

# Three Frames for Studying Users in Virtual Environments: Case of Simulated Mobile Machines

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# Outline

## Studying Users in VE

- The case - presented by Asko Ellman
  - Mobile Work Machines
  - Simulated Mobile Machines in VE
- Three frames - presented by Tarja Tiainen
  - Technology
  - Work / task
  - People

# CASE: Mobile Work Machines

- We focus on the development of their cabins with virtual prototyping



# CASE: Used VE technology



## Elements:

- 3 wall walk-in VE
- Real-time simulation and visualization of a machine
- Sounds of a machine
- Physical components
  - a bench
  - controls
- Motion platform

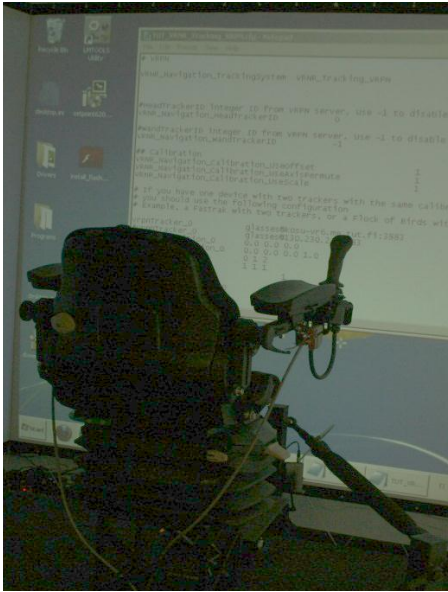
# Case of Simulated Mobile Machines



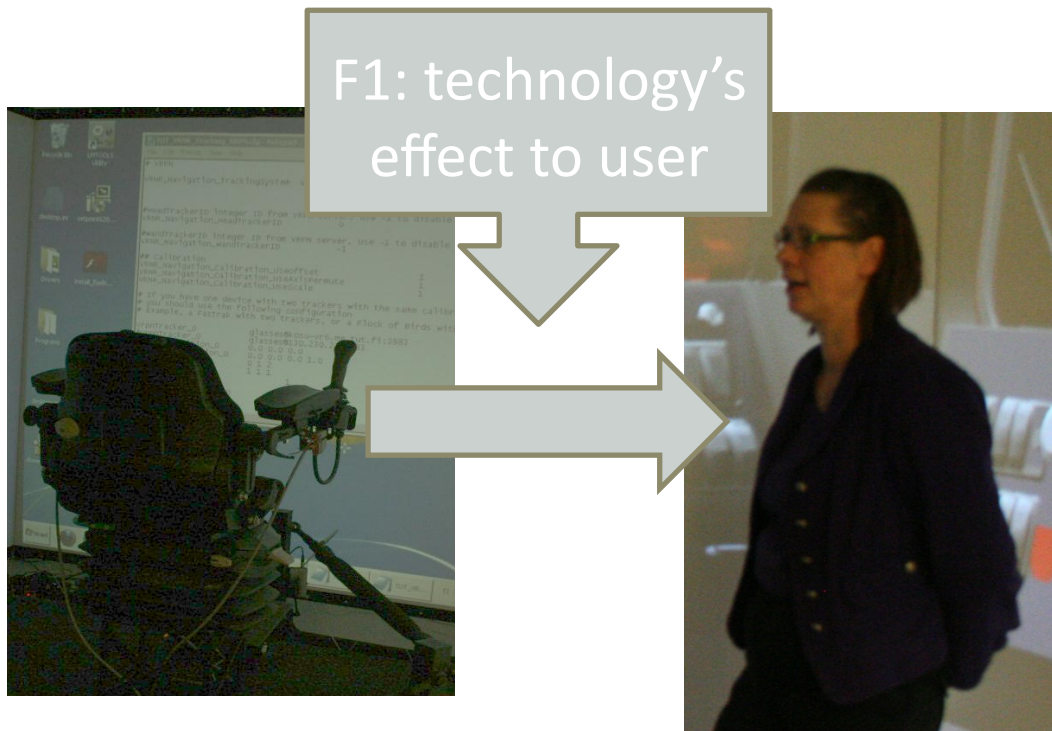
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Tiainen, Ellman, Kaapu: Three Frames for Studyin Users

