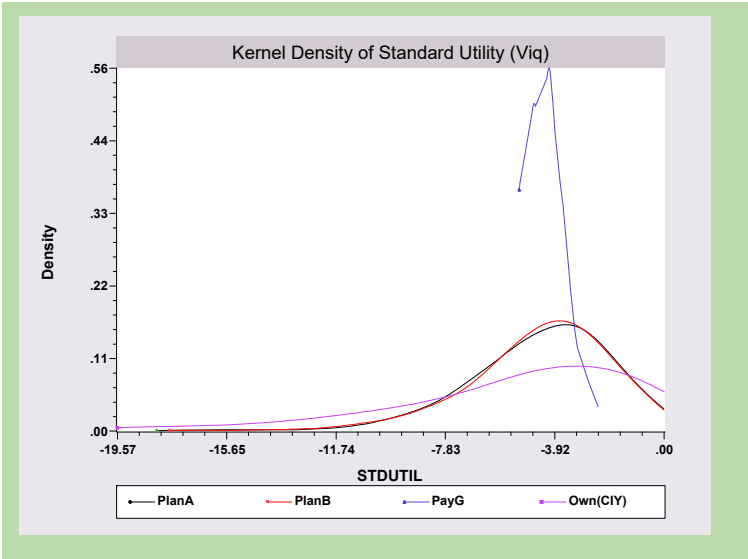
$$\Pr_{jq} = \frac{\exp\left\{\sigma_q\left[\left(1+\sum_{l=1}^{L}\gamma_l z_l+\sum_{k=1}^{K}\varphi_k y_k\right)\times(\boldsymbol{\beta}\boldsymbol{X}_{qj})+\sum_{c=1}^{C}d_{jc}E_{qj}\right]\right\}}{\sum_{i=1}^{J}\exp\left\{\sigma_q\left[\left(1+\sum_{l=1}^{L}\gamma_l z_l+\sum_{k=1}^{K}\varphi_k y_k\right)\times(\boldsymbol{\beta}\boldsymbol{X}_{qj})+\sum_{c=1}^{C}d_{jc}E_{qj}\right]\right\}}$$

Description	Para	Sig	t-value
Heteroscesdastic conditioning function (I_q)			
Car non-users (base = infrequent users)	0.306	***	6.87
Car frequent users (base= infrequent users)	-0.147	***	-4.06
Car very frequent users (base= infrequent users)	0.021		0.65
Age between 35 and 44 (base = 18 – 24)	-0.200	***	-7.46
Age 55+ (base = 18 – 24)	0.326	***	8.61
Household with 2+ children (base = up to 1 child)	0.096	***	4.22
Car-negotiating household	-0.012		-0.76
Member of GoGet	0.003		0.08

$$U^{*}_{jq} = I_q U_{jq} = \left(1+\sum_{l=1}^{L}\gamma_l z_l+\sum_{k=1}^{K}\varphi_k y_k\right)\left(V_{jq}+\varepsilon_{jq}\right),\ j=1,\ldots,J$$

Standard utility function (V_{jq})			
Fortnightly fee of pre-defined MaaS plans ($)	-0.069	***	-12.43
Fortnightly fee of CIY MaaS plan ($)	-0.083	***	-13.33
Fortnightly fee of PayG MaaS plan ($)	-0.117	***	-3.19
Days entitled to unlimited PT use, **mean = std dev**	0.447	***	11.76
Hours entitled to car-share use, **mean = std dev**	0.411	***	12.2
Hourly rate of car-share if PayG ($/hour)	-0.062	*	-1.9
One-way car-sharing (base = round-trip)	0.252	***	4.47
Advance booking time for car-share (minutes)	-0.005		-1.25
Entitled to taxi discount (% off every bill)	0.026	**	2.22
Entitled to ride-share discount (% off every bill)	0.050	***	4.81
Unused credit lost (reference = roll-over)	0.009		0.14
Average fortnightly cost of car ownership and use ($)	-0.006	***	-10.15
Days using PT in a typical fortnight (day)	-0.037	*	-1.79
Hours using car in a typical fortnight (hour)	-0.023	***	-2.68

