


How does Mobility as a Service (MaaS) influence travel behavior?

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How does Mobility as a Service (MaaS) influence travel behavior?

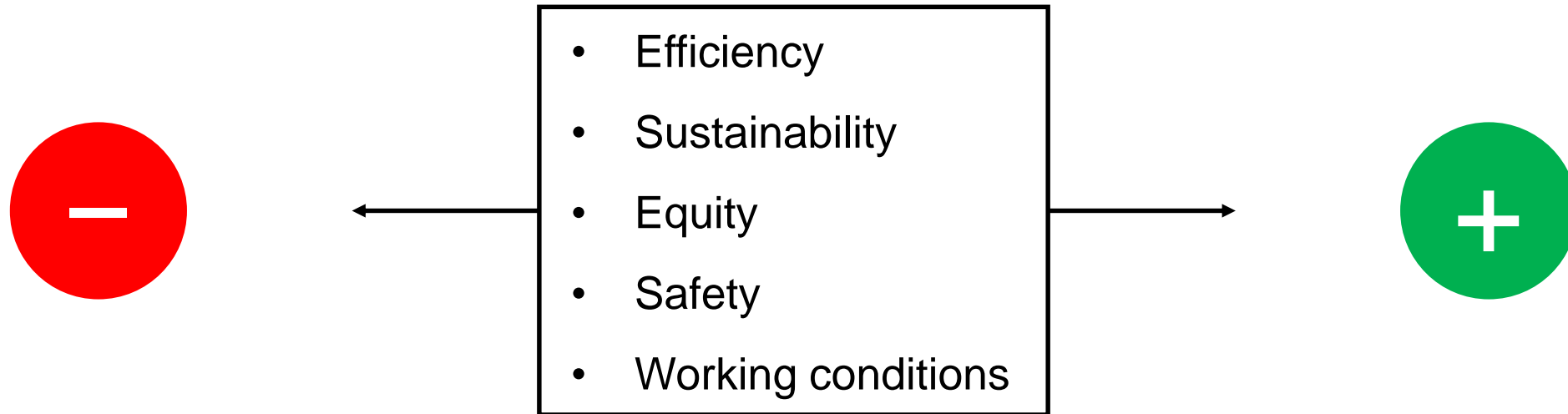
MaaS - A European Perspective
Daniel J. Reck
22 Jun 2021

Passenger transport is changing



Source: Bloomberg

Discussion on impact is ongoing and net effects are unclear



Observation



VS



<https://www.taxplanners.com.au/taxi-travel-services-ride-sourcing-uberx-tax-implications/>

<https://www.transitsystems.com.au/news/2018/4/19/transit-systems-secures-region-6-bus-contract>

Observation



<https://www.taxplanners.com.au/taxi-travel-services-ride-sourcing-uberx-tax-implications/>

&



<https://www.transitsystems.com.au/news/2018/4/19/transit-systems-secures-region-6-bus-contract>

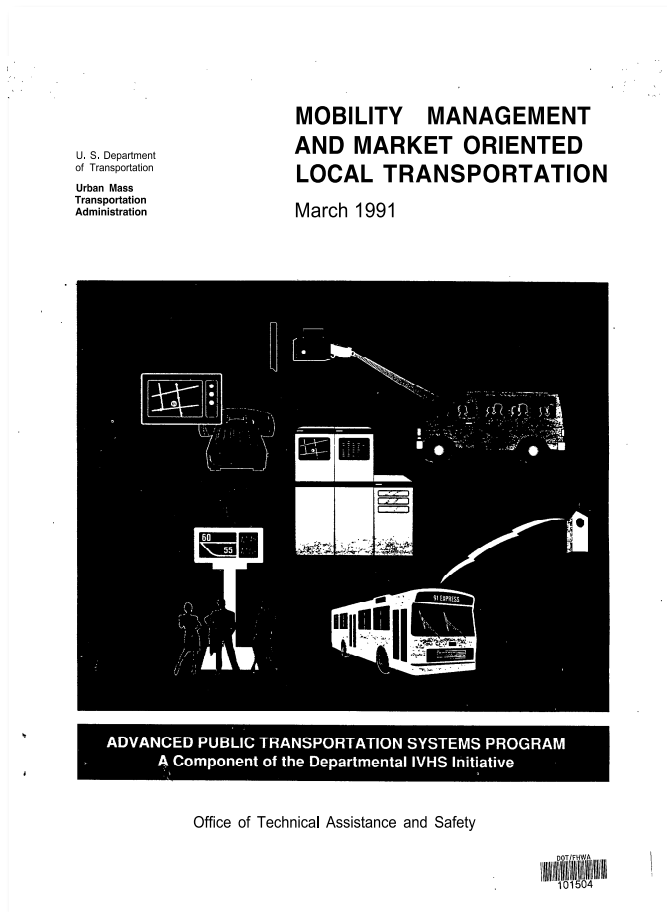
Emerging question from a societal perspective

How to *integrate* emerging mobility options with public transport and
incentivize sustainable use?



Mobility as a Service (MaaS)

Mobility as a Service is not (entirely) new



“The Mobility Manager accomplishes its goals by linking together all travel modes – bus, taxi, vanpools, express bus, specialized services, carpools etc. at an informational level and, in most cases, at a transactional level as well”

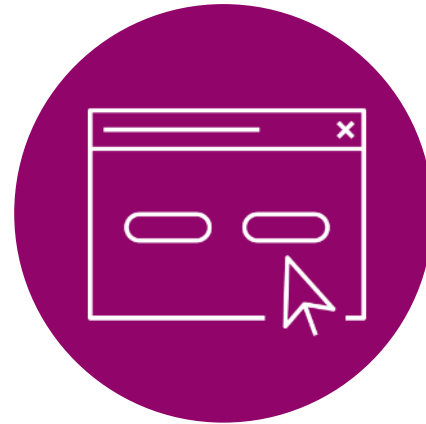
US DoT, 1991, p. 16
In: Mulley (2017)

