

**week**

**14**



# Evaluating TUIs

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Approaches for novel interfaces

# Lecture Outline

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- Quantitative evaluation of TUIs: Pico [Patten & Ishii, 2007]
- Multiple and heterogeneous interpretations [Sengers & Gaver, 2006]
- Research through design [Zimmerman et al., 2007]
- More examples

# Evaluating Tangibility

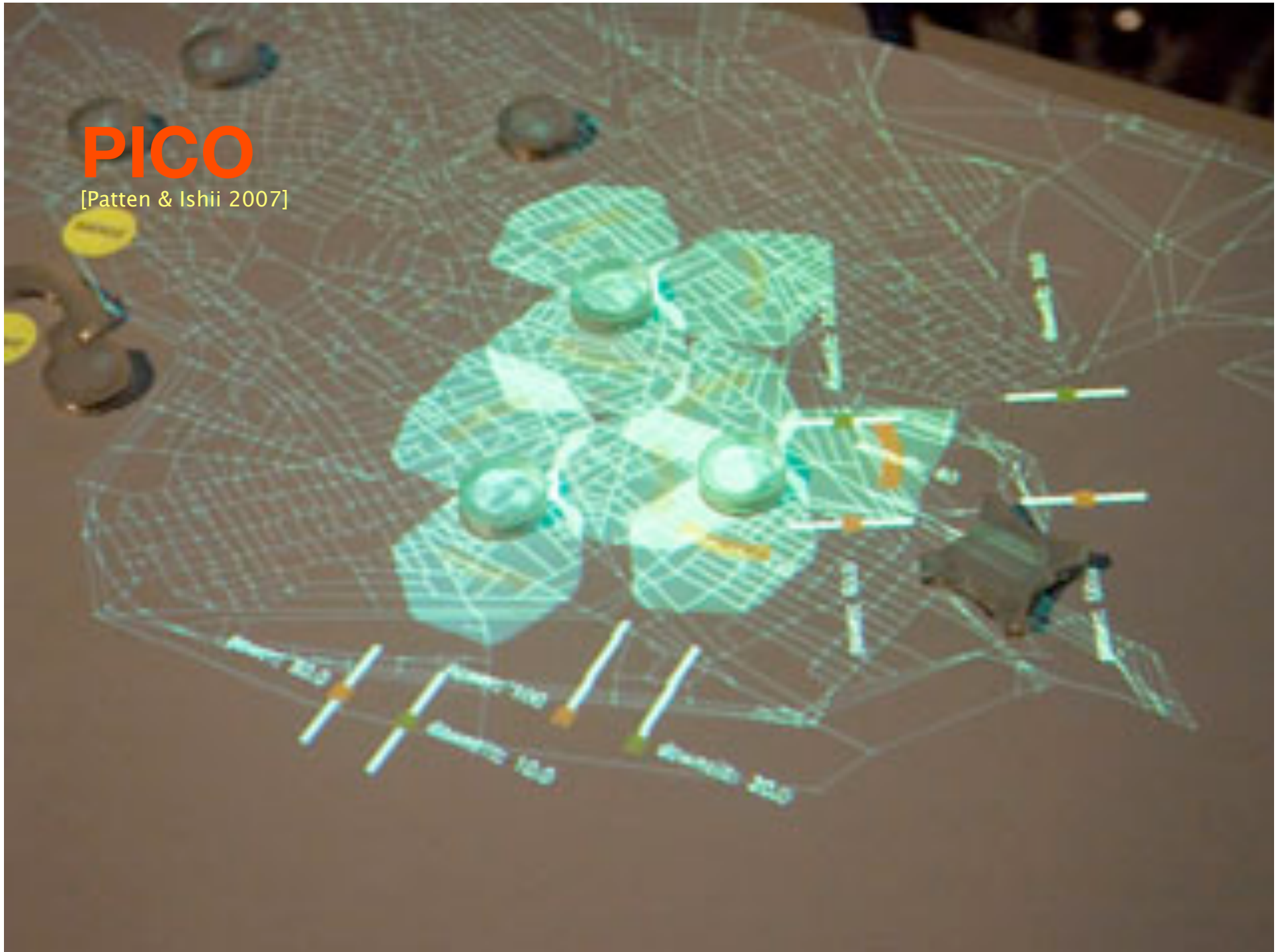
Studies of TUI in the cellphone tower placement task