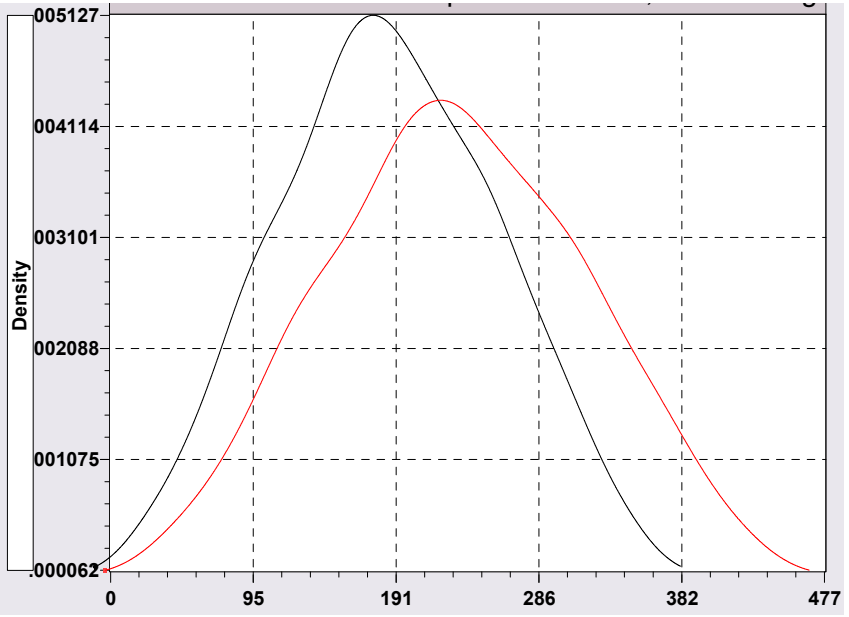




WTP for Mobility Entitlements

MaaS component	WTP ($/fortnight)
An hour access to car-share	$6.39
A full day access to car-share (10 hours)	$63.85
One-way car-share	$7.27
Round trip car-share	$0.00
Every 15 minutes increase in advance booking time	−$1.06
A day of unlimited PT use	$5.92
10% discount to every taxi bill	$3.68
10% discount to every ride-sharing bill	$7.18

Entitlement per fortnight	Plan 1	Plan 2
Car days	2	2
Car hours	10	15
Car-sharing scheme	one way	round trip
Advance notice	60 mins	30 mins
Taxi discount	10%	20%
Ridesharing discount	10%	10%
PT days	4	6
Average WTP	$185	$231



Potential Interest in MaaS Contracts – Mobility and Non-Mobility Suppliers

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Mobility contract design: Attribute levels

Attribute category	Attribute	Attribute levels[1]
Mobility offering (Revenue mix)[2]	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, <u>None</u>
	Monetary support for fixed route public transport	N/A[3], Yes, <u>No</u>
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][4]-branded, New company branding, <u>Partner company branding</u>
Equity contribution	Total value of the MaaS business[5]	**Small:** USD 0.7, 1, 2.5, 4.5, 7, 10 million
		Medium: USD 7, 10, 25, 45, 70, 100 million
		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*

[1] The base level is underlined for dummy variables
[2] Sum of attribute levels in this category is 100%
[3] Nested attribute level—only displayed if fixed route public transport=0%
[4] Respondent's actual organisation name is displayed within the choice task
[5] Segmentation by value—see Section 4.5

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.*	○	○	○	○

Need for urgent Governance Reform

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How a System Might be Governed?

- A key issue is the set of assumptions about how a system would have to be governed were it to achieve public value?
  - Leave it to the market or what?
- Such tightly regulated approaches do not exist today in even the most progressive welfare societies
  - and there has yet to be a commitment to the types of parking restriction and charging measures that would be necessary to make the transition from today's mixed fleet to a fully shared system beneficial.

Comment – Been there before?

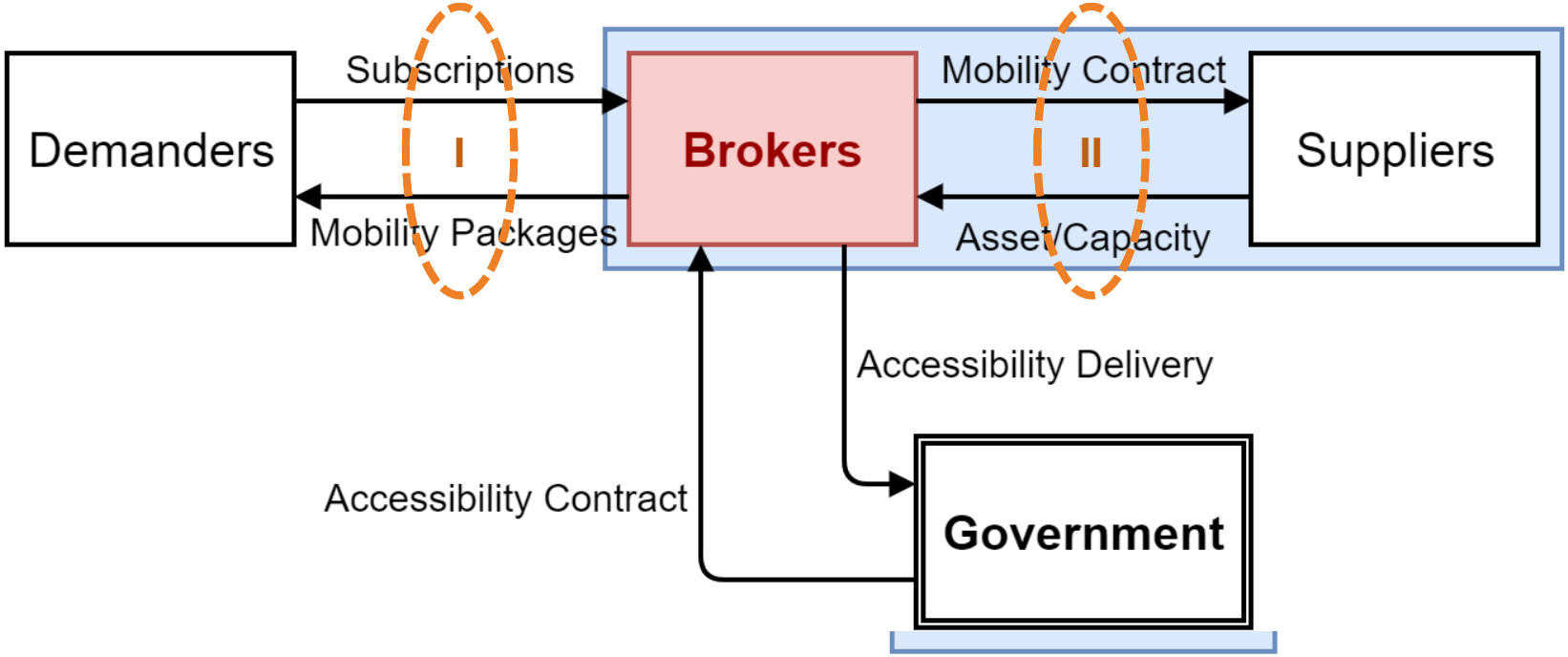
- The Smart Transition and MaaS, to date, has clear echoes of other transport markets through the decades, which have tended towards conditions of oligopoly or monopoly:
  - Without effective regulation, preventing anti-competitive behaviour such as a global-scale company providing mobility services from strangling new market entrants at birth through price attacks, could be well-nigh impossible.
- A further issue is how these new systems consider the allocated access to public space of different sorts (A city vision).