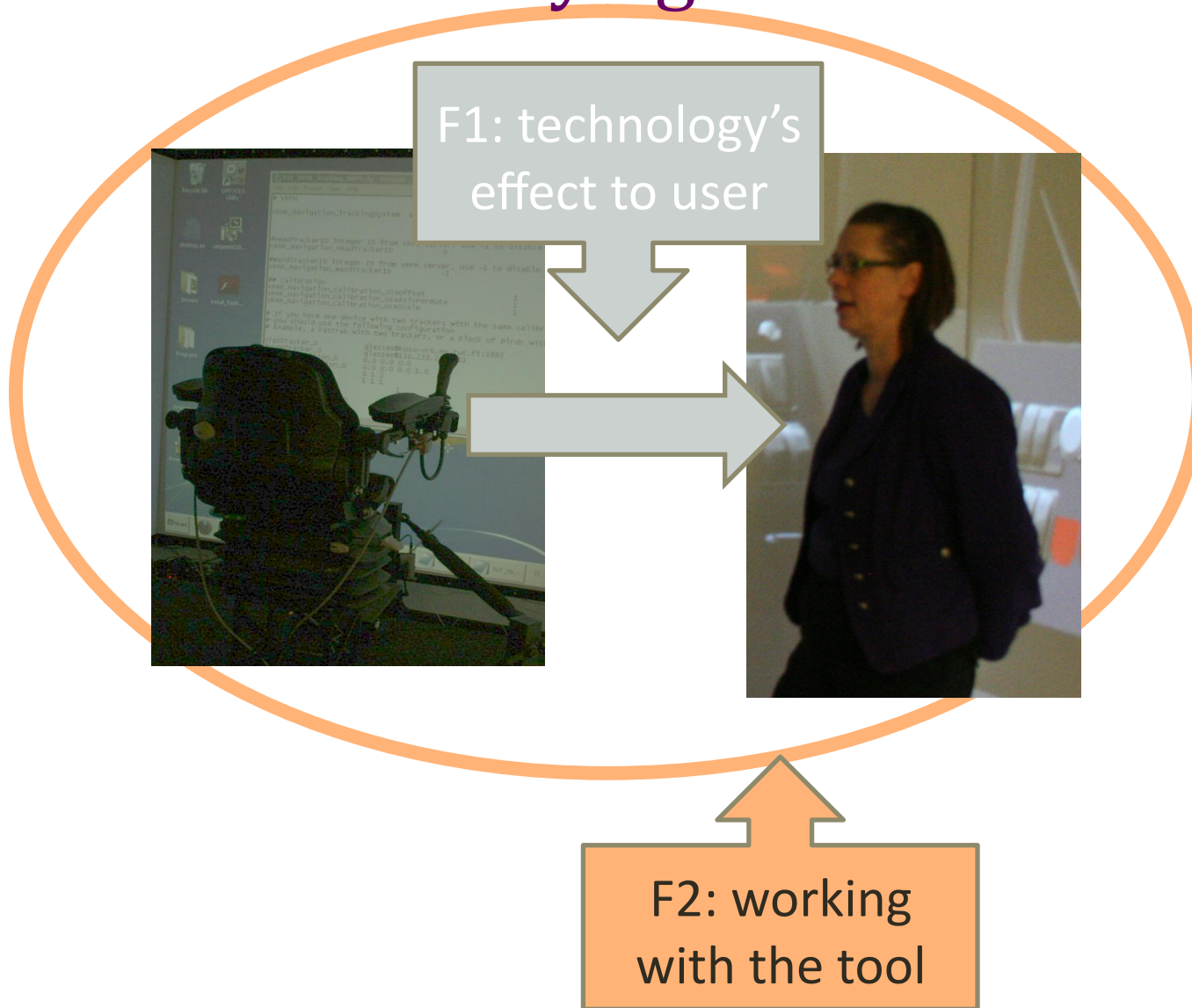
# Frames for Studying Users in VE



