



FREEBAND

Bring the lab to the cities: experiences from two Dutch Living Labs

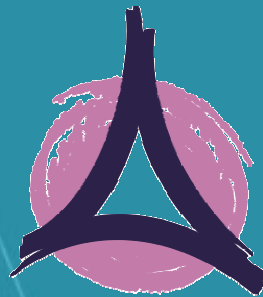
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28-30 June 2006

Manchester

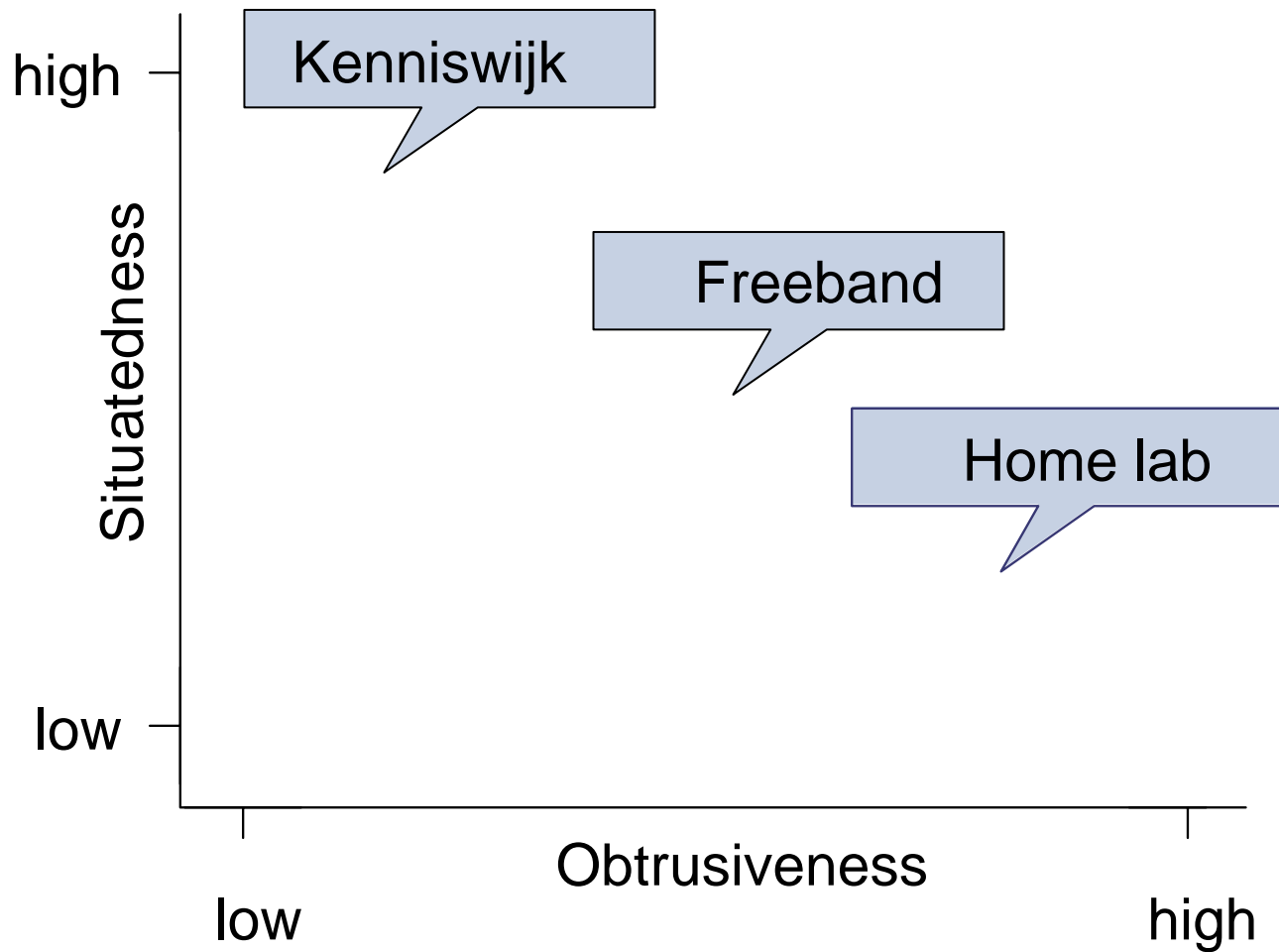


Telematica
Instituut

The Living Lab approach

- The Living Lab approach represents a research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts.
- Most of these Living Lab initiatives are about real-life environments,
- and not about intelligence to facilitate and enhance experience research.