How might we do it?

- In a smart future, will the state need to consider supporting mobility subscriptions rather than the transport services which underpin them
  - or could a social contract form part of the right to operate, a new kind of 'Public Service Obligation' for Smart Mobility?
- For example, a kind of per-transaction charge could be levied in areas with very high sharing densities, which subsidises the areas which would otherwise be under served (rural/regional).
- So will it be
  - an economically deregulated market place (competition in the market),
  - a tendered contracting place (competition for the market), or
  - some hybrid form?
- We may need an independent (National or State)office of the smart mobility regulator?

Service Delivery Models

C: Mobility as a service under government contracting



WHAT MIGHT MAAS MEAN FOR FUTURE BUS CONTRACTS?

More Questions than Answers at this stage on the Learning Curve

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PT in the new Digital Sharing Age: The Three B's

- I have referred to this as the 3Bs future – Budgets, Bundles and Brokers.
- The roles of existing public transport providers might change as they see opportunities to be brokers for multi-modal bundles of services (like Telco plans or packages - budgets),
  - in which they may no longer deliver services themselves (or this becomes a totally separate business),
  - but act as a broker,
  - which may still require some public subsidy in some service components that cannot be commercial under the MaaS banner (e.g., Community Transport MaaS - partial CSO MaaS).

A Big Challenge – Contracts and which Bus Services?

- A starting position is a consideration of the conditions under which point-to-point MaaS, supported by smart booking technology, can be provided as a substitute for conventional urban bus services,
  - where the latter are typically offered under an areawide contract that is either competitively tendered or negotiated.
  - Existing contracts in many geographical jurisdictions provide regular public transport services (timetabled), contracted school runs (also timetabled) and charter services.
- The question of interest is whether some of these services might be better delivered by point-to-point smart booking transport or whether the nature of transport service required makes the new digital inspired smart MaaS an inappropriate substitute?

IMAGINE THE FUTURE …

Small baby steps ?

MaaS skeptic ?

MaaS supporter ?

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IMAGINE THE FUTURE …

Final Comments

- I see the growth of MaaS Mobility Contracts (linked to Digital mobility apps)
- Conventional PT will be folded into the Mobility Contract
  - With possibility of a single mode initially (giving future proofing on contract)
- Multi-modal Contract Brokers will play an increasing role
- PT operators may become providers of all modes, ensuring matching of vehicle to user need
- Geographical contract boundaries will disappear (they create inefficiency and poor services)
- New mobility regulations will replace mode specific service contracts
- The autonomous car and the autonomous bus (of varying sizes) will act as essentially the same 'mobility mode' but with differing passenger capacities
- Pricing will be market driven with a community service obligation built in as appropriate for specific users (it will be a user side and not provider side subsidy)

What is new?

Transpn Res. Vol. 1, pp. 1–2. Pergamon Press 1967. Printed in Great Britain

NEW DIRECTIONS IN TRANSPORTATION RESEARCH

THE GREAT changes in transportation which are now in progress are so widespread and so profound as to be truly revolutionary. On the surface there are visible administrative reorganizations of transportation agencies in large states and municipalities, in natural economic units and in developing regions. New devices for improved mobility are being put forward on all sides and the investment needed to translate successful systems into reality will not be lacking.

THANK YOU

David Hensher FASSA
Institute of Transport and Logistics Studies (ITLS)
The University of Sydney Business School

THE UNIVERSITY OF SYDNEY
E david.hensher@sydney.edu.au | **W** http://sydney.edu.au/business/itls

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Extra material not included in presentation

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The need to Integrate the digital PT future and Autonomous vehicles into integrated transport and land use/location Strategic Model Systems