Conceptualizing Mobility as a Service: Elements

App



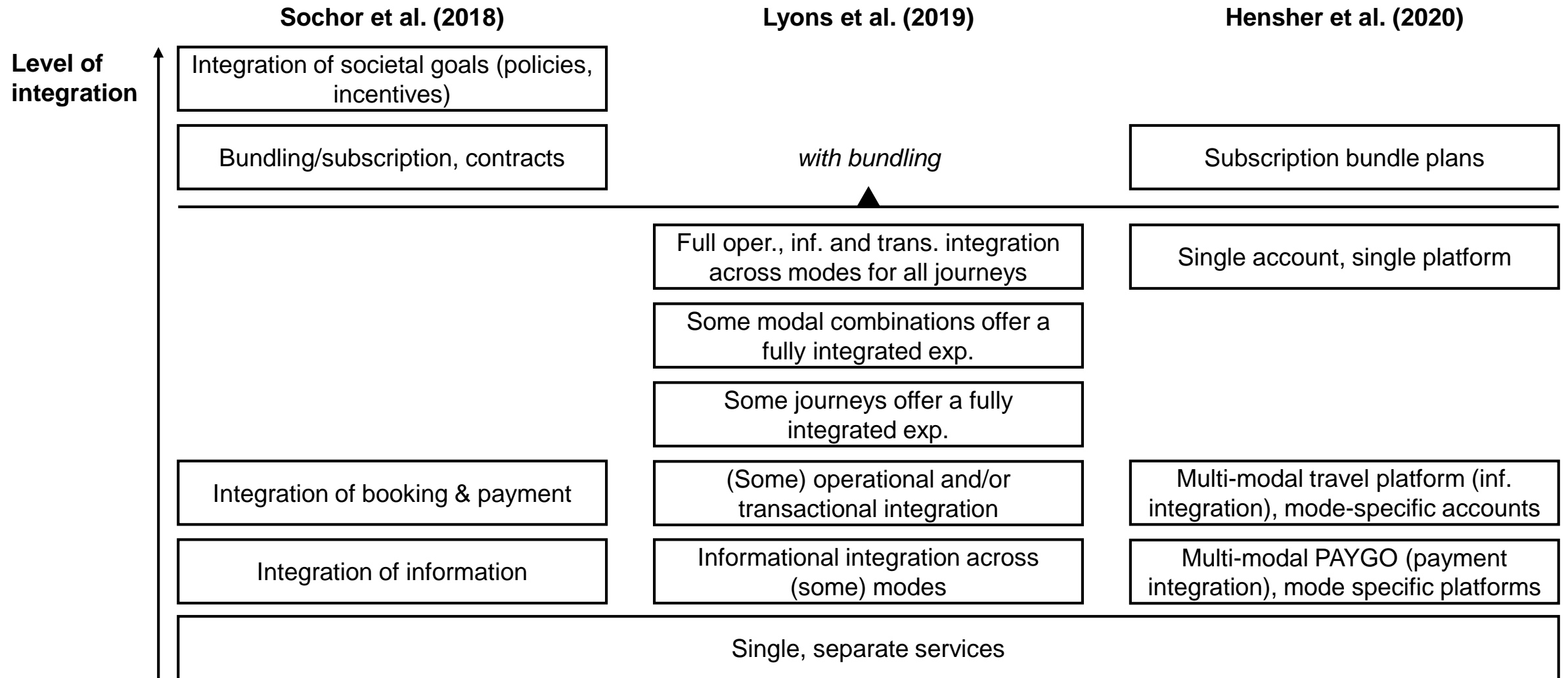
Platform integration



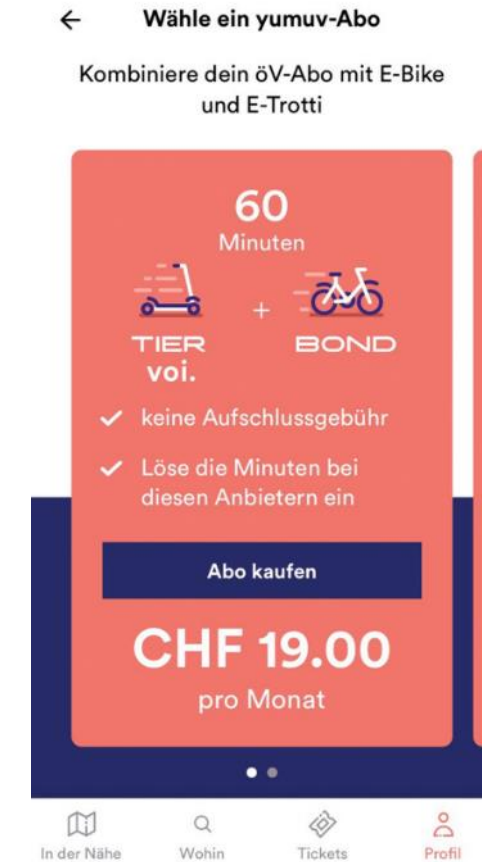
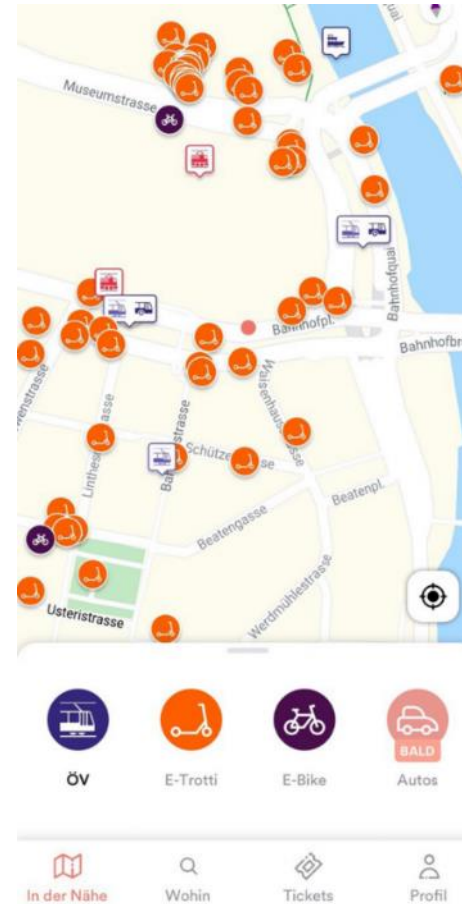
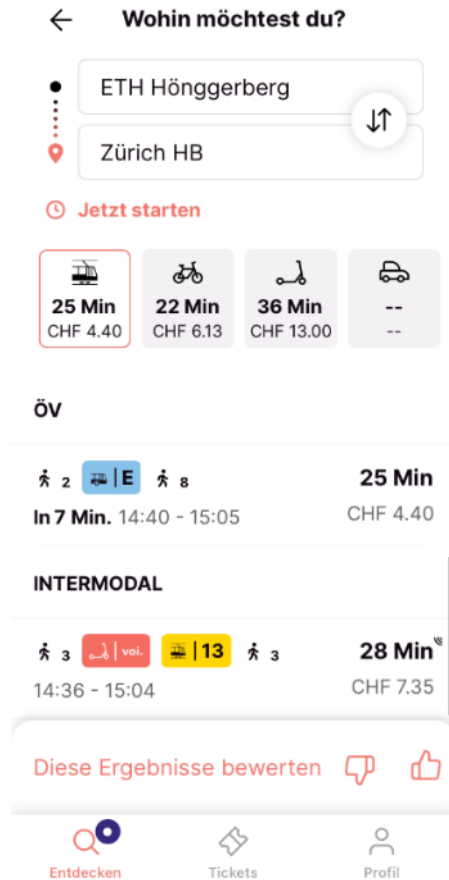
Bundles



