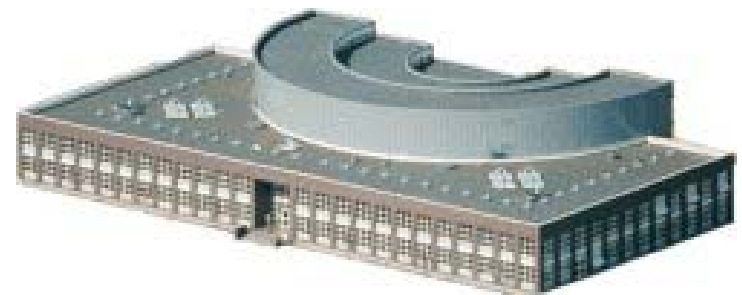


# A wireless solution for mobile collaboration on construction sites



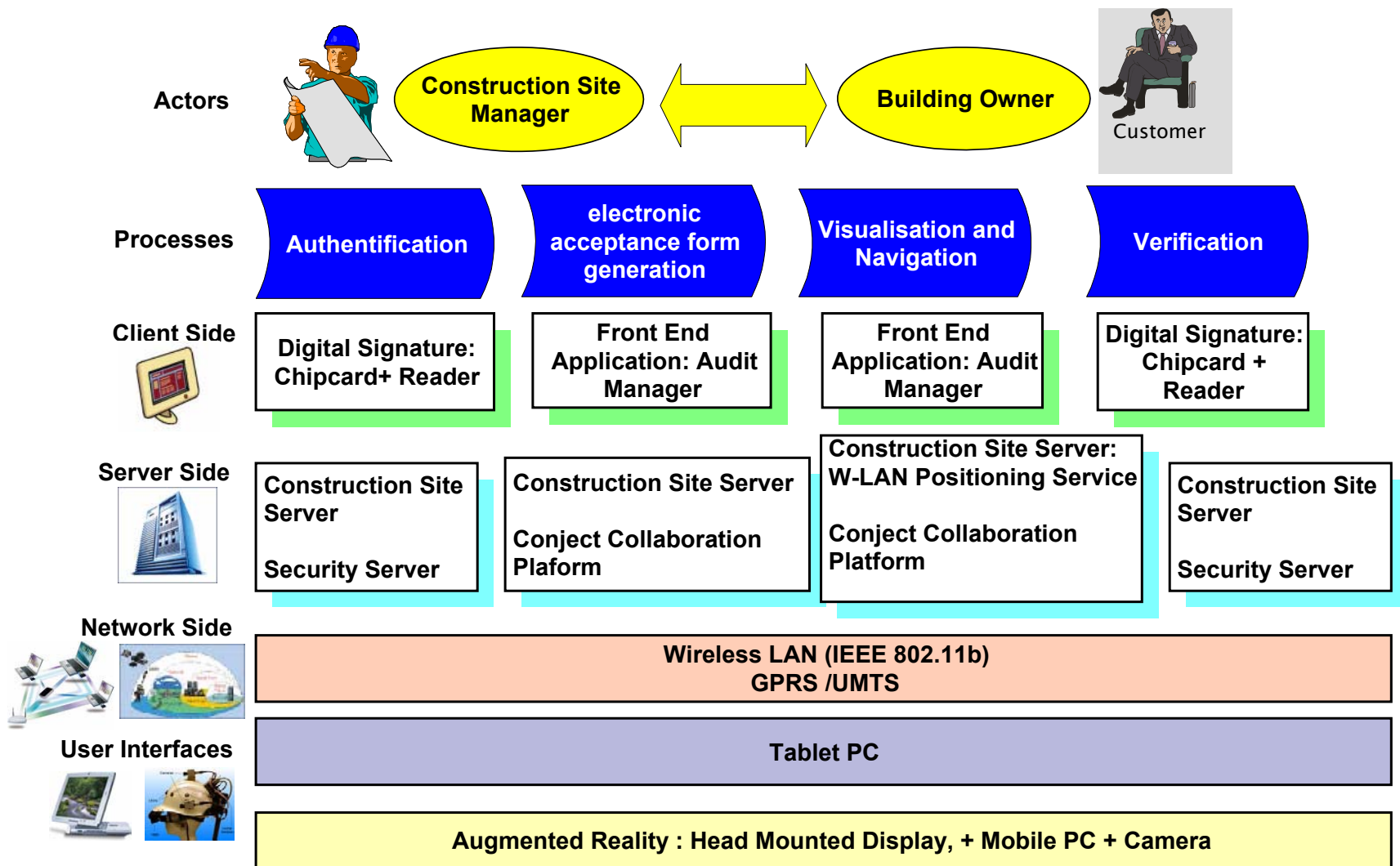
1. The research project
2. The scenario
3. Objectives
4. Approach
5. Applied methodologies
6. The design study
7. Usability experiences
8. Outlook
9. Lessons learnt

