

Public perceptions of the FEVER concept: a case study of Marwell Zoo visitors

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Abstract

Public perceptions of science and technological innovation can shape their likelihood of real-world success. This questionnaire-based survey (QBS) explored public perceptions of the FEVER charging concept. The QBS was distributed to a convenience sample of visitors to Marwell Zoo. The QBS was designed around the Technology Acceptance Model (TAM), which is a psychological model used extensively to understand technology use intentions. Participants (N=221) were positive about the FEVER concept, indicating agreement that they would intend to use it, that it would be useful and easy to use. There were concerns about the availability and need to book the chargers, and mild concerns about the cost of charging and the potential that the chargers would be faulty. The vast majority of participants were willing to pay the 'going rate' for using a public charger, particularly if the zoo were to benefit from the revenue.

Introduction

- Electric vehicle (EV) ownership and use in the United Kingdom (UK) is increasing rapidly. This is raising questions about the expectations of end-users regarding the availability, accessibility and affordability of charging infrastructure.
- The importance of considering the 'public face' (Apt & Fischhoff, 2006) of technological research and innovation is well-established (Wüstenhagen et al., 2007). This is particularly the case in Westernised democracies like the UK where publics are empowered to affect decision making about innovation at different scales (e.g. at the socio-political level as voting citizens and at more local levels as users of technology) (Upham et al., 2015).
- While outstanding questions remain (Wicki et al., 2023), the social scientific literature on public acceptance of electric vehicles (EVs) is maturing (Corradi et al., 2023). For example, studies have identified issues such as the perceived affordability of EVs and range anxiety as key *barriers* to their uptake, with common *facilitators* including the anticipated environmental benefits of EVs and the image/status benefits that come from driving an EV.
- While less developed, there is also a growing literature pertaining to the nature and determinants of public attitudes and intentions towards the use of EV chargers and/or charging initiatives (e.g. smart charging) (Baumgartner et al., 2023). The provision (or lack thereof) of public charging infrastructure, alongside the anticipated speed and cost of charging, are commonly cited concerns among prospective end-users (Potoglou et al., 2023).
- The **current study** was conducted in collaboration with Marwell Zoo, a 140-acre zoo that is situated near to Winchester in Hampshire. It welcomes over 500,000 visitors each year. There are currently no EV charge points available for use by visitors to the zoo and so the operators of the zoo are investigating the prospect of introducing some. This might include the demonstration of the FEVER charging concept and so the opportunity was taken to engage visitors to the zoo to assess their intentions to use the FEVER chargers, if they were to be installed at Marwell Zoo.
- A questionnaire-based survey (QBS) structured around the Technology Acceptance Model (TAM, Davis, 1989, see **Figure 1**) was delivered face-to-face to a convenience sample of people visiting the zoo across a 3-day period in April 2023 and to a sample who completed an online version of the same QBS after responding to an invitation received via an online mailing list curated by Marwell Zoo.
- The study was designed to explore the nature of public opinion towards the FEVER charging concept.