Conceptualizing Mobility as a Service: Topologies



One example of “high-level” MaaS in practice: Yumuv (Switzerland)



How does MaaS change
travel behavior?

Quantitative empirical evidence from 3 cities

Sydney (AU)
2019-2020

Augsburg (DE)
2018-today

Zurich (CH)
2020-today



Quantitative empirical evidence from 3 cities

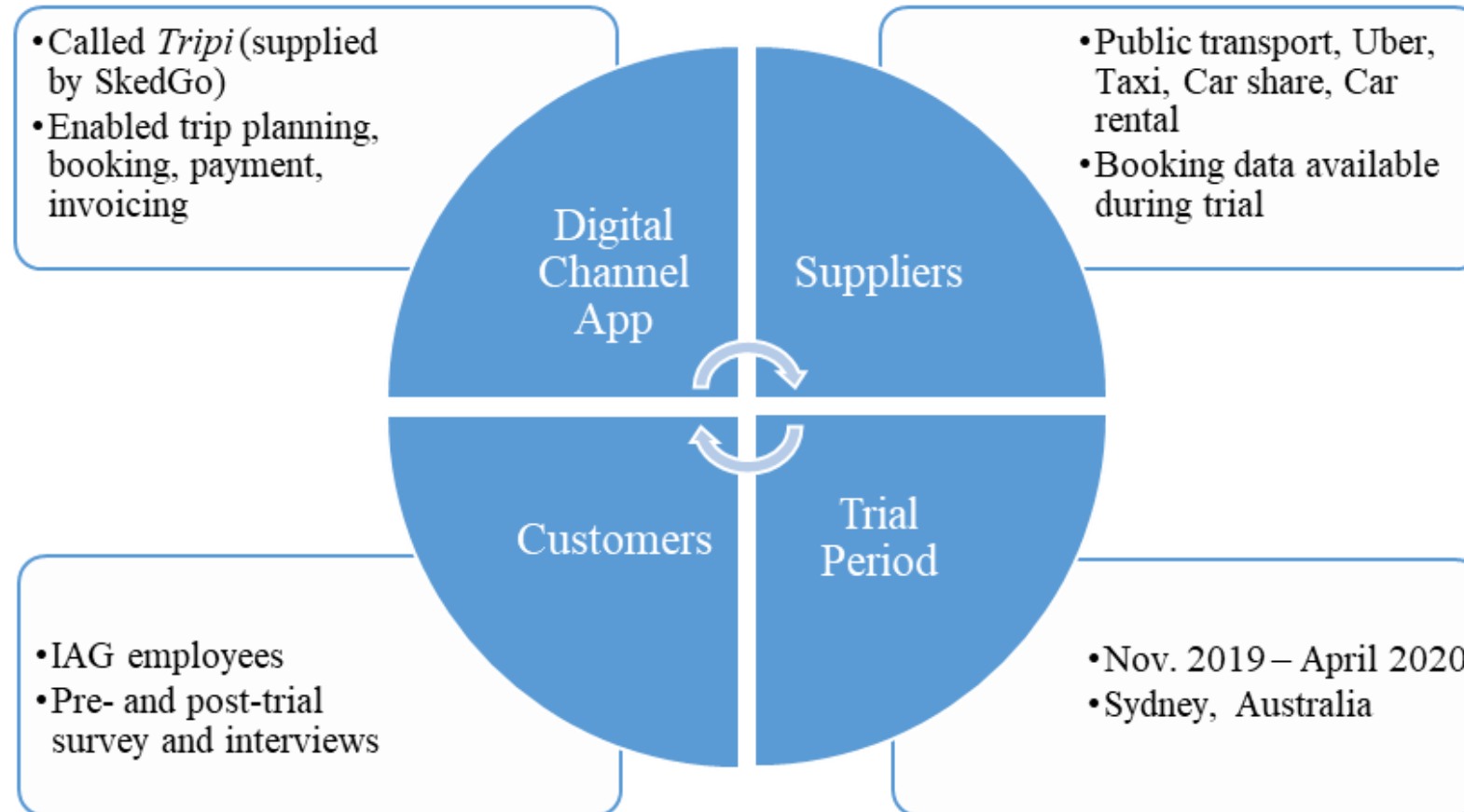
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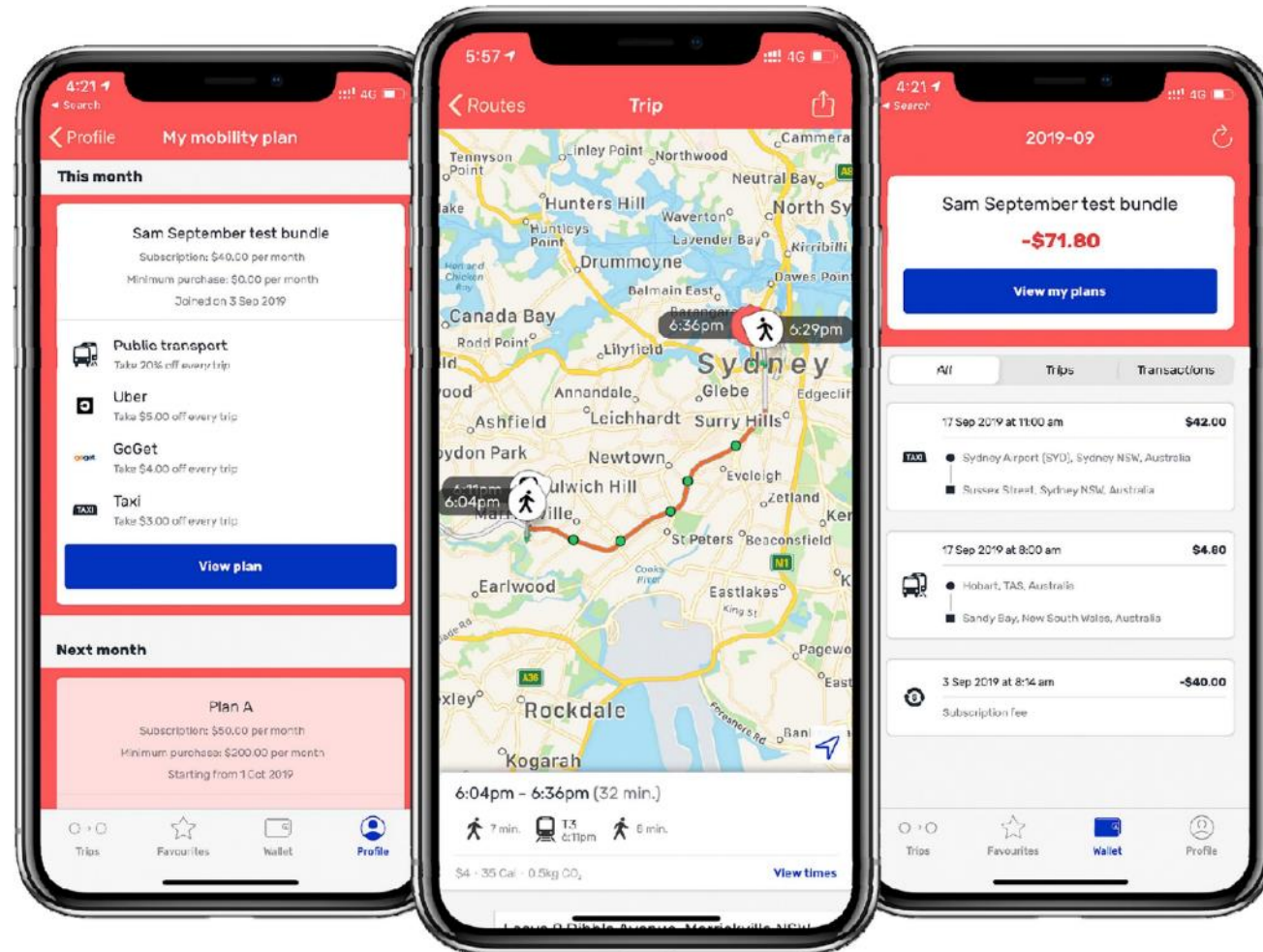
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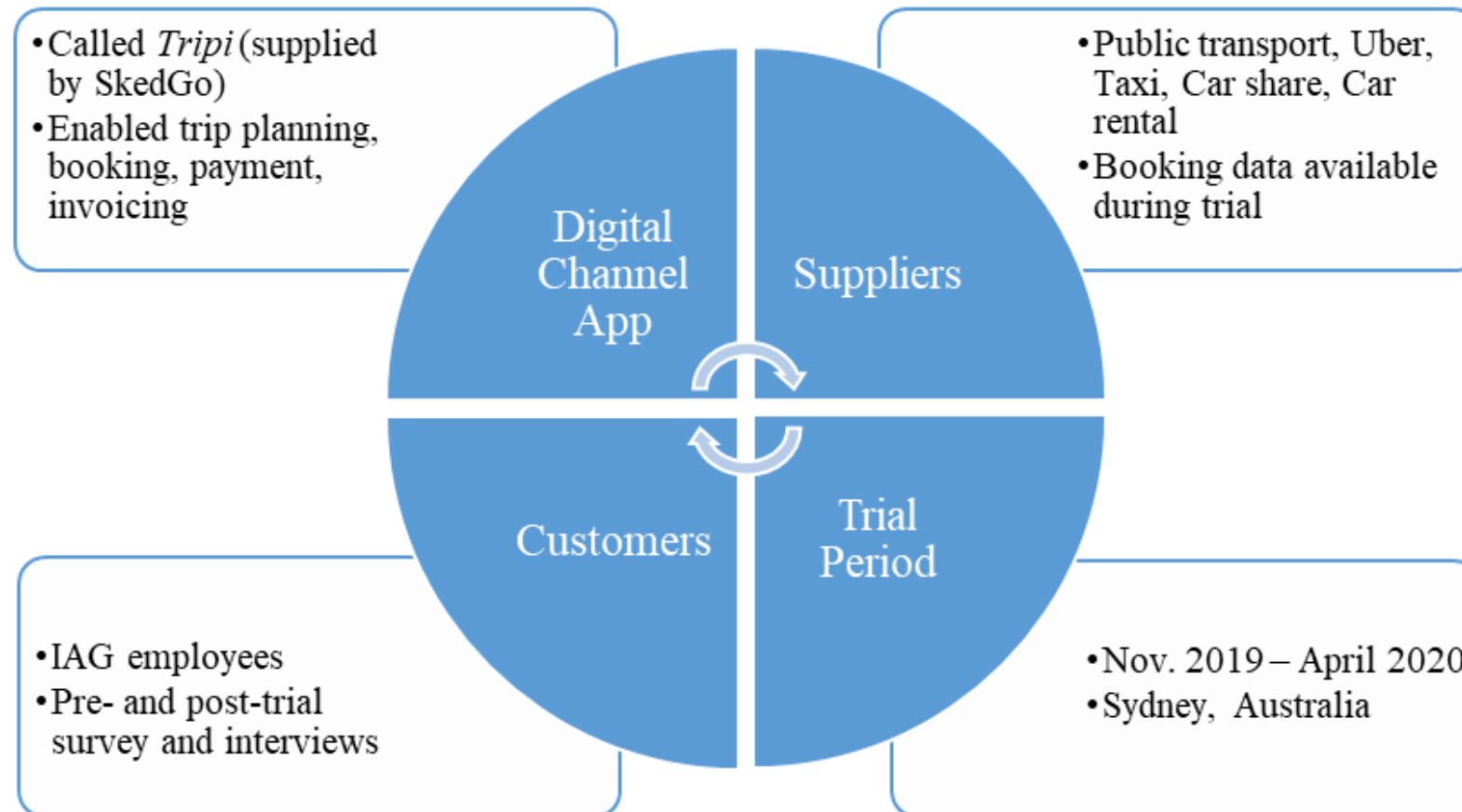
Sydney – trial overview