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[Patten and Ishii, 2007]

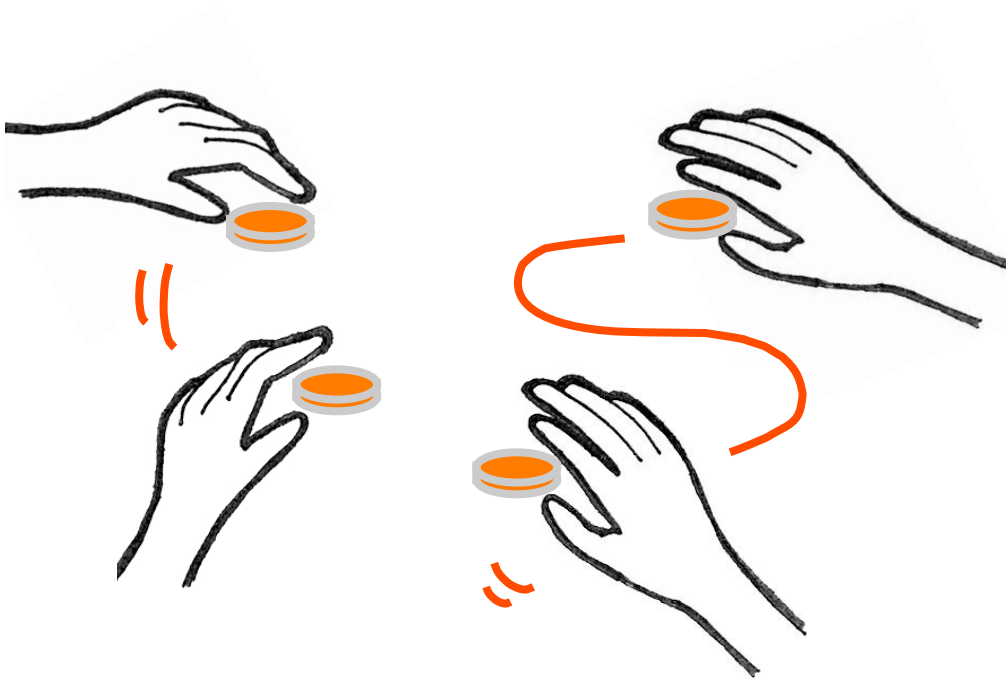
# PICO

[Patten & Ishii 2007]



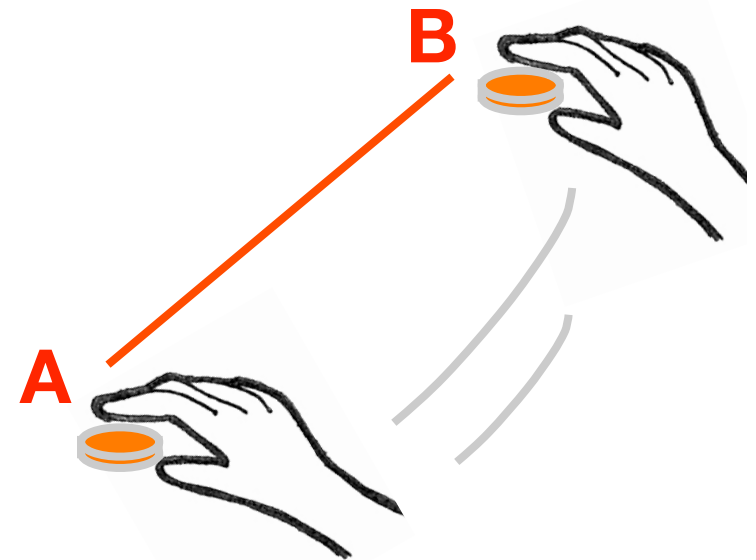
## Epistemic Action

Users change their environment to search for the best solution or strategy to perform a task.



## Pragmatic Action

Action taken to actually perform the task.



