

# The co-evolution of taxi drivers and their in-car navigation systems

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2008 AAG annual meeting, April 15, 2008

# Motivation

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- 17% U.S. adults use a GPS location device/service. 33% of them use it in their vehicle (Harris Interactive, 2007)
- Relative market success with issues of poor intergration of the technology into driving practices
- Chance to observer how users adapt to the technology and adapt the technology to their needs (co-evolution - O'Day et al, 1996)
- Observe how positioning and navigation technologies integrate into/change already existing practices and how practices influence the use of the technology
- Inform the design

# Aim

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- Similar approach as other research on understanding mobility practices with technology devices (Activities not as isolated events, but situated within a context)
- Socio-technical lenses to analyze the complexities of changes created by the introduction of new technologies
- Acknowledge change and adaptability as inherent part of location-aware system use
- Focus on drivers for whom mobility is a labor

# Previous works

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- We know that there are issues in realability, wayfinding, the support of mobile workers
- Interaction with the in-car device result in distraction from driving task (often in the news). Studies at an experimental level (see Burnett's work)
- However, device-centered perspective falls short of full appreciation of the envolvment people and their use of novel mobility enhancing technologies.
- It neglects the role of the user in co-constructing technology (technology studied in context)
- Lack of empricial evidences. Particularly usefull for the design of future location-aware systems

# Focus

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Analysis of use, adoption, and appropriation

Not focused on how the system work but how the systems are used

<b>Aspect</b>	<b>Description</b>
Acquisition	Why and how does this new technology get integrated among other artifacts, and how satellite navigation systems impacted the use of these artifacts.
Gap in expectation	Understand if the reasons to adopt are matched in practice.
Appropriation	How much the system can be trusted and what is the reaction when the quality is not met (awareness of the limitations/imperfections). Importance of the knowledge of the urban environment.
Access to the <u>geoinformation</u>	What <u>kind of geoinformations</u> are used by the drivers both from the system and from the environment (experience, radio, interaction with customer, context such as visibility to landmarks).

# Method

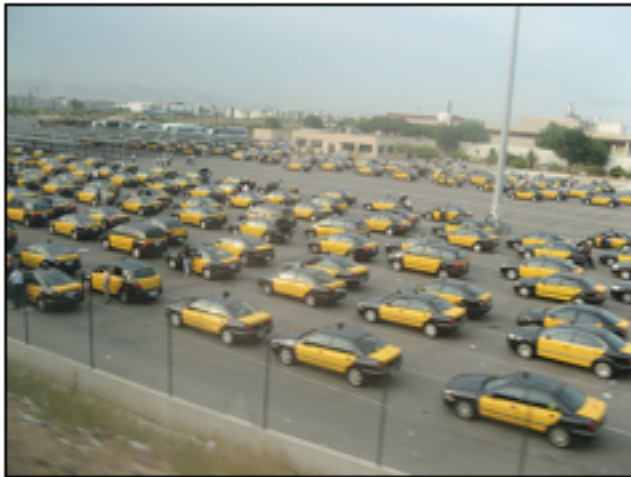
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- Interpretative and not statistical
- Examine situated activities
- Ethnography, interviews supported by in-car observations
- Users accounts
- Small sample (12 taxi drivers) but, but rich data (extended field notes of accounts and observations). Coded as themes emerges
- 6 months to 25 years of experience

# LOCUS

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Barcelona taxi drivers: massive population of early adopters, strong practice of relying on mobile technologies and maps to support their work



