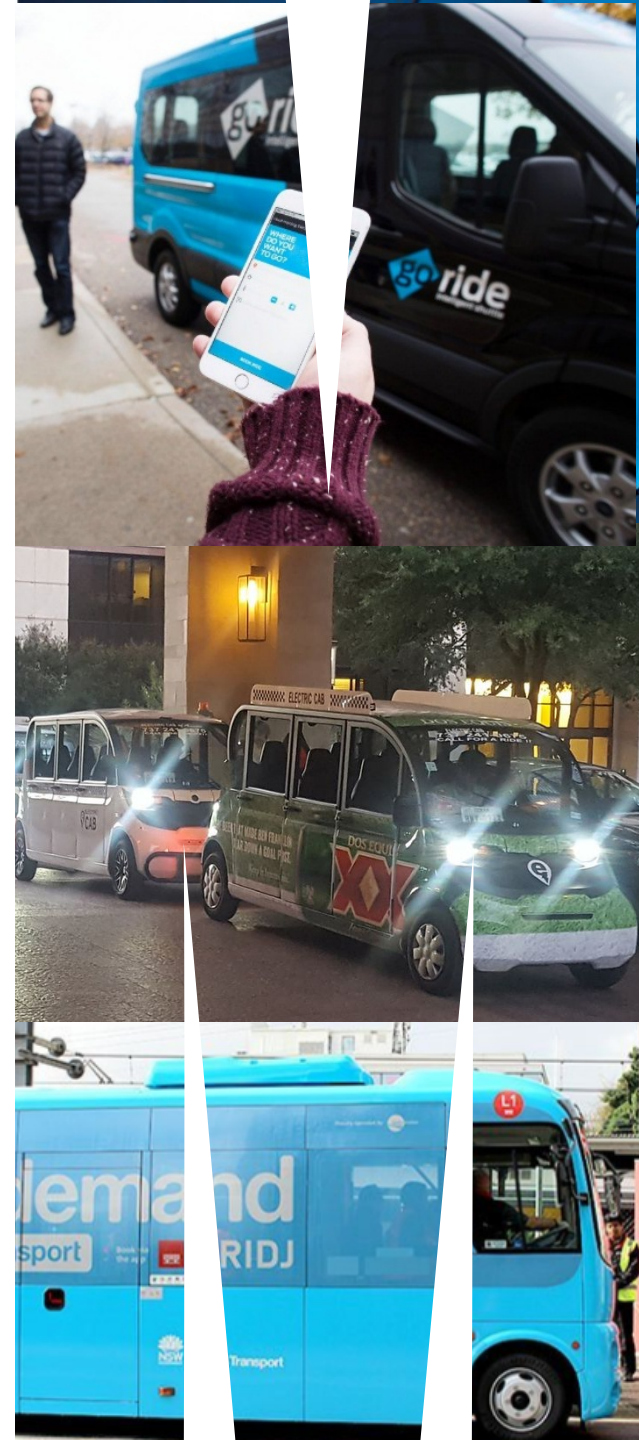


Why most DRT/Micro-Transits fail what the survivors tell us about progress

Prof Graham Currie FTSE

Public Transport Research Group
Monash Institute of Transport Studies
Monash University, Australia



1. Introduction

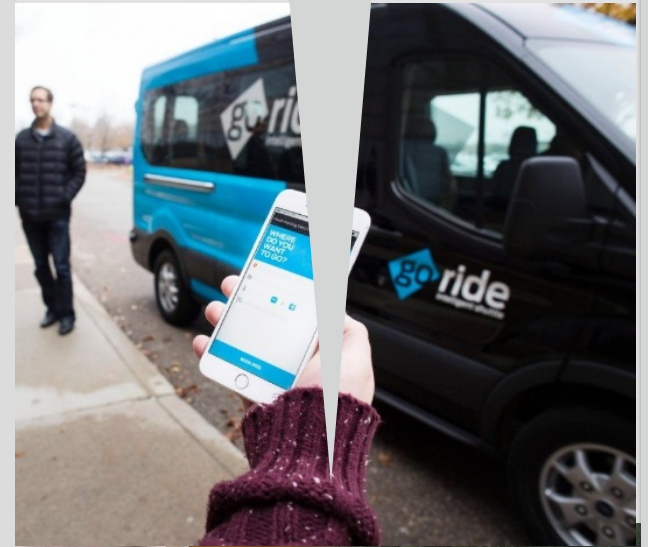
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6. Workshop Outcome



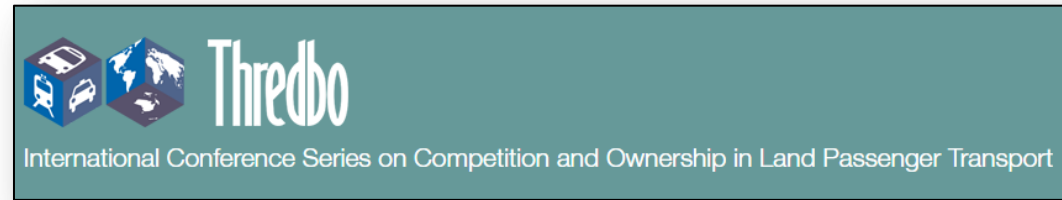
This paper explores DRT success/failure over the last 50 years

- Despite much recent ‘hype’ about Demand Responsive Transport (DRT) as a new solution to urban/rural transport problems; there is a long history experience in factors affecting success and failure which can inform progress
 - this is the focus of this paper
- This paper explores **success/failure of DRT over 50 years** including:
 - Service types
 - Trends, failure and success rates
 - Factors affecting success/failure



Electric Demand Responsive Transport Service, Slovenia

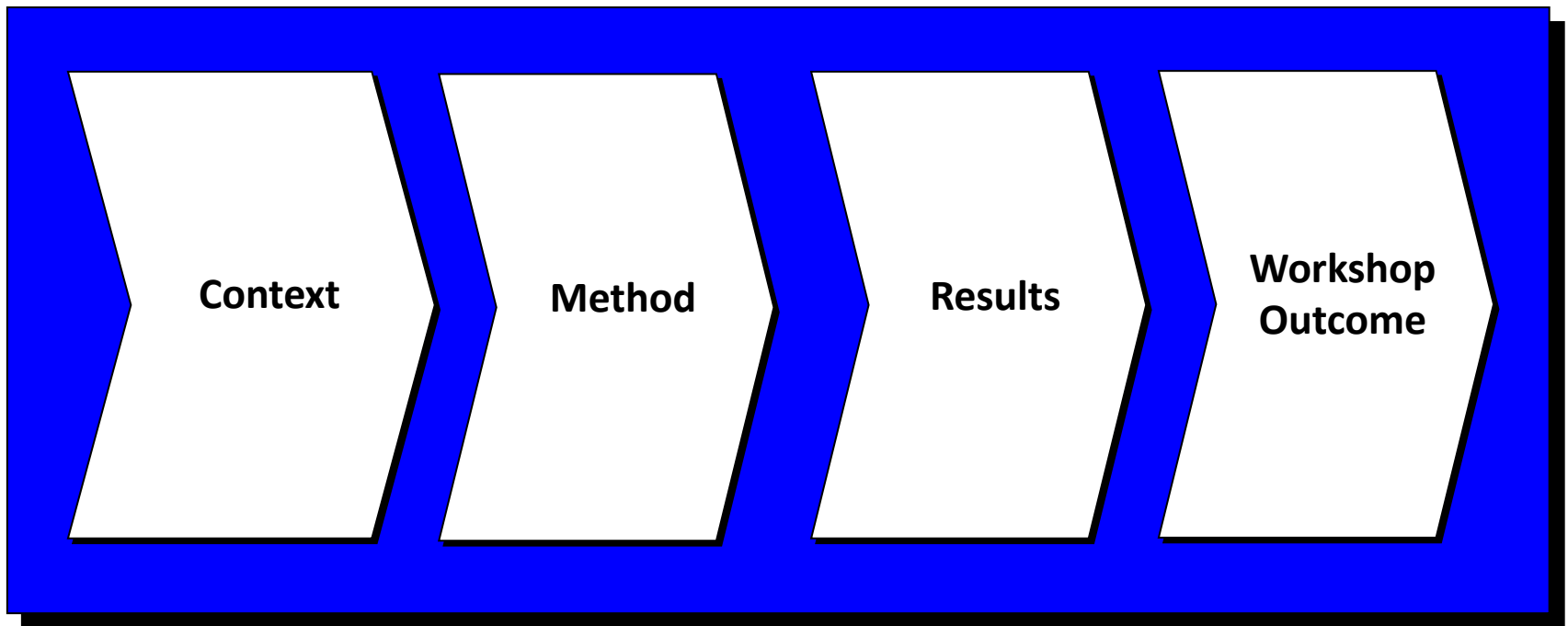
It is was 1st presented in Thredbo 15 Singapore in 2019 in a DRT Workshop – here I present the paper and some workshop findings