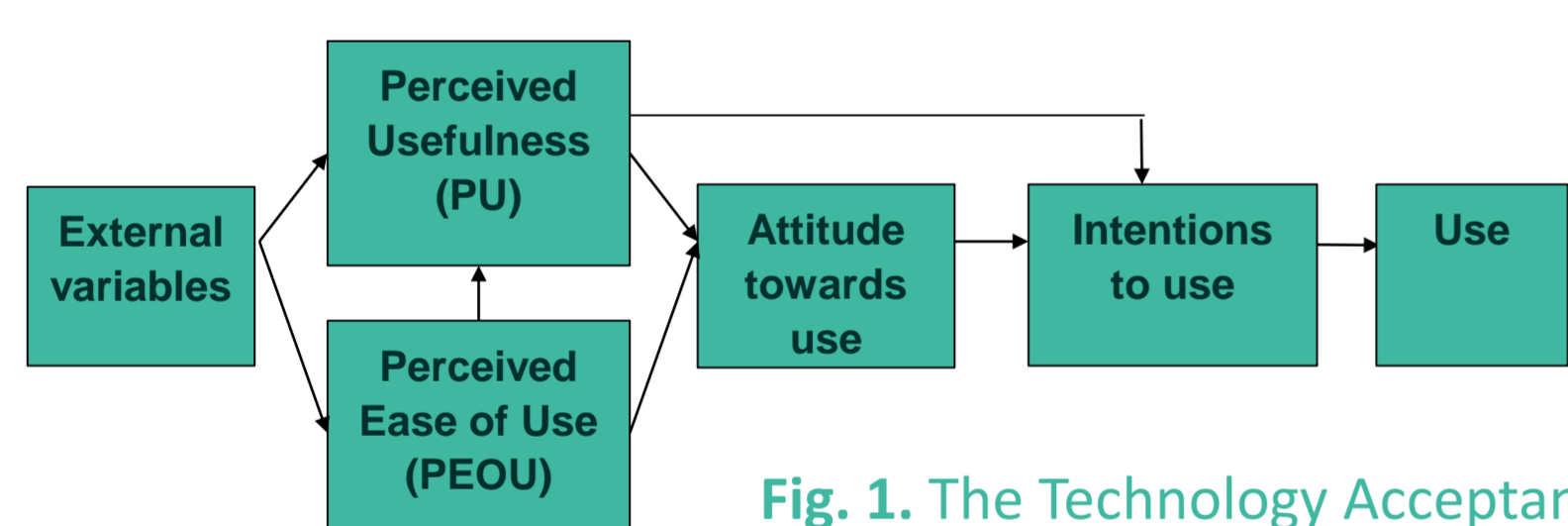
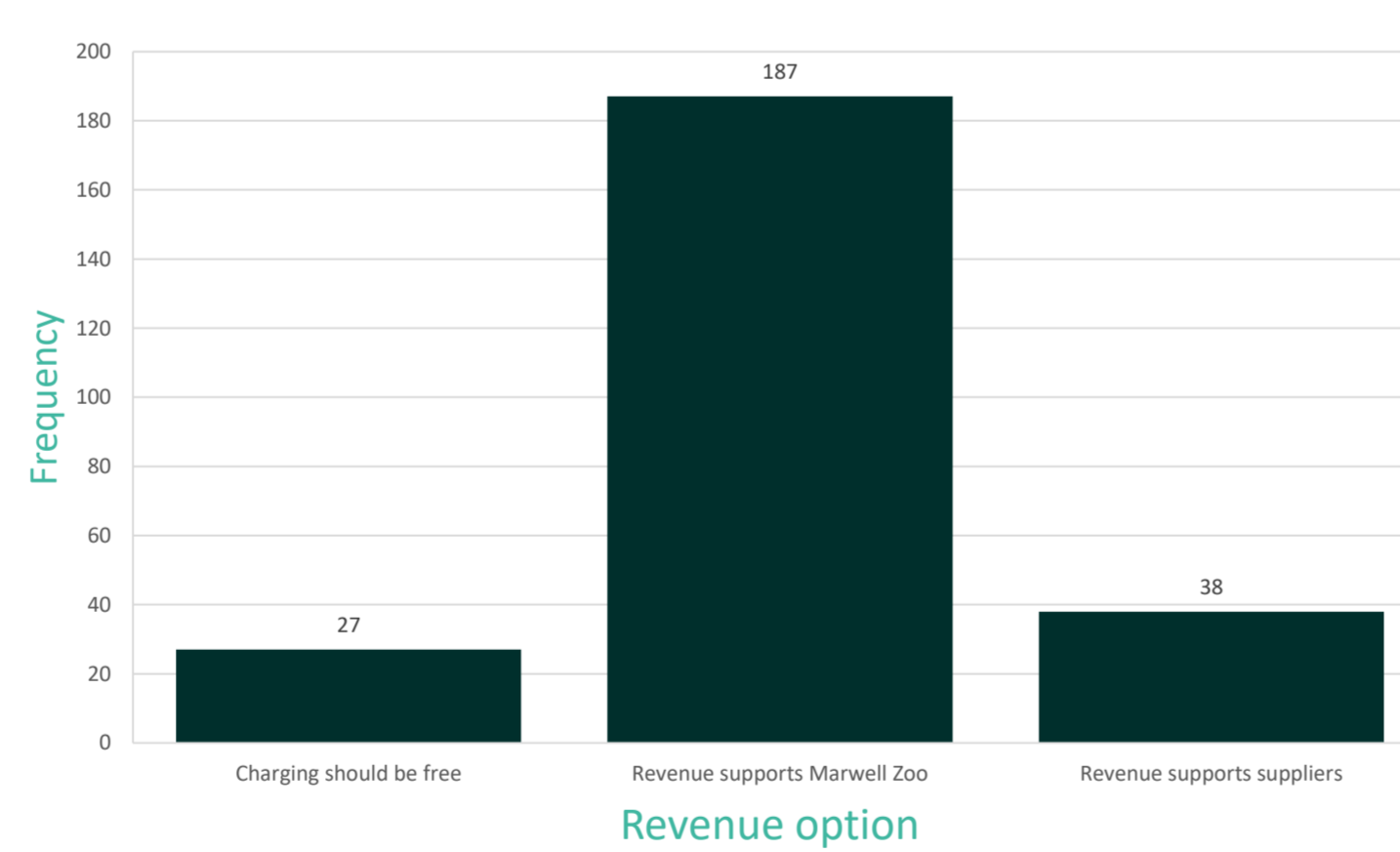