A new paradigm: 4G



ambient intelligence
ambient communications
ambient computing
distributed computing
grid computing
wearable communication
ubiquitous communication
ubiquitous attentiveness
seamless experience

All infrastructure related to a person in his environment will be instantly available anywhere anytime under personal control:
ubiquitous communication

Freeband

- Freeband is a large Dutch research programme on ambient intelligent communication
- (85 million euro budget over 7 years), which comprises more than 30 organizations, including technology providers, knowledge institutes and many representative end-user organizations.
- The focus of Freeband is to pave the way towards fourth generation (4G) communication, i.e., 'seamless communication any time, everywhere and with the best possible means'.
- In the Freeband vision, the user is the center of information and communication, thus a user being in control of his information need and his communication means.



Facts Freeband

- **Freeband Communication**
- April 2004 - December 2008
- 61 Million Euro
- 26 partners, 9 projects, testbed
- Management: Telematica Instituut
- More info www.freeband.nl

- **Freeband Knowledge Impuls**
- April 2002 - April 2004
- 24 Million Euro
- 20 partners, 15 projects, testbed
- Management: Telematica Instituut
- More info www.freeband.nl/kennisimpuls



Research challenges

- **Society, user and applications**
 - understanding and utilizing personal environments, services and networks
 - embedding user behaviour
 - business models
- **Personal environment, services & network**
 - 'distributed intelligence' for personalisation & adaptation
 - pervasive computing, context awareness
 - (seamless) integration of services and networks, ad hoc, P2P
 - security and privacy
- **Enabling technology**
 - ubiquitous optical networking
 - inexpensive broadband radio supporting 4G
 - wearable radio intelligence
 - ultra low power communication



**society,
users and
applications**



applications

context aware enabling services
service adaptation profile management
seamless connectivity
Identity, protection & security content distribution

**service
provisioning,
networking
and access**



**enabling
technology**

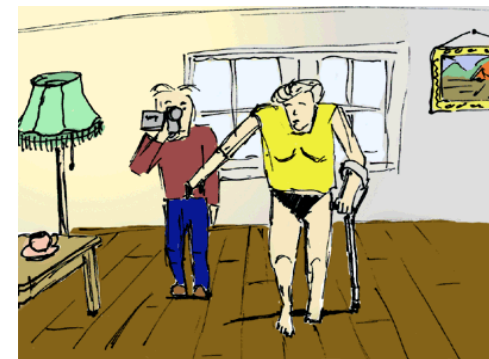
**user experience
(DUI)**

**(IWI)
ambient internet**

TEST BEDS

From cure to well being

- Cure
 - tele monitoring
 - tele treatment
- Care
 - at home
 - tele care
 - integrated healthcare
- Well being
 - preventive
 - family



Neighbourhood pointer

Services aimed at supporting dynamic user groups, and which automatically adapt to changes in the social/ task context of a group



