



AITPM Webinar

Life Cycles: New (and old) bicycle technologies as part of our human transport system

Wednesday, 14th February, 2024

User acceptance of smart e-bikes: evidence from five European countries

Dr Rumana Sarker

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



MONASH
INSTITUTE OF
TRANSPORT
STUDIES



Global e-bike purchase is on the fast track post-pandemic. However, there is also a surge in e-bike injuries.



@cyclingnews

- Increasing number of e-bikes
- People ride more (including elderly)

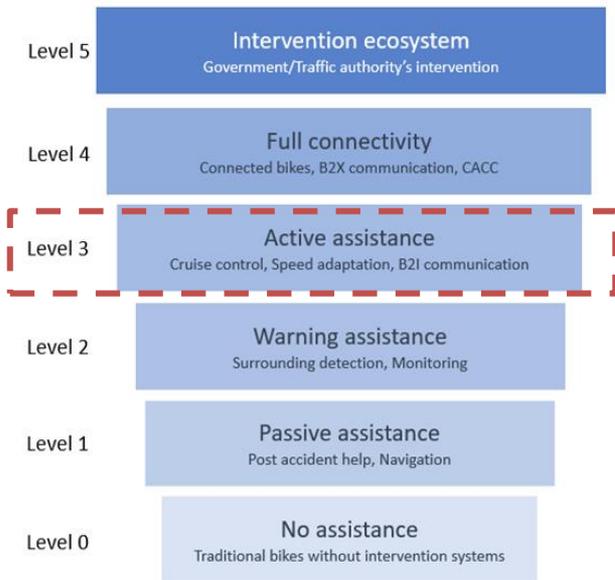


@Henry Carus

- Increasing number of e-bike injuries; both collision and single crash
- Lack of infrastructure for high speed bikes

There is an increased emphasis on preventing e-bike crashes by leveraging advanced and new bike technologies.

Technology-readiness level of the e-bike



Georgios Kapousizis, Baran Ulak, Prof. Karst Geurs

UNIVERSITY OF TWENTE.



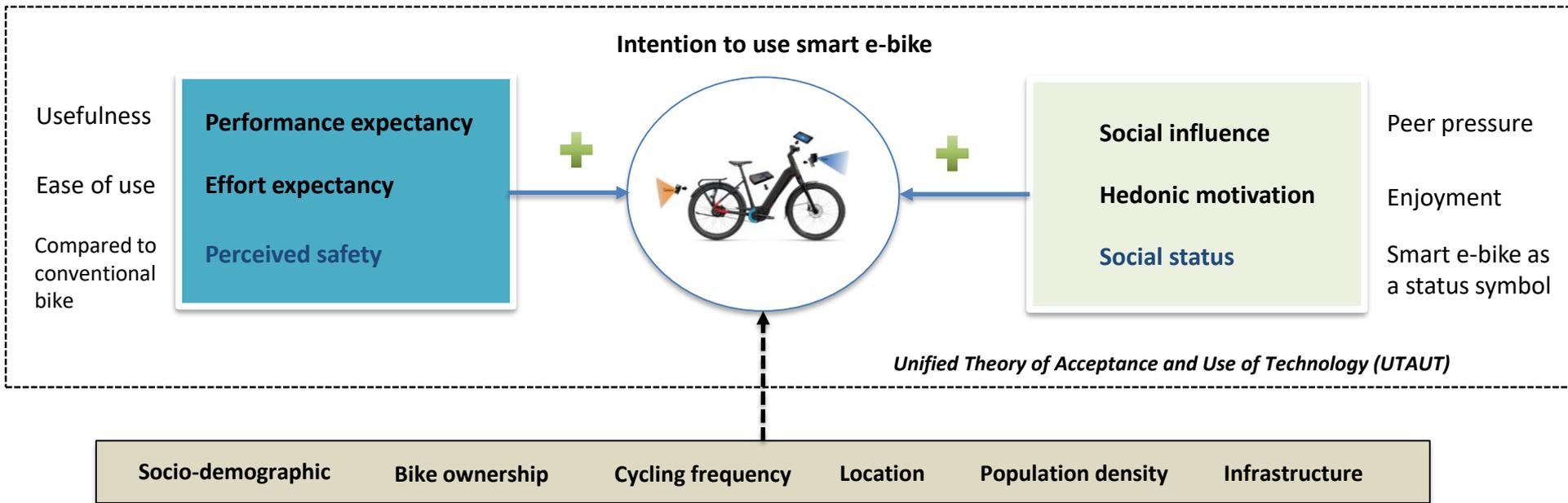
Conceptual bike prototype in the study

- Warnings/Automatic speed adjustments
- B2I communication (green wave)
- Emergency call
- Safe route recommendation

- 💡 What are the influential factors to purchase?
- 💡 How can we promote the smart e-bike?