WORKSHOP 4 Realising the Potential Benefits of Demand Responsive Travel



It is structured as follows



1. Introduction

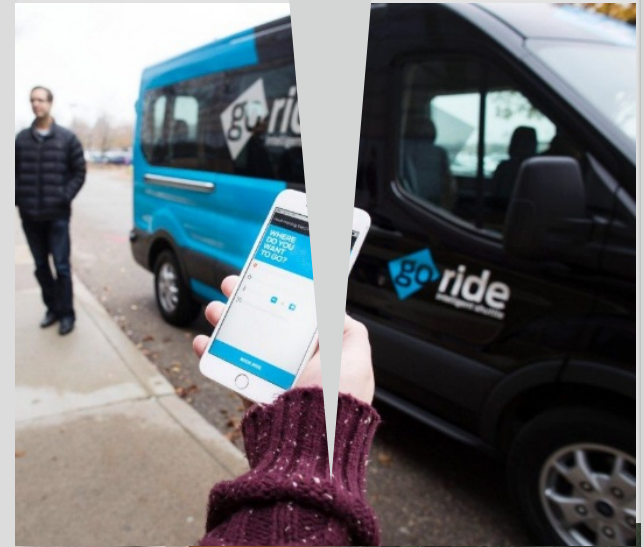
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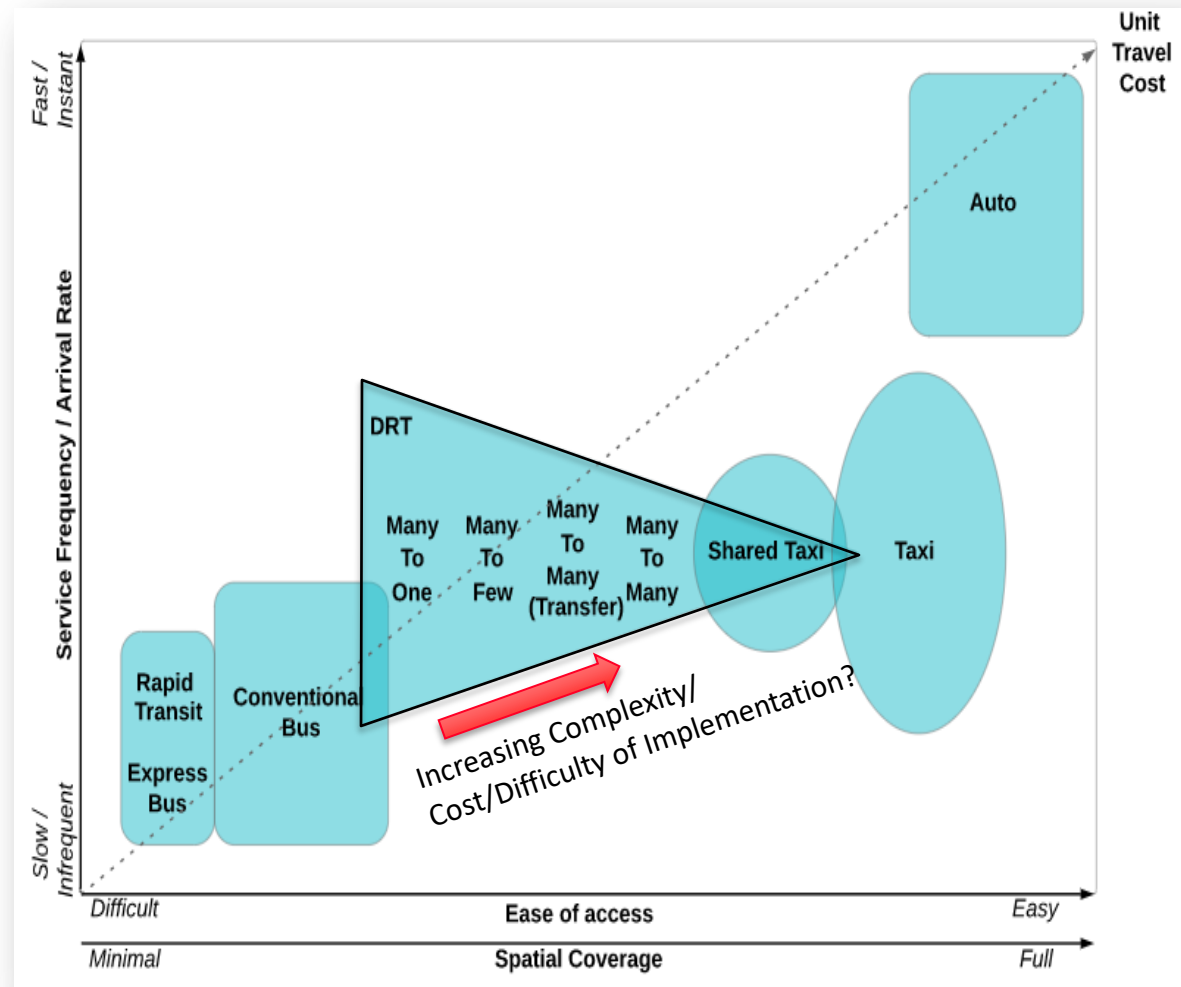
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DRT service types have many names but fit in between conventional scheduled bus services and taxis as an 'intermediate mode'

- Many type of DRT services and names:
 - Dial-a-bus
 - Dial-a-ride
 - Paratransit
 - Community Transport
 - Micro-transit
- DRT is often seen as being
 - “flexible and intermediate” mode
 - that “fills the gap” between individual taxis and fixed transit



Source: D'Este et al. (1994)

Research suggests DRT services struggle with financial viability – but there is almost no research on actual failure rates

DRT Outcomes Review

- **Commercially viable**
 - Very few
- **Acceptable subsidy**
 - Also very few – DRT has same or less subsidy than alternative services
- **Justifiably high subsidy**
 - Specialist niche DRT markets
 - The most common type of surviving service
- **Financially unsustainable**
 - Many in this category

Enoch et al. (2004)

“Most of the services that have stopped have done so because of the high costs in relation to their patronage”

Oxley (1979)

“Increased mobility is rather intangible when compared to the harsh reality of deficits on a balance sheet”

Transport Canada (1978).

Contemporary thinking is that 1. DRT can meet social needs thus high cost is justified, & 2. New technology reduces costs improving viability

Commonly held Contemporary beliefs in DRT literature:

1. Paratransit/community transport DRT services are “justifiably high cost” to meet social need.
“...where a public DRT service is more cost effective than running a set of parallel services for people with disabilities, non-emergency ambulances, Social Services and schools transport.” – (Enoch et al. 2004)
2. New and emerging technologies are reducing operating costs, increasing the commercial viability of DRT.
“...the reduction of technologies’ costs, have made the provision of flexible and more customer-centric public transportation more feasible.” – (Volinski, 2019)

How the Microtransit Movement Is Changing Urban Mobility

ERIC JAFFE APR 27, 2015

The good and the bad of all these new flexible ride services.

SHARE TWEET ...

Much like the U.S. political system, American urban mobility has traditionally been dominated by two parties: private cars (or cabs), and public transportation. But lately residents of America's largest cities have no doubt noticed lots of new options that seem to fall somewhere in between. A recent *Strong Towns* post [fittingly labeled](#) this middle-tier movement “microtransit” —more micro than a fixed-route 40-foot bus or a metro rail system; more transit than, well, non-transit; here's Lisa Nisenson:

We are on the cusp of widespread microtransit.

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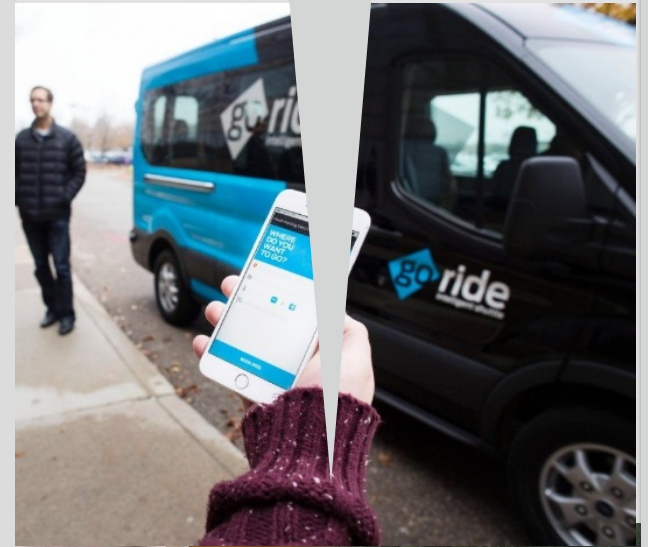
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Analysis collated DRT data over 50 years including cost analysis in comparable real terms

Objectives:

- The goal is to conduct a **broad** investigation of many DRT systems, not an in-depth investigation of few.
- However data on service types and cost, effectiveness performance was preferred

Data collection

- Scan for DRT service data in many countries; published academic/practice literature and online sources
- 14 US DRT systems identified from recent TCRP report (Volinski, 2019)
 - *most contained operational data*
- 24 worldwide DRT systems identified from early consultancy report (Travers Morgan, 1990)
 - *some contained operational data*
- 86 worldwide systems were identified from UK Report (Enoch et al., 2004) and a range of web searches
 - *none contained operational data, and only operating dates could be found for 70, the remainder could not be confirmed.*

A major methodological problem was finding failed systems is a problem; evidence of them tends to be removed; operating services all have a visibility - hence its likely failure rates are an underestimate

Analysis explored failure rates, trends and cost/operational performance

Analysis

1. **Failure rates:** Broad analysis of DRT failure rate using start/end years by location (e.g., country or region) or time (i.e., year). Also explores **Life Span**.
 - NOTE: newer Micro Transit would expect to have lower failure rates due you recent implementation – so recent DRT failure rates would be underestimates compared to older systems
2. **Temporal analysis:**
 - Analyse temporal trends to identify if larger economic and political factors are at play
3. **Cost and operational analysis:**
 - More detailed analysis of the subset of DRT systems with sufficient data to reveal overall factors associated with failure (e.g., high costs, simple operation, etc.).
 - Conversion of cost data into \$Aust, 2019 using currency and real terms adjusting for inflation

1. Introduction

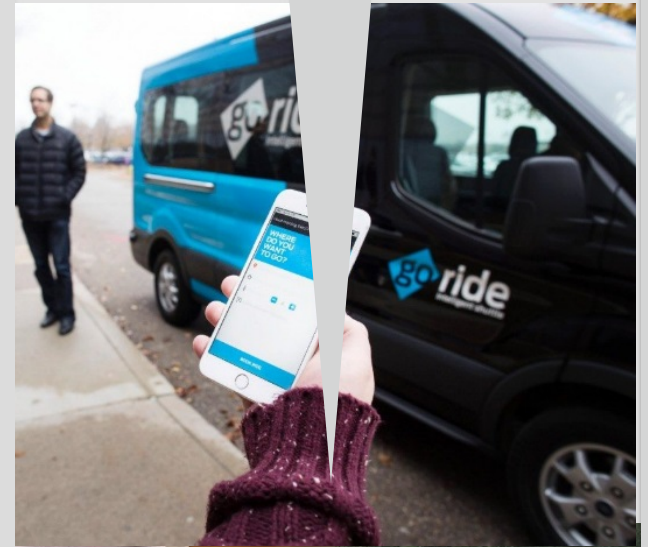
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114 DRTs were identified in 4 geographies; detailed cost data was found for 33 DRTs

DRT Database Developed from the Research Project

- A database of 114 confirmed public DRT services across 19 countries (4 regions) and over 50 years was developed.
- DRT services spanned from 1970 to 2019
- 33 had operational and cost attributes.
- This ONLY includes public DRTs, not exclusive services with restricted ridership, such as paratransit or community transport. In the US alone, there are an estimated 1,900 paratransit services (*TCRP Report 136*)



DRT Service Database

Region	Total
USA/Canada	34
UK	36
AU/NZ	13
Continental Europe	31
Total	114

Overall ~ half the DRT's failed; failure rate in the UK was 67%. AU/NZ 54%; lowest failure rates in Cont. Europe (23%)