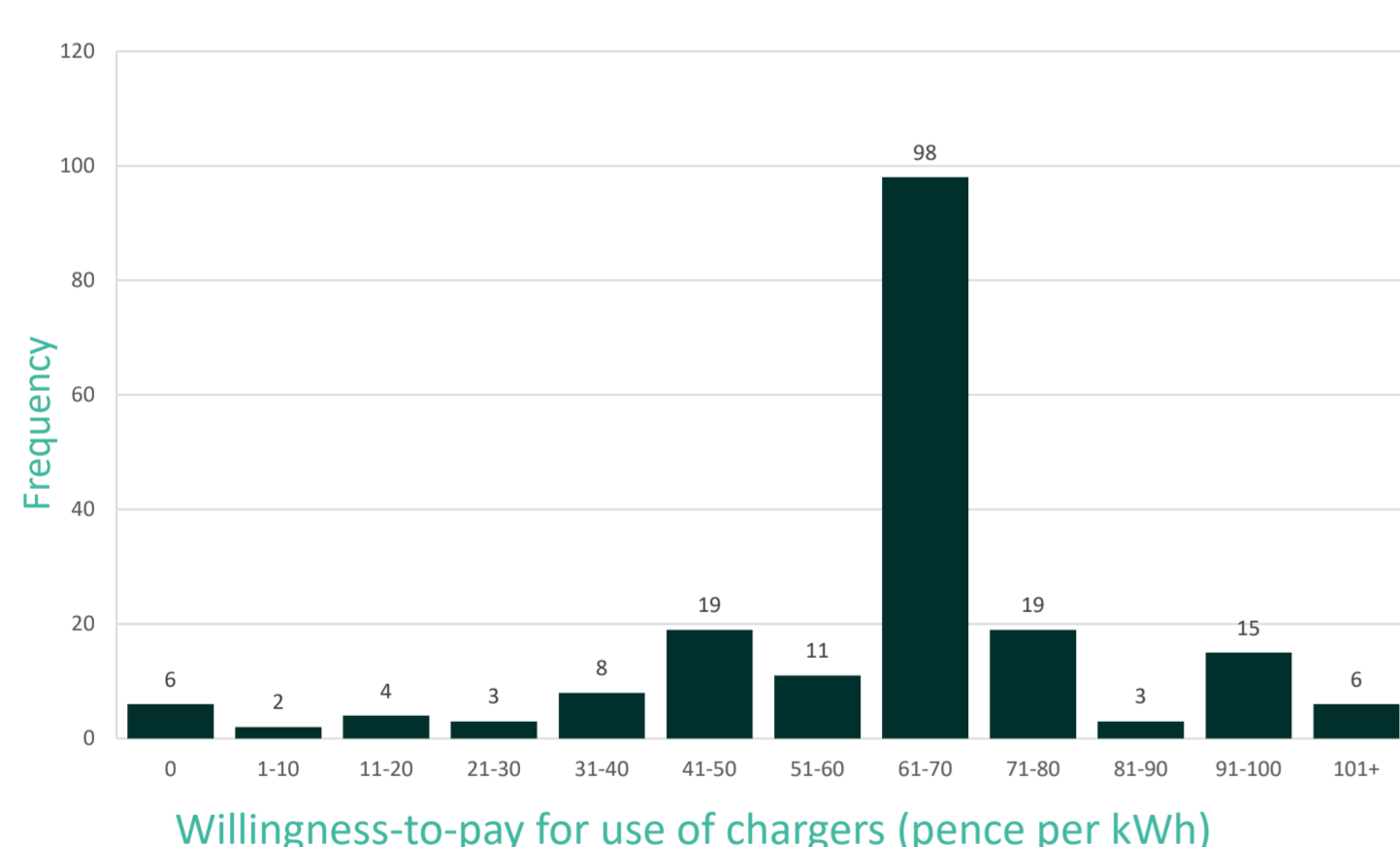