G. Kapousizis, B. Ulak, K. Geurs & P. Havinga (2023) A review of state-of-the-art bicycle technologies affecting cycling safety: level of smartness and technology readiness, Transport Reviews, 43:3, 430-452, DOI: [10.1080/01441647.2022.2122625](https://doi.org/10.1080/01441647.2022.2122625)

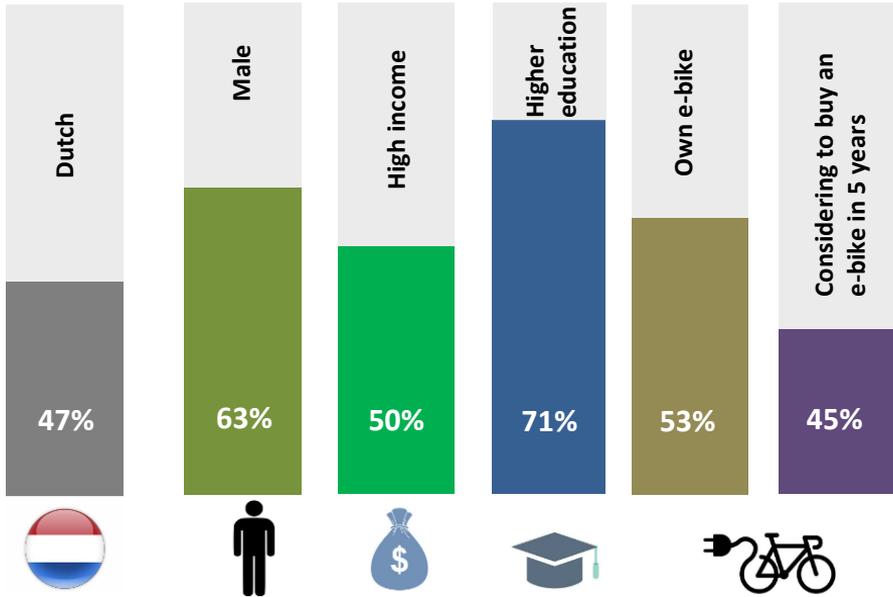
Unified Theory of Acceptance and Use of Technology (UTAUT) from the organizational research is used to explore the willingness to buy a smart e-bike.



1,116 responses were collected with an online survey in Austria, Belgium, Germany, Greece, and Netherlands; countries that are varying in sizes and cycling culture.

- **Countries:** AT, BE, DE, GR, NL
- **Target population:** interested in buying an e-bike or own one, (18+)
- **Channels:** European Cycling Federation's local unions, other cycling unions
- **Timeframe:** November 2022 – January 2023
- **Sample:** 1116 adults (1100 Postcodes)
- **Additional data:** Population density (NUTS3), cycling infrastructure (OSM), city size.

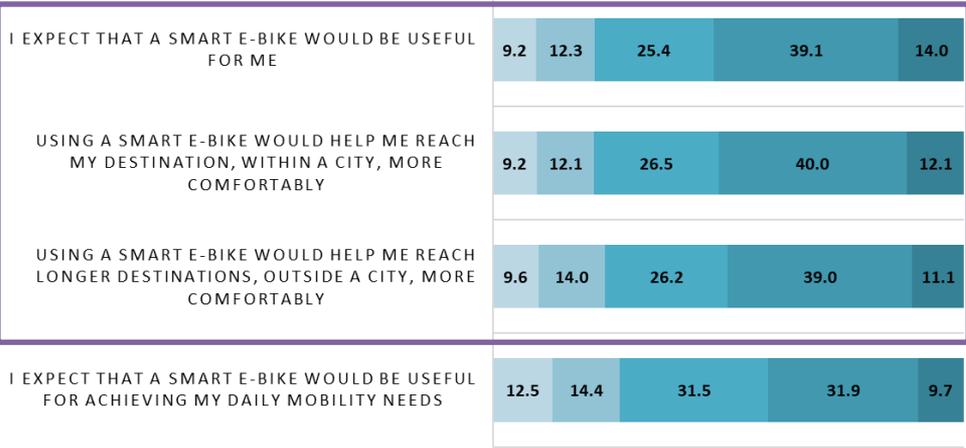
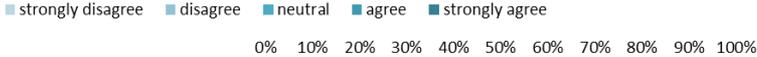
Sample characteristics



