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Use of knowledge in electric mobility: Preliminary results about the Directive on Deployment of Alternative Fuels Infrastructure

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State of the art

Contributions to transition to decarbonize mobility can be knowledge-dependent.

- In a famously failed strategy from 1973, for example, Electricité de France predicted the end of the internal combustion engine due to improvements in electrochemical generators, but ignored other knowledge, such as catalysts, companies' self-interest and customer preferences (Callon 1986 & 1987).

Previous works about the role of knowledge in electric mobility have studied **only explicit** forms of knowledge (i.e. indicators, studies).

- Research conducted in Portugal, Sweden and the EU and confirmed the minor influence of explicit knowledge (i.e. indicators) in these decisions (Boavida et al. 2014, Gudmundsson 2013, Boavida 2017a).

However, these works **did not** account for the influence of **tacit knowledge**, in both **policy and business contexts**.

State of the art (cont.)

Tacit knowledge can be subdivided into 3 different types (Collins 2016):

- **Relational** knowledge when it is dependent of the relations between people and arising out of social interaction;
- **Collective** knowledge when it is a property of society rather than the individual; and
- **Somatic** knowledge when it is inscribed in the brain and body.

Examples suggest that **relational** and **collective** tacit knowledge is a significant influence in decision-making:

- Nissan managers, for example, disclosed **relational** knowledge to Portuguese governmental members about the electric vehicle Nissan Leaf to push for an investment decision in charging posts as soon as 2012. This type of knowledge bound the government to invest vainly in chargers across the country and even led to neglect available explicit knowledge (Boavida 2017b).
- Presently, Tesla's decision to install superchargers in Norway ahead of demand and based on **collective** tacit knowledge is having a significant effect in the transition to sustainable mobility (Figenbaum et al. 2015).

State of the art (cont.)

Transfer of tacit knowledge → Networks with **developed Social Capital** (Inkpen and Tsang 2005)

- **Earlier interactions** (Callon and Latour 1981)
- **Generating trust in social networks** (Nooteboom 2005)
- **Supplying knowledge** (Maqsood et al. 2004)

State of the art (cont.)

Trust is important in technology innovation networks, because it provides the **condition for cooperation and higher performance to occur during long-term research efforts and costly investments** (Inkpen and Tsang 2005).

- Inferences about trustworthiness are based on the **history of interaction** with a partner and further draw on **third parties** to inform their trust judgments (Giest 2013).

Knowledge can enhance individual social capital through its exchange, display, implying possession or contributions to its flow in a network.

- Many innovators significantly **rely on knowledge exchanges through intermediaries for the ability to come up with new ideas and products** (Callon and Latour 1981).
- **Complexity** is associated with experiences where information is incomplete or ambiguous and the consequences of actions are highly unpredictable (Aram and Noble 1999).
- **Uncertainty** motivates an individual to seek information from near-peers, especially with regard to their subjective perceptions and evaluations of the innovation through a convergence process involving interpersonal networks (Rogers 2003).

State of the art (cont.)

So, **biases, heuristics and learning processes** can contribute to the **use of 'incomplete' knowledge** that may do more harm than good in the decision (Maqsood et al. 2005; Harrison et al. 2015).

Therefore, it can be hypothesized that:

Tacit knowledge can be significantly valorised to ground decisions of electric mobility, because innovators seek, among trustful members of their networks, for knowledge that can be useful, partial and/or partisan knowledge or for information that does not exist yet.

Objectives

The objective is to understand the role of tacit knowledge in policy and business networks of electric mobility.

The project has three specific objectives:

- Objective A: Conceptualize **social capital, trust and knowledge** involved in strategic investment decisions of electric mobility.
- Objective B: Provide an explanatory **framework for the use of tacit knowledge** in electric mobility decisions.
- Objective C: **Expand** the framework and concepts to **technology innovation theory**.

Research questions

- **How, why and when** are different types of knowledge used?
- Under what circumstances does **explicit or tacit knowledge dominates** decision-making?
- What is the differing role of **relational, community and somatic tacit** knowledge in different contexts?
- What is the role of **social capital and trust in selecting knowledge** to ground decisions?

Hypotheses

1 – There are **significant differences** between policy and business cases:

- **Explicit** knowledge is more concentrated in **policy**
- **Tacit** knowledge is more prevalent in **business** (particularly **collective** and **relational**)

2 – When **low levels of explicit** knowledge exist:

- relevance of tactic knowledge increases to the decision
- Risks of a bad decision increase.

3 – **High trust in low social capital networks is risky** because it increases the potential for basing decisions on dangerous bits and partisan knowledge.

4 – Knowledge **exchange, display or implying its possession improves trust & social capital**

Methodology and approach

Qualitative analysis with **case studies** and **social network analysis** to obtain insights from **policy and business** decision makers of electric mobility regarding:

1 - the pool and flow of knowledge in **past networks**:

- Face-to-face anonymized interviews with different questionnaires to policy makers and innovation leaders and their networks:
  - Context (political, economic and organizational)
  - Main actors (background, role in the decision and social group).
  - Decision narratives
  - Identify the network
  - **Earlier interactions, Social capital and Trust**
  - Clarify the way **networks were built** by participants, their **individual social capital** and internal **power relations**
  - Process of construction of evidence
  - Type and extent of **knowledge integrated and excluded** in the decision.
  - **Snowball**

2 - the pool and flow of knowledge in **present networks**:

- Simulations using verbal protocol analysis (Harrison et al. 2015; Miller et al. 2015) to uncover the biases, heuristics and learning processes of to policy makers and innovation leaders networks in relation to knowledge utilization (Maqsood et al. 2004; Phillips Hey 2016).