DRT Failure Rates by World Region

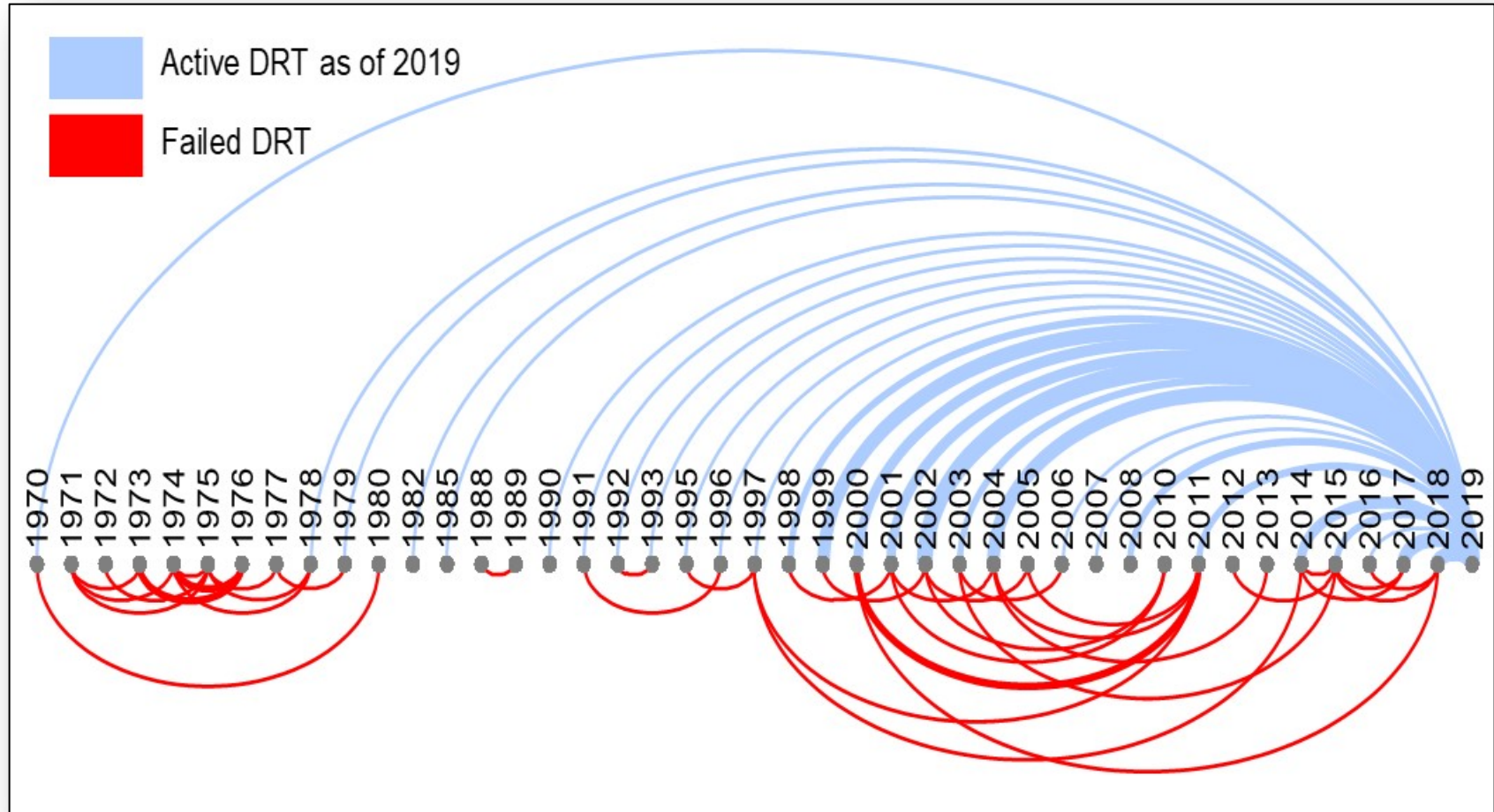
Region	Active	Inactive	Total	% Active	% Inactive
USA/Canada	17	17	34	50%	50%
UK	12	24	36	33%	67%
AU/NZ	6	7	13	46%	54%
Conti. Europe	24	7	31	77%	23%
Total	59	55	114	52%	48%



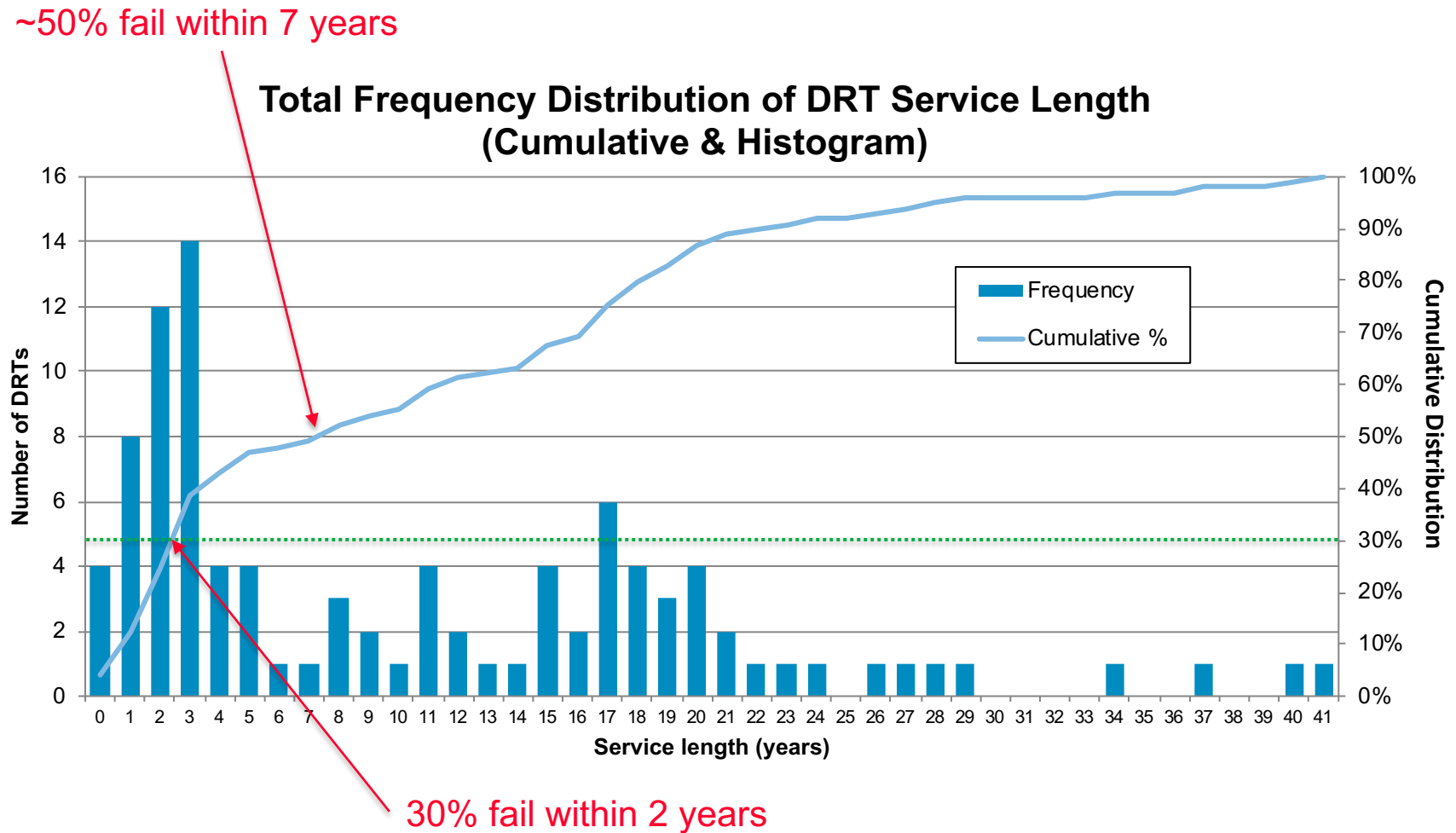
METHODOLOGICAL NOTE: failure rates are an underestimate, notably for Continental European systems where language barriers make access to data more difficult

A DRT Lifespan analysis mapped start and finish dates over 50 years

DRT Start and Finish Years for Active and Failed DRT Services

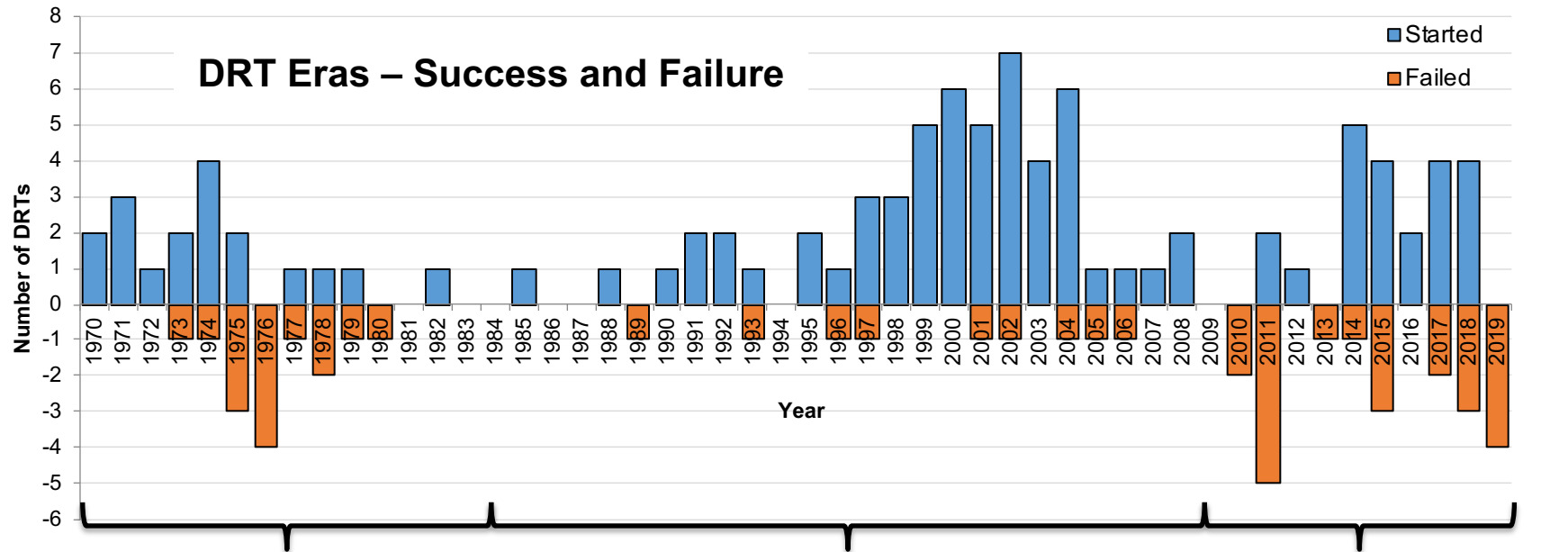


A DRT Lifespan analysis suggested ~50% fail within 7 years; 30% fail within 2 years