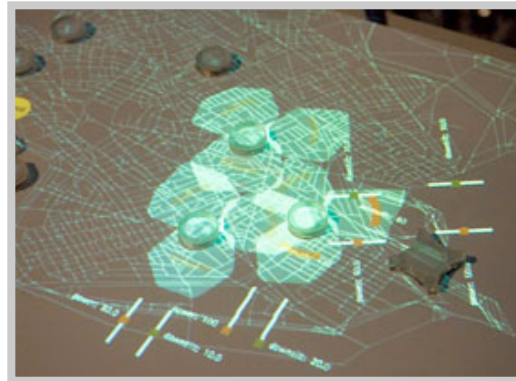
[Kirsh and Maglio, 1995]

# PICO Study [Patten & Ishii, 2007]

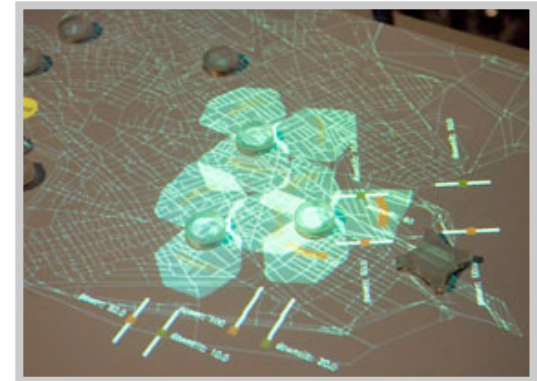
- 15 participants, within-subject study
- Position the towers to reach an optimal coverage under 4.5 minutes



**Screen**



**Pico w/o actuation**



**Pico**

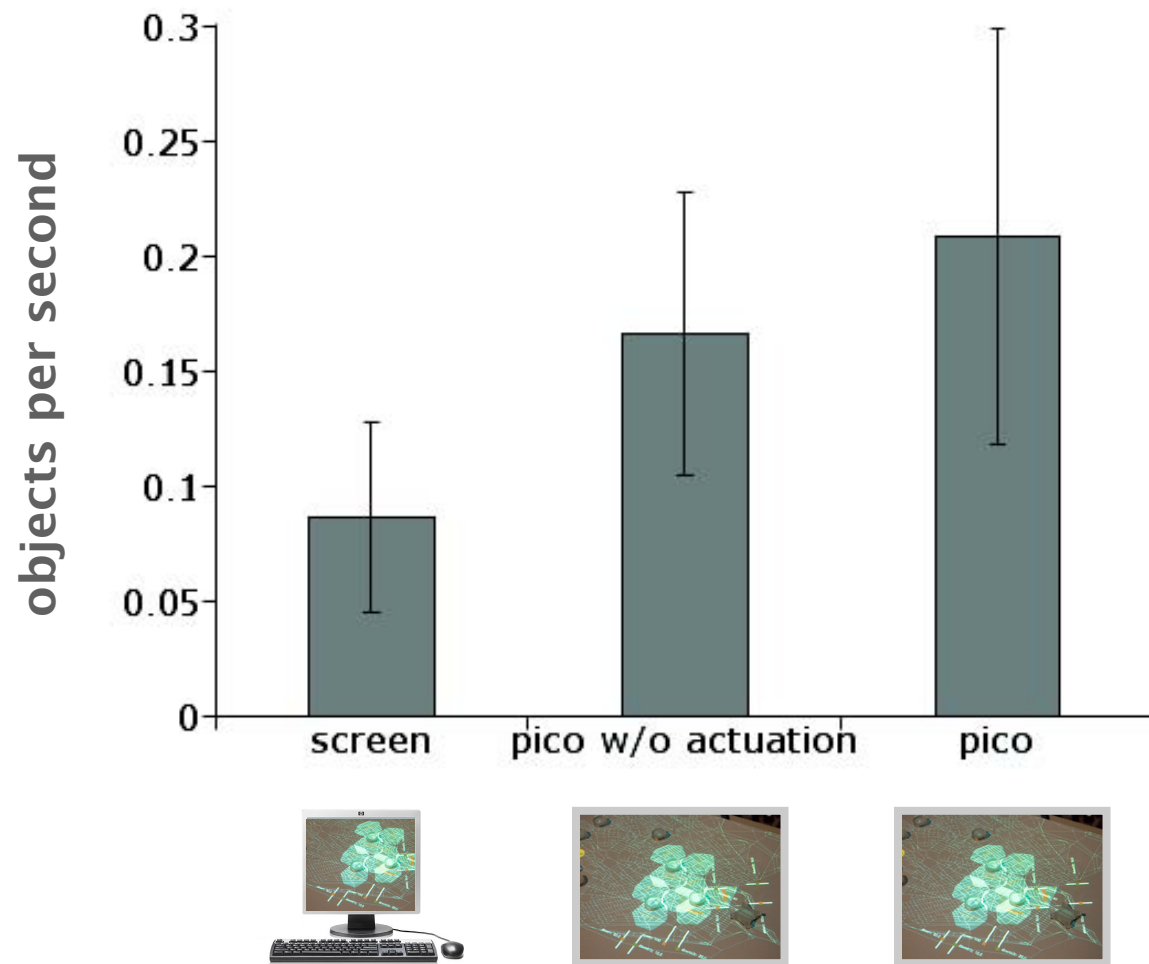
# Hypotheses [Patten & Ishii, 2007]

