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E-iED Summit 2011, Madrid

# Using 3D Virtual Worlds to Support Geographically Distributed Software Development Teams

Institute for Information Systems and Computer Media (IICM)  
Faculty of Informatics – Graz University of Technology, Austria

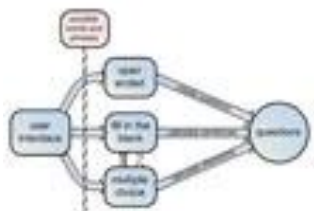
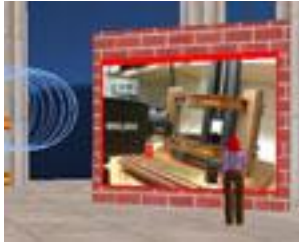
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# About Graz University of Technology 1





- Remote & Collaborative Learning
  - Adaptive e-learning systems
  - Virtual learning environments
  
- E-Assessment
  - Computer-based assessment
  - Peer assessment
  
- Virtual Environments & Setups
  - Virtual 3D World Infrastructure
  - End devices (immersive ... mobile)
  
- Multimedia IR and NLP
  - Access to learning repositories
  - Pre-processing of content

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# Agenda

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- Motivation & Background
- Requirements & Solution
- Evaluation & Results
- Current & Future Work

# Motivation and Background

- Globalization has huge impact on virtual all parts of our life (education, work, private life)
- Impact on all business and industry knowledge, competition, work place
- Software Industry
  - Shortage of local skilled workforce
  - Economic scale and cost structure
  - Extend of working hours and availability

## → Global Project Teams

- Appropriate environments
- Prepare students and employees



# Global Software Development (GSD)

- Definition (Mohagheghi, 2004)
  - Software engineering activities
  - in a globally distributed environment
  - coordinated by synchronous and asynchronous communication
- Issues in GSD (Mockus et al., 2001; Wong et al., 2000)
  - Complexity of organization and communication
    - Communication for information exchange
    - Participation in group activities
    - Control of groups and artifacts
  - Social aspects
    - Different cultural background
    - Different organizational background
    - Trust building and sustainability



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# How to be Successful?

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- ICT can support GSD
  - ... asynchrony & synchrony communication
  - ... knowledge access and transfer
  - ... virtual meetings & collaborative tasks
  - ...
- CS collaborative environments (Gütl, 2011)
  - Available for decades, but most tools ...
  - ... restrict the social presence
  - ... diminish social context cues
  - ... restrict numbers of communication channels

## ? Virtual World

- Gartner (2009b) *"... 90 Percent of Corporate Virtual World Projects Fail within 18 Months"*

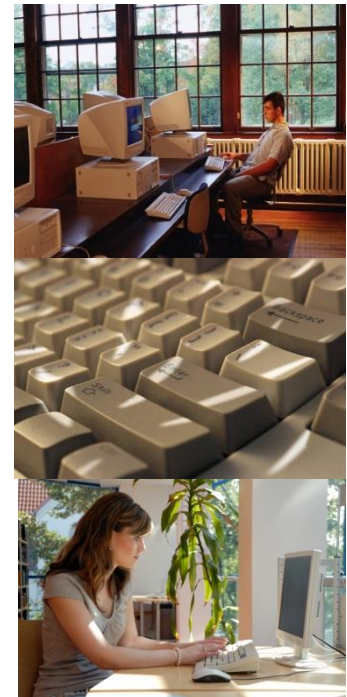
# Advantages of V3DW

(De Lucia et al., 2008; So & Brush, 2006; Bouras & Tsiatsos, 2006; Kemp & Livingstone, 2006)

- *Multiple communication channels*
  - improve social awareness & knowledge transfer
- *Presence (feeling to be part of the environment)*
  - effect suspension of disbelief,
  - increase motivation & productivity
- *Awareness of other avatars and the environment*
  - impact the dynamic of group communication
- *Reducing barriers*
  - improve interaction btw. students & instructors
- *Belonging to a community*  
creates virtual social space, impact learning
- *Facilitating collaboration* on 3D artifacts or other content

# General Requirements

- Communication
  - Multiple communication channels
  - Synchronous communication
  - Asynchronous communication
  - Social and informal communication
- Team awareness
  - Team structure & contact information
  - Presence & absence awareness
  - Peer and activity awareness
  - Expertise & responsibilities