MetroScan

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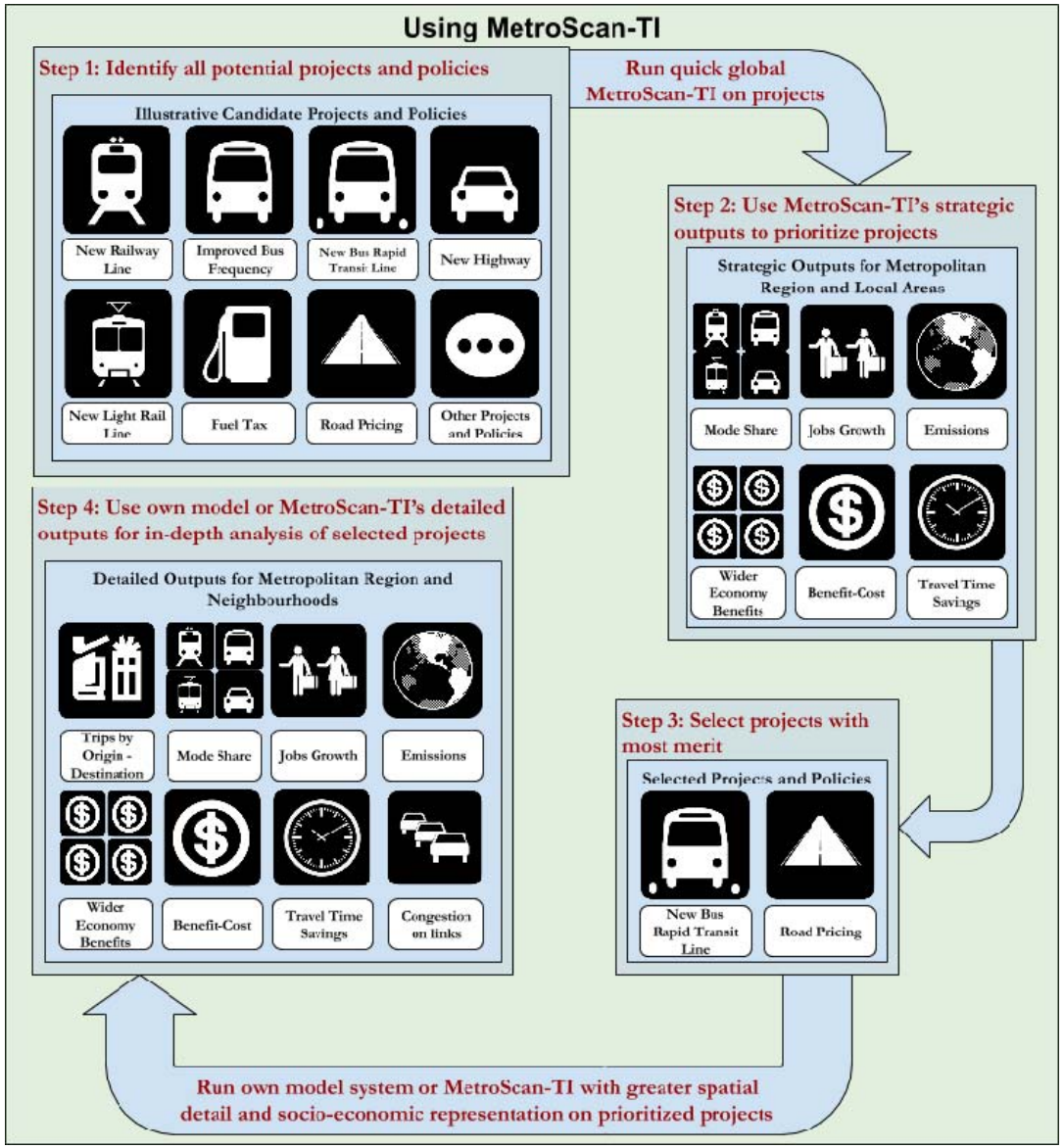
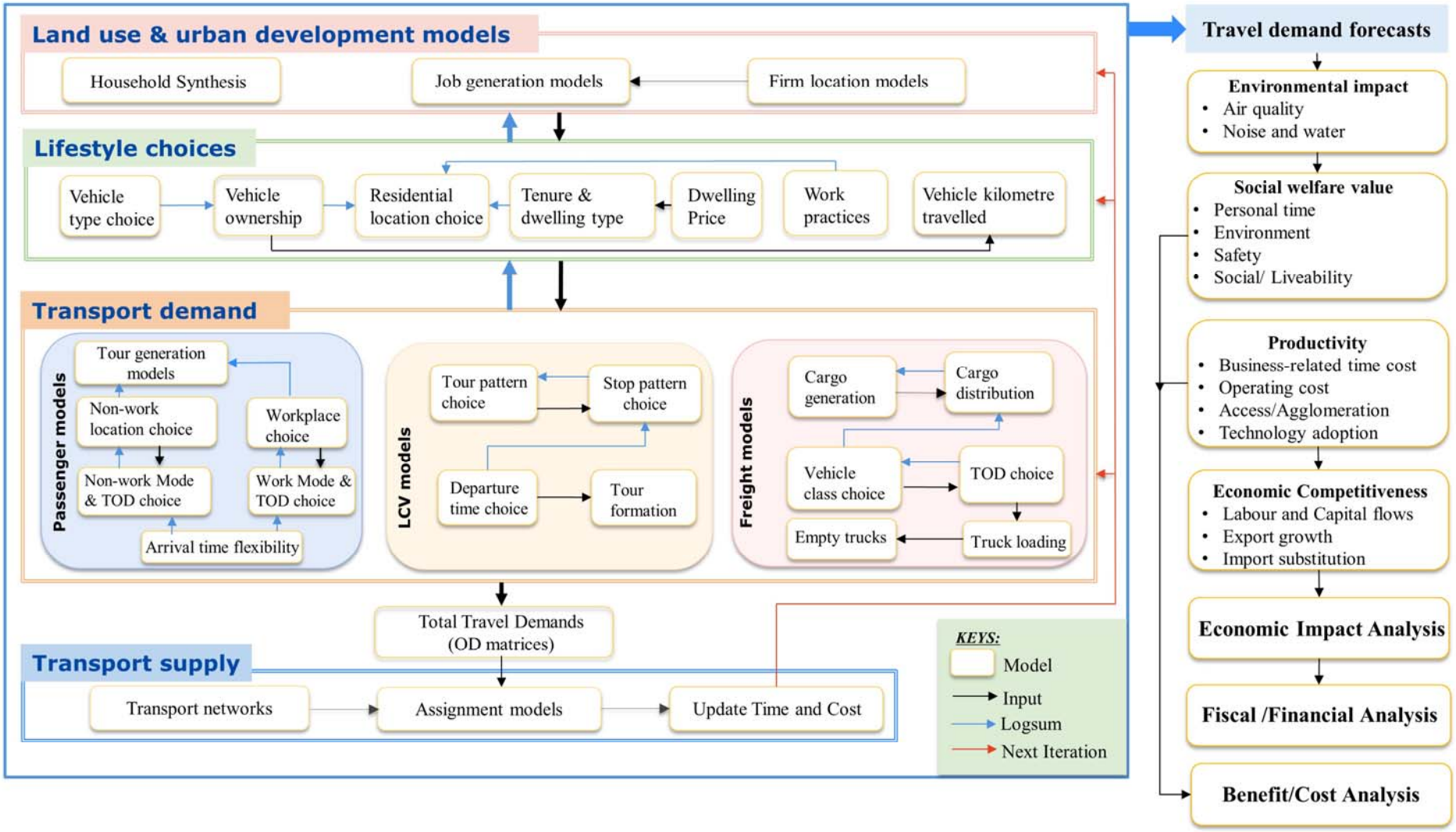
MetroScan-TI

