REACT

Renewable Energy for Self-Sustainable Island Communities

Configuring the user in the design and testing of demand response: Implications for user engagement with smart grid solutions

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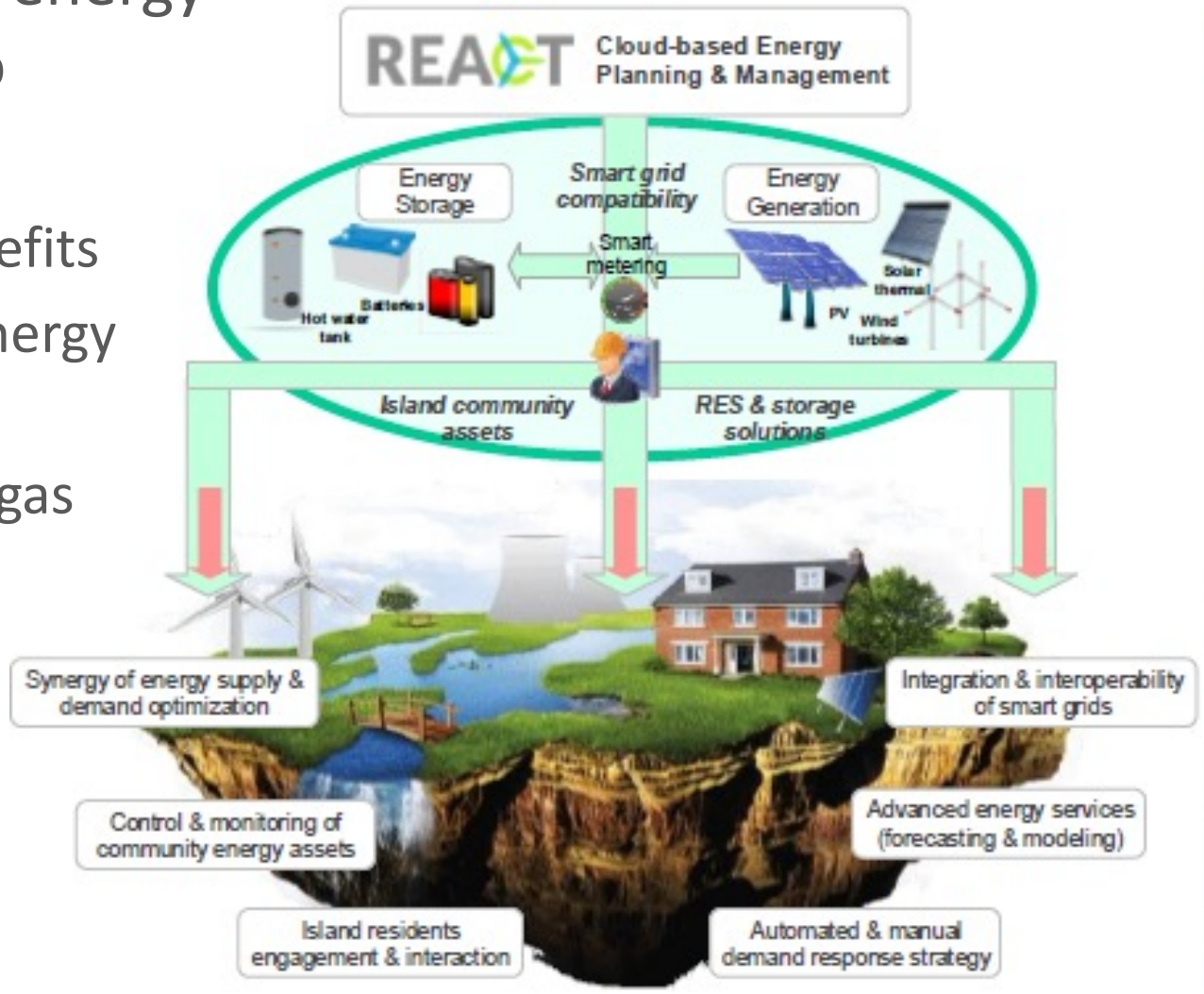
- REACT aims to demonstrate potential of RES and energy storage on islands to