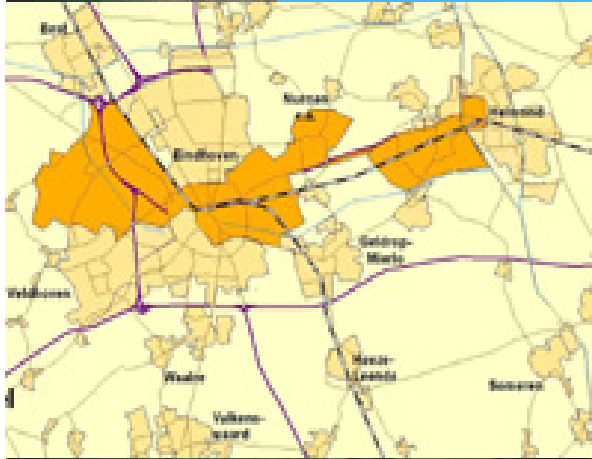
Kenniswijk: experiencing the future

- Kenniswijk is an initiative of the Dutch General Directorate of Telecommunication and Post (DGTP) of the Ministry of Economics.
- Kenniswijk is an experimental environment in the region of the city of Eindhoven where consumers have access to innovative products and services in the sphere of computers, (mobile) communication and Internet (early 2000 – October 2005).
- The intention is that the developments within the Kenniswijk-area are, on average, two years ahead of the rest of the Netherlands in 2005, resulting in a “consumer market of the future”.
- Kenniswijk is a national project (45.4 Million Euro), which is carried out by a small, professional organization with a similar name Kenniswijk BV.