- A strategic travel model integrating all aspects of transport and land use (Passenger travel, Firm locations, LCV, and Freight)
  - Able to simulate a variety of transport initiatives
  - Capture the interactions amongst these 4 modules
- Travel demand forecast and BCA, EIA are fully integrated:
  - Scenarios in, benefit-cost ratios
  - Investment in, economic impact
  - Web-based, user-friendly and very quick run-time (HPC)
  - Users around the world benefits from our access to HPC
- Many initiatives can be assessed at once with many selectable outputs

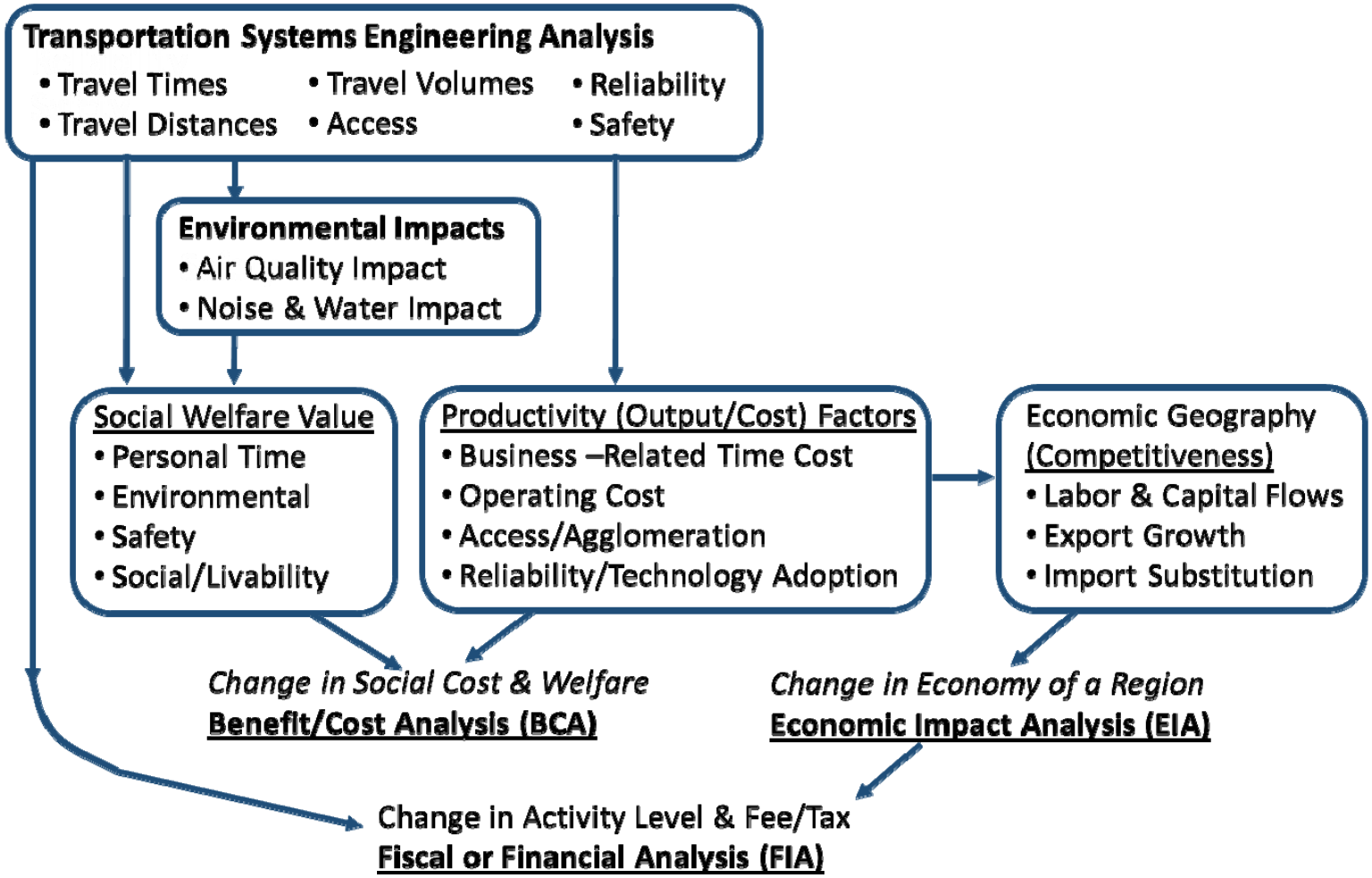
MetroScan-TI: A Powerful Scan Tool for Practitioners



