Why should others care about Ubiquitous Information?

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Definition

Information:
- (Encyclopaedia Britannica)

- [1] the communication or reception of knowledge or intelligence
- [2] knowledge obtained from investigation, study, or instruction ...
- [3] the act of informing against a person
- [4] formal accusation of a crime made by a prosecuting officer ...
Narrowing the Gap

Virtual world

Real world

Source: Friedemann Mattern
The ultimate consequence of Ubiquitous Computing:
- The real world is mapped in the virtual world
  - Completely
  - In real-time

Source: Friedemann Mattern
Outline

- Economics
  - Real-time economy
  - Taxation
  - Microeconomic issues
- Law
  - Privacy
  - Accountability
  - Consumer protection
- Sociology
- Philosophy
  - Ontology
- the problem of explaining the world
Outline

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Economics

- Thesis:

  with UbiComp Systems much better resource allocation possible

- old economy $\rightarrow$ new economy $\rightarrow$ now economy
  - (real-time economy)
  - real world represented in the virtual world
    - as complete as possible
    - instantaneously
Bull-whip-effect

Figure 1: Increasing Variability of Orders up the Supply Chain

Consumer Sales

Retailer’s Orders to Manufacturer

Wholesaler’s Orders to Manufacturer

Manufacturer’s Orders to Supplier
Real-time economy

- reducing the bull-whip effect
  - Daimler Chrysler
    - $7.2m reduced stock
    - $10m improved order fulfillment
  - Sun
    - saved $15m, earned a plus of $30m
    - in ¼ year!
  - and this only through better software, no UbiComp systems involved (tagging etc)

- no macroeconomic wasting any more
  - milk bottle reduces price with age
    - super-market becomes stock-market
  - shelf line rotation → no forgotten goods in warehouse
  - smart pill-box keeps track of taken medicine
  - if transport was too hot, do not use chemicals
Real-time economy

- other economic benefits:
  - improved supply-chain-management, logistics
    • always know where goods are, when they arrive, ...
  - potential to quickly react
    • plane engine reports failure, spare part waits at destination airport
    • if transport is too hot, order new chemicals
  - customer satisfaction
    • keep track of orders
    • help desk is able to provide up-to-date information

- but also negative consequences:
  - putting economies on autopilot can lead to accidents (e.g. 1987 stock-market crash) → need for circuit breakers
  - market lives from lack of information
    • perfect market is innovation-unfriendly place
Taxation

- Products determine their taxes autonomously
  - no failures or corruption, low costs

Tax: 0.30 CHF  Tax: 0.05 CHF
Microeconomic analysis

- classical economic theory
  - models with average behavior of market participants
    - households
    - corporations
- with UbiComp fine-granular analysis possible
  - distinctions by region, gender, social class
  - relevance?
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Privacy

- we already leave data-traces everywhere ...
  - bank transactions
  - car license plates on Limmatquai
    - or at swiss border
  - Migros, Coop
- ... and it doesn’t get any better
  - face recognition
    - 1m cameras in GB
  - personal items communicating with the world
    - PDA, car, watch, coffee cup, belt, shoe
- not only quantity, but also quality changes
  - unlimited coverage (24/7): home, school, office
  - loss of awareness
  - Important: ensure that opt-out remains possible!
How to ensure privacy

Four different views:

- „You have zero privacy anyway, forget about it“
  - Scott McNealy, CEO Sun Microsystems
- „An era of democratization of information comes; you may shoot back at Big Brother“
  - David Brin, Author of „The transparent society“
- US self-regulatory approach
- European legislative approach
Privacy Infrastructure

The Internet

PA Counterpart

Privacy Policy
Accept / Decline

Camera Counterpart

Privacy Beacon

Devices

PA (Privacy Assistant)

Source: Marc Langheinrich
Other law issues

- **Accountability:**
  - are you responsible for the actions of your software agents?
    - false informations, denial of service
    - how ensure/enforce QoS?

- **Consumer protection:**
  - I want to keep a diet
    - but the chips keep calling in the supermarket
  - last milk bottle in the shelf raises its price

- 2 CHF
- 5 CHF
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the problem of explaining the world
UbiComp technology could have revolutionary consequences:
- **perfect memory:** things are never forgotten
  - once a mistake, always a mistake?
- **much more technology dependency**
  - loss of control?
- **new interaction forms needed**
  - can people keep up with the technological progress?

- **many perceived drawbacks**
  
  → Michael’s talk
Ontology:

is this the same bottle?

how about the tomato?

→ General problem: how to represent the world?
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Explain the world

- i.e. provide the links real <-> virtual world
- Philosophical problem
  - which computer scientists try to solve pragmatically
- ... with economical implications
  - same service (DNS-like) for everyone
  - new economic branch
    - two-class society?
- ... and legal ones
  - what if the world is explained badly?
    - the pill-box was not of aspirins, but of morphine
  - IT becomes through UbiComp life-critical
    - in the past just few applications like autopilots
Are we narrowing the gap?

- ... or do we just move the problem?
- to be part of the UbiComp-world you need a world explainer
  - install/configure/update/maintain/…
  - do we all understand the world in the same way?
- new and more complex technology dependencies
  - lots of new problems and possible causes
    - low battery, communication problem, mud in my shoe
- who does the tagging?
  - are these people trustful?
    - to have the „right“ tagging is inherently irresolvable by automation
  - how about UbiComp-viruses?
- and who is tagging the tags?
  - bull-whip-effect in tag supply chain?