Kenniswijk: an experimental garden

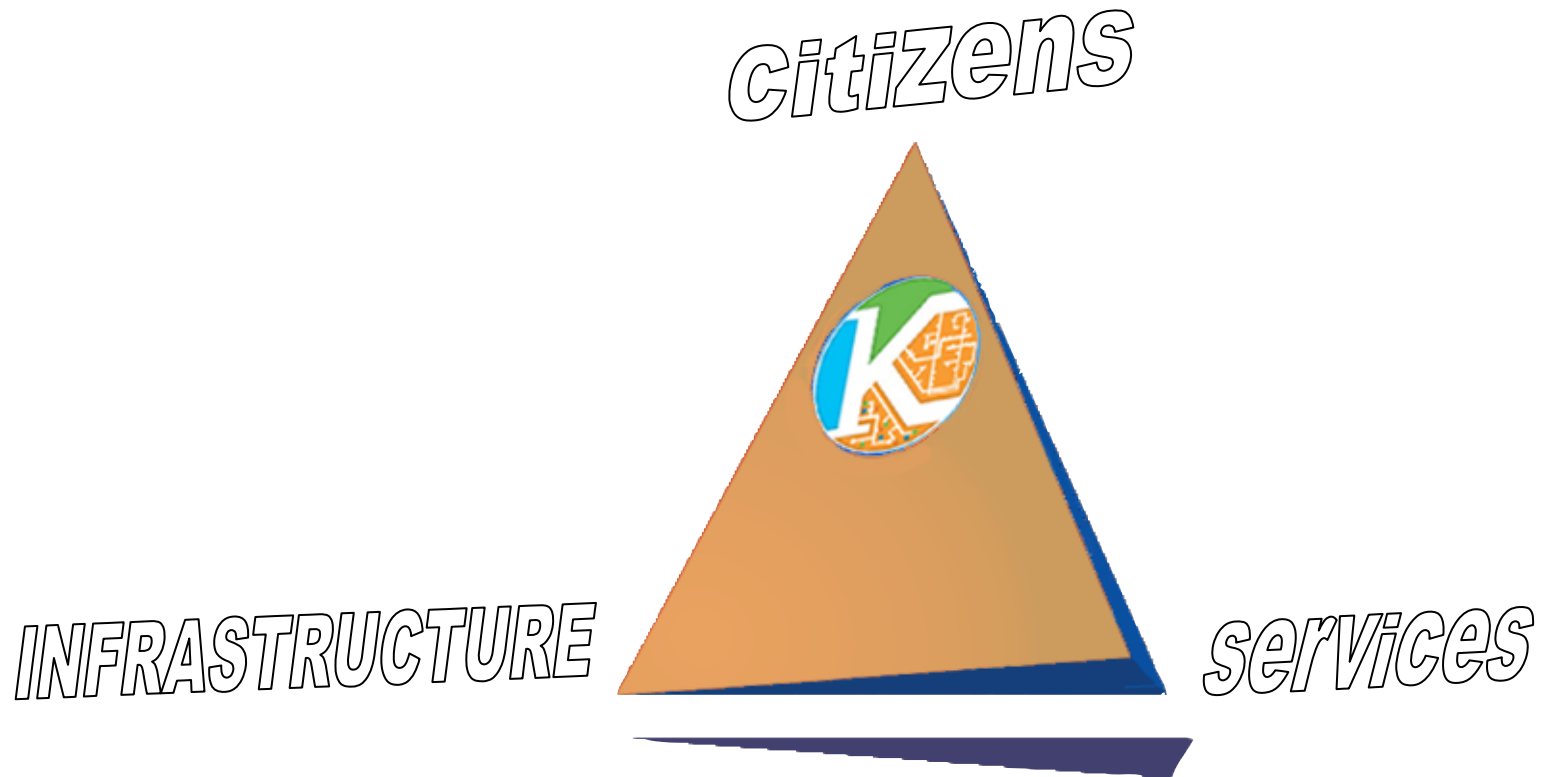


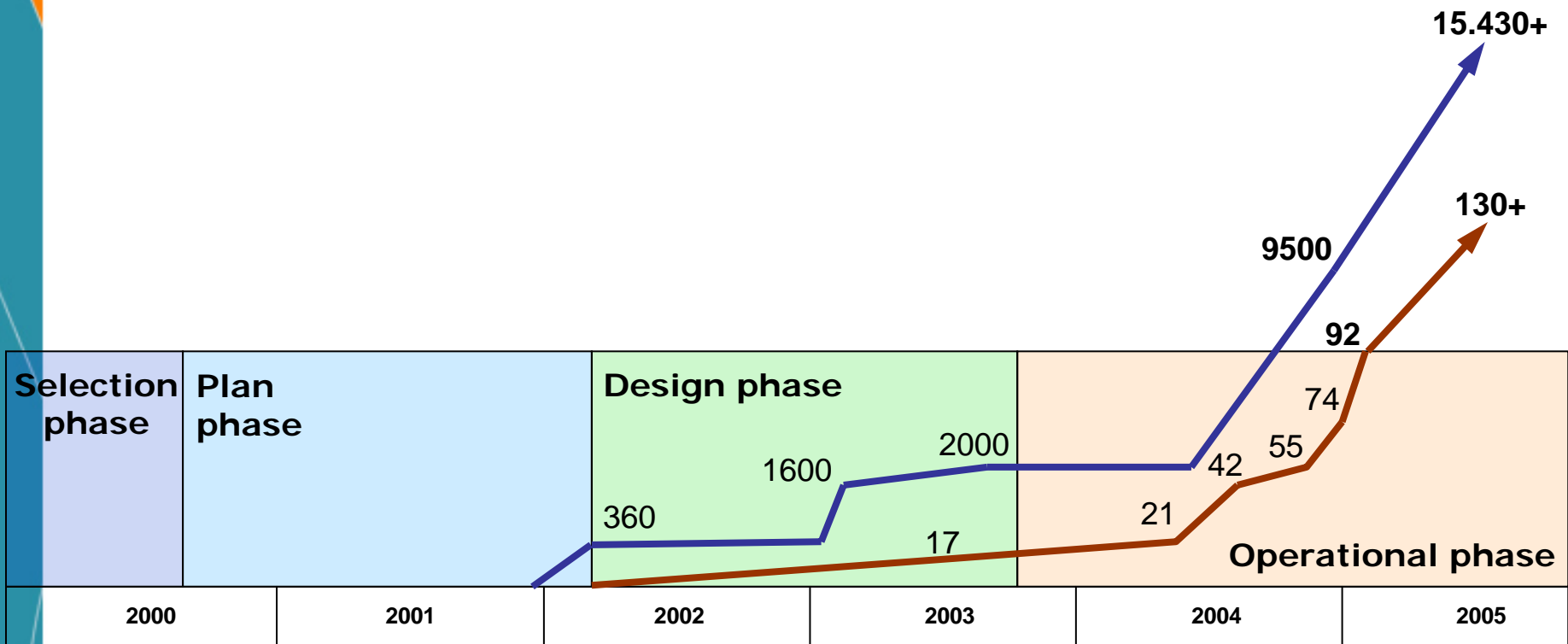
Ambition :
Create an open consumer
market of the future with an
innovative character