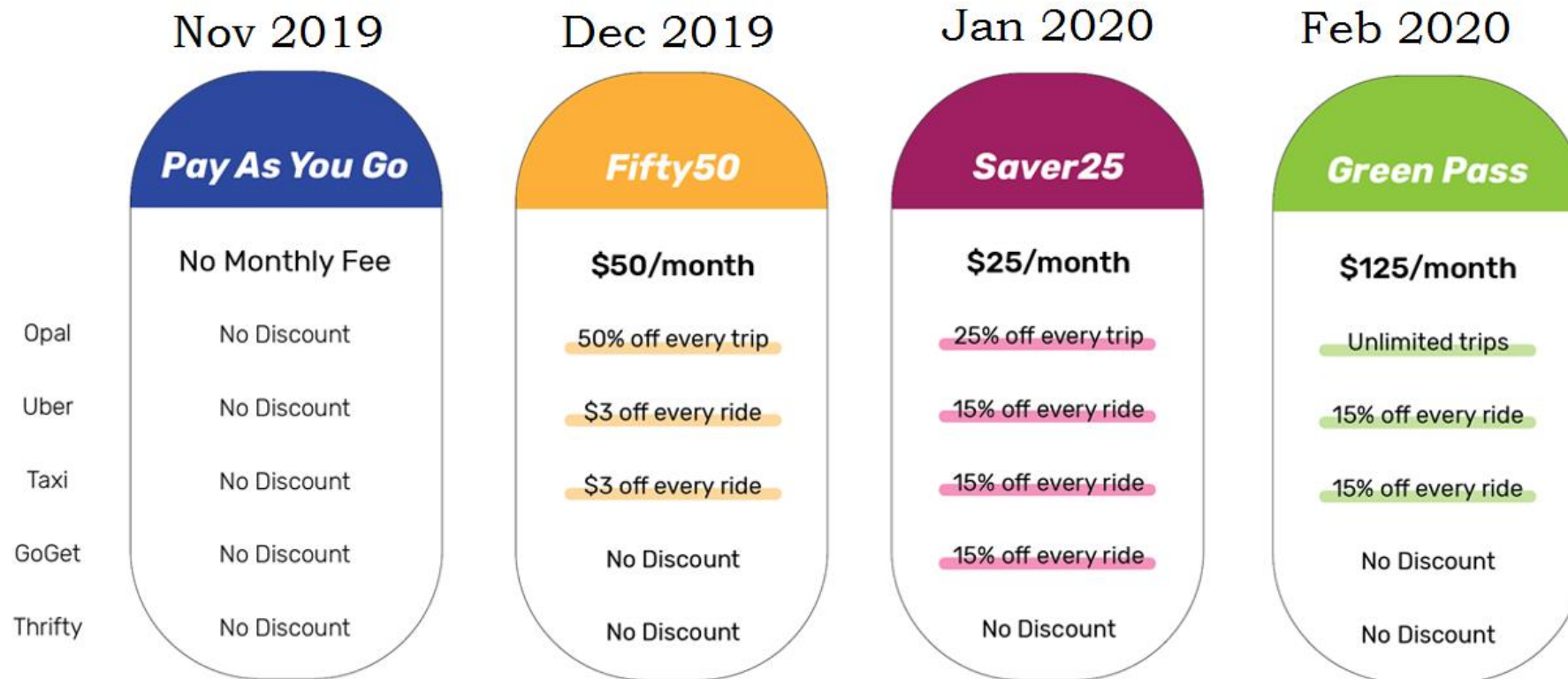
Sydney – app



Sydney – trial overview



Sydney – bundles



Sydney – bundle design

Table 1

A first master design for MaaS bundles.

	Term	Definition	Examples
<i>Necessary design dimensions</i>	Modes	Modes of transportation included in the bundle	Public transportation, carshare, (e-)bikeshare, e-scooters, taxi, car rental, ridehail
	Metrics	Way in which the mobility budget/ entitlement and consumption of a mode is measured	Time-based (minutes, hours, days), distance-based (km, miles), trip-based (number of trips)
	Geography	Area of validity	Single city, multiple cities, country
	Market segment	Entity the bundle is designed for, and whether the bundle can be shared	Individuals (residents, tourists, commuters, seniors), households, employee groups
	Subscription cycle	Period of single recurrence of a subscription	Weekly, fortnightly, monthly; calendar or rolling
<i>Complementary design dimensions</i>	Discounts	Type and granularity of rebate	Trip-based (20%/\$5 off each trip), budget-based (subscription fee or top up \$50, pay \$45)
	Caps	Limit to discounted trips/entitlements depending on the metric, also referred to as budgets	Time-based (30 h/trips up to 30 min), distance-based (30 km), trip-based (10 trips)
	Add-ons	Non-transportation services included in the bundle	Parking, coupons (e.g., shopping, accommodation, restaurants, food delivery)
	Customizability	Bundles can be pre-defined by the mobility broker or personalized by the users	NA
	Roll-over option	Transfers unused credit to the subsequent time period	NA

Reck, D.J., D.A. Hensher, C.Q. Ho (2020) MaaS Bundle Design. *Transportation Research Part A: Policy and Practice*.

Sydney – key results with regards to travel behavior

- Data
 - Monthly bundle choice
 - Private car kms (GPS trackers)
- Method
 - Model bundle choice and car kms jointly as discrete-continuous choice model
- Key publications
 - Hensher, D.A., C.Q. Ho and D.J. Reck (2021) Mobility as a Service and private car use: evidence from the Sydney MaaS trial. *Transportation Research Part A: Policy and Practice*, 145: 17-33.
 - Ho, C.Q., D.A. Hensher and D.J. Reck (2021) Drivers of participant's choices of monthly mobility bundles: Key behavioural findings from the Sydney Mobility as a Service (MaaS) Trial. *Transportation Research Part C: Emerging Technologies*, 124: 102932.
 - Reck, D.J., D.A. Hensher and C.Q. Ho (2020) MaaS Bundle Design. *Transportation Research Part A: Policy and Practice*, 141: 485-501.