## **MOBIKO**

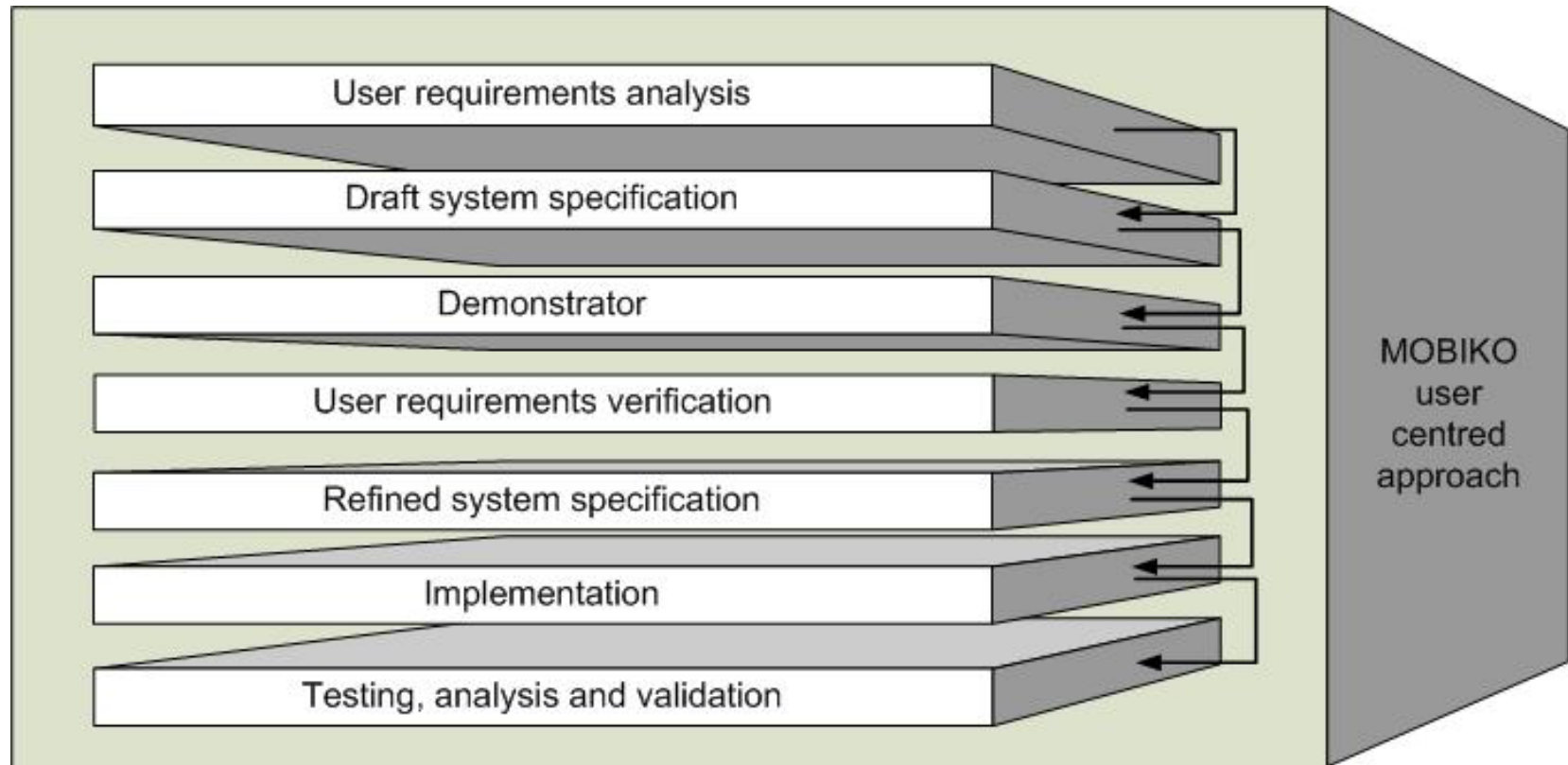
### **Mobile Collaboration in Construction Industry with Wireless Communication Technologies**

- > BMWa-supported project (German Federal Ministry of Trade and Labour)
- > Duration: 30 months
- > Partners:



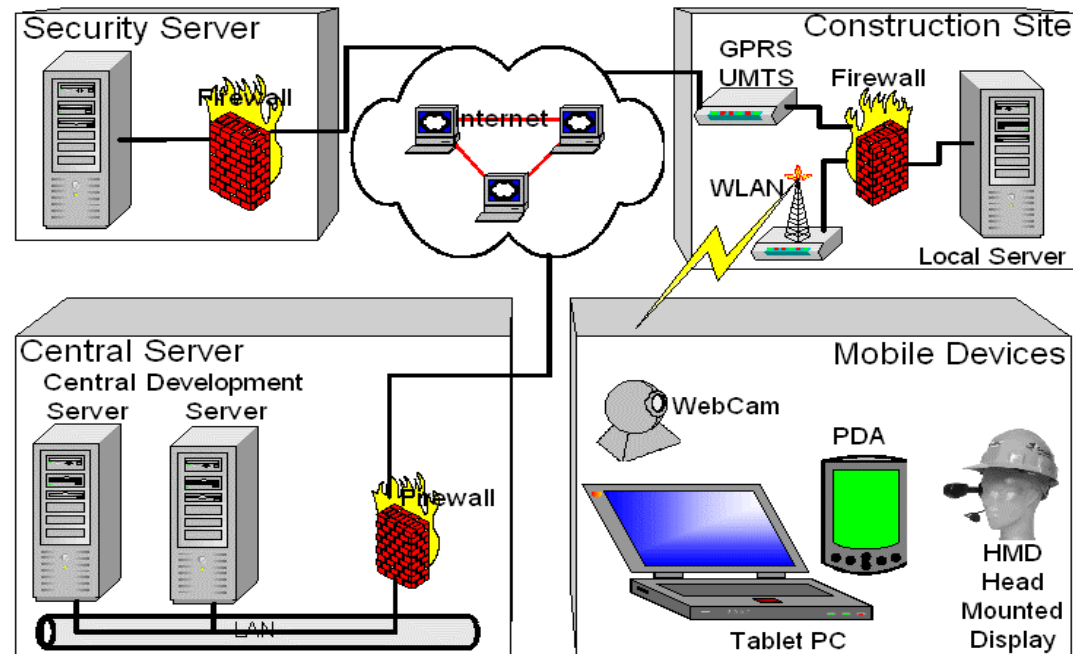


- To introduce 3G/4G communication technologies on construction sites
- To demonstrate the feasibility and foster user acceptance in utilising wearable mobile devices combined with non-traditional interface techniques.
- To find out how new paradigms of work as well as the new mobile interaction styles with advanced mobile applications be accepted by the users
- To justify the need of wireless i-centric solutions in construction.
- To support new methods of work, namely mobile collaboration on remote business environments
- To develop and adapt new wireless applications



- User requirements analysis
  - Scenario development
  - Site visits and interviews
  - Feedback from endusers (e.g. site visits, interviews and questionnaires)
  - UML use cases
- Specification
  - UML diagrams
  - XSD schemes
  - XML documents

- Why...
  - To verify theoretical results
  - To acquire a design study
- How...



**Main requirements:**

- Hands-free interaction
- Flexibility
- Mobility
- Ease of use



Xybernaut „Mobile assistant“



HP Ipaq 55xx



Itronix „Go Book“



Fujitsu-Siemens  
Convertible PC

## Results:

- Too many components  
(mobile PC, display unit, battery pack, mobile mouse, HMD)
- Operation and handling is complicated
- Takes too long to put on
- Too heavy
- Looks “strange”- futuristic
- Processing power of the mobile PC is not up to date
- Power consumption too high
- Helmet does not fit over HMD
- Too many cables



Mobile demonstrator: User testing the Xybernaut mobile assistant

The MOBIKO architecture provides a **communication layer**  
consisting of a web service API...

## **Regarding QoS...**

- ☺ IP roaming
  - ☺ open web service API: Seamless roaming capabilities for the user
  - ☹ Lack in stability
  
- ☹ Web services are not suitable for time-critical functionality across wireless networks
  - ☹ Web service latency across GPRS networks is often unacceptably high for response to calls due to the behaviour of TCP over 2.5G networks

## Regarding security...

- ☺ Provision of a unique identity across the system
  - ☺ Integration of encryption and digital signature (USB smart card stick „Kobil mIDentity“)
  
- ☺ User roles and rights management decoupled from the applications
  - ☺ LDAP mechanisms
  
- ☺ User-friendly, effective and persistent means of authentication
  - ☺ Single sign-on (considering replication, session management and caching)



## Ekahau positioning engine: W-LAN based positioning solution)

- ☺ Full software solution
  - ☺ Minimum investment
- ☹ Reliability
  - ☹ Dynamic environments → recalibration
- ☹ Precision and accuracy
  - ☹ 2.4 GHz characteristic

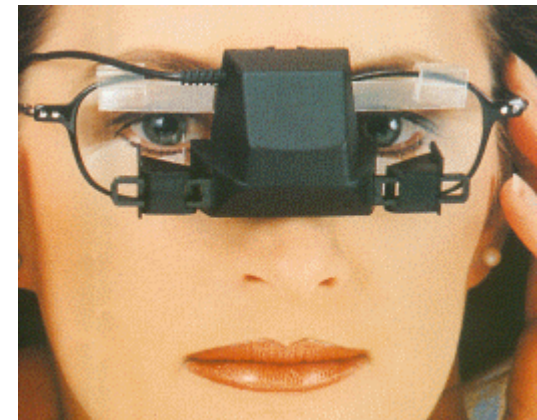


## **Reduce and optimise/customise interface components:**

- Monocular and binocular displays
- Less cables → wireless connection between HMD and mobile device
- Integration of a voice interface for hands-free interaction

## **Analysis of alternative positioning technologies :**

- IEEE 802.11a...
- Bluetooth...
- RFID or RFID-combined...



- User acceptance is high regarding the architecture level...but rather low regarding the usage of non-traditional user interfaces
- There is no “one-fits-all” solution regarding human-machine interfaces...
  - Customized interfaces, applications and devices, adapted to the individual work environment and to the specific deployment purposes prove to be essential
- Web services proved to be a good core integration technology, but still lacking in...
  - WS latency
- There is a need for more accurate indoor positioning solutions

# Thank you for your attention!

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