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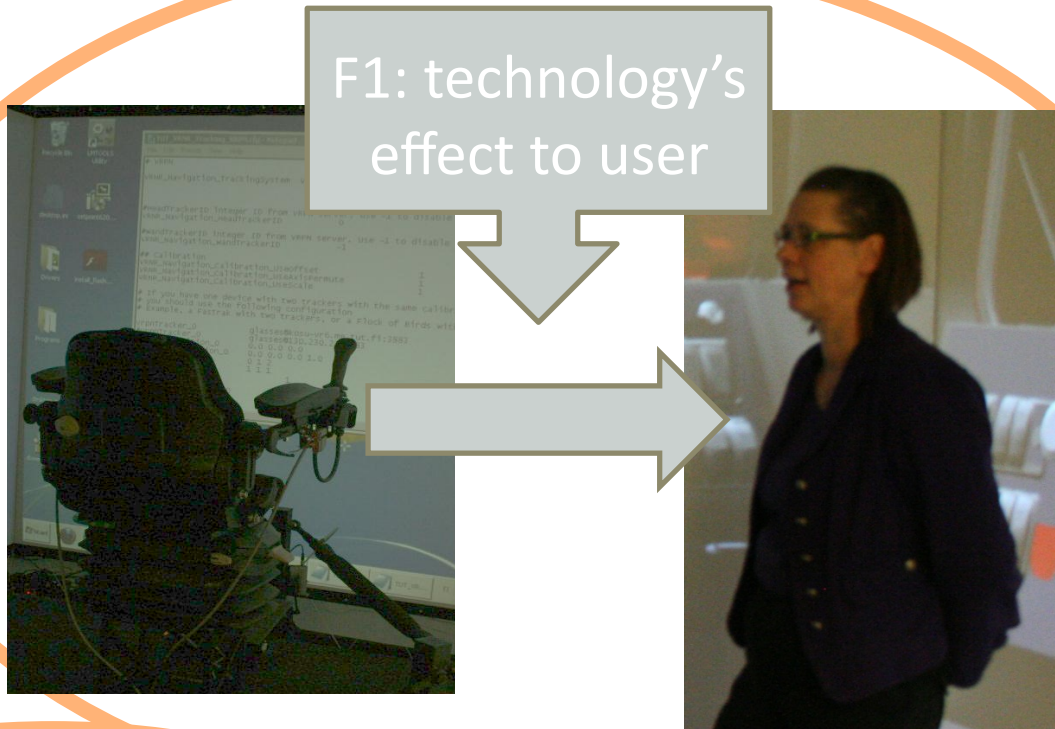