  - bring economic benefits
  - decarbonise local energy systems
  - reduce greenhouse gas emissions
  - improve air quality



Aims and objectives

- To understand the expectations of the DR engineers and designers about the Smart Grid and how DR functions within that future
- To explore the expected modes of use that the DR engineers and designers make about their prospective users
- To compare these with findings from the users (survey and interviews conducted at different stages of the REACT project) and identify the gap between their expectations and the reality of living with DR for households and businesses
- A gap in the expectations in designers and users expectations of DR solutions leads to a gap in expected performance of those solutions

Why study the design process?

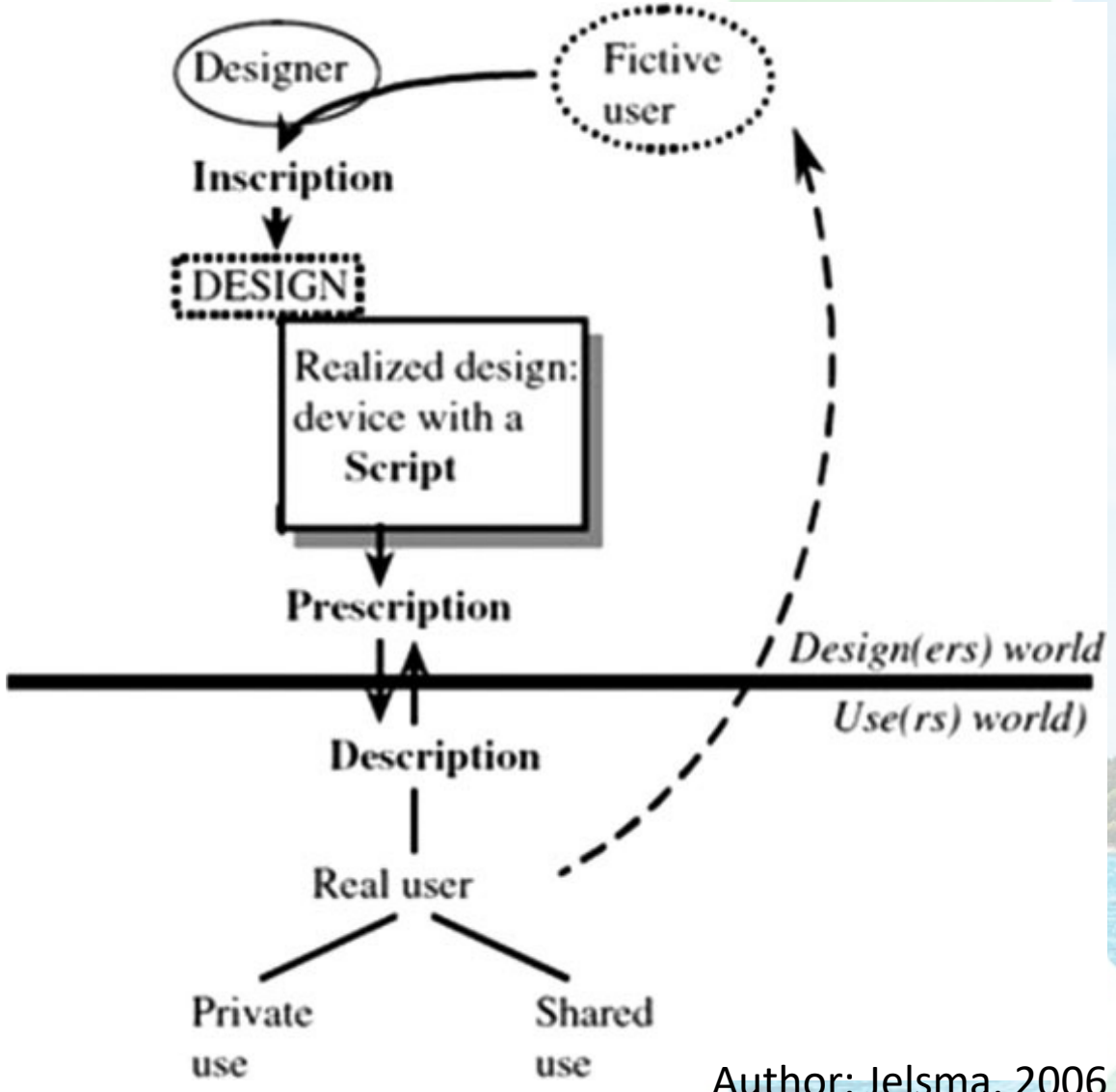
- The diffusion and adoption of technology is affected by the processes involved in design and development