The kenniswijk-triangle

• www.kenniswijk.nl





— Fiber-to-the-Home connections
 — Services powered by Kenniswijk

Some exemplary findings

Citizens join forces

The role of the housing agency



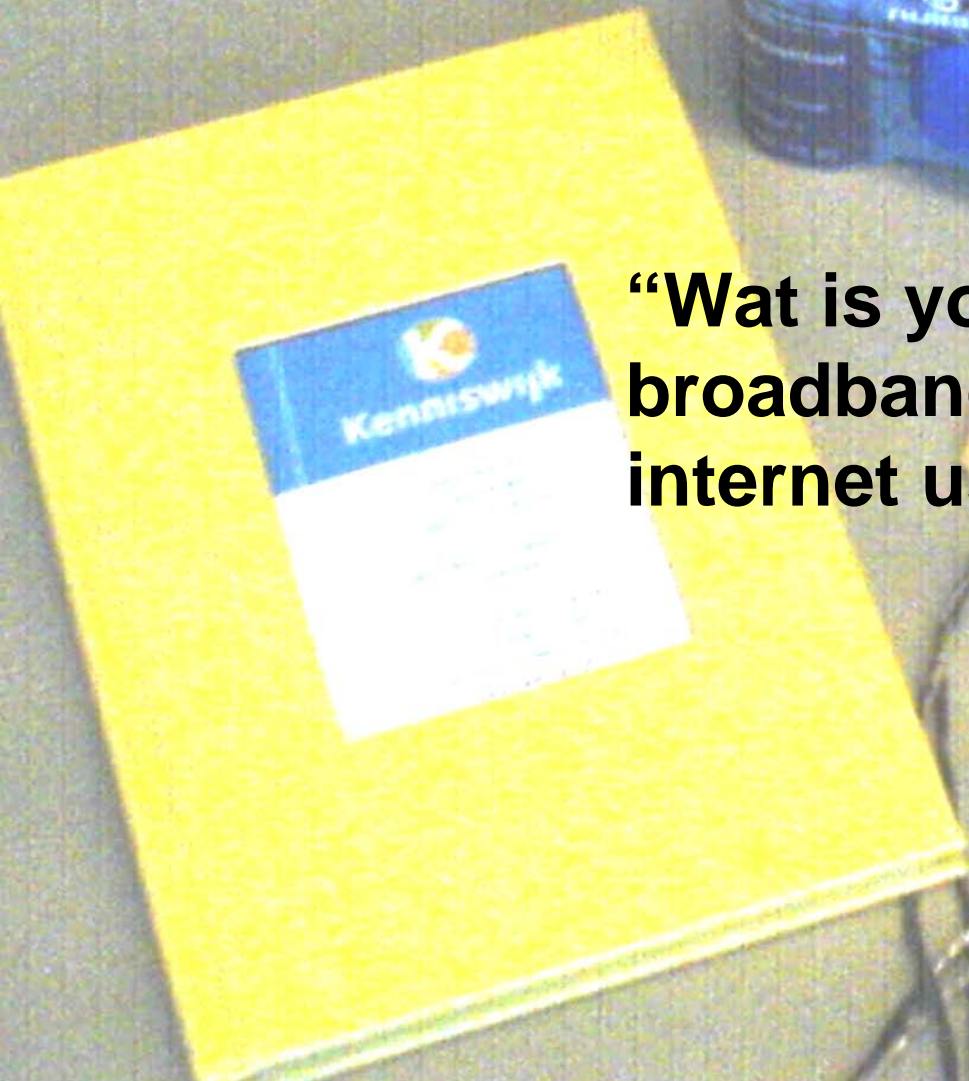
The co-operative model

Research in Kenniswijk

- Baseline studies (and follow-up measurements)
- Experience research
- Usability testing
- Consumer panel
- User-centred design



Personal experiences



“Wat is your experience of broadband services and internet use?”



Advantages – newer news

“An encyclopedia is not always up-to-date. Mostly new flowers or plants are not in the book. On the internet these new forms are added”. Mrs. Jager enjoys surfing the Internet and she is improving her skills. Sometimes she is online until early in the morning. “Recently I was chatting with my daughter till 3.30 AM!” “We found the photos of the new baby of Maxima (just born princess) on ‘NOS teletekst’. The next morning it was in the newspapers (old news!)”.



