

Sensor networks: Opportunities and Challenges

Report from Session 3 – Transportation

- **What are the benefits? What are the drivers and obstacles?**
 - **Readiness**
 - **What are the needs of society and customers?**
 - Strong efficiency gains for supply-side (infrastructure providers and transport services) leading the introduction in the market
 - Also strong efficiency gains for customers, but there are issues of
 - » Minimum number of adopters for effectiveness (network economies)
 - » Rivalry between consumers (value of privileged information)
 - » Ex-ante perception of value for money (and willingness to pay)
 - **How mature is the technology? (in the lab, close to commercialization)? Are there specific technical obstacles (e.g. energy)?**
 - Most basic ingredients are ready and available in the market, biggest difficulties associated with technical integration and organizational issues
 - Very different lifecycles for transport infrastructure ; transport vehicles; sensor hardware; telecoms hardware; telecoms norms; software increase difficulty of harmonious and lasting integration

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- Are there infrastructures issues (Internet vs close networks, IP based or not, bandwidth, addressing issues)?
 - Many applications start as proprietary, over closed networks, but real consumer-oriented intermodality raises need for open networks
 - In most current applications, bandwidth is not a pressing issue
- **Deployment (drivers and obstacles)**
 - **Market:**
 - Is there demand (need+money)? Is there a market failure? Why ?
 - » For road users, information in incidents is mostly freely available by radio
 - » For public transport users, main difficulty is associated with indirect (universal) subsidization of service through operators, largely preventing innovation and market segmentation through optional services
 - What are the current business models? Are they sustainable (ROI)?
 - » Most price systems in transport are very biased, forcing business models to be biased too (and fragile in face of possible rationalization of prices)

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- **Security:** can confidentiality, integrity, and availability be ensured?
 - Higher efficiency for consumers implies tighter tracking, and loss of anonymity.
 - » Certification and auditing of processes and organizations should prevent trivial intrusion, but risks increase with complexity of organizations and of supplied services
 - Possibly many people will happily trade-in this risk of intrusion versus the much higher convenience and efficiency
- **Regulatory framework:** can privacy and personal data protection be ensured? Are there liability issues?
 - Biggest impact of regulatory framework derives from international differences on ownership and responsibility for various elements in the system
 - No clear liability issues as far as service consists of advice to travelers and not of automatic actions / decisions

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- **Interoperability:** is interoperability critical? At which level? Is there a need for standards? In which area?
 - Interoperability critical for support to intermodality
 - » Higher efficiency in the transport system as a whole
 - Standards already exist in some domains, will evolve with market in more sophisticated apps
- **Acceptance:** are applications acceptable to and usable for users?
 - Most applications are of voluntary adhesion, some could pose usability problems (too much sophistication for many citizens)

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→ How risky is investment in this area?

- Highest risk is posed by current bias of pricing systems in transport systems, undermining solid economic calculations for reasonable time frames
 - But better information on current states of transport systems facilitates introduction of more rational pricing models (opportunity as well as risk)
- Technological evolution in some components may also pose some obsolescence risk
 - But good modular design should largely mitigate this risk

→ Should governments intervene, in which areas, at which stage, and how?

- Promote development and demonstration of new apps, especially intermodal ones, forcing utilities to share data, and allowing standards to emerge
- Promote discussion on different levels and modalities of privacy protection in exchange to availability of services and opportunities for consumers
- Introduce gradual but firm change in pricing regimes of transport systems, promoting rational support to efficiency, equity and sustainability