# Application Domain Requirements

- Project and knowledge management
  - Project management tool  
*planning, administering & controlling*
  - Team meetings
  - Access to project documents
  
- Software Development Process
  - Software development tools  
*Analysis, design, implementation & testing*
    - Word processor
    - Graphical tool
    - Presentation tool
    - Web access
    - CASE tools
  - Team meetings

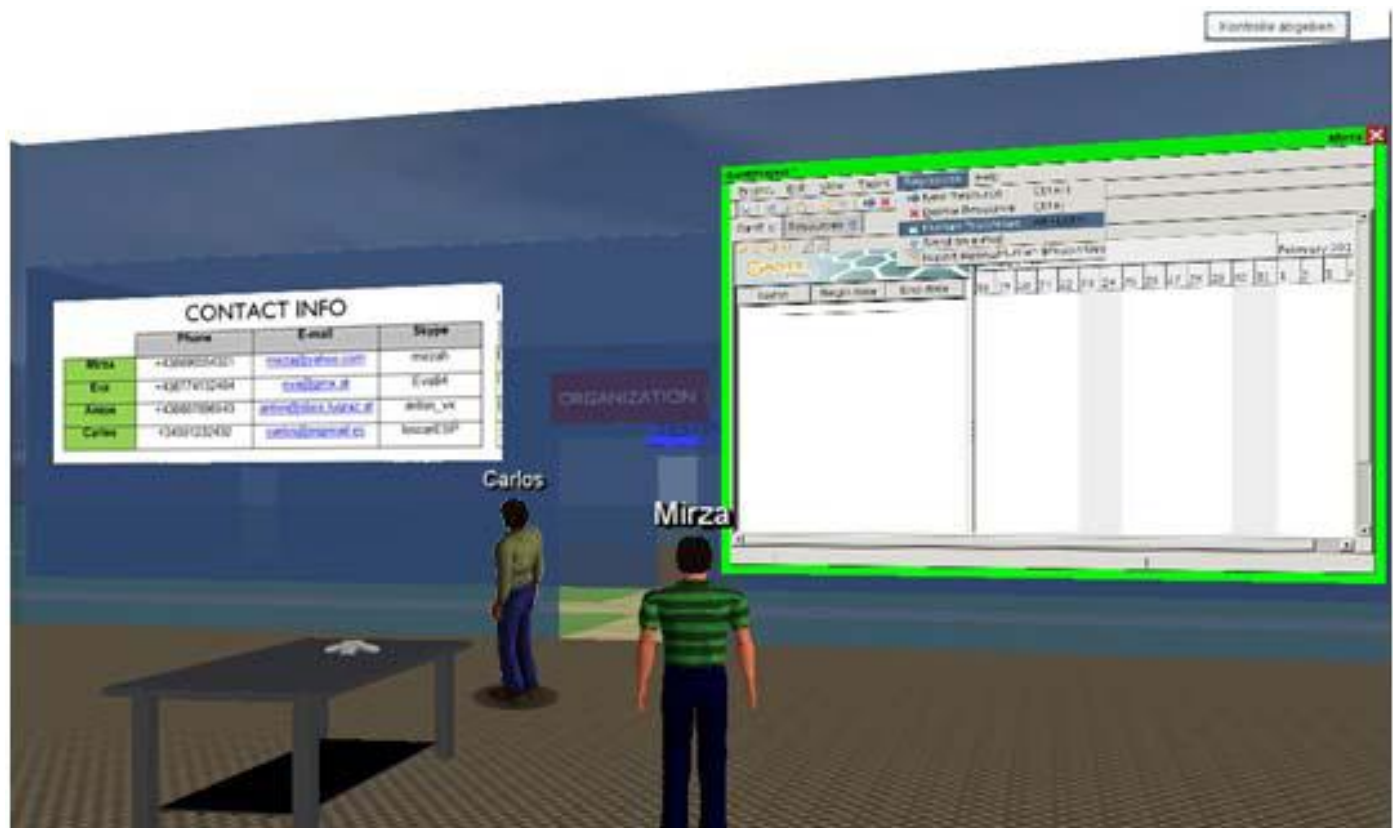


# Conceptual Design

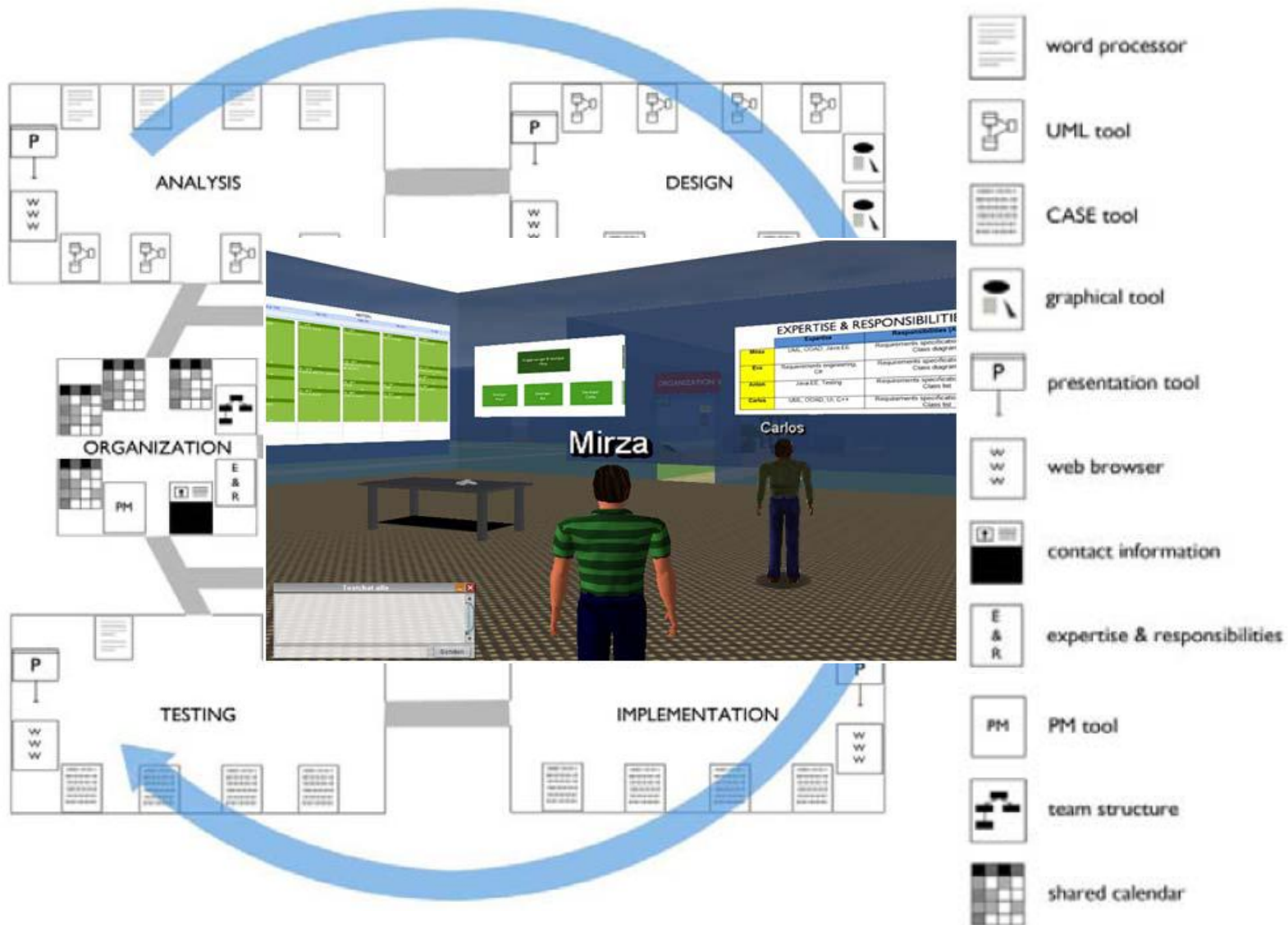


# Project & Knowledge Management

- Providing set of supportive tools for managing the software engineering projects