Sydney – key results with regards to travel behavior

- Data
 - Monthly bundle choice
 - Private car kms (GPS trackers)
- Method
 - Model bundle choice and car kms jointly as discrete-continuous choice model
- Results
 - **Bundle subscribers reduce monthly car kms**
 - An increase of a bundle choice probability by 0.1 unit (from 10% to 20% for example) is predicted to reduce average monthly private car kms by 29 kms, from an average of 434 to 405 kms
 - If scalable, this yields a substantial reduction in car kms
- Key publications
 - Hensher, D.A., C.Q. Ho and D.J. Reck (2021) Mobility as a Service and private car use: evidence from the Sydney MaaS trial. *Transportation Research Part A: Policy and Practice*, 145: 17-33.
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Sydney – contributions and future work

Contributions

- Fully transparent trial from design to implementation to impact assessment and lessons learnt
- Quantitative empirical evidence on actual bundle uptake and induced changes in travel behavior

Future work

- Scalable beyond specific customer group (IAG employees)?
- Substitution effects between modes (and net effect on car-based travel)?

Quantitative empirical evidence from 3 cities

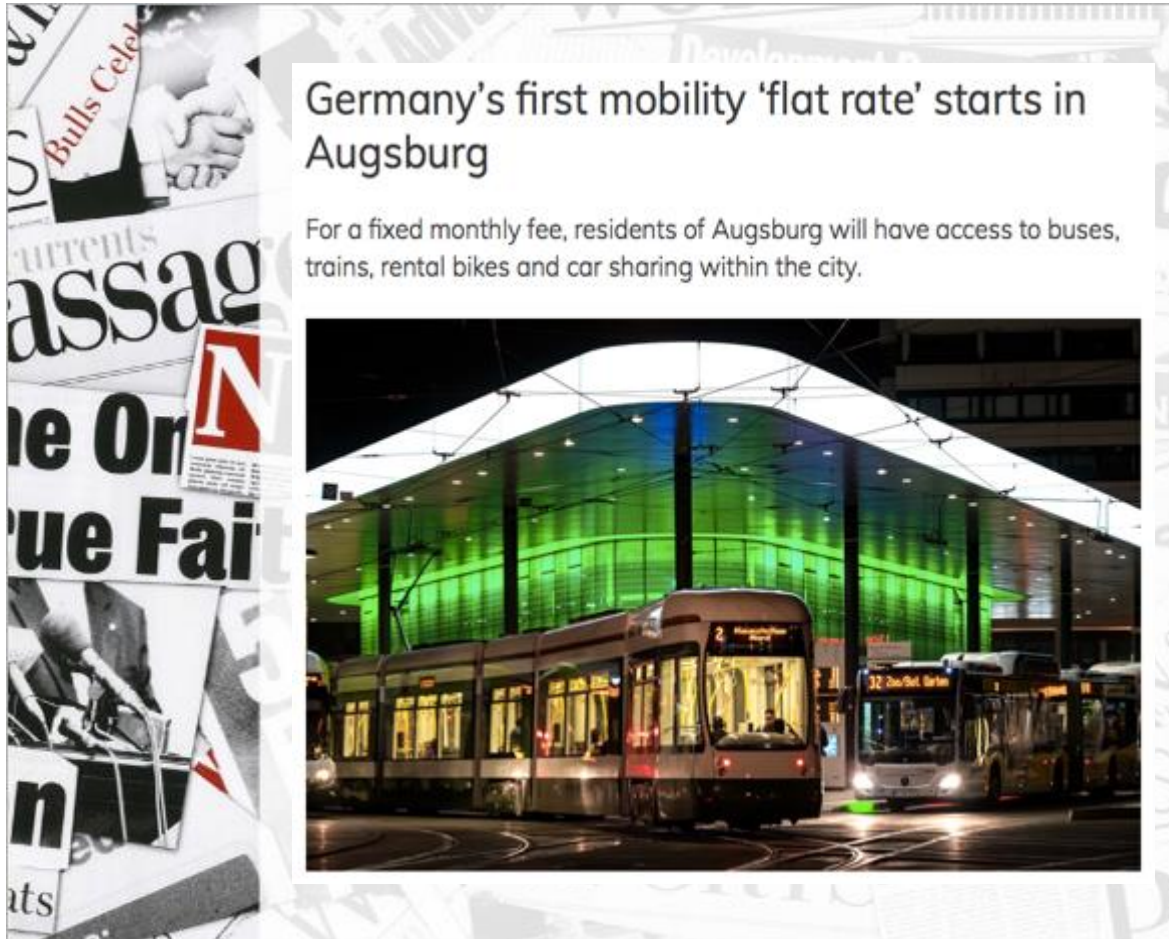
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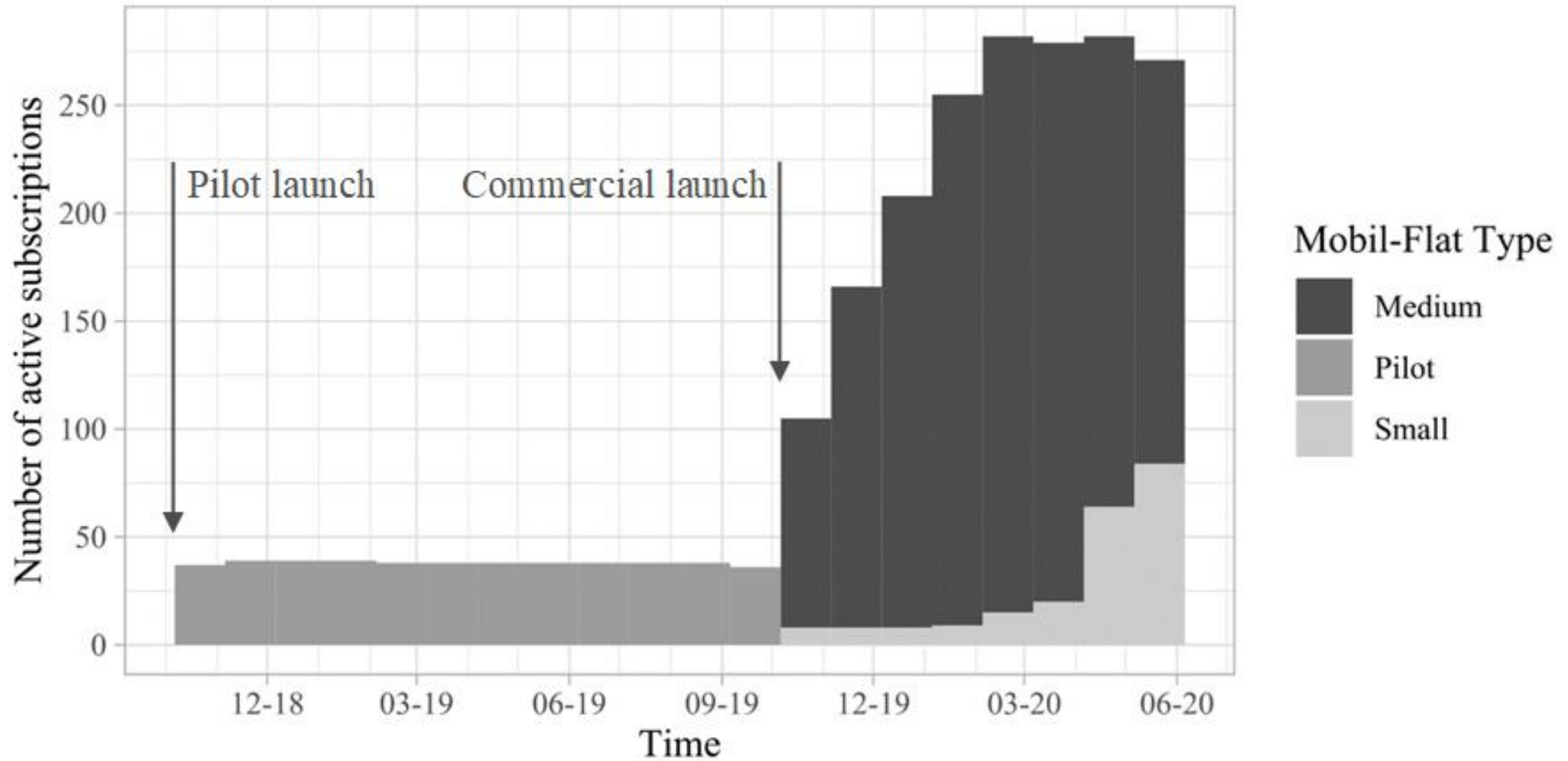
Augsburg – overview