The view from literature on sociology of technology:

- How designers imagine the user and the user environment (Akrich, 1992), imagining a technological ideal (Abi Ghanem and Mander, 2014)
- The important role designers and engineers play in ‘configuring’ or shaping the interaction of the user with the technology (Woolgar, 1991)
- How the technology is intended to be used, what for and by whom (Jelsma, 2006)
- The gap between the expectations of the designer and what the user wants (Oudshoorn & Pinch, 2003)

Rationale and framework

- Explore the gap between design logic and use logic (Breukers, Crosbie and van Summeren, 2020)
- The conceptualisation and design of the REACT solution (design logic) vs the users energy practices and routines in their homes and buildings (use logic)
- Identify the potential gap and mismatch between these two logics



Author: Jelsma, 2006

Approach and method

Method

- A qualitative approach using semi-structured interviews
- 12 interviews conducted with a broad range of REACT engineers and designers, as well as project and innovation managers
- Thematic analysis of results informed by STS perspectives

Data

- Interviews were conducted remotely (online) and face-to-face at project event
- Most interviews lasted between 45 to 75 minutes
- Authors journal notes from REACT meetings

  NOT DATA, but informs framing and probing

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Results: Envisioning Demand Response

Role of users

"*Users are at the centre of the system and are very important*" (R4, engineer) and "*need to be actively engaged*" (R9, project manager)"

- Prosumers who engage with different types of DR (manual, automated, DLC)
- Accept the recommendations from the grid, esp. as energy costs increase
- Align their consumption to the energy available and continuously check the charge on the battery
- Living automated lifestyles

Results: Envisioning Demand Response

Role of users

...but they can be fatigued from over-engaging, so striking a balance is key

"I think that there needs to be an ongoing kind of engagement and involvement and a kind of willingness from users, but not necessarily day-to-day or hour-to-hour…" (R10, research engineer)

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Results: Envisioning Demand Response

Role of suppliers

- Facilitators of change
- Need to invest in DR (including for their own interest) in the context of complex liberalised market
- New entrants like aggregators are needed
- Energy companies have collaborate with other professionals
- Companies need to communicate with their customers in a simplified way and have to educate people about DR
- Use social media to reach

Results: envisioning Demand Response

Role of suppliers

- Not motivated to change radically by changing their business model due to their short term plans, including short-term managers' tenure

"They (energy companies) are not interested in investing in smart meters because it is expensive for them and they don't see themselves directly benefiting from the information these meters provide" (R4, engineer)

- Strong government policy needed to push companies down that road to change their business model.

Results: envisioning Demand Response

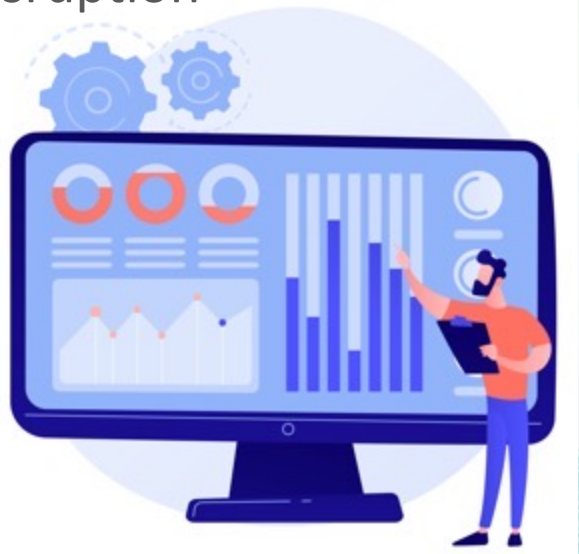
Design and digital interface

Demand response

- DR is automated, digital based, streamlined with minimal disruption
- Offers different levels of engagement
- Open and transparent systems
- More focused on EVs and transport