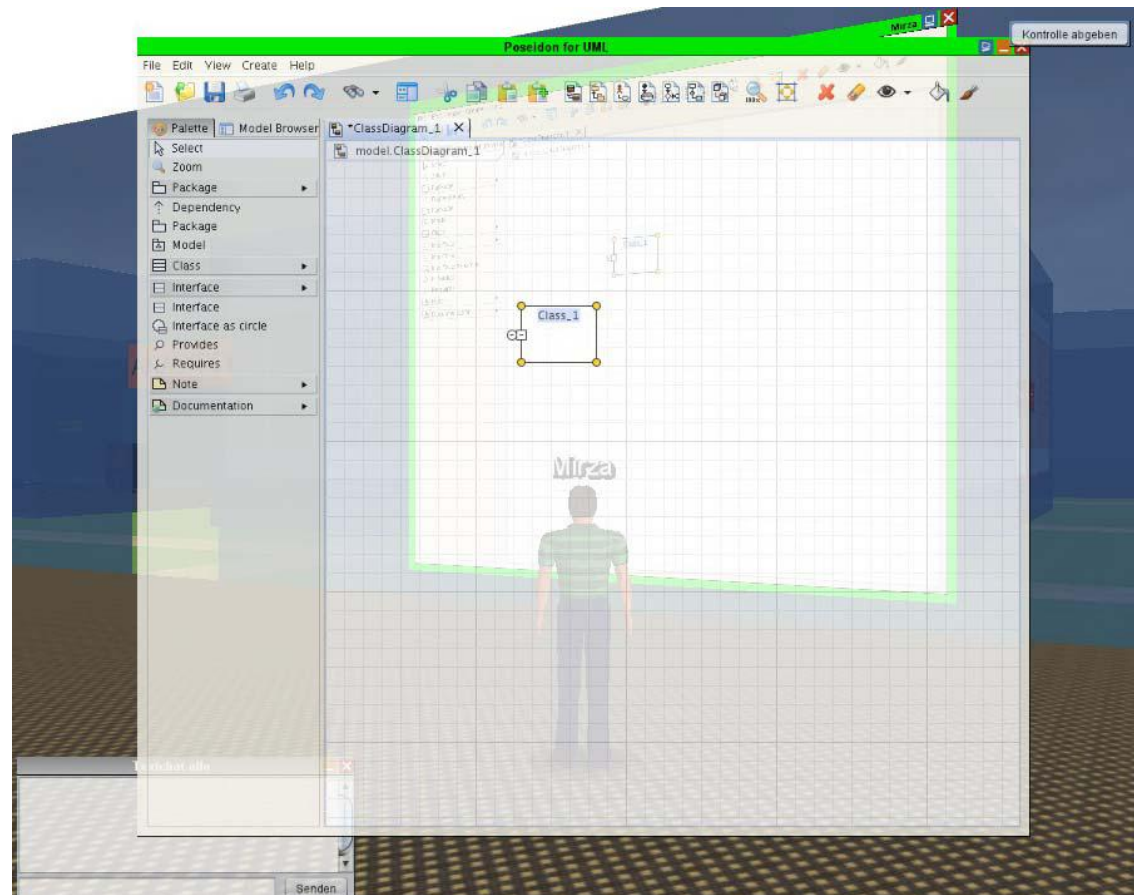


# Project & Knowledge Management

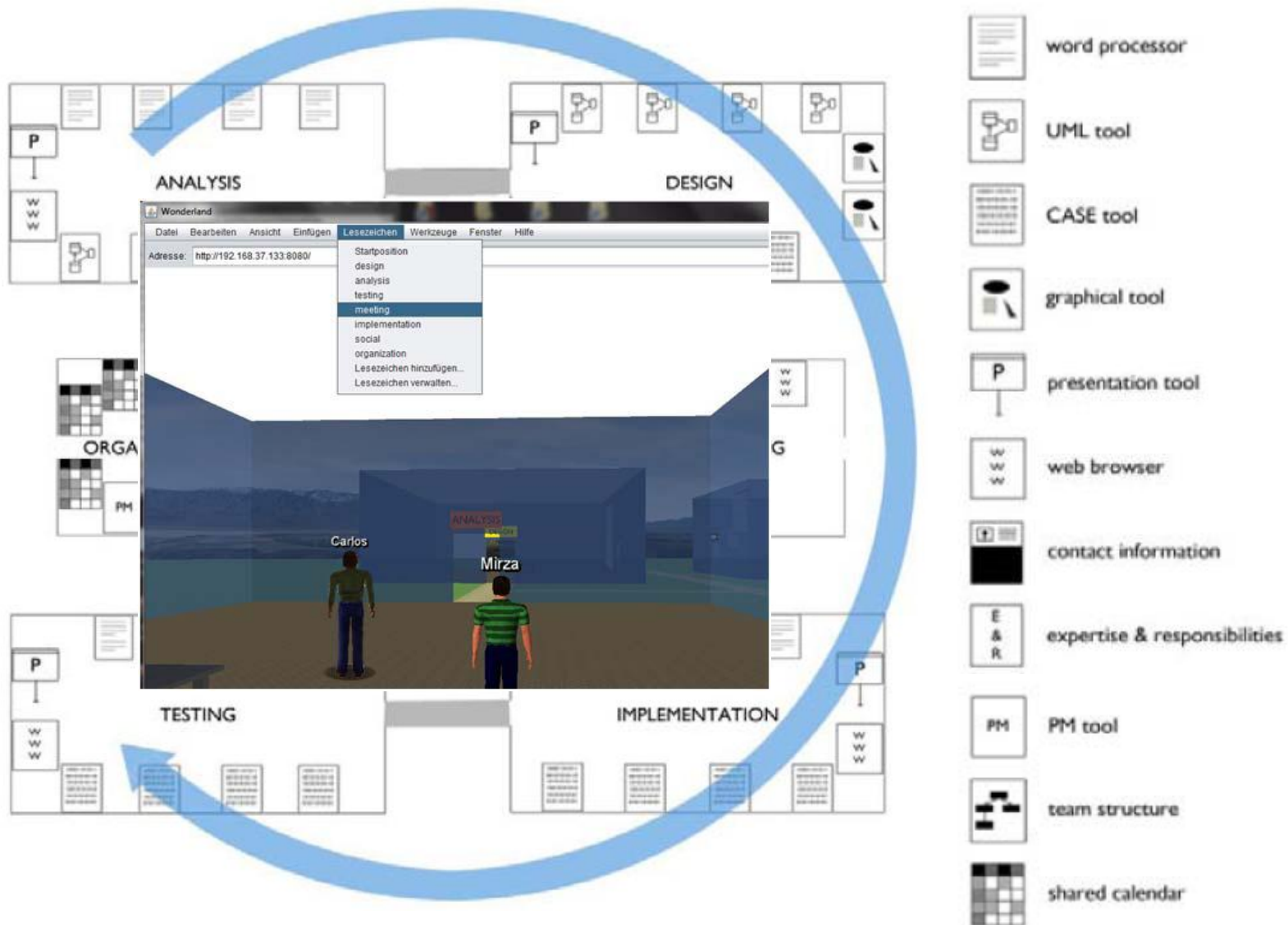


# Software Development Process

- Providing set of supportive tools for each software development phase



# Software Development Process

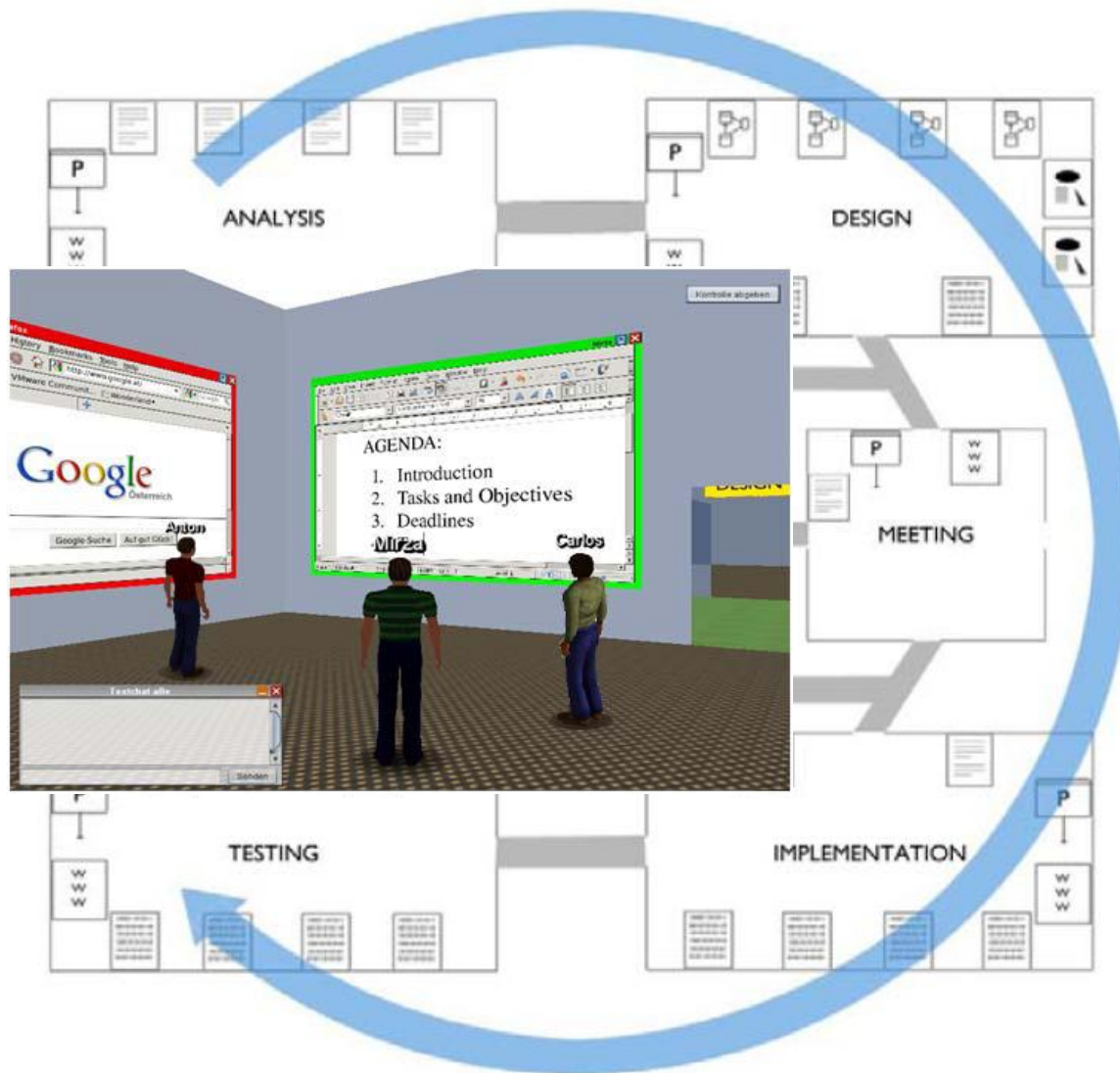


# Meeting Room

- Providing set of supportive tools for formal meetings



# Meeting Room



-  word processor
-  UML tool
-  CASE tool
-  graphical tool
-  presentation tool
-  web browser
-  contact information
-  expertise & responsibilities
-  PM tool
-  team structure
-  shared calendar

# Social Room

- Providing an environment for non formal meetings and socialization



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# Initial User Study

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- Research Interest
  - Does the prototype support the software development process?
  - Does the prototype support the project management process as meta-process of the software development process?
- Study Setup