<https://www.intelligenttransport.com/transport-news/91851/germanys-first-mobility-flat-rate-starts-in-augsburg/>

- Launched in stages
 - Initial trial (“Mobil-Flat”):
01.10.2018 – 30.09.2019
 - Expansion (“Mobil-Flat S/M”):
since 01.10.2019
- Real product
- Goal for municipal transport provider:
learn about travel behavior under the influence of a subscription bundle

Augsburg – uptake



Augsburg – bundles

TABLE 1 MaaS bundles offered in Augsburg.

		Pilot	Mobil-Flat S	Mobil-Flat M
Dates	Start	11/2018	11/2019	11/2019
	End	10/2019	-	-
Modes and budgets	Public Transportation	Unlimited (zones 10 and 20)	Unlimited (zones 10 and 20)	Unlimited (zones 10 and 20)
	Carshare	30 h / unlimited km	15 h / 150 km	30 h / unlimited km
	Bikeshare	Unlimited <=30 min rides	Unlimited <=30 min rides	Unlimited <=30 min rides
Price	Start	75 € (2018)	79 € (2019)	79 € (2019 / 6 month offer) 109 € afterwards
	Current	-	83 € (2020)	115 € (2020)

Augsburg – results

TABLE 2 Estimation results for mixed effects model.

Fixed Effects		
	Estimate	t
(Intercept)	1.97	82.29***
Mobil-Flat Pilot	0.57	8.19***
Mobil-Flat M	0.61	16.17***
Mobil-Flat S	0.31	3.91***
COVID-19	-0.28	-5.34***
N observations	28189	
N individuals	2504	
N months	33	
R ²	0.40	
RMSE	0.88	

*** : $p < 0.001$, ** : $p < 0.01$, * : $p < 0.05$

Mobil-Flat subscriptions increase carsharing consumption

COVID-19 reduces carsharing consumption

Reck, D.J., K.W. Axhausen, D.A. Hensher, C.Q. Ho (2021) Multimodal Transportation Plans: Empirical Evidence on Uptake, Usage and Behavioral Implications from the Augsburg MaaS Trial. Paper presented at TRB 2021, online.

Augsburg – lessons learnt and future work

- Reductions in private car use cannot be interpreted as sustainability increases per se as interdependencies with other modes have to be accounted for
 - How does carshare substitute other modes (e.g., private cars)?
 - What is the net effect (i.e., car-based travel)?

Augsburg – lessons learnt and future work

- Reductions in private car use cannot be interpreted as sustainability increases per se as interdependencies with other modes have to be accounted for
 - How does carshare substitute other modes (e.g., private cars)?
 - What is the net effect (i.e., car-based travel)?
- Comprehensive data on travel behavior with all modes (private car, public transport, walking, cycling, carshare, ...) is essential to evaluate changes in travel behavior
- Missing data on any mode (Augsburg: private car travel) creates gaps that hinder conclusions on meaningful topics (e.g., net effects, sustainability)