# Frames for Studying Users in VE



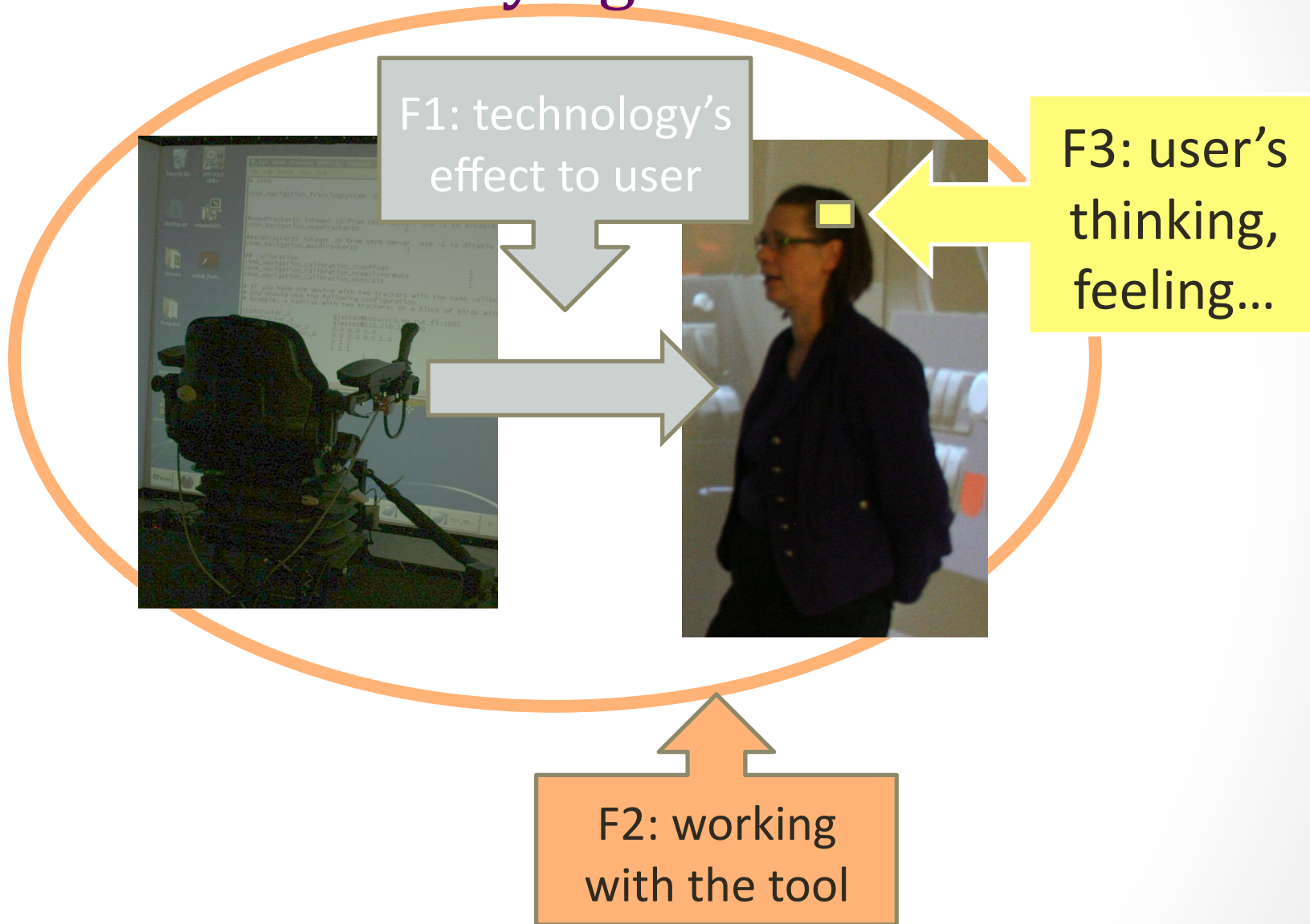


# Frames for Studying Users in VE



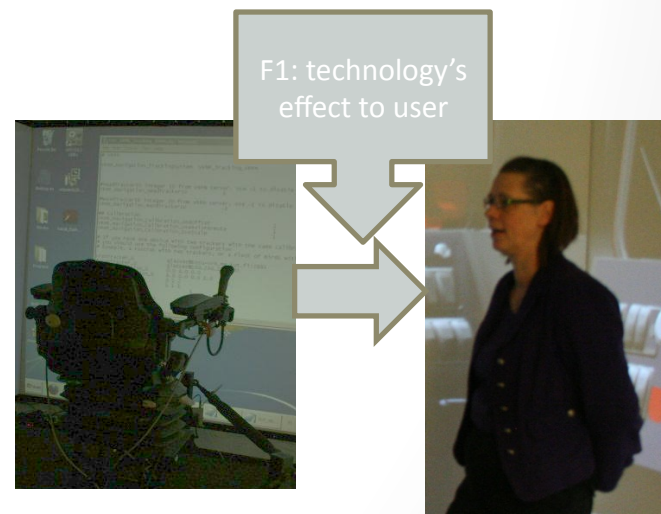
F2: working with the tool

# Frames for Studying Users in VE



# Frame 1: Technological environment for users

- The concept of *presence*
  - refer to a sense of realism in computer-generated environments
- The virtual test situation as realistic as possible
  - Focus on developing of technology
- Aspects of presence
  - Interaction, immersion and autonomy by Zeltzer 1992
  - Real, spatial, attention, being there, action, arousal, interactivity and exploration by Särkelä et al. 2009



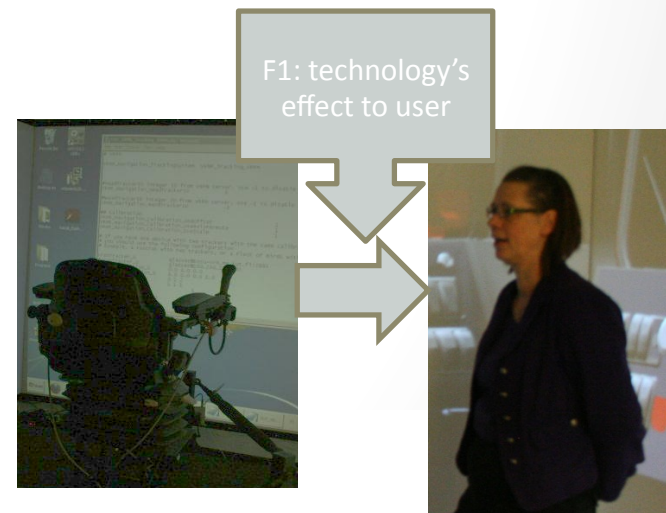
# Frame 1: Technological environment for users

- Our study: The effect of better VE technology on users' actions
- The group G1
  - 1. test drive: 2D visualization, no head tracking
  - 2. test drive: 3D stereoscopic view and head tracking
- The group G2
  - 1. test drive: 3D stereoscopic view and head tracking
  - 2. test drive: 3D stereoscopic view, head tracking and motion platform
- The driving task in each test run was the same
  - drive into a pile of rocks,
  - load as many rocks as possible in the bucket,
  - drive a few hundred meters to the unloading zone,
  - empty the bucket.
- The simulation system measured...
  - the time of the task
  - the weight of rocks
  - the number of collision
- no better results (in test drive) with 3D and motion platform