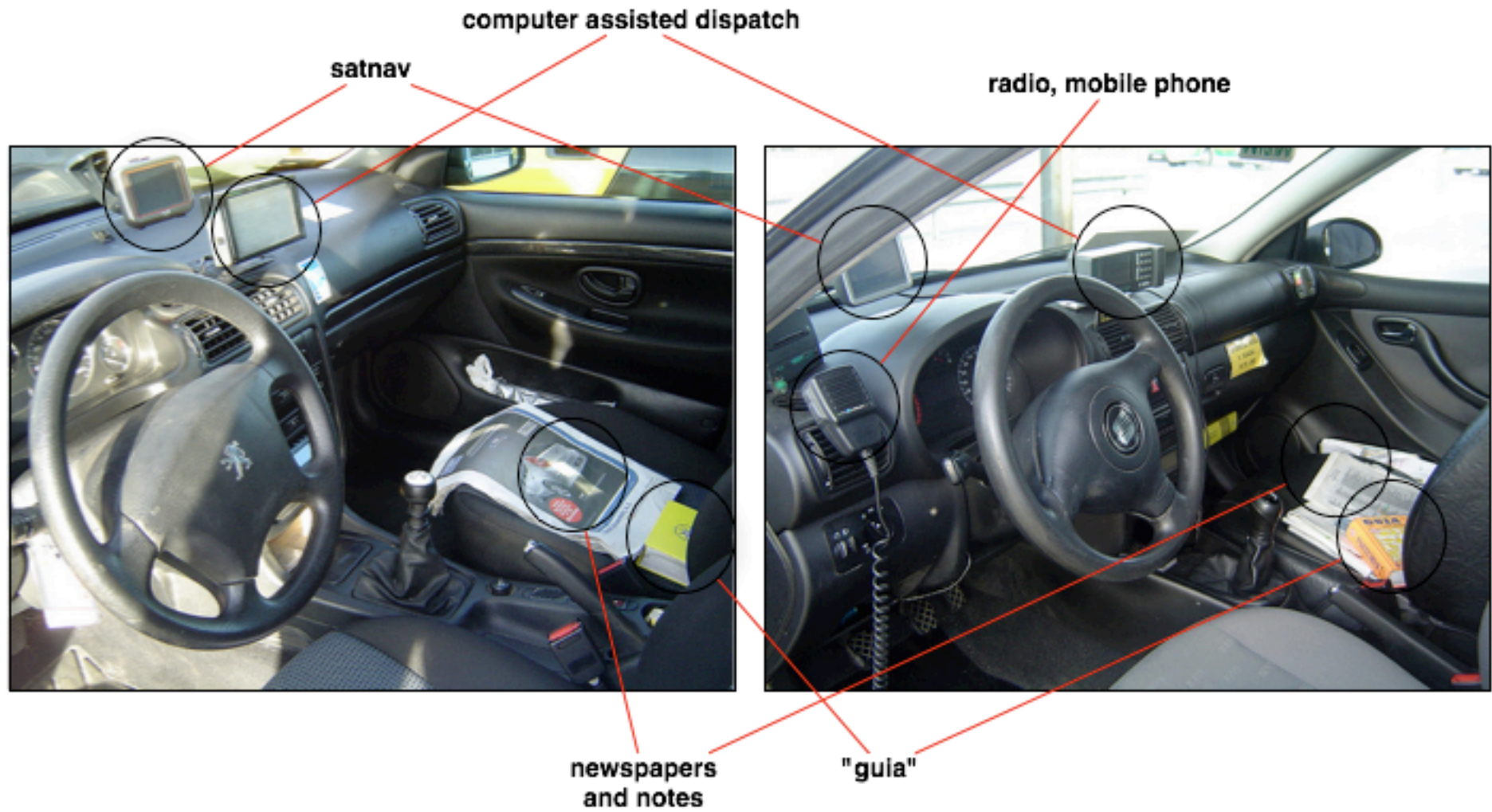
# Findings

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# Eco-system of artifacts

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# Sources of information

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- satnav (discussed later)
- “Guia”: usefull in areas with points of reference
- Mobile phone: primarily a social link, used when “really lost”
- Newspaper: keep general knowledge of the activity in the city
- Personal notes: list of “unofficial” POI not present in satnav or “Guia”
- The customers is a prime resource for information

# Acquisition of tranquility

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- Acquisition of satnav is not about performance, safety, or efficiency
- Biggest moment of uncertainty is to drive to unknown neighborhoods (villages, remote business areas)
- Satnav is a life saver for getting to destination
- Relieves the car driver to closely observe the environment, to look out for road signs or landmarks
- Relaxes the customer “*they know they cannot be cheated with it*”
- HOWEVER, the less experience drivers are confronted to system imperfections

# Knowledge of the city

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- Different appropriation depending on the knowledge of the space
- Inexperience drivers demand of accurate and updated information quickly reached the limits of the systems (unable to judge the accuracy or improvise)
- Their dependance made them rely on the “guia”
- Satnav as a learning tool (passive mode)
- Tendency to rely on it less and less with the experience (for navigation).  
Passive mode used to keep track of radars or speed
- Experienced drivers stopped using the “guia”

# Break the myth of deskilling

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- Assumption that satnav makes the practice accessible to cheap labor
- Satnav supports a reduced understanding of the city
- This study shows that knowledge is acquired by multiple sources, technology do not replace it

# The different granularity of information

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- To go: indication of an area, a neighborhood. Coarse-grained (no indications to avoid misleading recommendation)
- To arrive: specific building number. Fine-grained (with indications). Satnav engaged at a stop, slow traffic.
- To return: Need of landmark. Very cautious in the path taken. Push “barcelona” or “plaza espana” to get back to familiar places. Both fine-grained/coarse-grained



# Implication for design

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- Big issue of uncertainty and its representation. Reveal the ambiguity of positioning and incomplete map data (important for inexperienced drivers)
- Distinctive usage in a journey. Tailor the navigation to the context (go, arrive and return)



# Conclusion

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- First chance to observe how users adapt to the technology and adapt the technology to their needs in the context of location-aware systems.
- Limitations in the generalization: Spanish drivers (cultural bias), males (gender bias), workers (activity bias)
- Wayfinding, tendency to be used less over time
- Not necessarily deskilling of navigation and orientation
- Maybe deskilling in social. Transfer of the trust from social interacting to machine-supported. May lose interaction with the client, important in the learning process. Or new kind of interaction