METHODOLOGICAL NOTE: failure rates are an underestimate

We identified 3 DRT Eras; Early 'dial-a-bus', Para/Community Transport and Tech Based Micro-Transit DRTs



1970 – 1984

Early Dial-a-Bus services

First attempts to run demand responsive services



1985 – 2009

Paratransit/Community Transport era

US paratransit services developed in response to Americans with Disability Act (ADA)

UK bus deregulation outside London resulted in investment in special need style services to fill gaps in withdrawn social bus services

2010 – 2019

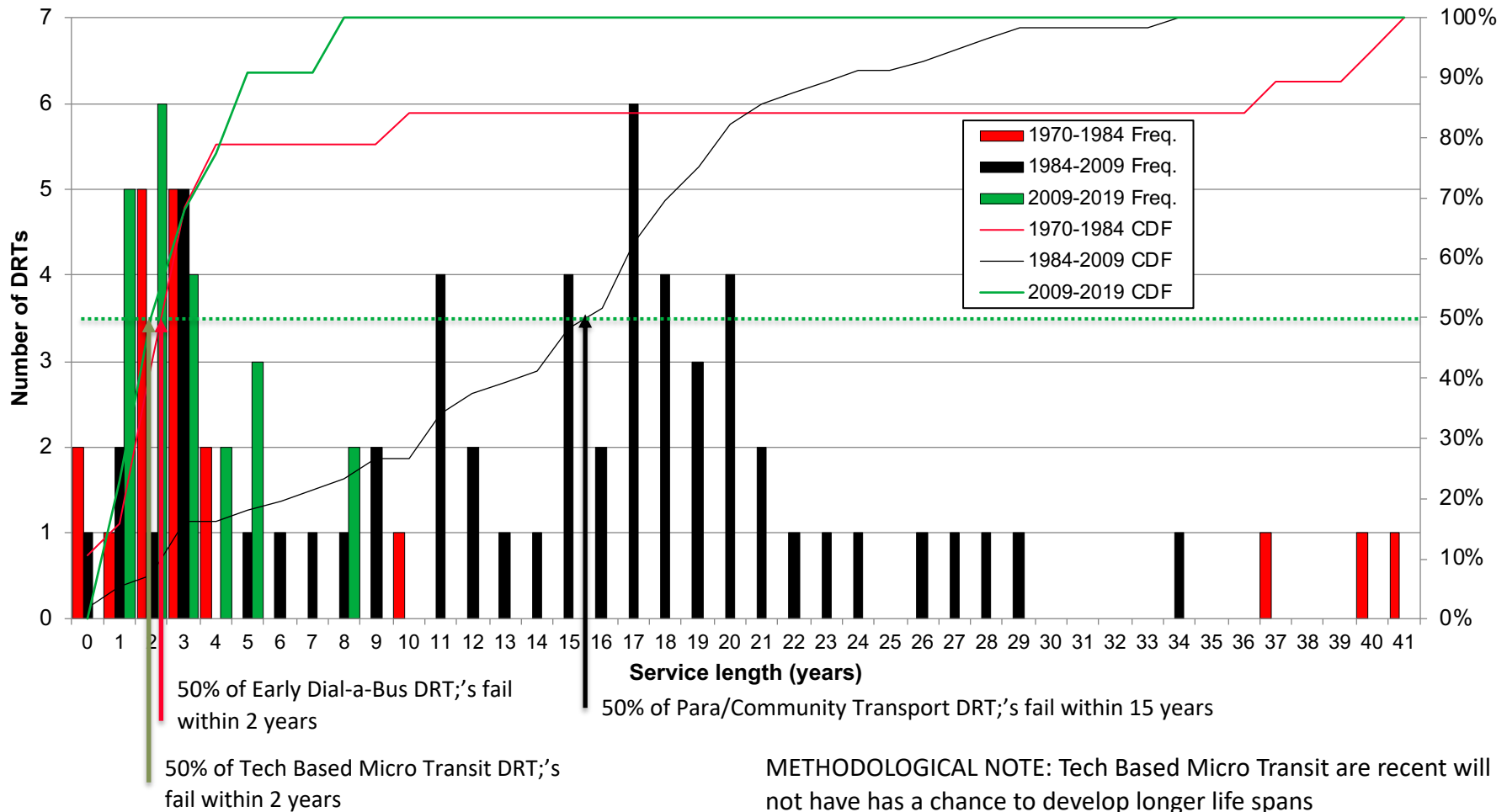
Tech-based Micro-Transit DRTs

New technologies are being deployed for modern 'micro-transit' based DRTs



The Para/Community Transport era DRT's considerably outlast other Eras; 50% of Early 'dial-a-bus' and Tech Based Micro-Transit DRTs fail within 2 years

Frequency Distribution of DRT Service Length by 'DRT era' (Cumulative & Histogram)



The Para/Community Transport era DRT's last on average 12.8 years; Tech Based Micro-Transit DRTs 4.13 years and Early 'dial-a-bus' 5.29 years

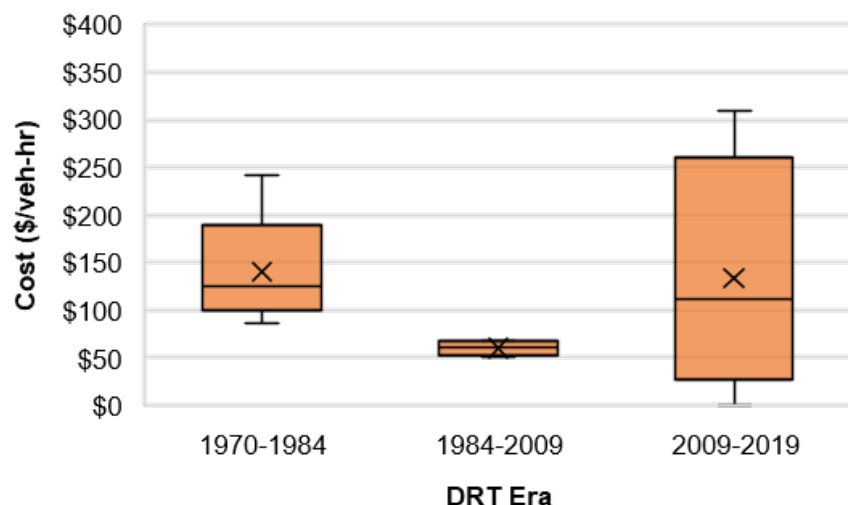
Average DRT Service Length by 'DRT era'

	Early 'dial-a-bus'	Para/Community Transport	Tech Based Micro-Transit
	1970-1984	1984-2009	2009-2019
Av. Service length (Years)	5.29	12.78	4.13

METHODOLOGICAL NOTE: Tech Based Micro Transit are recent will not have has a chance to develop longer life spans

Contrary to contemporary thought - cost analysis shows Tech Based Micro-Transit DRTs are most expensive and the Para/Community Transport era DRT's the cheapest

Average Cost (\$Aust) by 'DRT era'

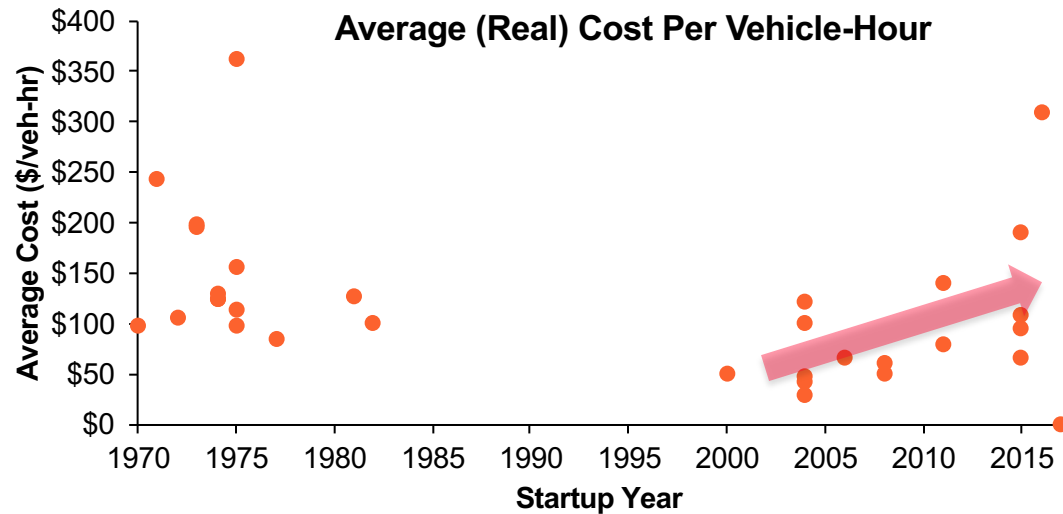


- The 2nd generation DRT systems are actually the cheapest and longest lasting
- This is interesting considering it is the paratransit/community transport era which are supposed to be “justifiably high cost” and Micro-Transit which new technology is said to make cheaper

	Early 'dial-a-bus'	Para/Community Transport	Tech Based Micro-Transit
	1970-1984	1984-2009	2009-2019
Av. Cost \$/veh-hr	150.37	63.07	123.18
Av. Cost \$/pax	21.26	13.8	42.72
n	15	9	8

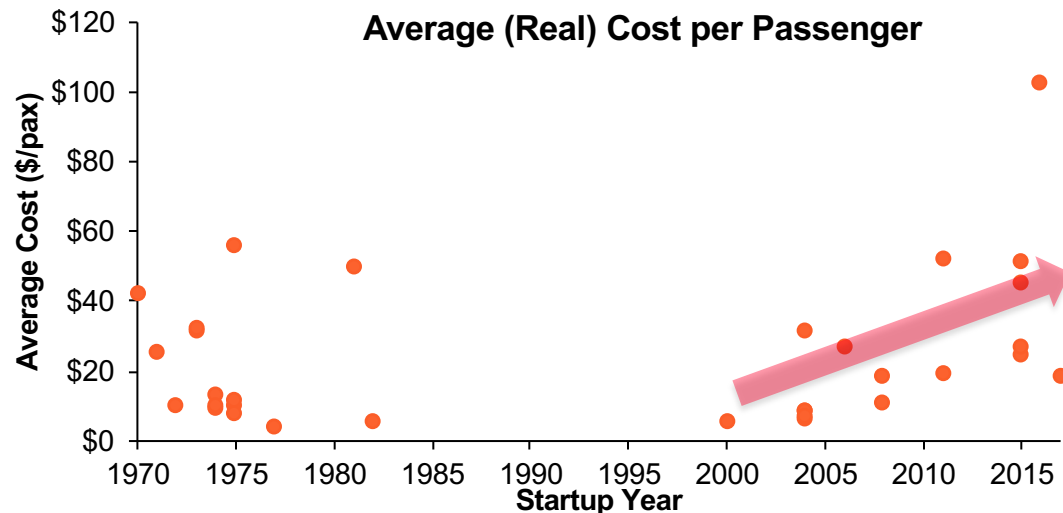
METHODOLOGICAL NOTE: sample is low - 33 DRT systems