MetroScan-TI: An Overview



MetroScan-TI: Links to BCA and EIA

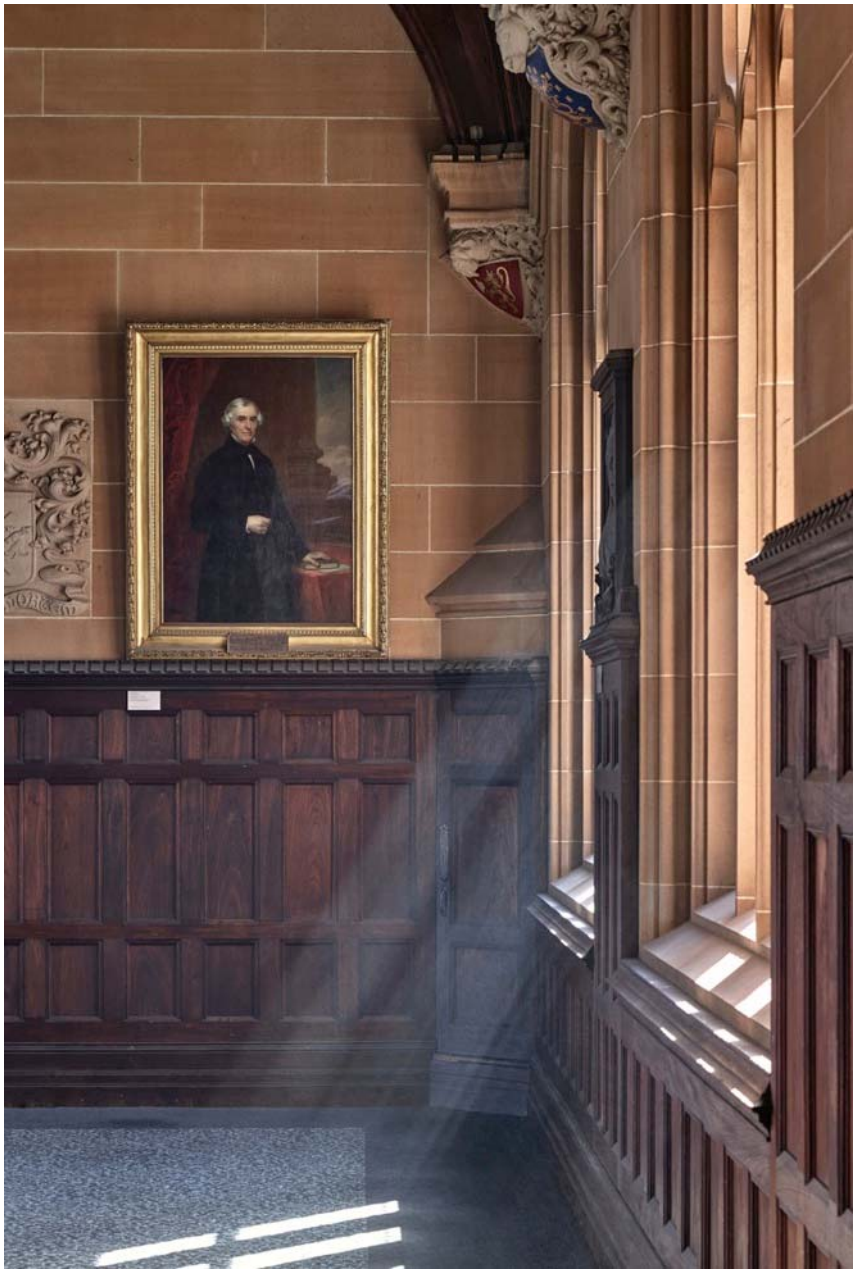


Benefit-Cost Analysis of BRT Lite (B-Line) and BRT Full

Note: Negative value of travel time and positive travel time reliability is because of a switch from car (which has lower average travel times but lower reliability) to BRT/B-line (which has higher average travel times but higher reliability).