Over 30% of the sample is at their 30s and another 30% at their 60s

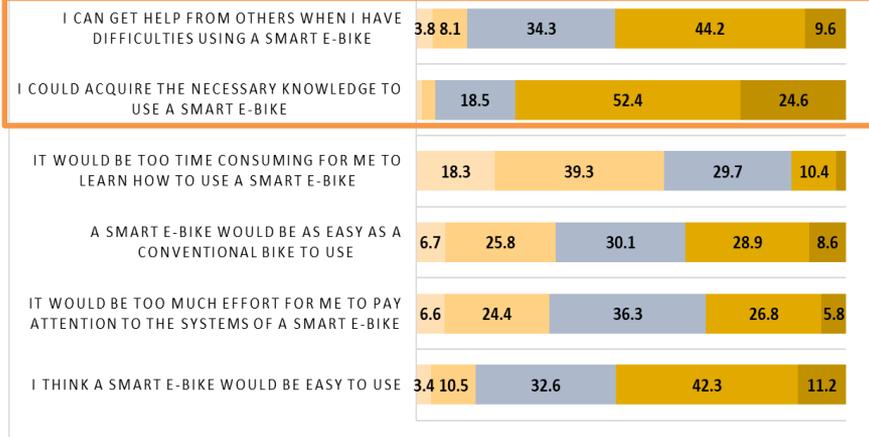
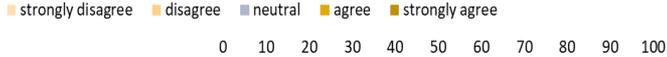
Participants perceive smart e-bike useful and comfortable for both short & long-distance travel. They perceive that smart e-bike will be easy to use.

PERFORMANCE EXPECTANCY



Over 50% sample perceives that smart e-bike is **useful** and **comfortable**.

EFFORT EXPECTANCY



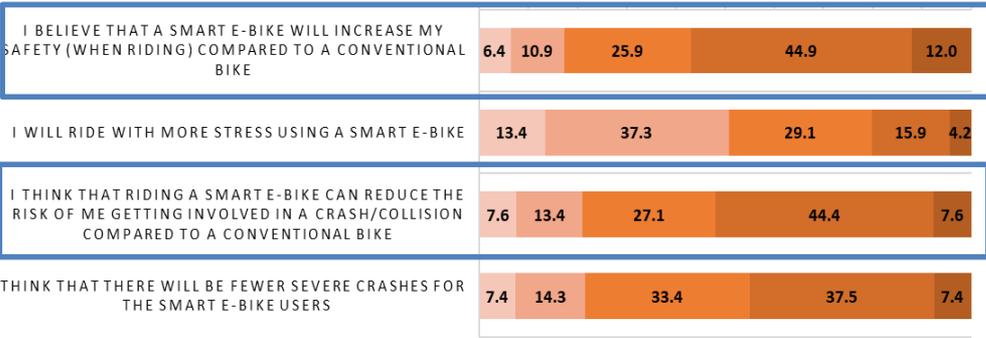
Majority of the sample (77%) perceives that they have **adequate knowledge** to ride a smart e-bike.

Smart e-bike is perceived to improve safety and reduce collision compared to the conventional bike, and people are willing to buy given that it is cost-effective.

