



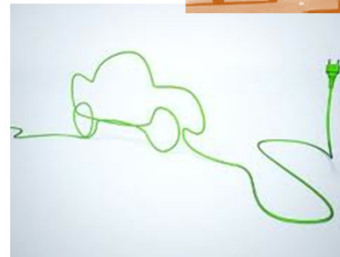
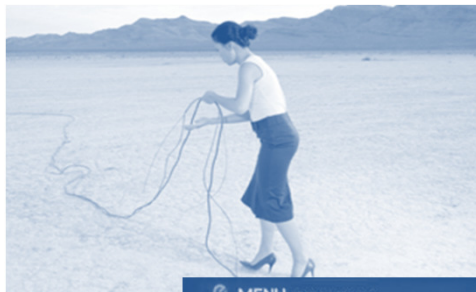
WHY WOULD YOU USE AN ELECTRICAL VEHICLE?

-challenges and opportunities for drivers-

Dr Maria Nilsson

CHALLENGES AND OPPORTUNITIES FOR EV DRIVERS

It is more complex than one may think ..



RANGE ANXIETY

The fear of getting stranded in an EV

VALUE CREATION

The positive and negative values related to EV usage

INFRASTRUCTURE

Charging the EV

CURRENT ON-GOING PROJECTS at Viktorija institute

Experiences from the introduction of EV into society

Viktorija Institute is focused on enabling sustainable mobility through the use of information and communication technology.

The Electromobility group prepares for the electrification of vehicles by performing research and by bringing different actors together in one arena.

- Optimisation of energy management and battery usage
- Smart grid and EVs
- Conductive charging on the move
- Stationary inductive charging
- Hybrid vehicle optimisation
- Test and simulation of electric vehicles
- Business models for consumer adoption

→ TODAY, user experiences

ELVIIS

National project

Re-defining the concept of EV charging

ELVIRE

*International project-
Lindholmen science park*

Introducing the new service providers

FAST CHARGE

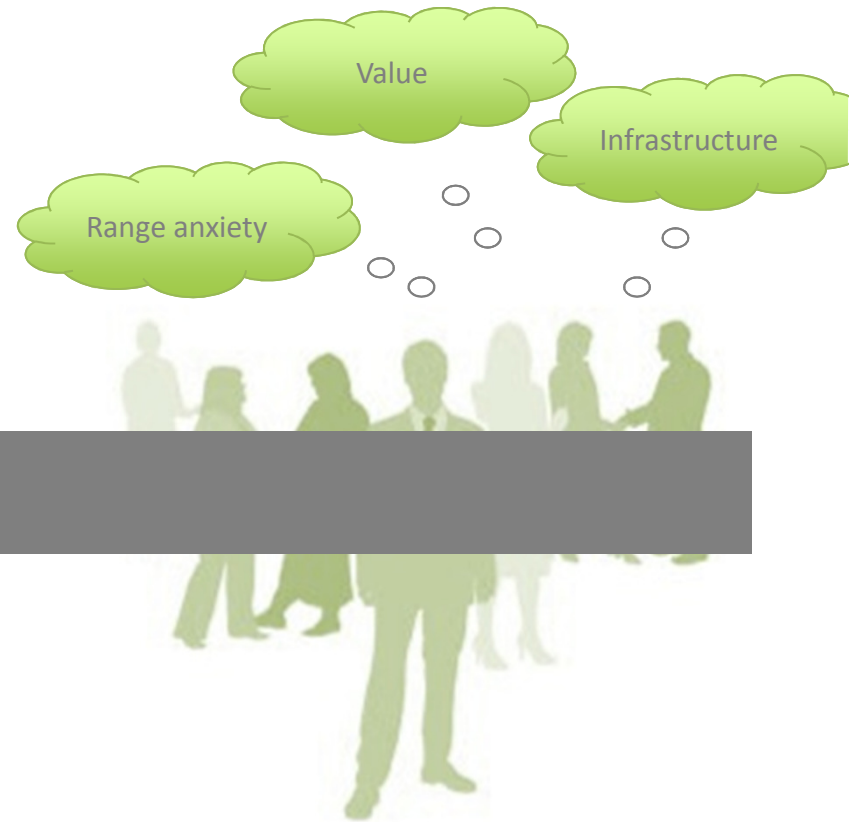
National project

Introducing test sites for fast charging

RAM

National project

Method development for range anxiety



WHAT DO DRIVERS THINK?

The perceptions and experiences of drivers

RANGE ANXIETY: DEFINING THE PHENOMENA

Thematic synthesis (Thomas & Harden, 2008) of EV market trends and EV research for conceptualising the unknown phenomena of range anxiety

The **belief** or the **experience** of drivers regarding the fear of not reaching your destination while in your EV. Experienced while **driving** or and attitude of **prospective** costumers.