7% Discount	Bline ($m)	BRT full ($m)	LRT ($m)
Present Value of Benefit Stream	4,388	6,301	15,419
Travel Benefits	3,702	5,341	16,120
Value of Vehicle Operating Cost (VOC)	6,270	8,809	5,917
Value of In-Vehicle Travel Time (IVTT)	-8,402	-10,192	3,995
Value of Out-of-Vehicle Travel Time (OVTT)	-10	-13	-1
Value of Improved Travel Time Reliability	5,233	5,797	5,610
Value of Safety Improvement	611	940	598
Value of Consumer Surplus From Induced New Activity	0	0	0
Environmental and Social Benefits	685	960	673
Value of Emission Reduction For Mobile Source Pollutants	143	205	134
Value of Emission Reduction For Carbon Dioxide	542	755	539
Wider Economic (Productivity) Benefits	0	0	0
Transfer Benefit Effects (net benefit adjustment)	0	0	-1,374
Present Value of Cost Stream	871	1,578	3,159
Project Costs	663	1,304	4,854
Capital Investment Costs	531	1,040	3,898
Operation and Maintenance Costs	132	264	956
Cost Adjustments	208	274	-1,695
Residual Value of Capital Spending	-38	-75	-321
Reduction in Effective Capital Cost Due to Added Fees Collected By Govt.	247	349	-1,374
Net Benefit (Benefits - Costs)			
Transportation System Efficiency - Traveler Benefits Only	2,831	3,763	11,587
Traditional BCA - Traveler Benefits + Environmental Benefits	3,517	4,724	12,260
Full Societal BCA - All Benefit Categories	3,517	4,724	12,260
Benefit Cost Ratio (Benefits / Costs)			
Transportation System Efficiency - Traveler Benefits Only	4.25	3.39	4.67
Traditional BCA - Traveler Benefits + Environmental Benefits	5.04	3.99	4.88
Full Societal BCA - All Benefit Categories	5.04	3.99	4.88

Tackling Congestion for a Growing Sydney



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Five Themes

- Smart mobility and implications for congestion
- Need for urgent Governance Reform
- Network Control
- Road Pricing reform- Always needed
- The Future with no traffic congestion

Smart mobility and implications for congestion

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What do we know today about the implication for congestion of the collaborative and sharing culture?

- An OECD study found that if all individually-owned private cars were removed from the city (in Europe), there would be a substantial reduction in the number of vehicles required to service overall mobility demand, and greater equity of service across the city as a whole.
- However, the findings suggested an increase in VKM driven of 6.4% per day.

- Once the assumption of perfect conditions breaks down, and 50% of private cars are assumed to remain (who knows?), the performance of the system deteriorates further with up to 90.9% more kilometres being driven per day.

- A congestion buster? Even more congestion on our roads!
  - Although interestingly, the congestion levels may be more predictable (non-random) with ACs – i.e., improved reliability and a lower value of travel time savings and reliability WTP.

Network Control – necessary to manage network congestion

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Telematics and private organisations take control (a bit like Transurban has control over much of key road network in a number of cities such as Sydney)!

- "A key enabler of the value chain for Smart Mobility services is a city's upfront investment in ITS and other intelligent infrastructure that generates key raw data…Public agencies, including city government, are seeing the economic value in making their data available at no cost… for private data owners, this raw material may be a saleable asset in its own right." (Buscher et al., 2014: 30)

Open Data for Who and What?

- A critical risk in the 'open-data' movement is that the shift in the control of knowledge and associated power away for Govt will make governing mobility much more difficult in the longer term.

- The state is already losing its position as the principal source of knowledge about travel patterns on the network relative to mobile phone operators as well as Google etc. (and even concession toll coys), with this information asymmetry also set to grow further through
  - e.g. better peer to peer sharing of location data.

- The positive externalities of opening data outweigh the negative but there are ways for the state to avoid the negative:
  - E.g., it is possible to license access to free 3D infrastructure maps and service data such that anyone making commercial gain from this open provision has to provide the state access to some aspects of the data they generate.
  - Others may also capture this (Google and phone Coys) – data competition!

Road Pricing reform

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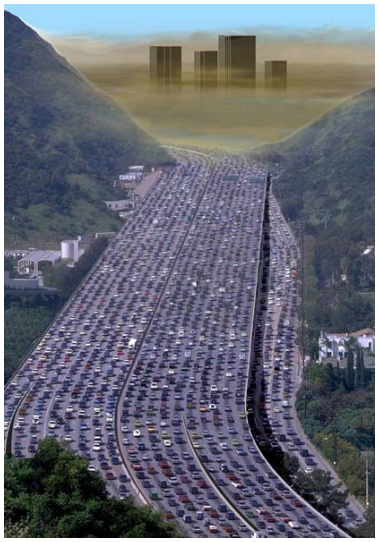
What we all know

- Road pricing reform is needed, because just investing in more roads is too costly, too unliveable, too polluting
- Road pricing reform is an emotional topic
- Road pricing reform is a political problem
- Road pricing reform requires strong leaders



Beginning the Sell: Registration-Usage Pricing Reform Proposal

- **Simple Rule:** begin with what is in place at present and see how that might be modified in line with a longer term objective.

- What if we can modify **the current registration fee** to signal real opportunities for individuals to reduce their road use charges?