The value of experimenting

- Learning by practice
- Learning in practice
- Dare to make mistakes
- Unexpected findings



Conclusion

- In sum, Freeband and Kenniswijk are large initiatives of the Dutch government. Without such experimental environments, achieving innovation [in the Netherlands] would be much harder. Such initiatives need to be stimulated in order to reach the ambition of Europe being the most competing and dynamic knowledge society of the world as defined by the European Council in Lissabon (2000).
- From the Kenniswijk and Freeband initiatives we have gained the insight that combining both approaches into one intelligent large-scale real-life environment provides an unobtrusive high quality environment in which usage of (novel) applications can be validated.

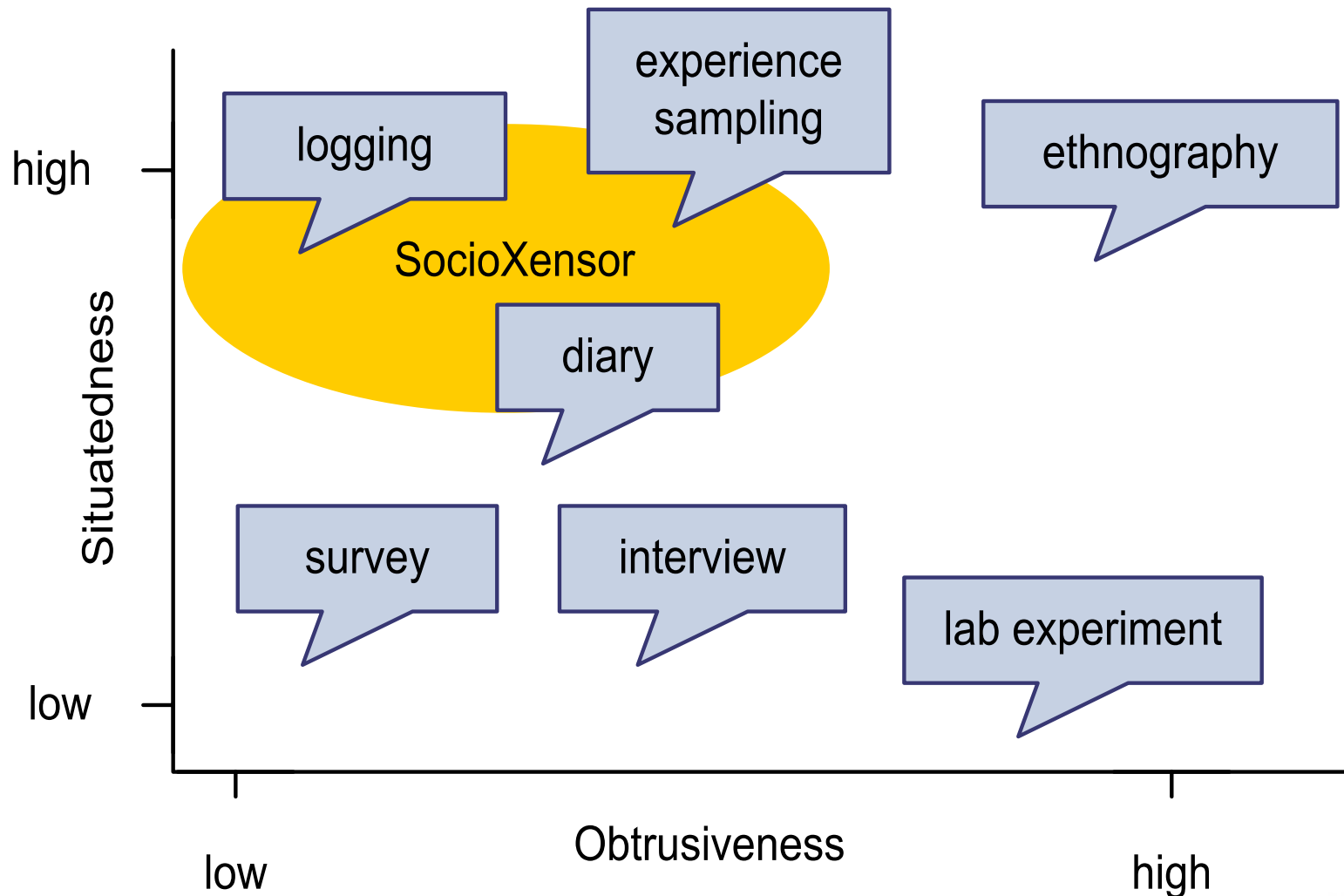


Future of Living Labs

- ... can be envisioned as intelligent large-scale real-life environments.
- Intelligent environments allow for the design of new stimuli from which people can create their own meaningful experiences, which raise new challenges and ask for new methods for data collection and analysis.


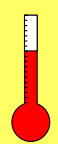
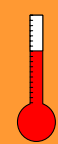


SocioXensor brings the lab to the people, and to the cities where they live



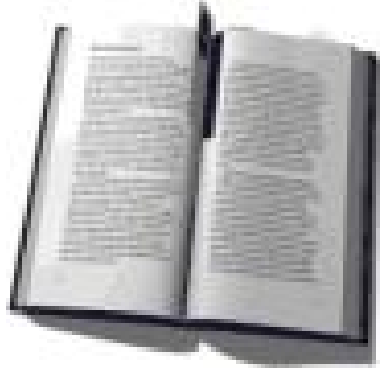
SocioXensor, a Living Lab research tool

in-situ data collection about:

Phenomenon	User Experience	Application Usage	Social Context
Type of data	self-report, subjective	log, objective	log, objective
Examples	needs, emotions, frustrations	application usage	proximity, communication, relation
Measurement Software	Experience Sampler 	Usage Sensor 	Context Sensor 

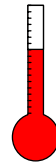
Provide social scientists with ... (in 2008)

Method (book)



***Sensing
user eXperience,
application usage &
(social) ConteXt
in-situ
with mobile devices***

Instrument (tool)



SocioXensor

tested, used and validated

Context Sensors for proximity

Who is near?