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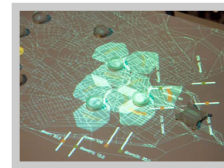
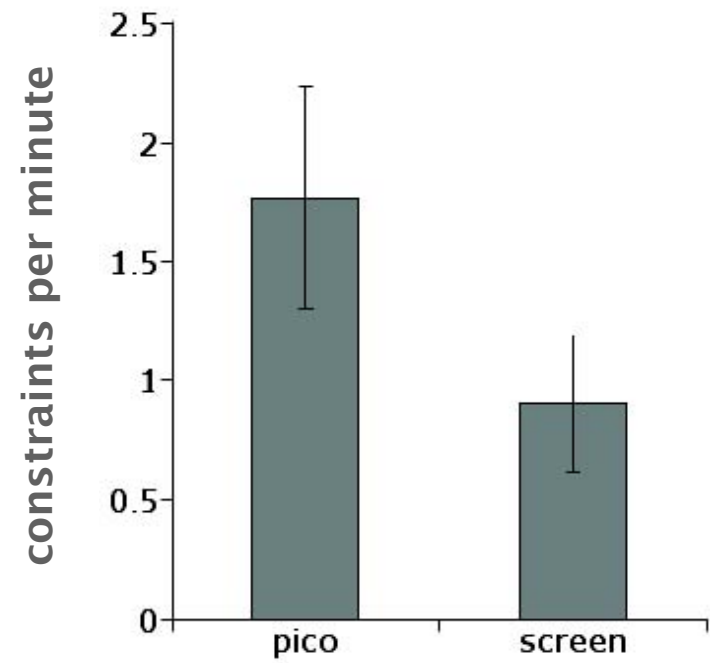
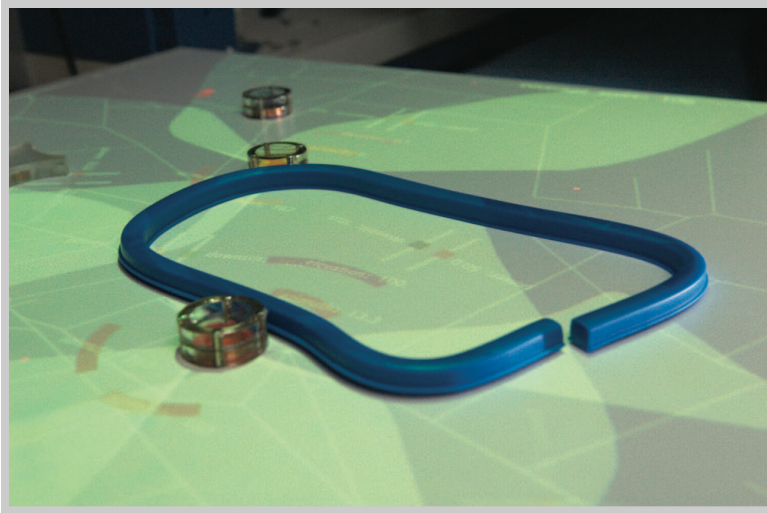
**H1:** Users will shift their control between objects more often in the Pico condition than with the screen based condition.

**H2:** Users will shift their control between objects more often in the Pico condition than in the Pico without actuation condition.