Digital interface

- Informative yet simple and easy to use
- Not sufficient on its own as a form of interaction
- Needs to be informed by users and based on the principles of use-centred design



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Results: User representations

Residential users

- Altruistic / community oriented
  - Actively engaged in community [thinking of others, cares about the island]
  - Interested in sharing energy from RETs and "doing their bit" (R1, development manager)
  - Environmentally minded

- Economically motivated
  - More likely to benefit middle income families as they can reduce their consumption more.

"People are very simple. They are very financially driven and benefit driven. So in the end it comes down to ..how will it benefit them from the financial aspect and their social and comfort aspects" (R7, Innovation manager)

Results: User representations

Residential users

- ‘Techno-abled’/ ‘Techno-educated’
  - People with technical background and “naturally inclined” (R6, research engineer)
  - Will engage/make the “right choices” when principles are explained (R1, development manager)
- Old/young
  - Young, more likely to engage because of their exposure to these concepts
  - Older generation, caring about their grandchildren’s future
- Busy home-makers
  - Distracted by routine, everyday priorities and time poor
  - Parents of young children

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Results: User representations

Non-residential users

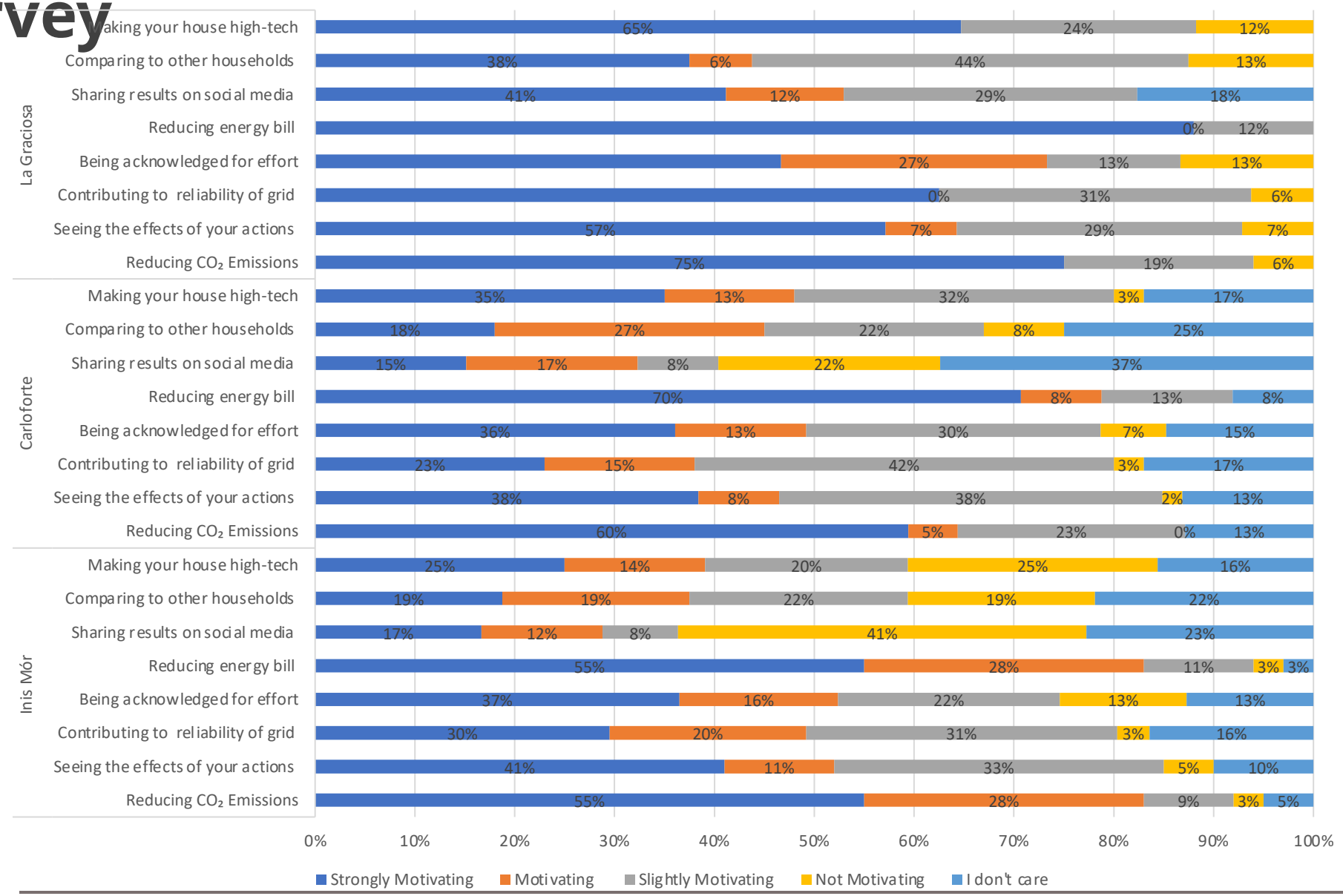
- Constrained by the services that they provide
- Diversity in size and consumption
  - Ability to manage their energy (Marko)
  - Bigger companies/buildings or energy intensive activities
- Diversity of motivations
  - Financial vs. social responsibility
  - Can attract new customers
- Employees
  - Should contribute to lowering the companies bills
  - Will not notice changing comfort levels
  - Will be motived if young