- Dynamic
- Subjective
- Temporal
- Emotional
- Object related
- Experience
- Attitude
- Hypothetical
- Future oriented

MITIGATION APPROACHES

Removing the feeling/situation

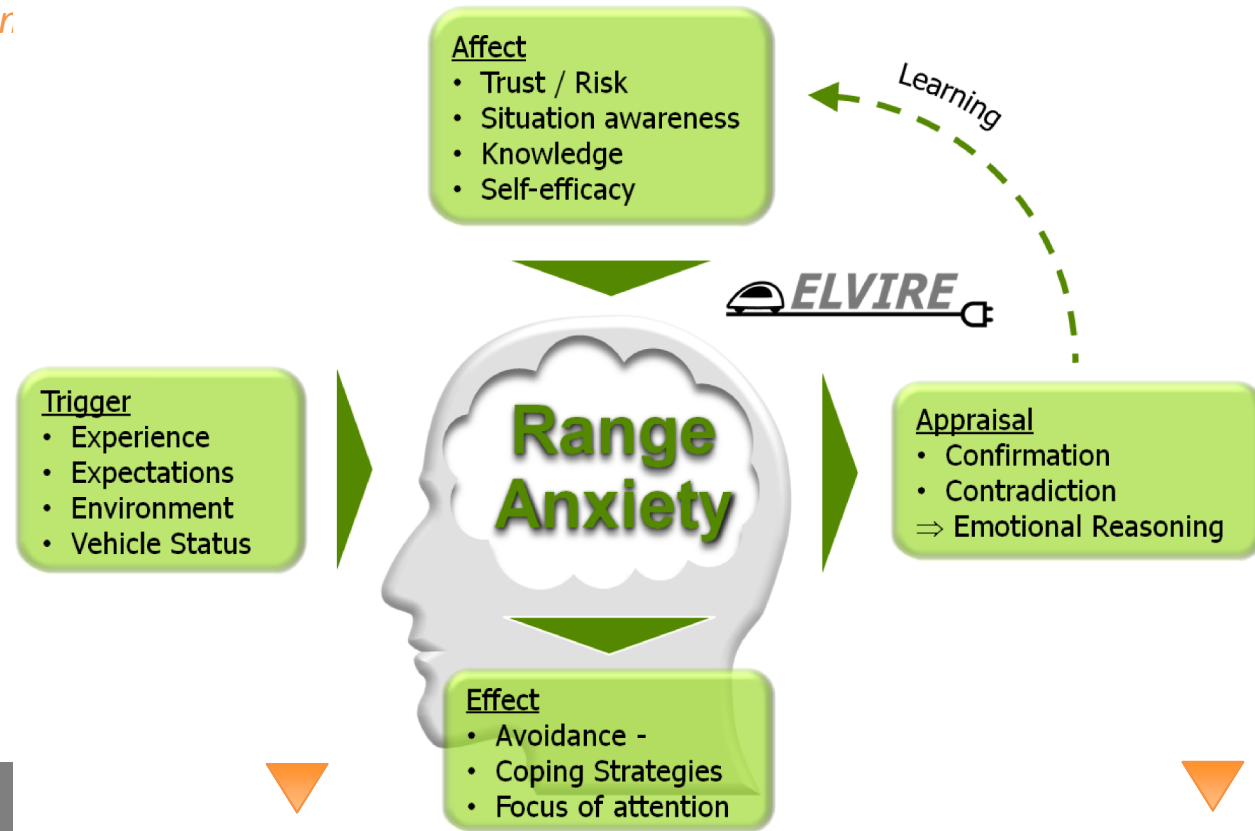


Prevent *Inform* *Limit* *Solve* *Eliminate*



RANGE ANXIETY: CHARACTERISING THE PHENOMENA

Zeidner & Matthews (2011) characterisation of anxiety provides an improved understanding of the causes and effects of range anxiety



RANGE ANXIETY

The psychological feeling/experience of drivers

A complex phenomenon which goes **beyond the limited range** of the vehicle

Identification of factors which may have **potential to mitigate range anxiety**

VALUE CREATION: IDENTIFICATION OF CRITICAL INCIDENTS

“A critical incident is an unusually positive or negative event that deviates from the norm and catches attention” (Edvardsson and Olsson, 1992)

” You are always driving at the margin ... ”



” The fuse blew... ”

” Had to get up in the middle of the night to start the charging due to a blackout ... ”

” People are very interested in the car... ”



” I had to charge it in a parking lot... I plugged it into a toilet... ”