Methodology and approach (cont.)

Criteria to select the case studies:

- Study 2 policy and 2 business decisions to expand the scope of decisions with **different strategies and networks**
- 2 decisions based on **quantified** measures (i.e. explicit knowledge) and 2 decisions based on **broader objectives** to guarantee a comprehensive use of different types of knowledge
- Relevance of decisions to **trigger transition** to **sustainable** mobility
- Considerations about the access to the main decision makers and time and financial restrictions

Methodology and approach (cont.)

Case	Institution	Investment decisions	Content
Case 1	European Union	**Directive** on the deployment of **alternative fuels infrastructure**	The programme will develop a supranational case study because, increasingly, decarbonisation efforts need to combine efforts among states and this presents an opportunity to understand the role of knowledge in a policy decision related to electric mobility. In the European Union, the Directive on the deployment of alternative fuels infrastructure requires Member States to ensure that high power recharging points for electric vehicles to **comply to the technical specifications of Type 2 or Combo 2** (in accordance with the European Norm 62196-2 and 62196-3). Several interviews in Brussels were developed with decision makers active during the preparation of the directive that set these specific technical standards. Access obtained to MEPs, assistants, transport secretariat and research unit in the Parliament, DG Move experts, lobbyists (Transports and Environment, EnBW, BMW), Transport secretariat in the Council (maybe) and CoReper members (maybe). Greens voted against
Case 2	Norway	Innstilling fra energi- og miljøkomiteen om norsk klimapolitikk	The project will study a case at the national level significantly anchored in climate policy. In 2012, the Norwegian Parliament unanimously agreed to **extend financial tax incentives, including no purchase taxes and VAT, on all electric vehicles until 2018 or when the 50000 Electric Vehicle target is reached**. This important policy decision considerably contributed to a boom in electric automobile sales and the highest per capita of electric vehicles in the world. The access point will be the leaders at the time of the Energy and Environment Committee Erling Sande and Nikolai Astrup.
Case 3	Tesla	European Supercharger Network	The project will study the European Supercharger Network that enabled Tesla owners to travel for free between major Norwegian cities. According to Tesla quantification, approximately **90% of the Norwegian population lives within 320km of a Supercharger station, and about 60% of the country's total land mass is within the same distance of a station**. The access point to the company will be Christian Marcus (program strategy manager for Nordic countries, Iceland and The Baltics) and Raza Uddin (program strategy manager for North American).
Case 4	Renault-Nissan	Renault Zoe	The project will study a second investment decision in a company. In late 2012, Renault-Nissan Alliance delivered the first Renault Zoe, almost one year after its Nissan Leaf was launched. Despite being produced within the same company, **Renault Zoe has a different battery system than the Nissan Leaf and a battery partnership with different company.** Access to the company will be facilitated by Tommaso Pardi (CNRS-IDHES, GIS-Gerpisa at Ecole Normale Supérieure de Cachan) and other colleagues from the GERPISA (The International Network for Automobile).

Case study - Directive on Deployment of Alternative Fuels Infrastructure

#	Institution	Employment	Type of work	DDAFI	Nationality	Education
1	European Commission	European public officer	Negotiations and elaboration of directive	Direct	Belgium	Engineer
2	European Commission	European public officer	Elaboration of the directive	Direct	Germany	Lawyer
3	European Council	European public officer	Secretariat of the transport committee	Direct	Italy	Lawyer
4	European Council	National public officer	Negotiations in transport area of Reper	Indirect	Portugal	Economist
5	European parliament	European public officer	Research service on Transport topics	Indirect	Poland	Journalist
6	European parliament	European public officer	Secretariat of the transport committee	Direct	Greece	Political scientist
7	European NGO	Lobbyist	Activist for decarbonisation of mobility	Direct	French	Political scientist
8	Car multinational	Lobbyist	Interests of automotive construction company	Indirect	Germany	Economist
9	National energy company	Lobbyist	Interests of firm's energy interests	Direct	Germany	Lawyer
10	National energy company	Lobbyist	Interests of firm's energy interests	Indirect	Austrian	Manager

Case study - Directive on Deployment of Alternative Fuels Infrastructure

Decision making process:

- Developed in a highly complex and elaborated institutional setting
- Developed towards a consensual outcome

Explicit knowledge:

- Formal scientific evidence is of limited use for this decision making process
- Not even the consultancy's trigger study (endorsed by the EC) was important

Tacit knowledge:

- Use of grey literature is widespread
- Often includes informal and tacit knowledge
- it can include reports with "gossips" about another actor's point of view, from news agencies specialized on providing news to institutions working in or for the Brussels "bubble".

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Thank you for your attention

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