- Bluetooth (e.g. 'BlueAware')
- Infrared (e.g. 'Sociometer')
- WLAN
- Audio
- ...
- and correlation of e.g.,
 - GPS,
 - GSM cell-ID,
 - WLAN access point ID,
 - usage of computers at fixed locations.



Context Sensors for communication

Who communicates with whom, how long, which media?

- audio (for f2f conversations, e.g. 'sociometer'),
- mobile telephony
- fixed telephony
- Instant Messaging
- E-mail
- ...



Context Sensors for relations

Is A on the contact list of B? Do A and B have shared contacts?

- E-mail contact lists
- Instant Messaging contact lists
- Speed dial entries in (mobile) telephones
- ...



Other Context Sensors

- Acceleration (vibration), orientation
 - Gait, posture, gesture, activity
- Gaze
- Facial expression
- Physiological (skin temperature, blood pressure, heartrate, skin conductance, muscle activity, etc.)
- Sensors in the field, e.g.
 - Camera observation
 - Building security enter/leave events
 - GSM triangulation by operator
 - Tiny sensors @home, @ office (e.g. chair, door)
 - ...
- ...



Usage Sensors

Which application functions are used, how often?

- Keyboard, mouse events
- Screenshots
- Application events
- ...



Experience Samplers

- Notify user
 - Pager (~semafoon)
 - **Reminder on PDA/Smartphone**
 - Phone
 - SMS
 - Instant Messaging
 - ...
- Collect answers
 - Paper form
 - **PDA/Smartphone application**
 - Voice (-response system / voicemail diary)
 - website
 - i-mode site (wapsite)
 - Instant Messaging (survey “bot”)
 - SMS
 - ...



New challenges

- Analysing social context data, application usage data and user experience data collected in real-life settings present new challenges
- Studying subjective experience data in relation to social context and usage data
- How to deal with the enormous amount of data



Grid technology

- Amount of data can be enormous
 - It's not a priori clear which data is relevant
 - New analysis and reporting modules
 - Scalable, flexible storage and computing resources to cope with large amount.