Results: User representations

Island communities

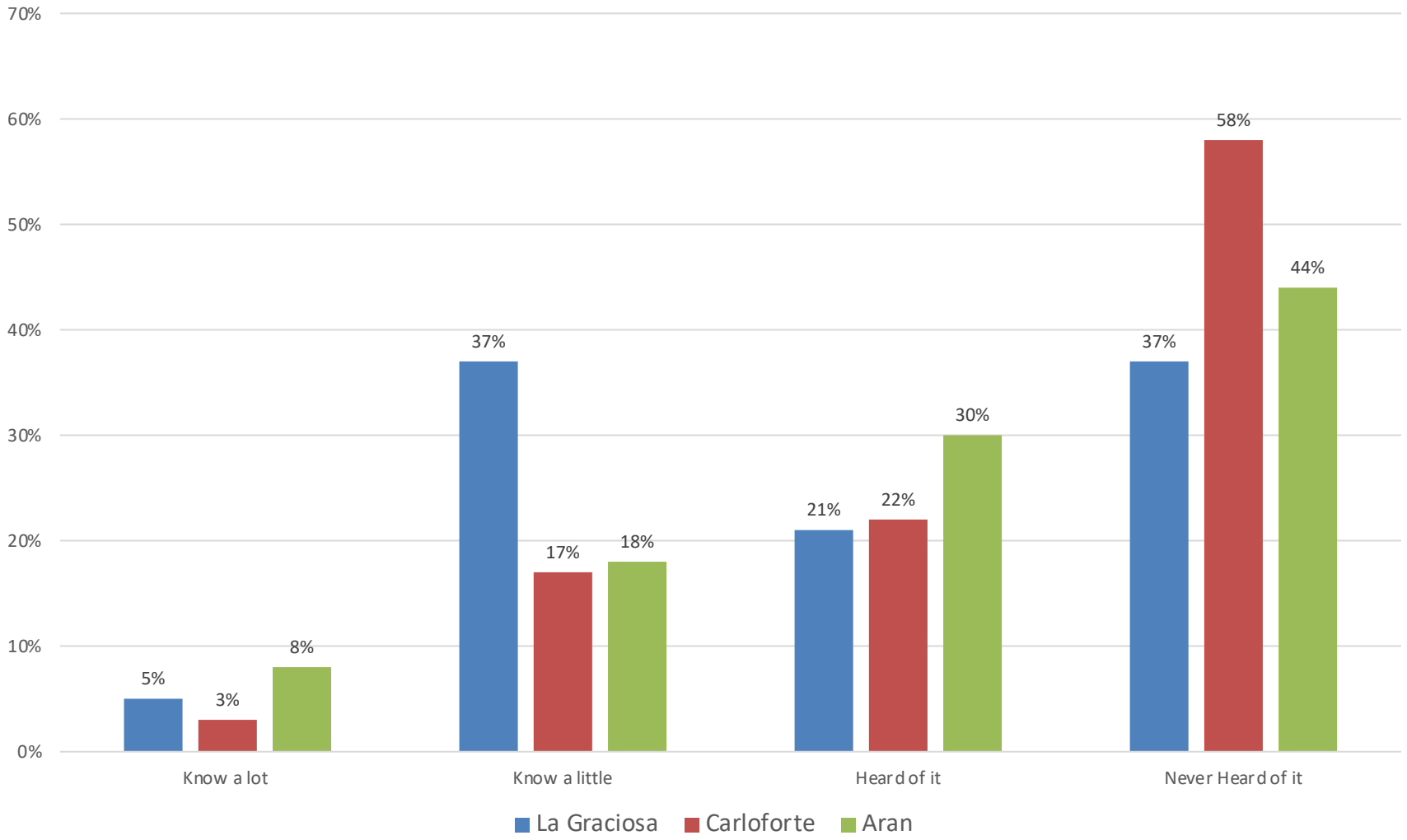
- Localities aligned with nature
  - Exposed to the natural elements
  - Can see environmental damage after end of tourist season
- Very diverse with different energy needs and cultural traits
- Close and socially engaged/involved more than mainland residents
- Ideal experiment beds
  - More aware of electricity challenges due to geographic constraints
  - Have the potential to be green sustainable communities
  - Lack critical mass and so in need of cooperative DR

