The Future Internet: The Social Nature of Technical Choices

A SEMINAR ORGANIZED BY SESERV

Internet of Things (IoT) as new technology

It is difficult to pin down specific IoT technologies, as existing technologies are increasingly being enhanced and ‘made intelligent'. IoT can be said to include mobile technologies, sensors, indexing, and the creation of ‘intelligent’ and encompassing databases. Key to all IoT technologies is the enabling of seamless, 'invisible' interaction between systems. Internet of things technologies are bringing data together to create new services.

1. Current barriers & challenges identified by participants

1.1 Existing socio-technical barriers

- **Too abstract definitions**

  Current definitions are hard to grasp. They are too academic and do not focus enough on design/application. This is partly due to lack of interaction between the actors of these two domains.

- **Lack of vocabulary for multi-device interaction**

  Multi-device IoT interaction do not have a well-developed vocabulary, and it is therefore difficult to facilitate efficient and effective IoT design discussions. Currently, design development is characterised by 'doing' rather then by reflexivity and design discussions.

- **General public perceives IoT as Big Brother enforcement**

  ‘Smart’ applications tend to be received with scepticism by the general public. One example is the ‘smart’ bins in London that were provided with sensors. These were quickly coined ‘spy’-bins.

- **Technologies framed as having autonomous forces**

  In popular discourses, technologies are often being framed as autonomous forces; and people as being ‘affected’ passively. Changing this attitude and the underlying technologically deterministic view, would help to inform design better.

- **EU's Digital Agenda's influence on IoT innovation/design**

  The Digital Agenda enforces a certain amount of transparency and privacy for IoT application end-users. For designers and IoT business developers, however, it can be experienced as restricting for new business plans and technology designs. It also affects the global competitiveness.

1.2 Current/future socio-technical challenges

- **Moving beyond IoT for domestic uses**

  IoT technologies are predominantly designed for domestic purposes; e.g. the interactive ‘intelligent’ Internet fridge. There is a lack of design and creativity in the domain of IoT. New applications should be implemented in existing infrastructures to make environments more intelligent; e.g. transport systems; health applications.

- **Making multiplex data compatible**

The uptake and uses of new technologies in general generates vast amounts of data. Individual systems, however, are not able to harness the data because there is no common agreement on what to do with it. There needs to be an ‘intermediate’ level of technology, to help understand data on individual system levels. The challenge is to design tools that can harness data that is being generated independent of the tool itself.

- **Determining boundaries between public and private data**

IoT technologies are blurring the boundaries between public and private data. One example is the ‘passive’ monitoring of mobile phones: Walking around with mobile phones switched on, users can be tracked at all times. There is a need for addressing ethical issues around such data. Where are the boundaries between e.g. public and private spaces, or public spaces and consumer goods?

- **Ensuring transparency for end-users**

There is a need for ensuring transparency on data usages by corporate entities. Clear statements of advantages and disadvantages (e.g. spam risks) of technologies/services are needed. Users/consumers should be presented with different levels of ‘sign-off’ options.

- **Balancing privacy concerns**

While privacy is an obvious concern for IoT applications, it is necessary to develop an approach that does not result in moral panic. To that end, it is important to clearly communicate to end-users the implications of usage of Internet of Things technologies.

- **Enforcing the right to digital choice**

It is vital to provide opportunities for 'offline' access to services for users who do not use certain technologies; whether this is due to digital choice, or lack of access to certain technologies. ‘Opting out’ currently penalizes people, which should not be the case.

- **Developing back-up mechanisms for large-scale system failures/attacks**

A major challenge relates to developing security measures for potential catastrophic failures of technologies that would affect individuals, businesses, governments, etc. An example would be a cut-off from the Internet. There is a need for developing adequate offline back-up mechanisms.

- **Acknowledging and addressing the possibility of unintended consequences of IoT design**

Socio-technical designs and applications might have unintended outcomes. An example from the health sector: Some elderly people have sensors implemented in their homes, measuring levels of moisture. While such sensors can help alert carers, they might also result in new practices, in which human expertise replaced by automated sensor-network data analysis. There is a need for ways of assessing and analysing unintended design outcomes of IoT technologies affecting the social world.

2. Moving forward: Strategies for bridging the gaps

- **Facilitating collaboration between privacy research and engineers.**

Research in the two domains seems highly disconnected, despite the obvious parallels. These sources of expertises should be brought together for the development of IoT.

- **Integrating ethical dimensions as core component of discussions on IoT-'design potentials'.**
- **Ensuring that policy-makers set up frameworks for connecting designers and users; and help raise awareness.**
- **Inviting users to play a role in the design of technologies; e.g. by means of market research.**
- **Funding further ethnographical research on ICT usage in everyday life that can inform design choices.**
- **Bringing ethics and privacy experts into early stages of design development phases.**

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