Fig. 1. The Technology Acceptance Model (TAM)

- The TAM is often expanded to explore the specific 'external variables' of relevance.
- The 'attitude' construct is often omitted from the model.



Conclusions

- Diverse sample recruited, higher proportion of EV owners (21%) than national mean (~7%).
- Participants were generally positive about the FEVER charging concept, showing an intention to use it, and believing it to be useful and easy to use. Use intention and PEOU were statistically higher among the non-EV owners.
- Some agreement that there would be social pressure to use the chargers and that use of the chargers would be fun. The non-EV owners held more positive feelings about charger use.
- Concern about the availability and need to book the chargers. Cost and lack of technical support were secondary concerns. Charge duration was a tertiary concern. Participants were ambivalent about the 'FEVER specific' concerns (charge sufficiency and limitation).
- Participants were generally technophilic and biophilic. The non-EV owners were significantly more technophilic.
- Participants were generally happy to pay for the chargers, particularly if revenue would help the zoo. The modal preferred charge was 65p per kWh [note: anchor point].

Questionnaire-based Survey (QBS)

- 2-5 minutes to complete, Face-to-Face (n=63) and Online (n=158) versions [Total N=221]
- Demographics (Age; Gender) [Participants had to be 18 years+]
- EV Ownership and Use (first part of postcode; EV ownership/lease; how travelled to zoo)
- Context-specific TAM Questions (1 = Strongly disagree; 5 = Strongly agree)
 - Core:** Use Intention; Perceived usefulness; Perceived ease of use
 - Extended:** Subjective norms; Hedonic associations
 - Charging Concerns:** Financial cost, charger availability; charger operation; lack of technical support; charge time; charge sufficiency; charge limitation; need to book
- Identity: Technophilic; Biophilic (1 = very dissociated; 7 = very integrated)
- Willingness to Pay (who should benefit; how much per kWh)
- Willingness to Vacate (1 = very unwilling; 5 = very willing)
- Participants were **not** required to own an EV. When completing the QBS, participants were given a brief description of the FEVER concept and invited to imagine what it would be like to use the FEVER chargers.

Results

Roundtrip distance to site	
Marwell Zoo	
1-50 miles	122 (55.2%)
51-100 miles	59 (26.7%)
101-150 miles	20 (9.1%)
151-200 miles	3 (1.3%)
201-250 miles	7 (3.2%)
251+ miles (6, 2.7%); Unspecified (4, 1.8%)	