Exploring user perceptions: Results from user survey



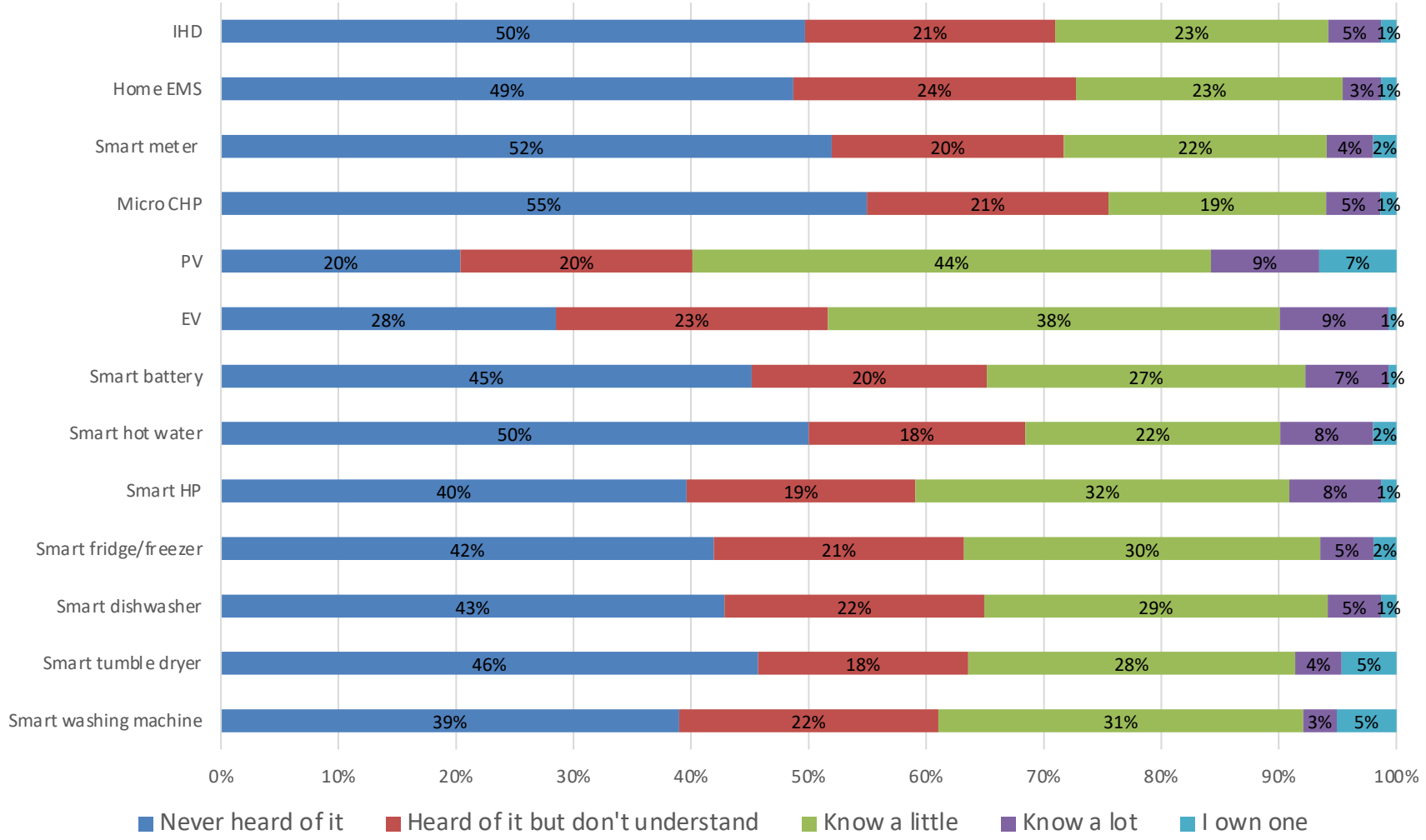
Motivations to take part in DR programmes