Trends suggest new Tech Based Micro-Transit DRT service costs might be increasing

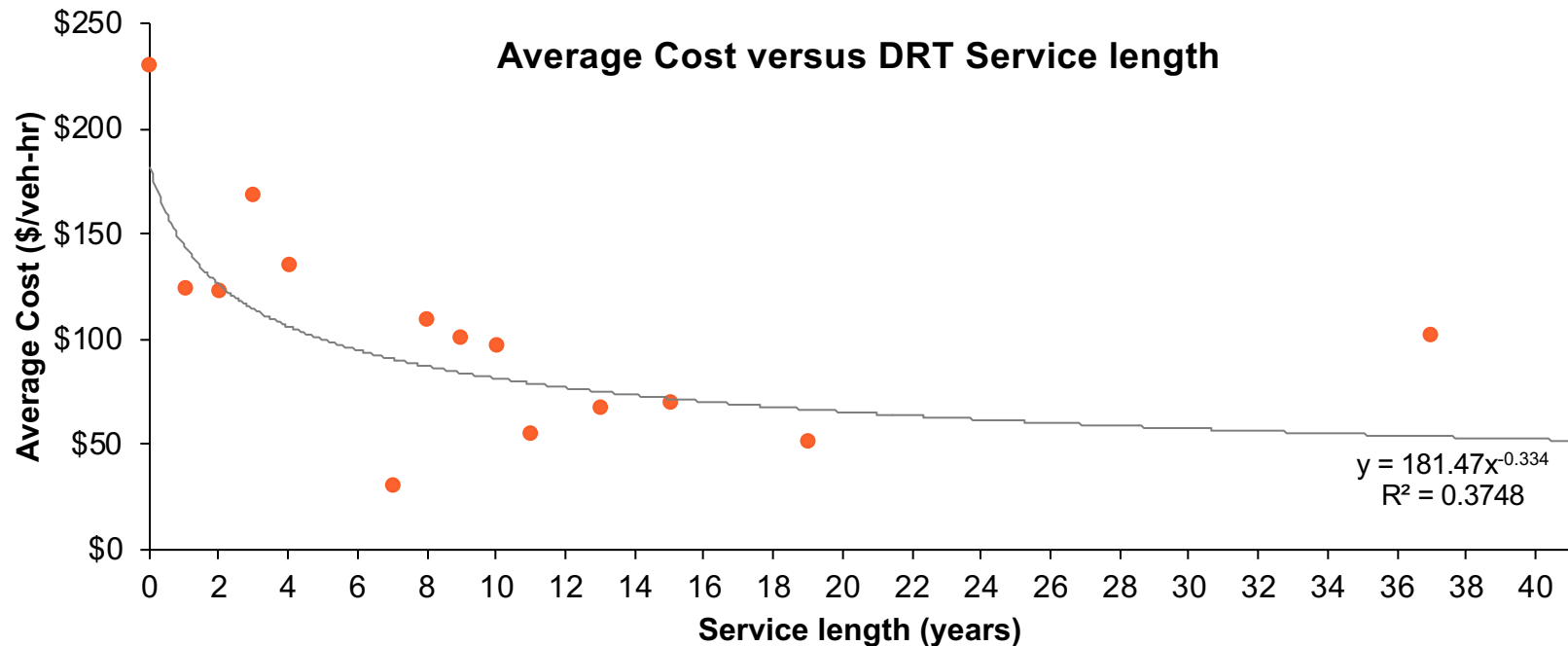


Cost appears to be **rising** in recent years, not falling!

- In both per vehicle-hour and per passenger;
- this shows that costs are high, regardless of ridership.



DRT service length increases with lower cost



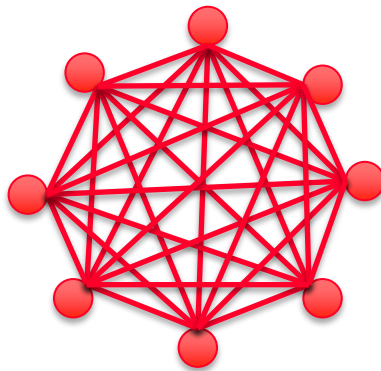
METHODOLOGICAL NOTE: sample is low

More complex DRT designs and route deviation DRT's have higher failure rates

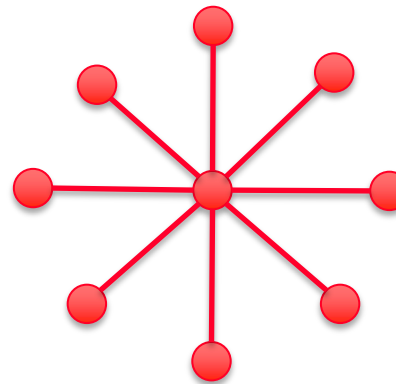
Failure rate of DRTs by Operating Design

Operating Types	Active	Inactive	Total	% Active	% Inactive
Route deviation	4	7	11	36%	64%
Many-to-One	0	0	0	-	-
Many-to-Few	5	4	9	56%	44%
Many-to-Many	5	13	18	28%	72%
Total	14	24	38	37%	63%

Many-to-many



Many-to-one



METHODOLOGICAL NOTE: sample is low

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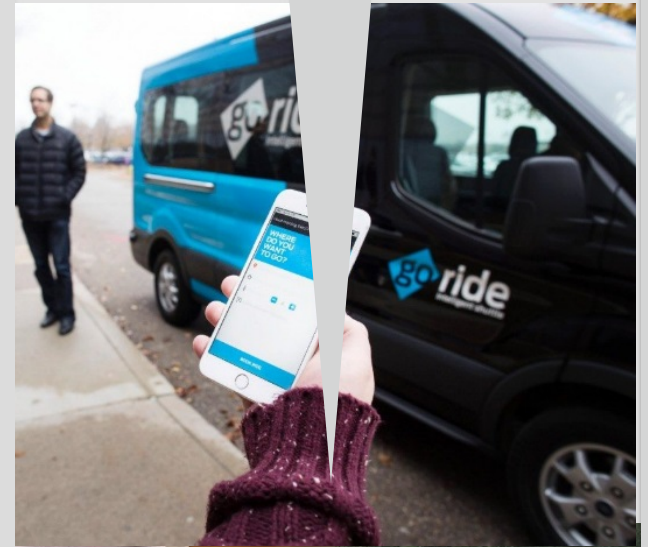
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Conclusions

Paper Findings:

- There are **three distinct phases** of DRT:
 - 1970s Dial-a-bus
 - Paratransit/Community transport era (1985-2009)
 - Technology driven micro-transit DRT (2009-present)
- Europe shows the highest rate of DRT survival, and UK the worst; Paratransit/community transport era has higher rate of survival
- Higher survival rates are associated with **low cost** and **simplified systems** (perhaps they are related)
- Advancing **technology is not reducing cost**, costs are increasing!
Reason is unclear, perhaps because new services tend spend a lot on up-front costs (e.g., marketing or new vehicles)

Considerations:

- Data is dependent on availability, and may not be a representative sample
- Cannot confirm all costs are allocated based values taken from published literature
- Currency inflation and exchange rates over 40 years can be prone to distortion

Findings match social media posts

The Story of “Micro Transit” Is Consistent, Dismal Failure

By Angie Schmitt | Jun 26, 2018 | 79



The Chariot vans running around Brooklyn streets are mostly empty. Photo: Ford



To hear the start-up world tell it, “micro transit” is the next big urban transportation breakthrough. But out in the real world, the results haven’t lived up to the hype.

“Micro transit” refers to services that function like UberPool or LyftLine but with large vans or minibuses instead of sedans and SUVs, using mobile apps and algorithms to match passengers making similar trips in a single vehicle. The pitch to public agencies is that micro transit can be a more cost-effective way to provide service in some travel markets than fixed-route buses.

Microtransit Costs too Much Per Passenger

By Shelia Dunn , NMA Communications Director • July 1, 2018 • 0 Comments • [Mass Transit](#), [Microtransit](#), [PPP](#), [Public Private Partnership](#), [Ridesharing](#), [Technology](#)

So much hype over transportation disruption right now that sometimes it is hard to see the road with all the [bikes](#) and [scooters](#) laying around or even to understand if a disruption is viable and efficient. Microtransit, similar to ridesharing but supposedly cheaper, is one such disruption that use to be known as Dial-a-Ride. In its disrupted form, microtransit is a way to catch a shared ride in a van or a minibus via phone app and algorithm in your location and not at a regular stop such as how you would catch a city bus. Cities like it because it seemingly could be a more cost-effective way to provide service instead of rigid transit routes.

Experts and the media everywhere have [proclaimed microtransit as the answer for cities losing transit riders](#). In theory that all sounds great but in reality, microtransit does not really work without subsidies and it appears even then to be quite expensive per passenger ride.

[For example, an early experiment in Kansas City was a complete flop](#) and even though the local transit agency spent \$1.5 million to administer the service, drivers only made 1,480 trips with a subsidy of \$1,000 per ride. The service was only offered as a one-way commuter-based service... only available during rush hour and generally in one direction. A core group used it but since the service offered no flexibility, it turned off potential users.