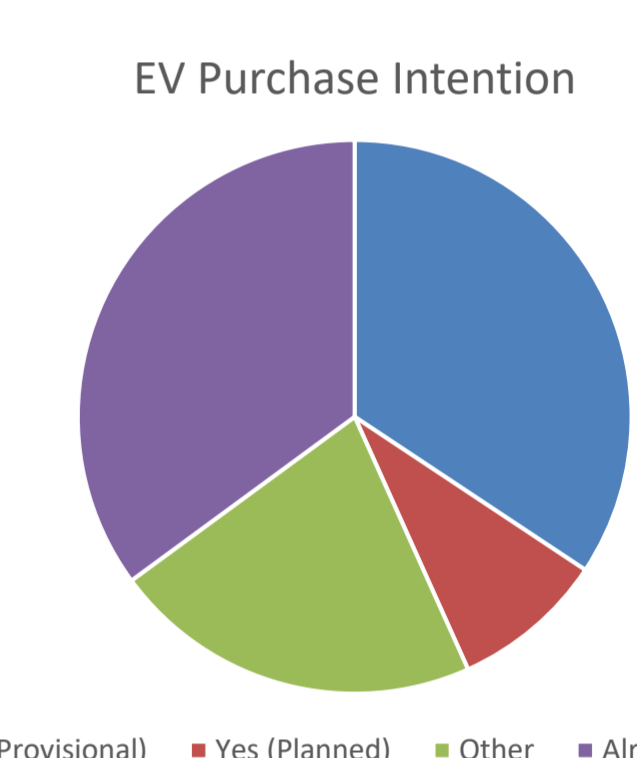
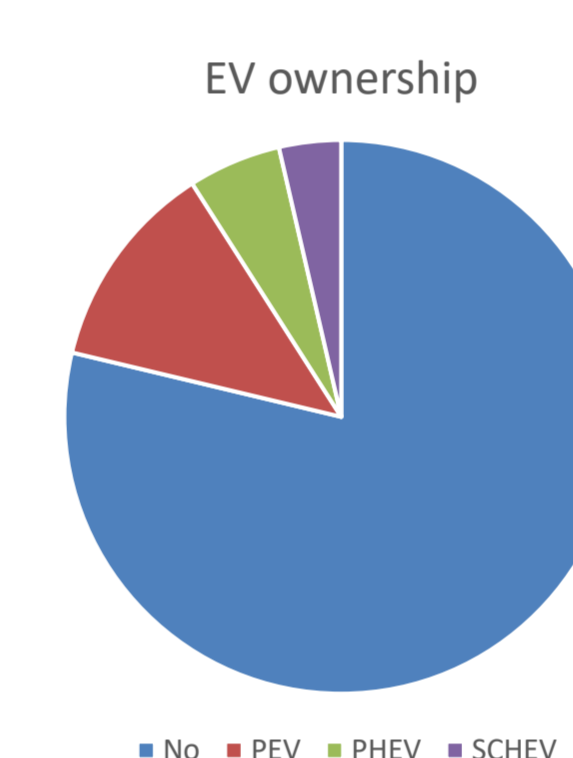
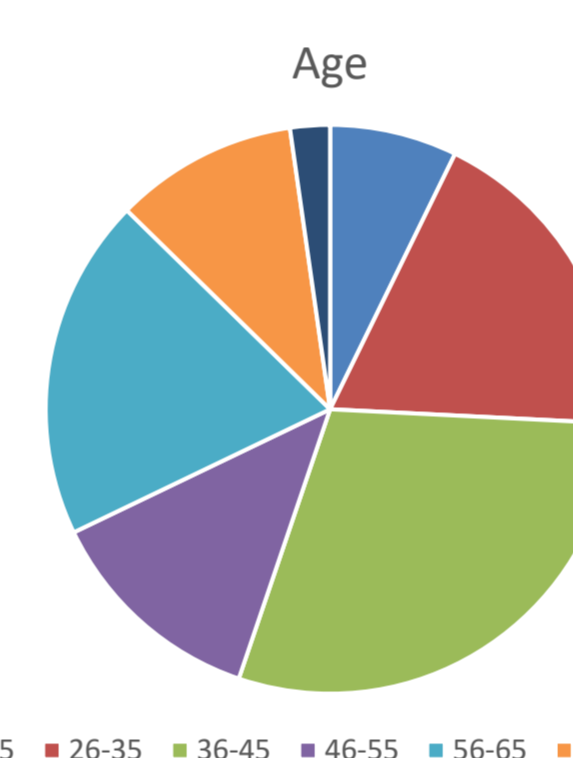
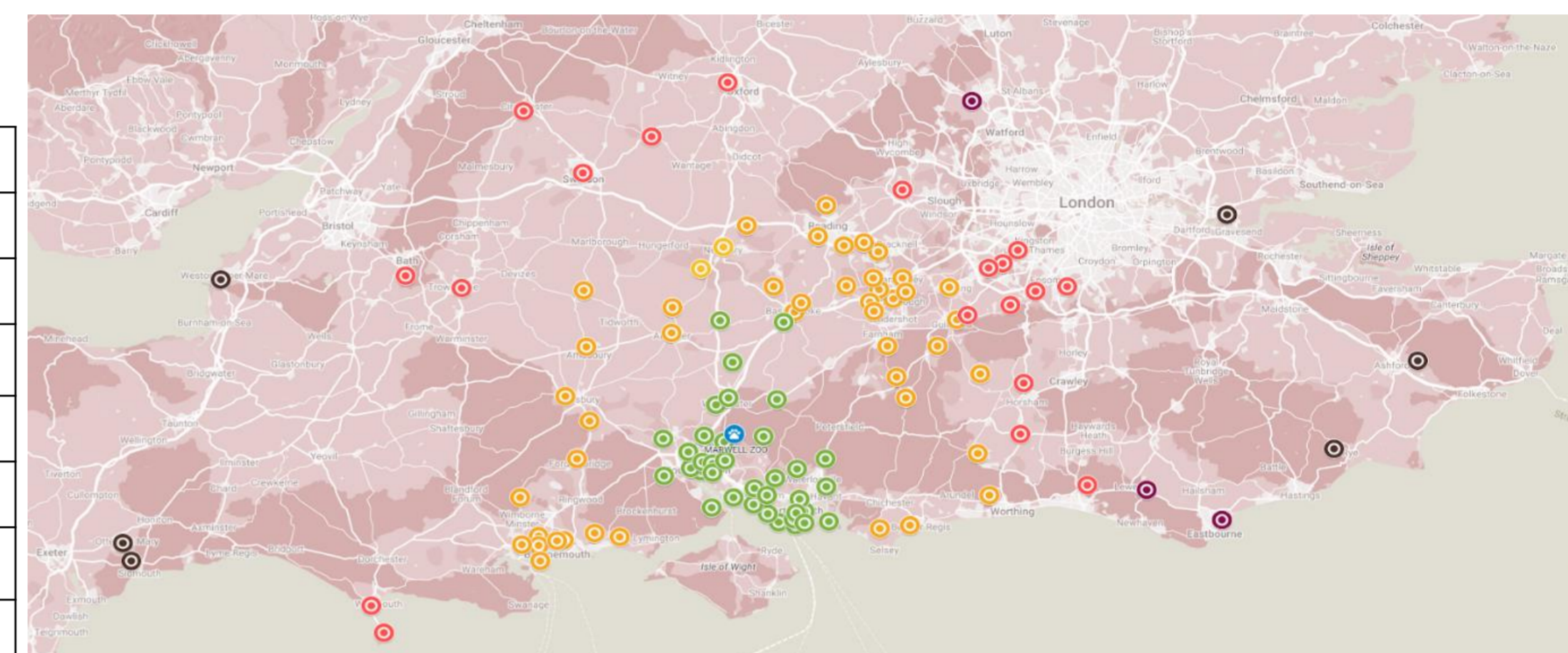