# Frame 1: Technological environment for users

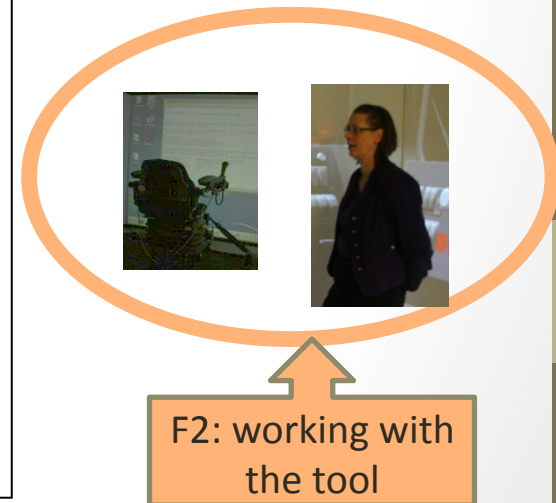
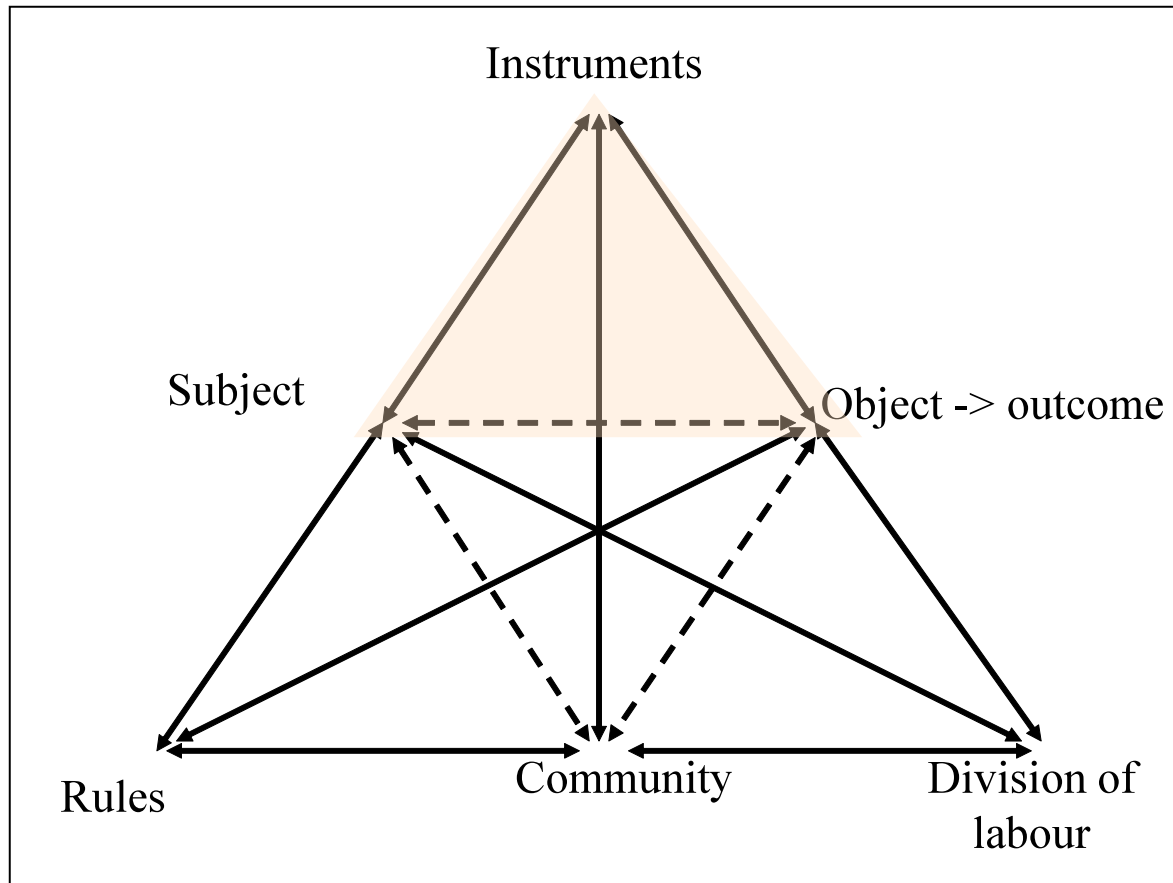
- The concept of *presence*
- The virtual test situation as realistic as possible

USER	TASK in VE	CABIN
<ul style="list-style-type: none"><li>- Mechanical view of human</li><li>- No personal differences</li></ul>	<ul style="list-style-type: none"><li>- Controlled lab test</li><li>- Measurable objective</li><li>- Starting point: cabin features</li></ul>	<ul style="list-style-type: none"><li>- Visibility</li><li>- Ergonomic</li><li>- Functionality</li></ul>