BEFORE

No experience: 9
Limited experience: 7

DURING

45 critical incidents occurred:
37 negative
8 positive

AFTER

Generally positive despite a majority of negative incidents

VALUE CREATION: EV DRIVERS' EXPERIENCES/PERCEPTION

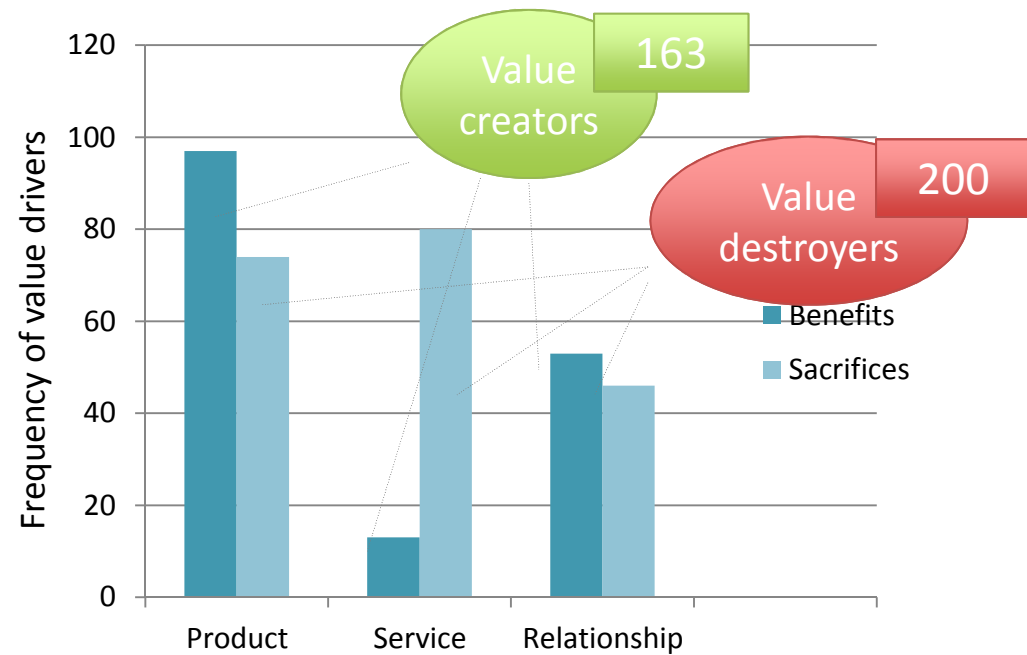
Lapierre's (2000) conceptual model of value provides an improved understanding of problems and possibilities of value creation of EVs

CREATOR

'Quiet' and 'Fun to drive' (product customisation/ product scope) are the most frequently mentioned value creators

DESTROYER

Limited range (anxiety) (trust/ relationship scope) is the most frequently mentioned value destroyer



VALUE DRIVERS

The trade-off between benefits and sacrifices determines the perceived value

CONCLUSION

Driving characteristics of the vehicles are emphasised ('Quiet', 'Fun to drive', 'easy to drive', 'cost efficient', 'environment')

IMPLICATION

Monroe (1991) argued that customer values a reduction in sacrifices higher than an increase in benefits

INFRASTRUCTURE: EXPERIENCE FROM FAST CHARGING

In depth interviews elicit intimate and detailed information about one specific phenomenon of interest (Patton, 2002)

The ability to *quickly fully charge* the vehicle were emphasised as opposed to the *flexibility* and ability to use the vehicle *more* often. This is contradicted by chargers only being filled to 80%.

Also, the fast charger takes longer in winter (45 min as compared to 20 min).

Drivers were used to manage without the fast charger

- 01 Location
- 02 Ease of use
- 03 Cost
- 04 Time
- 05 Battery level
- 06 Safety
- 07 Timing
- 08 Private/commercial
- 09 Driving distance
- 10 Information
- 11 Accessibility



FAST CHARGING

When drivers charge at a higher power than usual

CONCLUSION

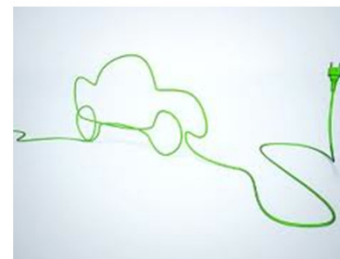
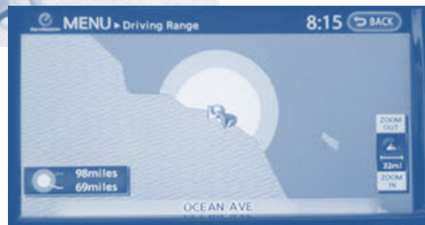
Its success depends on whether the charger *can play a significant role* in daily driving (added energy/location)

IMPLICATION

Introduce *context based* charging

CONCLUSIONS

How would you make people use EV?



RANGE ANXIETY

Minimise the range anxiety for the users

INFORMATION TECHNOLOGY

VALUE CREATION

Emphasise the correct EV values for the users

DRIVING CHARACTERISTICS

INFRASTRUCTURE

Enable flexible charging targeting the need of the user

FLEXIBLE CHARGING



WHAT MORE?

INTERESTED PARTIES: Follow the progress at viktorias.se

DEVELOPERS/POLICY MAKERS: Read the [full report](#)

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