- Introduce a **peak period distance-based charging** scheme

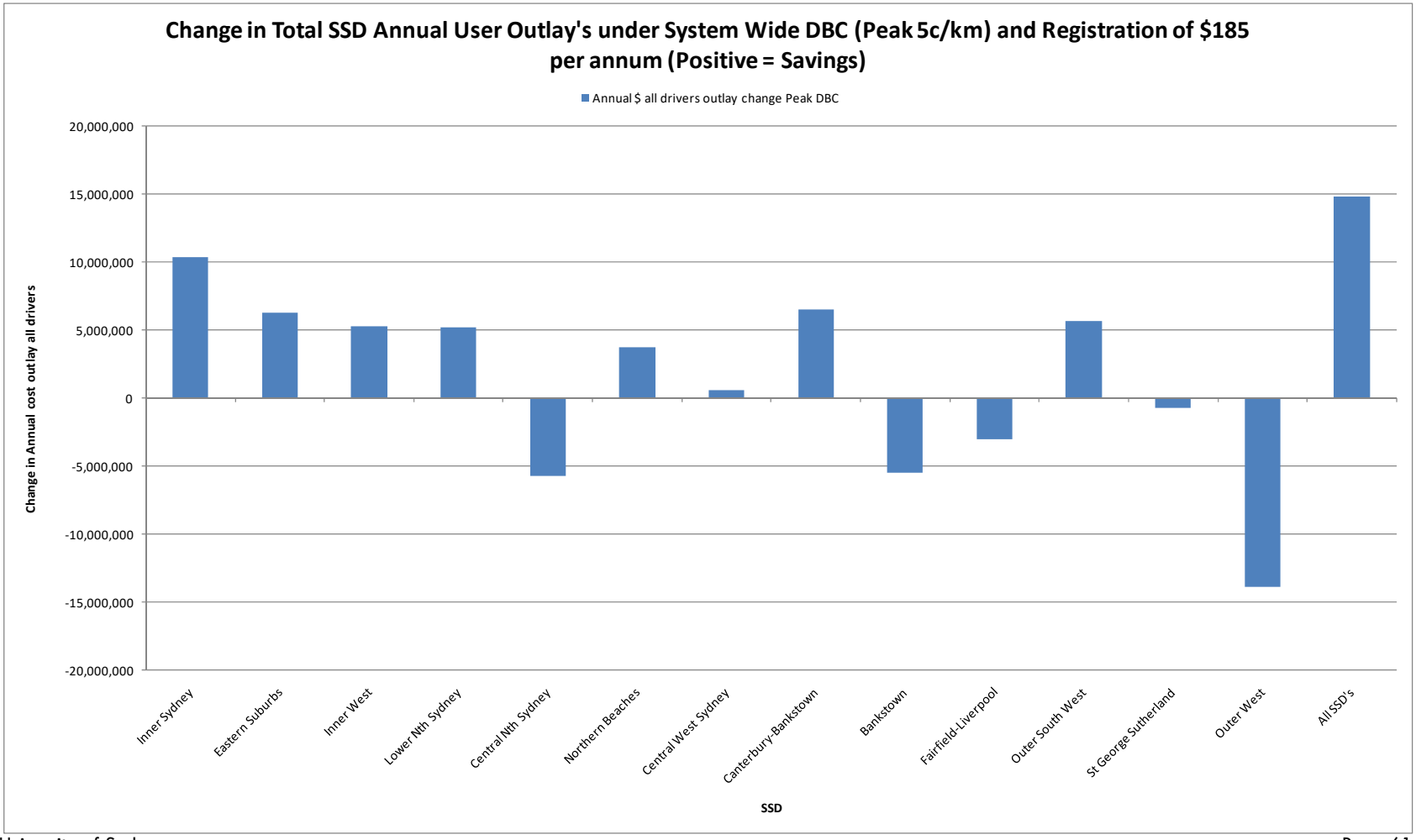
- **With the condition that:**
  - **Treasury is no worse off and**
  - **Drivers in total, outlay less money**

- **Recommendation: Halve car registration, 5c/km DBC in peak only**
  - **Enough drop in peak traffic to be like school holidays**

- In the future build Road user charging reform into Mobility subscription packages
  - Such providers are likely to use time varying pricing structures as well as relying on increasingly sophisticated digitally geo-referenced location platforms and
  - so may provide both the technology platform and the political cover to support a change in how we charge for use of the network.

Cost Implications for Drivers (range from 0.34 to 0.65c/km per driver)

Total cost gain of $43.6m and a total cost loss of $28.8m



The Future: Coming soon or maybe it has arrived?

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Will Congestion could be a thing of the past?
We might be able to Tame it but not eliminate it!

- Even if congestion is a thing of the past (?), Efficient Road User Charging (ERUC) will be crucial
  - Someone has to pay for the infrastructure!
- I think we can get close to 'guaranteeing' predictable (non-random) congestion (lower uncertain travel time variability) –
  - i.e., more reliable
  - But congestion will always exist subject to available network capacity and demand.
- "It ain't going away"
- ERUC is essential (not IF, but WHEN and HOW)

THANK YOU

David Hensher
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THE UNIVERSITY OF SYDNEY
E david.hensher@sydney.edu.au | **W** http://sydney.edu.au/business/itls

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