# Frame 2: Simulating work situation

- Focus on work tasks
- Based on extended activity theory



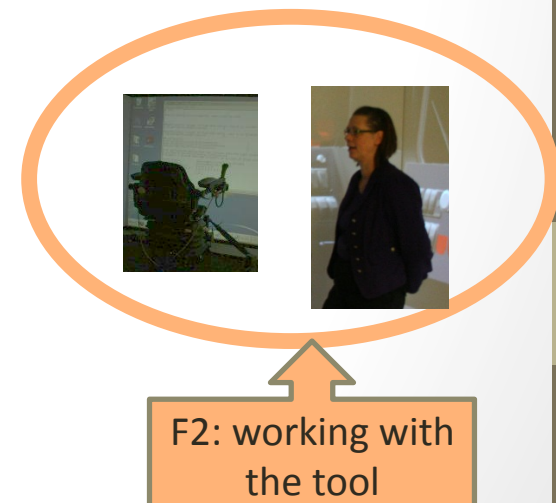
# Frame 2: Simulating work situation

- **Our study: Drivers work practice**
- The test drivers with 3D + head tracking + motion platform
- The driving task
  - drive into a pile of rocks, load rocks in the bucket, drive to unloading zone, empty the bucket.
- Driving situation
  - Observing, interviewing
  - Designers watched from web camera
    - Not guided the drivers
    - See that the work practice differs from the one that was planned
- Result
  - The test drivers talked about the virtual prototype as it was a real machine

# Frame 2: Simulating work situation

- Focus on work tasks
- Based on extended activity theory

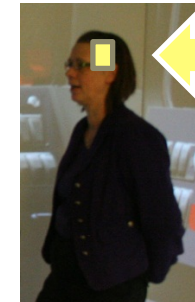
USER	TASK in VE	CABIN
- Member of work community - Situated acting	- Starting point: work practice - Description of work	- How cabin fits to work practice





# Frame 3: Emotional User

- UX – facet of emotion and affect
- users are seen as subjective and emotional
- differences between the test users
- users' negative and positive emotions affect their performance during the VE test



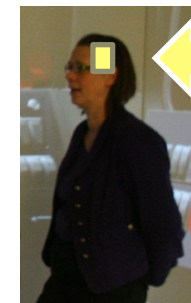
F3: user's  
thinking,  
feeling...

# Frame 3: Emotional User

- **Our study: Users' feelings about better VE technology**
- The test groups:
  - G1 ( 2D – 3D + head tracking)
  - G2 ( 3D + head tracking – 3D + tracking + motion platform)
- The driving task in each test run was the same
  - drive into a pile of rocks, load rocks in the bucket, drive to unloading zone, empty the bucket.
- Fill in a form ...
  - Answers given on a 7-point unnumbered scale
  - 1. How much were you able to control events?
  - 2. How responsive was the environment to actions that you initiated (or performed)?
  - 10. To what extent did you feel like actually being in a mine
- Results:
  - Better technology = more real feeling

# Frame 3: Emotional User

USER	TASK in VE	CABIN
<ul style="list-style-type: none"><li>- Subjectivity</li><li>- Feelings, joy</li></ul>	<ul style="list-style-type: none"><li>- Controlled lab test</li><li>- Measurable objective or users' own evaluation</li></ul>	<ul style="list-style-type: none"><li>- Subjective evaluation of cabin (or VE)</li></ul>



F3: user's thinking, feeling...

# 3 Frames: alternative scientific paradigms

- All frames are useful in research
- Depending on the research purpose, objective, and question which frame should be used

FRAME	USER	TASK in VE	CABIN
<b>Frame 1:</b> Technological environment for users	- Mechanical view of human - No personal differences	- Controlled lab test - Measurable objective	- Visibility, - Ergonomic - Functionality
<b>Frame 2:</b> Simulated work situation	- Member of work community - Situated acting	- Starting point: work practice - Description of work	- How cabin fits to work practice
<b>Frame 3:</b> UX (emotion and affect)	- Subjectivity - Feelings, joy	- Controlled lab test - Measurable obj. or users' evaluation	- Subjective evaluation of cabin