Exploring user perceptions: Results from user survey



Knowledge /familiarity with the concept of smart grid

Exploring user perceptions: Results from user survey



Knowledge /familiarity with DR technologies

Conclusions

- Ambiguity about the way DR should be designed
  - Risk of manual DR leading to fatigue
  - Difficulty of integrating DR in busy lives
- Data shows familiarity and knowledge among users is low

  but…
- Fixation with education and training users does not always translate into project designs that work
- Imperative to let go of the ‘techno-abled’ notion to reduce barriers in action
- Tensions across different user motivations
  - Contradictory notions of idealized/fictive users (age, technical ability)

Implications for DR design and development

Co-production of DR solutions

In co-production, service providers and users work together to reach a collective outcome.

Prospective DR users are best placed to help design it!

X 

Move away from notions of the naughty users who ought to change their behaviour

✓ 

Transform the nature of interventions: centring the user as the expert in understanding how DR can fit into their lives and businesses.

References

- Akrich, M. 1992. The de-scription of technical objects. In: Bijker W. and Law, J. (eds) *Shaping technology/ building society: Studies in sociotechnical change*. Cambridge, MA: MIT Press, pp.205–224.
- Abi Ghanem, D. and Mander, S. 2014. Designing consumer engagement with the smart grids of the future: bringing active demand technology to everyday life. Technology Analysis & Strategic Management, 26.(10): 1163–1175, doi: 10.1080/09537325.2014.974531
- Woolgar, S. 1991 Configuring the user: the case of usability trials. *The Sociological Review*. 38 (1_suppl): 58-99. doi:10.1111/j.1467-954X.1990.tb03349.x.
- Jelsma J. Designing 'moralized' products. In: Verbeek P.P. and Slob, A.(eds) *User behaviour and technology development: shaping sustainable relations between consumers and technologies*. Dordrecht: Springer, 2006, pp.221–231.
- Oudshoorn,, N. & Pinch, T. (Eds.) 2003. *How users matter: the co-construction of users and technology*, Cambridge, MA., The MIT Press.
- Breukers, S., Crosbie, T. and Van Summeren. 2020. Mind the gap when implementing technologies intended to reduce or shift energy consumption in blocks-of-buildings. Energy & Environment, 31(4): 613–633

THANK YOU FOR YOUR ATTENTION

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