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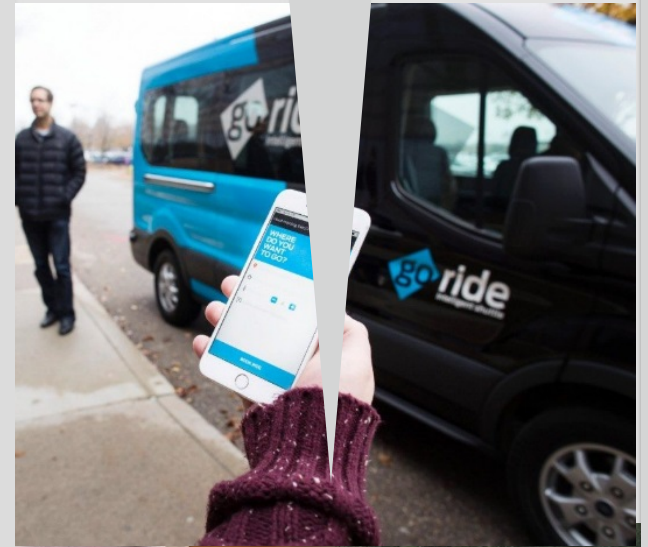
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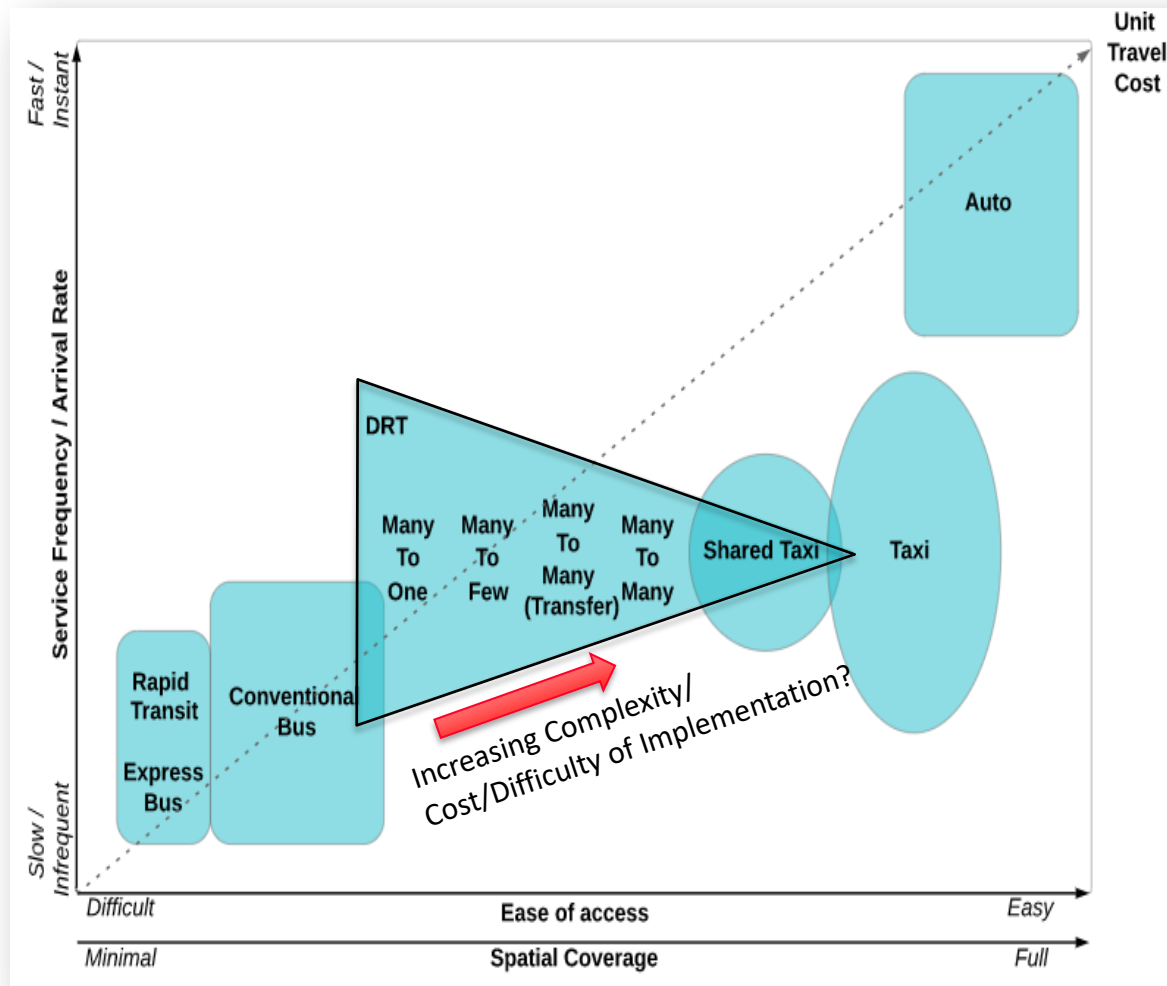


The workshop explored **opportunities and challenges of ‘mainstreaming’ DRT into existing public transport systems**

Key Workshop Questions

- i. How do we **DEFINE DRT** services? What are the major DRT **SERVICE TYPES/FORMS**?
- ii. What are the major **CHALLENGES and BARRIERS** to the successful adoption and development of DRT?
- iii. What **RATIONALE/OBJECTIVES** do DRT service seek to address? What is the **ROLE of DRT** in the transport ecosystem?
- iv. What are the major **DRT BENEFITS** of services
- v. What **SERVICE DESIGN FACTORS/APPROACHES** act to impact the success and failure of DRT services
- vi. What **REGULATORY/ORGANISATIONAL FACTORS** impact DRT provision and how can they best be structured to achieve successful DRT development.
- vii. What are the important **DRT USER PERSPECTIVES** affecting usability and the quality of the passenger experience
- viii. What are the major **SUCCESS/FAILURE FACTORS** affecting DRT performance?
- ix. What are the **FUTURE OPPORTUNITIES/CHALLENGES** to ongoing DRT service development.

DRT is flexible on demand (shared) transit – it lies between conventional PT and taxi



Contemporary Issues – microtransit – is it the new revolution for urban mobility?

How the Microtransit Movement Is Changing Urban Mobility

ERIC JAFFE APR 27, 2015

The good and the bad of all these new flexible ride services.

SHARE TWEET ...

Much like the U.S. political system, American urban mobility has traditionally been dominated by two parties: private cars (or cabs), and public transportation. But lately residents of America's largest cities have no doubt noticed lots of new options that seem to fall somewhere in between. A recent *Strong Towns* post fittingly labeled this middle-tier movement "microtransit"—more micro than a fixed-route 40-foot bus or a metro rail system; more transit than, well, non-transit; here's Lisa Nisenson:

We are on the cusp of widespread microtransit.



We are on the cusp of widespread microtransit

“...the reduction of technologies’ costs, have made the provision of flexible and more customer-centric public transportation more feasible.”

– (Volinski, 2019)

Contemporary Issues – what about paratransit and community transport DRT's?



DRT Outcomes Review

- **Commercially viable**
 - Very few
- **Acceptable subsidy**
 - Also very few – DRT has same or less subsidy than alternative services
- **Justifiably high subsidy**
 - Specialist niche DRT markets
 - The most common type of surviving service
- **Financially unsustainable**
 - Many in this category

Enoch et al. (2004)

“Most of the services that have stopped have done so because of the high costs in relation to their patronage” Oxley (1979)

Contemporary Issues – commercial DRT's operate in less regulated developing countries – chaotic but fill an important gap in conventional transit



Matatu



Jeepney



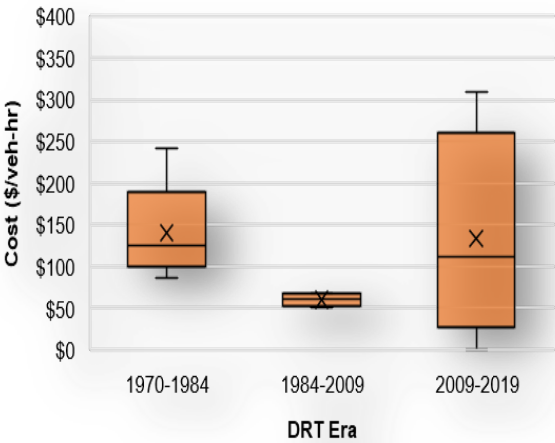
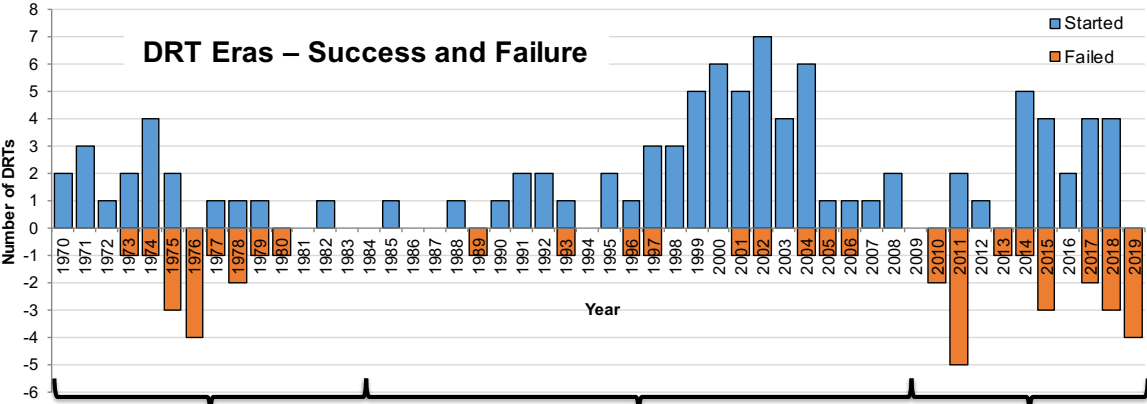
Tro-tro

DRT Review results ; 3 Eras – Microtransit biggest failure rate – high cost the key driver

30% of all DRT's withdrawn in 2 years

50% of microtransit DRT withdrawn in 2 years

Para/Community Transit highest retention rate



	Early 'dial-a-bus'	Para/Community Transport	Tech Based Micro-Transit
Av. Cost \$/veh-hr	150.37	63.07	123.18
Av. Cost \$/pax	21.26	13.8	42.72

1970 – 1984 Early Dial-a-Bus services

First attempts to run demand responsive services



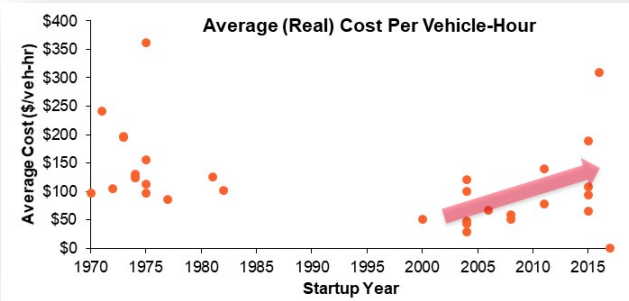
1985 – 2009 Paratransit/Community Transport era

US paratransit services developed in response to Americans with Disability Act (ADA)