PERCEIVED SAFETY

strongly disagree disagree neutral agree strongly agree

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

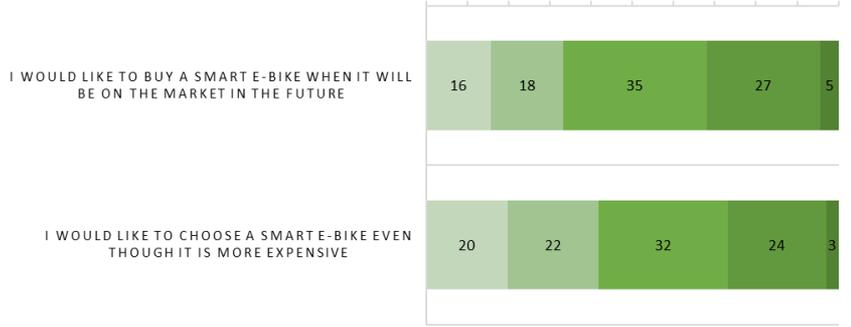


+ Over 50% of the sample perceive that smart e-bike will increase safety and **reduce collision** compared to conventional bike.

PRICE VALUE

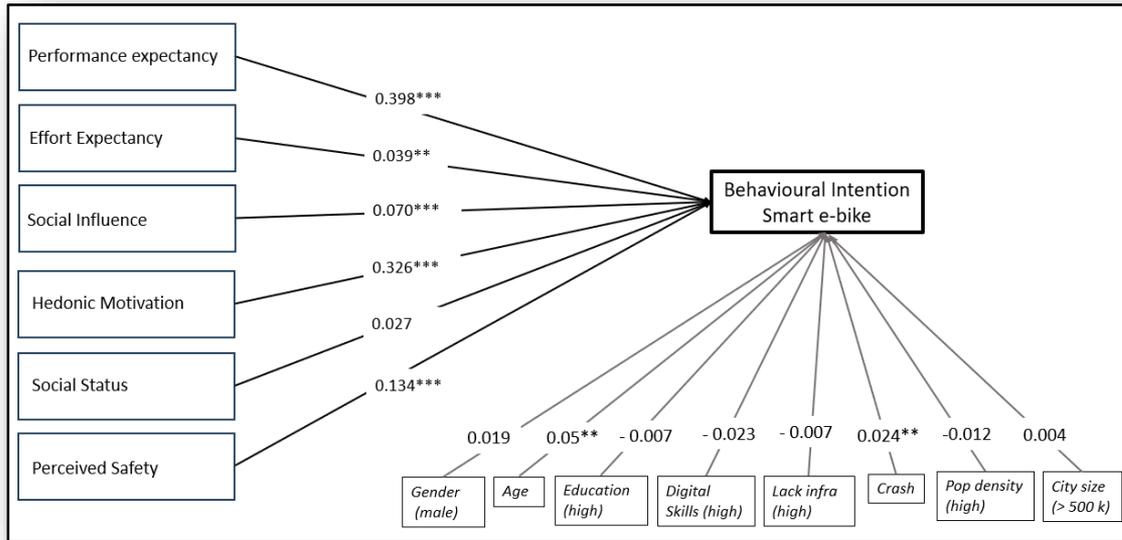
strongly disagree disagree neutral agree strongly agree

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%



+ 34% of the sample are willing to buy smart e-bike in future. However, over 40% are cost-sensitive.

UTAUT model confirm the hypotheses. People are more likely to buy a smart e-bike in future if they perceive it useful, find it “cool” and much safer than conventional bikes.



Statistical Significance: ***: p-value < 0.001, **: p-value < 0.05, *: p-value < 0.1

Model fit: CFI=0.981, TLI=0.976, RMSEA=0.043, SRMR=0.026

People are more likely to buy a smart e-bike, if:

- ✓ It is perceived useful & comfortable
- ✓ Easy to use
- ✓ Encouraged by the peers
- ✓ Branded as “Cool” & “Trendy”
- ✓ Perceived safer than existing bikes in the market
- ✓ They were involved in accidents previously

Measurement invariance test shows no difference between respondents from different countries. Hence, we performed a multi-group analysis.