  - 5 master students (1 female, 4 male) enrolled in software engineering program at TUG
  - Methodology:
    - Pre-questionnaire
    - Presentation of the virtual collaboration environment
    - Test run
    - Post-questionnaire

# Study Results 1/2

- What they liked
  - different facilities for communication (3/5 )
  - possibility to work with other people live (1/5)
  - separate rooms for different software development phases (1/5)
  - concurrent work on documents (1/5)
  - keeping in touch with colleagues and learning from them (1/5)
  - PM tool (1/5)
  - live tracking of project progress (2/5)
  
- What they disliked
  - Performance (5/5)
  - inability to change window size of shared applications (1/5)



# Study Results 2/2

- Overall impression of the environment  
Likert scale between 1 (worst) to 5 (best)
  - Distributed software engineering (mean 4.6)
  - Distributed project management (mean 4.2)
  - General impression (mean 4.4)
- Room for improvements
  - Performance
    - Big server and sufficient RAM (~ 1 GB per user)
    - Reduce number of shared applications
  - Flexibility
    - Instantiate shared application just when needed
    - Enable group and user to configure set of tools for each of the rooms task dependent

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# Conclusions & Future Work

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- 3D virtual worlds can be used to mitigate issues and challenges in distributed software engineering and project management
- Richer communication, mirroring of work environments of physical world, and the use of avatars
- Improvements
  - Flexible environment based on task-specific needs
  - Production server (sufficient RAM)
- User Studies
  - on training activities
  - Usage in real development scenarios

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# Questions & Contact Information

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Thank you for your Attention!  
Questions are welcome!

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