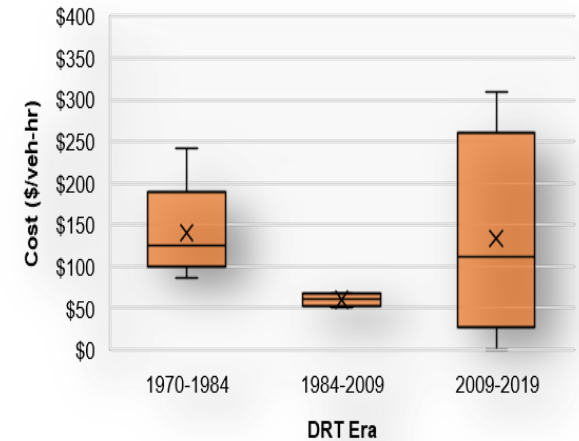
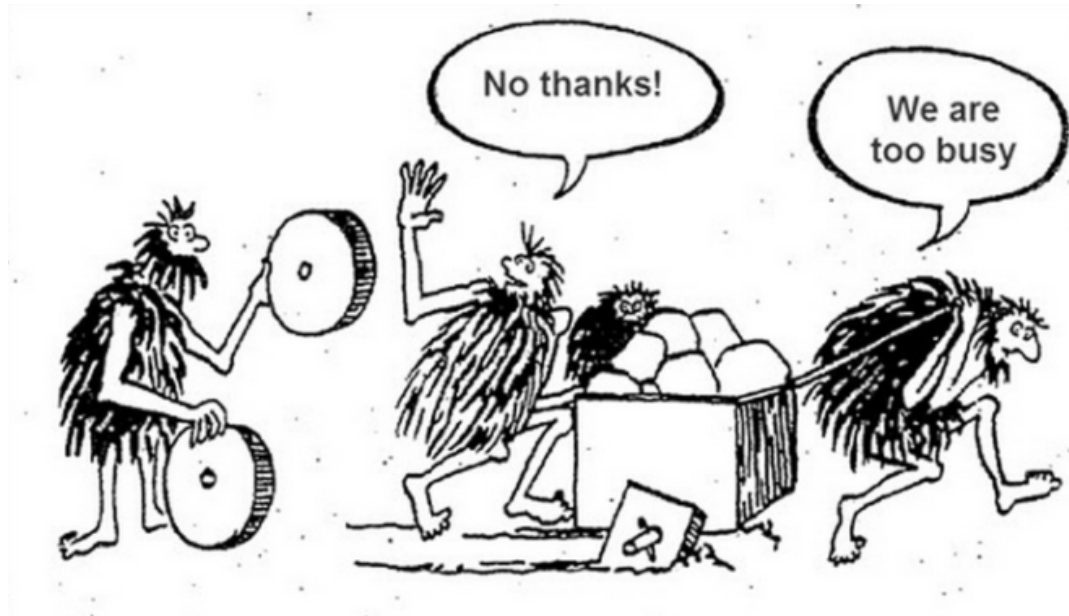
UK bus deregulation outside London resulted in investment in special need style services to fill gaps in withdrawn social bus services

2010 – 2019 Tech-based Micro-Transit DRTs

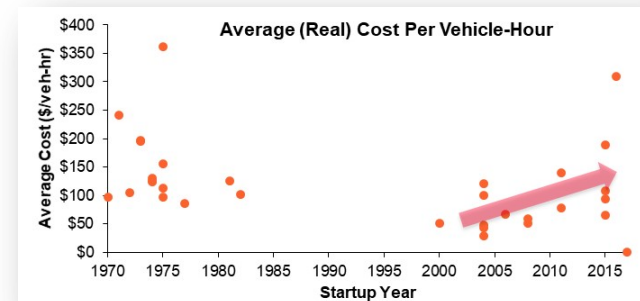
New technologies are being deployed for modern 'micro-transit' based DRTs



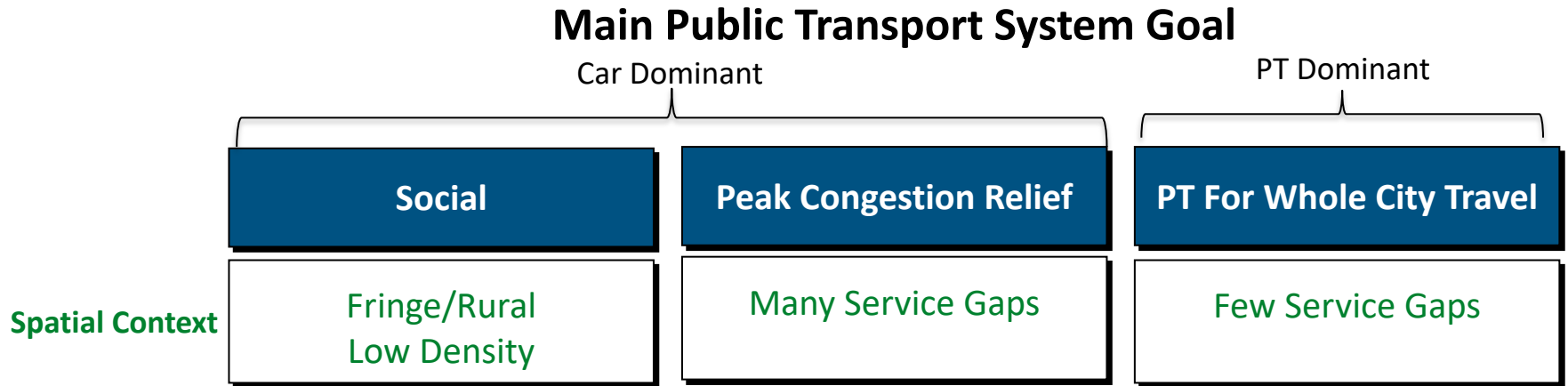
Is microtransit trying to reinvent the wheel...and getting it wrong?



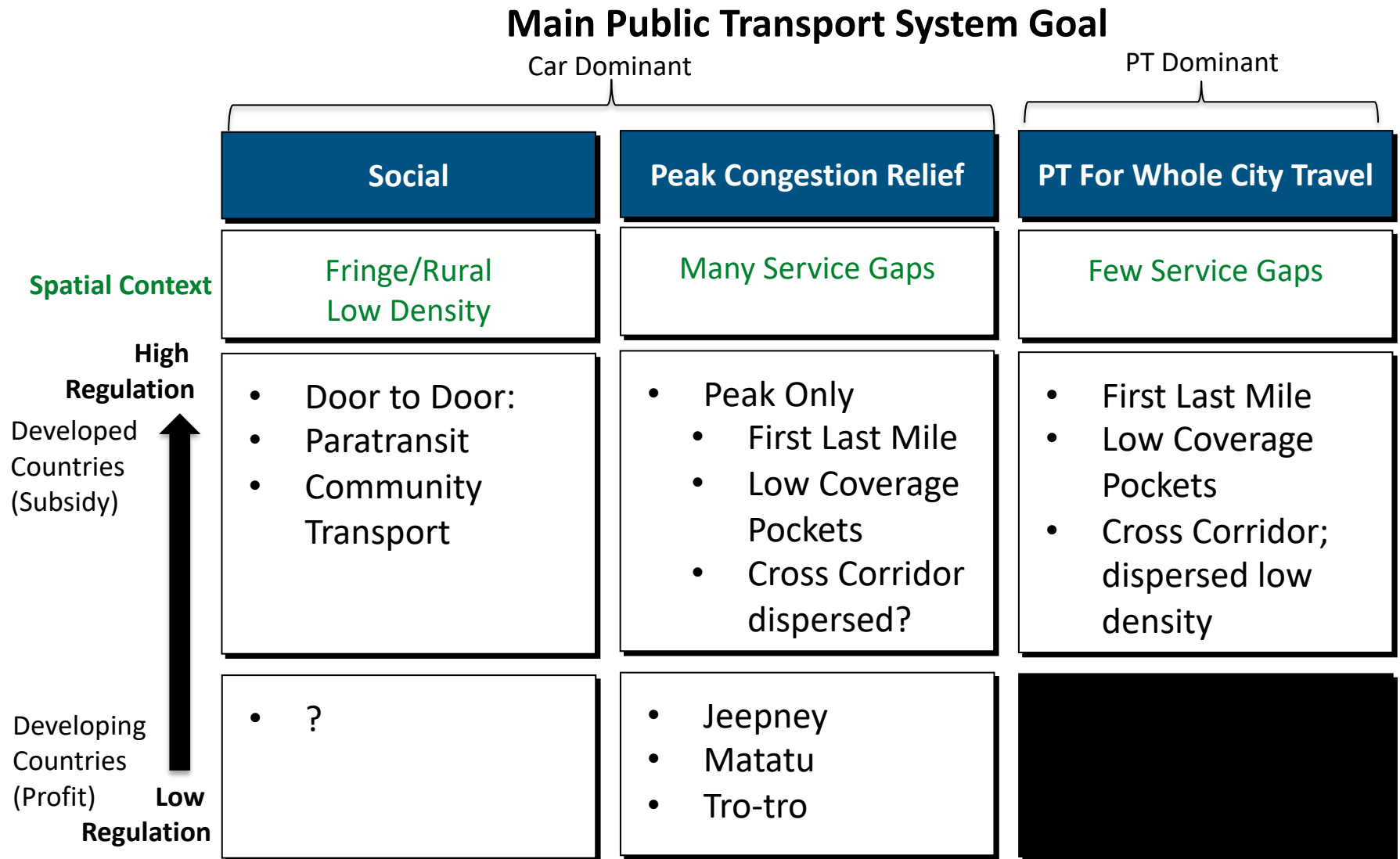
	Early 'dial-a-bus'	Para/Community Transport	Tech Based Micro-Transit
Av. Cost \$/veh-hr	150.37	63.07	123.18
Av. Cost \$/pax	21.26	13.8	42.72



We Synthesised the Current DRT Situation – Starting with Transit System Goals



High/Low Regulation DRT's fit into this framework explaining objectives, types within their context