Quantitative empirical evidence from 3 cities

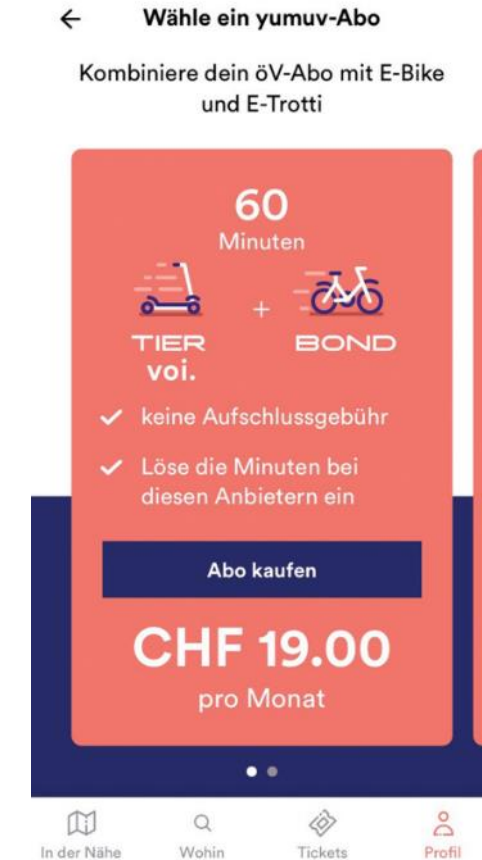
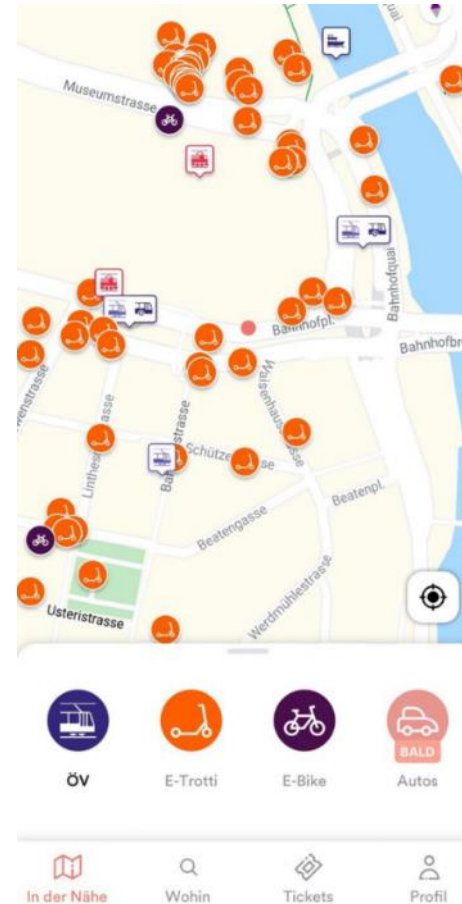
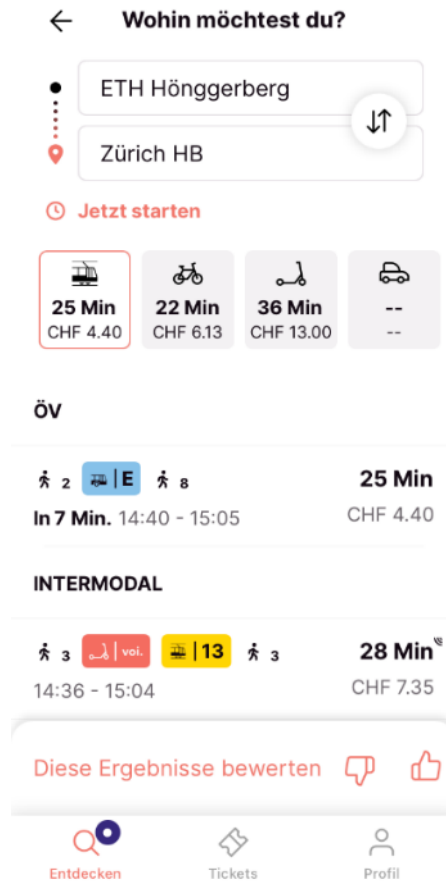
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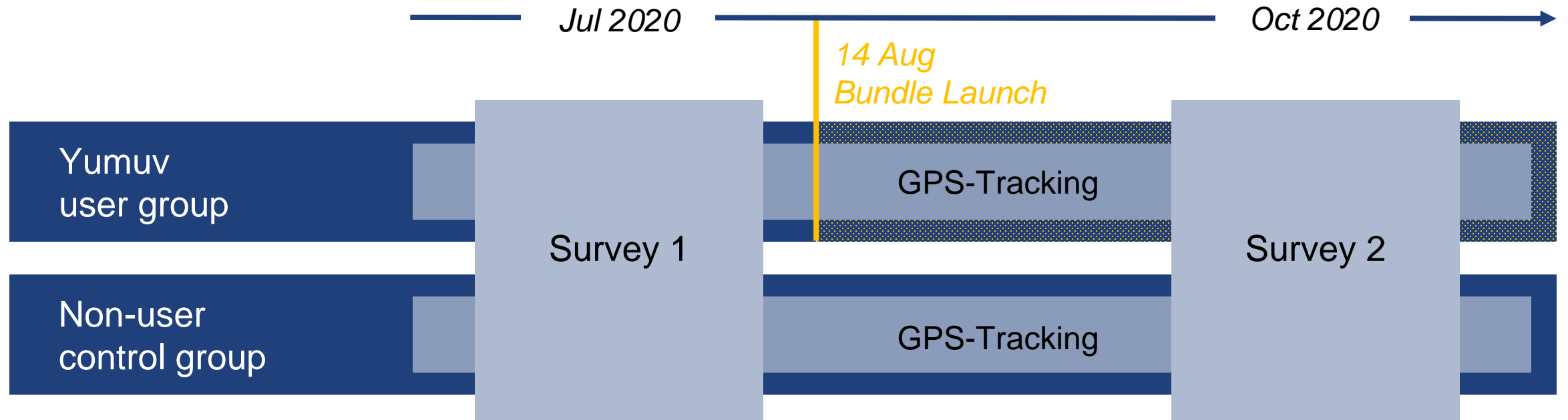
Zurich (CH)
2020-today



Zurich – app



Zurich – research design



- Booking data
- Contextual data (e.g., weather)
- Shared mobility vehicle availability

Conclusions

Conclusions

- MaaS has several key components (app, platform, bundles)
- Bundles (not pay-as-you-go) have the potential to induce changes in travel behavior
- Bundle design is key (input ~ output)
 - Lots of free e-scooter minutes → lots of e-scooter use (at the expense of other modes)
- When conducting pilots: data is key (e.g., does carsharing substitute private car kms?)
 - Comprehensive (tracking) data on travel behavior with all modes
 - Treatment group and control group
 - Booking data to correct for “new modes”
- Research on behavioral implications is far from done
 - Comprehensive evaluation of bundle components on travel behavior → Yumuv/Sydney trials
 - Niche or game changer? → Augsburg trial
 - Business model? → Who pays for what?

Key publications summarizing our experience from three trials

- MaaS bundle design
 - Reck, D.J., D.A. Hensher and C.Q. Ho (2020) MaaS Bundle Design. *Transportation Research Part A: Policy and Practice*, 141: 485-501.
 - Reck, D.J. and K.W. Axhausen (2020) How much of which mode? Using revealed preference data to design MaaS plans. *Transportation Research Record*, 2674 (7): 494-503.
 - Ho, C.Q., D.A. Hensher, D.J. Reck, S. Lorimer and I. Lu (2021) MaaS bundle design and implementation: Lessons from the Sydney MaaS trial. *Transportation Research Part A: Policy and Practice*, 149: 339-376.
- Influence of MaaS on travel behavior
 - Hensher, D.A., C.Q. Ho and D.J. Reck (2021) Mobility as a Service and private car use: evidence from the Sydney MaaS trial. *Transportation Research Part A: Policy and Practice*, 145: 17-33.
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Thank you for your attention!

Link to preprints of all papers: research.daniel-reck.de

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