Do you think that a Smart Bike would be useful to you?

	strongly disagree	disagree	neutral	agree	strongly agree
	-	-	.	+	++
I expect that a Smart Bike would be useful for me	<input type="radio"/>				
Using a Smart Bike would help me reach my destination, within a city, more comfortably	<input type="radio"/>				
Using a Smart Bike would help me reach longer destinations, outside a city, more comfortably	<input type="radio"/>				
I expect that a Smart Bike would be useful for achieving my daily mobility needs	<input type="radio"/>				

Model	RMSEA [90% CI]	Δ RMSEA (<0.015)	CFI	Δ CFI (<0.02)
MI-Country				
M1	0.021 [0.019-0.023]	-	0.977	-
M2	0.021 [0.019-0.023]	0.000	0.976	0.001
M3	0.026 [0.024-0.027]	0.005	0.963	0.013

MI: Measurement invariance, MI-Country: Measurement invariance for the countries, M1: configural invariance, M2: metric invariance, M3: scalar invariance.

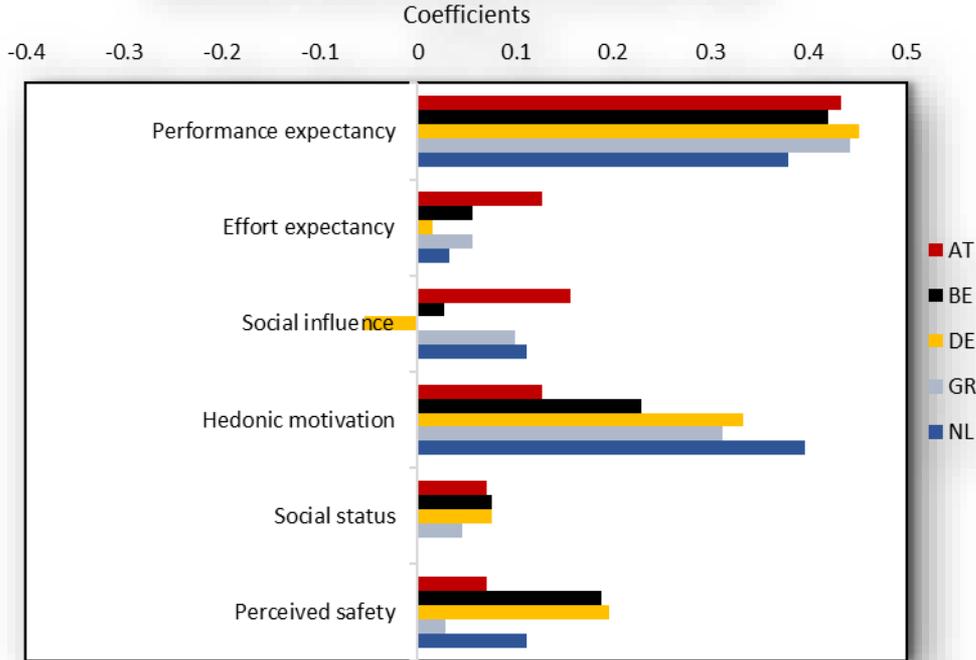


No difference among groups



Results show heterogeneity among the cyclist from different countries.

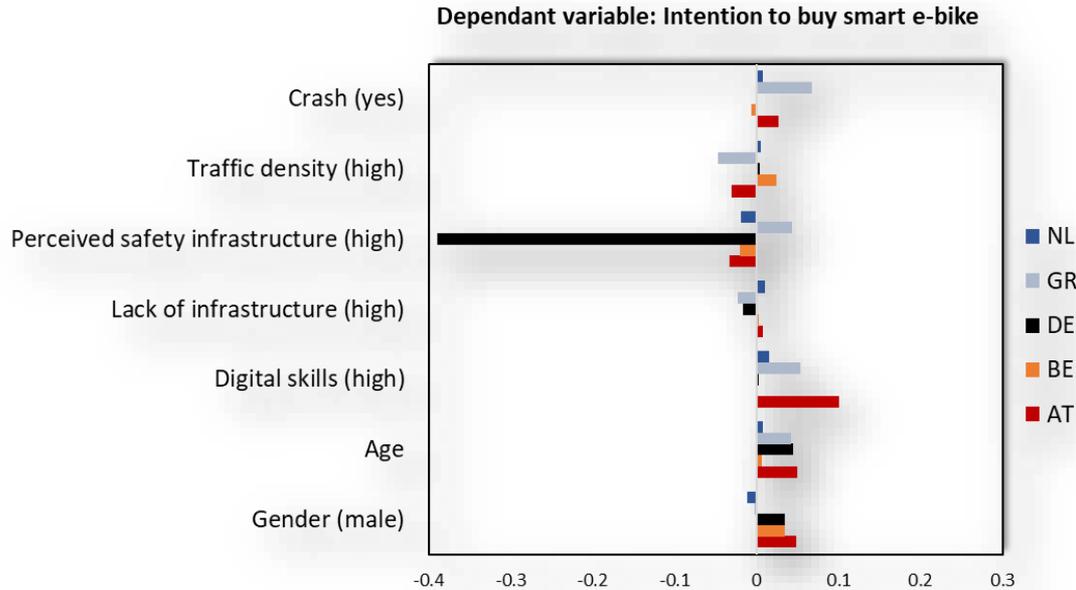
Dependant variable: Intention to buy smart e-bike