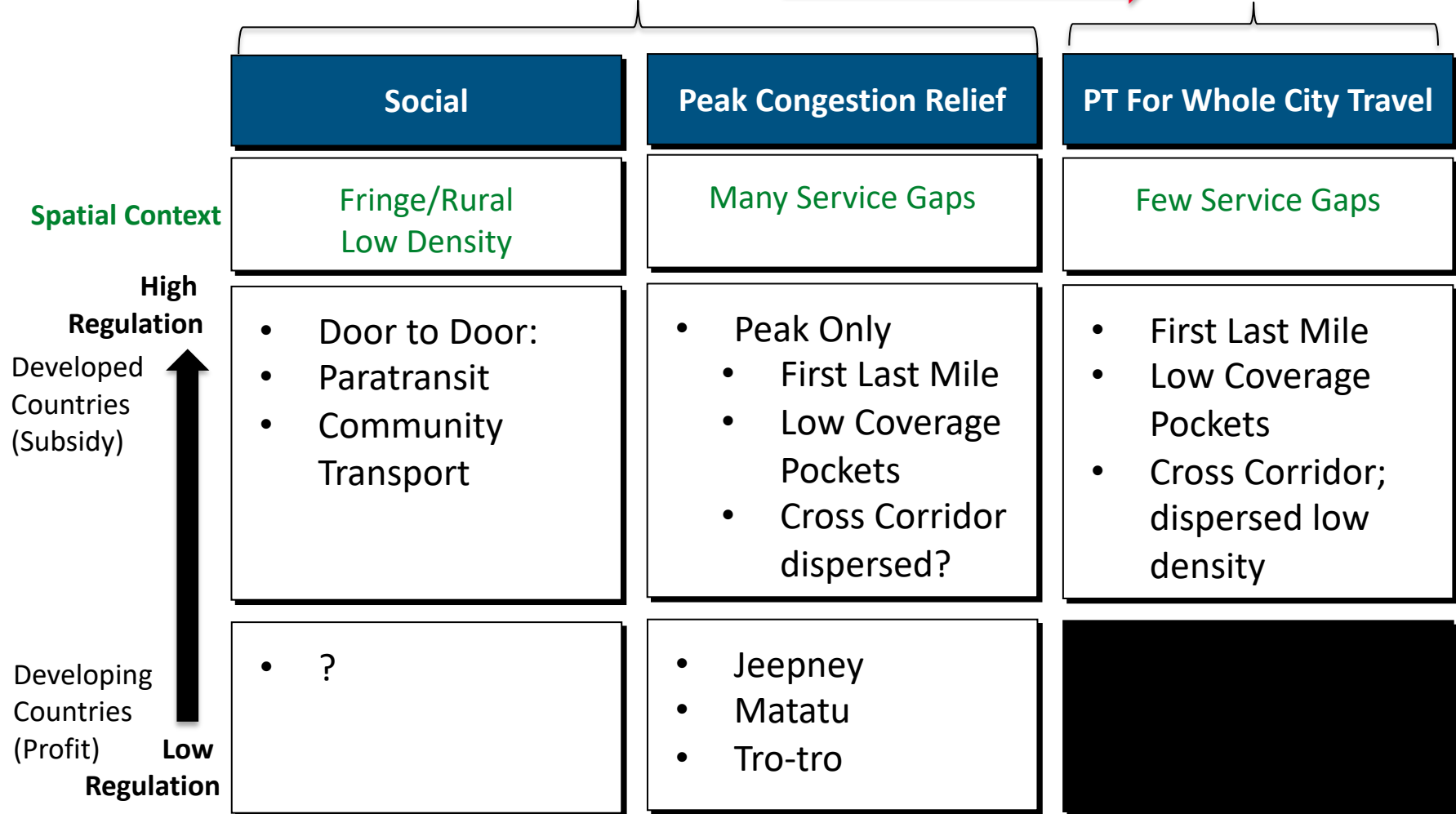
This framework also speaks to a policy imperative to move away from single occupancy vehicle travel to high occupancy shared travel solutions

Main Public Transport System FUTURE Goal

Car Dominant



PT Dominant



We recommend a clear objectives framework – and a focus on three DRT target marketfor DRT service development

Objectives Framework



DRT Development Target Markets

Objectives	A. Social Objectives	B. Efficiency/ Environmental – Congestion Relief Objectives	C. ALL Objectives
Target Market	<ul style="list-style-type: none">Poor/No PT serviceDisadvantaged, low incomeImpaired/ Isolated	<ul style="list-style-type: none">Car users who might be encouraged onto PT using DRT (Mode Shift)<ul style="list-style-type: none">Low density high income areas	<ul style="list-style-type: none">Public Transport Users which might be lost in future (Retention)
Locations Times Where Public Transport service is BELOW User Requirements			

Implementation Pathways can follow well established principles...

DRT Development Implementation Pathways

DRT Implementation - Steps

1. Market Definition
2. Understand User Needs
3. Product Definition
4. Business Model (funding)
5. Delivery Strategy
6. Customer Facing

DRT Implementation – Key Considerations

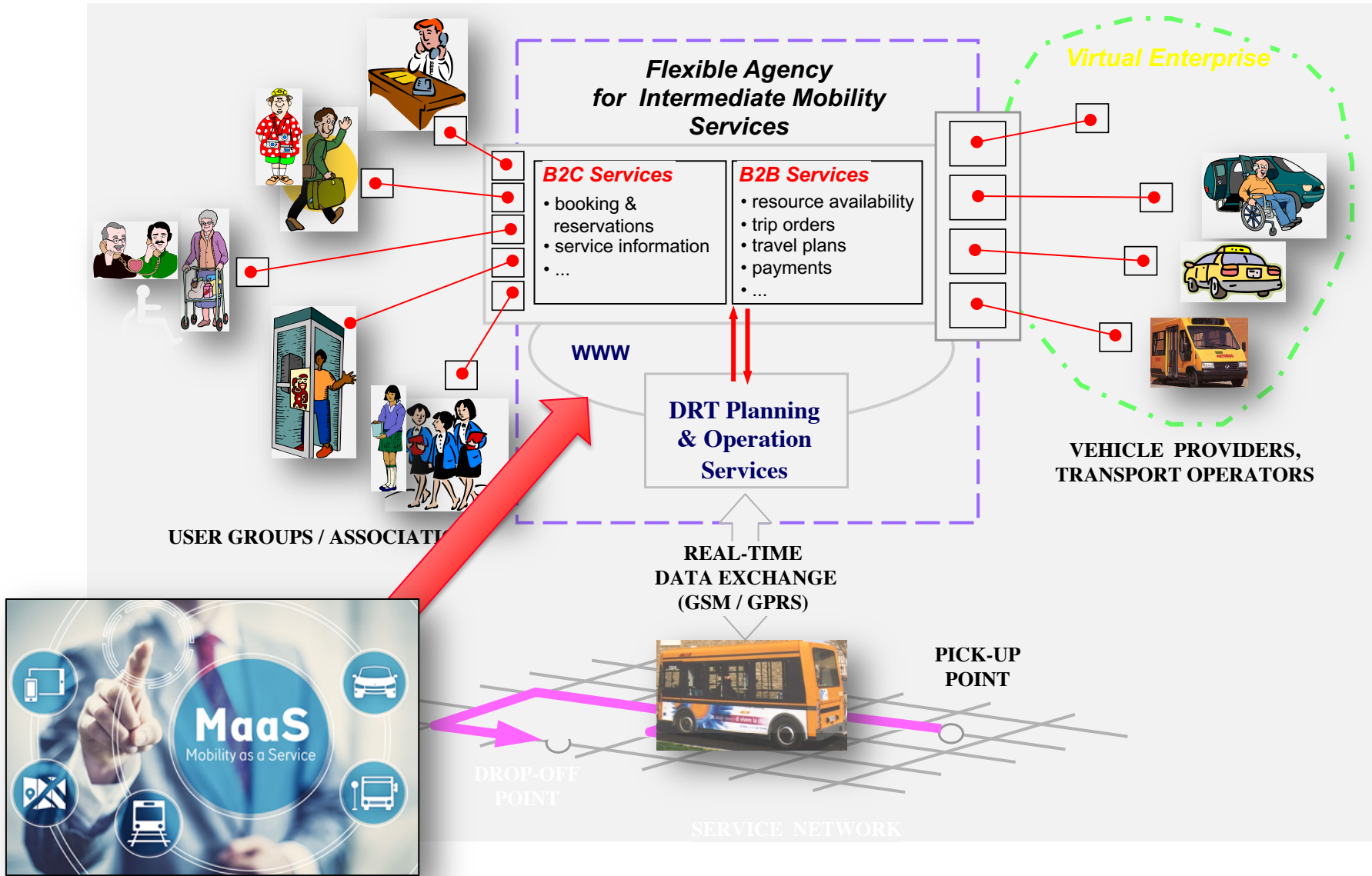
Scale

Pricing

Public Support

Deployment Strategy

...but will benefit from a Flexible Agency Mobility Service (FAMS) – MaaS is an obvious framework



Key Workshop Question - 9

ix. What are the **FUTURE OPPORTUNITIES/CHALLENGES** to ongoing DRT service development.

- Opportunities
 - MaaS
 - ScAV's yeah!!!!!!!!!!
 - [Scalable cost effective focussed] tech
 - Learning from the lessons and history
 - Shift away from the private single occupancy vehicle
 - More and growing attention to objectives behind DRT
 - Moving RIGHT (on our graphic)
- Challenges
 - Protectionist attitudes from many
 - Telecommuting
 - Mindless HYPE promotions of useless technology for the sake it which doesn't work and which doesn't achieve our aims; anything to do with single occupancy vehicles is BAD BAD BAD BAD BAD!!!!
 - Competition from new tech modes
 - Aligning DRT and Transit policy

RECOMMENDATIONS – for RESEARCH

- Need to better understand and quantify benefits
- Better understand user needs
- Demand forecasting models
- Post implementation evaluation
- Better understand costs and revenue (modelling)
- Ways to share and retain existing knowledge and use it in future practice.
- Understand sharing and user experience barriers
- Develop KPI where DRT may be attractive but we don't realise
- Develop DRT business models for car use mode shift

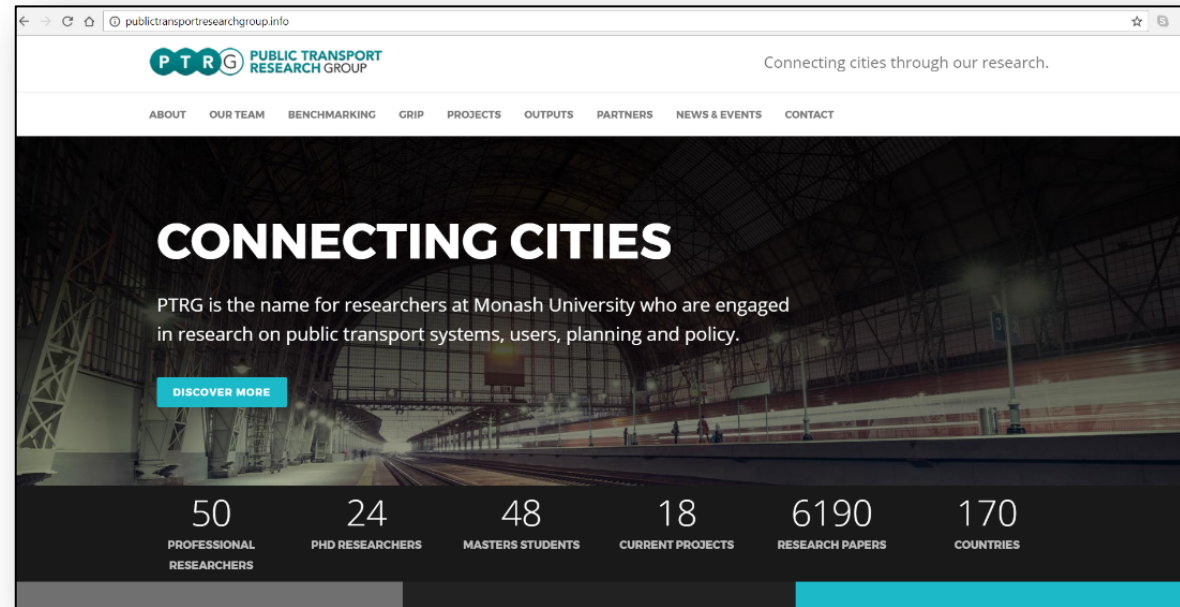
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