Table 1. Means and Standard Deviations for the context-specific TAM questions

	Total ¹	EV owners and EV contemplators ²	Non-EV owners ³	d	p	Sig.
Core TAM						
Intention to use FEVER	3.99 (0.92)	3.70 (0.97)	4.17 (0.83)	0.54	< .001	***
Perceived Usefulness (PU)	4.26 (0.87)	4.14 (0.87)	4.34 (0.87)	0.22	.120	-
Perceived Ease of Use (PEOU)	4.00 (0.88)	3.84 (0.81)	4.10 (0.92)	0.30	.033	*
Extended TAM						
Normative expectations	3.46 (0.91)	3.34 (0.88)	3.48 (0.93)	0.06	.678	-
Hedonic associations	3.20 (0.31)	3.06 (0.77)	3.29 (0.86)	0.28	.040	*
Charging Concerns						
Charger cost	3.39 (0.98)	3.49 (0.95)	3.32 (1.00)	0.12	.207	-
Charger availability	3.74 (0.92)	3.76 (0.88)	3.72 (0.95)	0.04	.772	-
Charger operation	3.32 (0.95)	3.36 (0.86)	3.29 (1.00)	0.07	.603	-
Lack of technical support	3.45 (0.98)	3.54 (0.95)	3.39 (1.01)	0.15	.273	-
Charge duration	3.13 (1.03)	3.28 (0.96)	3.04 (1.06)	0.23	.093	-
Charge sufficiency	2.93 (1.01)	3.00 (0.95)	2.89 (1.05)	0.11	.420	-
Charge limitation	2.99 (1.04)	3.11 (0.99)	2.92 (1.06)	0.18	.192	-
Need to book	3.56 (0.95)	3.63 (0.88)	3.52 (0.99)	0.12	.386	-
Identity						
Technophilic identity	5.53 (1.67)	5.25 (0.99)	5.71 (1.73)	0.28	.046	*
Environmental identity	5.79 (1.95)	5.52 (2.10)	5.96 (1.84)	0.23	.115	-

Participant nos.: ¹n=216-221; ²n=83-87; ³n=132-134
 Significance: p < .05*; p < .01**; p < .001***
 Effect size (Cohen's d): d = 0.2 (small); d = 0.5 (medium); d = 0.8 (large)

Next Steps

- Use of structural equation modelling to test strength and significance of the paths within our context-specific TAM.
- Compilation of current findings into journal article.
- Distribution of fuller survey designed to resolve some of the limitations of this short, opportunistic QBS (e.g. inclusion of multi-item measures of key constructs).
- Exploration of WTP aspect of public intentions to use FEVER charging infrastructure, using QBS distributed to nationally representative UK sample (WP6.2).
- Focal research activities designed to uncover more about public perceptions of the FEVER technology in and around demonstrator sites (WP6.3).

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