Country-specific factors:

- **Social influence** is more likely to motivate purchase intention in **Austria (AT)**, on the other hand it is less likely to influence purchase decision in Germany.
- Compared to other countries, **hedonic motivation or enjoyment** related with cycling will highly influence purchase intention in the **Netherlands (NL)**.
- **Higher perceived safety** with the smart e-bike will influence purchase intention in **Belgium (BE) & Germany (DE)**.

Lack of infrastructure is a key barrier to the adoption of smart e-bike (Greece). Interestingly, if existing cycling infrastructure is perceived highly safe, it also alleviates the purchase intention (Germany, Netherlands).



Country-specific factors:

- **Prior crash involvement** is more likely to influence purchase decision in **Greece (GR)**. However, **lack of infrastructure and heavy traffic alleviates** the purchase intention.
- **Higher confidence in safety aspects of the infrastructure** negatively influences purchase intention of smart e-bike in **Germany (DE)**.
- Intention to purchase smart e-bike **increases with age**.
- Geographical factors (e.g., city size, low availability of cycle paths and population density) were not significant.

Key takeaways.....



- Six psychological factors were tested, five were supported and have significant influence.
- Performance expectancy or usefulness of smart e-bike has the higher impact across all countries.
- There is heterogeneity across countries.
- Purchase intention increases with increasing age.
- Lack of infrastructure impacts purchase intention.
- Customised actions per country are needed when promoting smart e-bikes.

Please reach out for more information



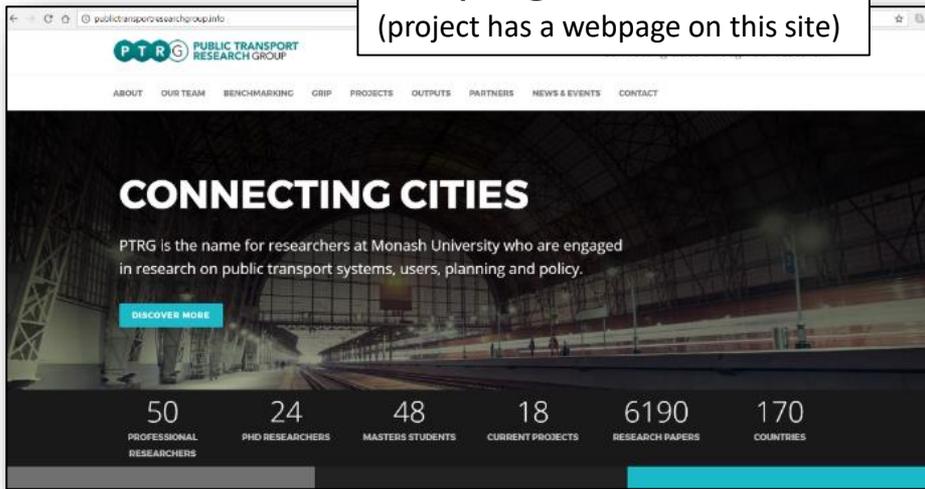
rumana.sarker@monash.edu

Connect with us on
LinkedIn

X (Former Twitter)



W: ptrg.info
(project has a webpage on this site)



Researching Transit



RT5 – Long term impact of COVID-19 on Travel Behaviour