**H3:** Users will constrain the motion of pucks more in the Pico case than the screen case.





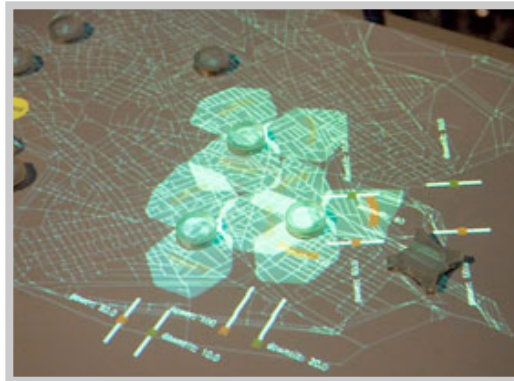


# Task Completed [Patten & Ishii, 2007]

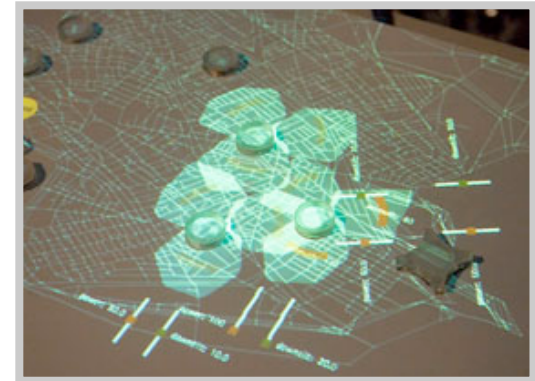
- 15 participants, within-subject study
- Position the towers to reach an optimal coverage under 4.5 minutes



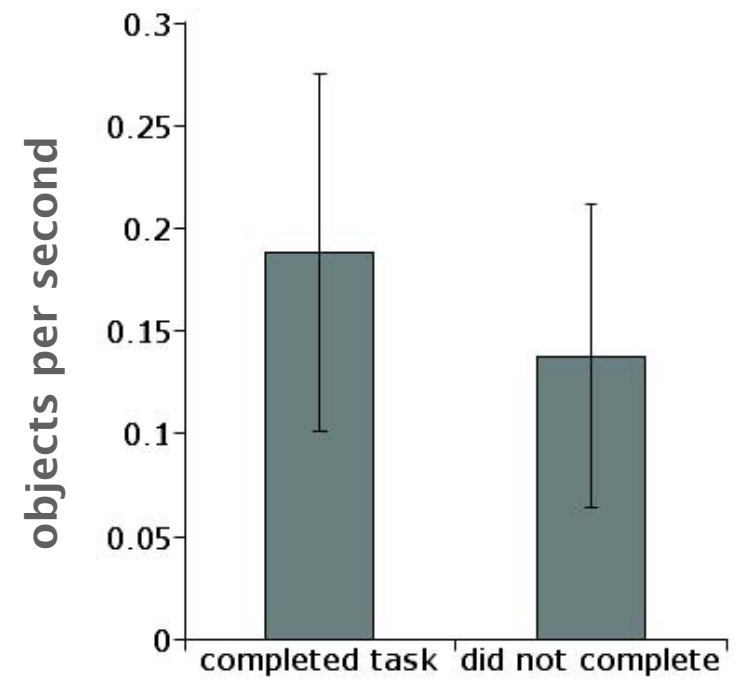
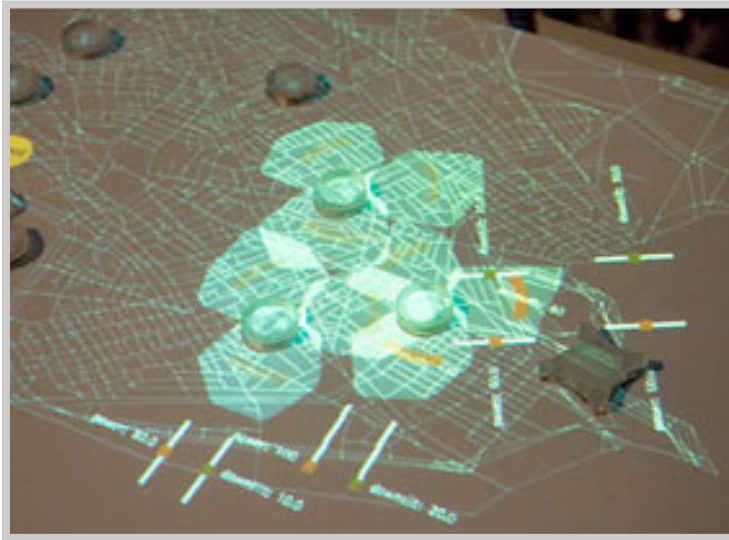
**Screen**  
4 participants



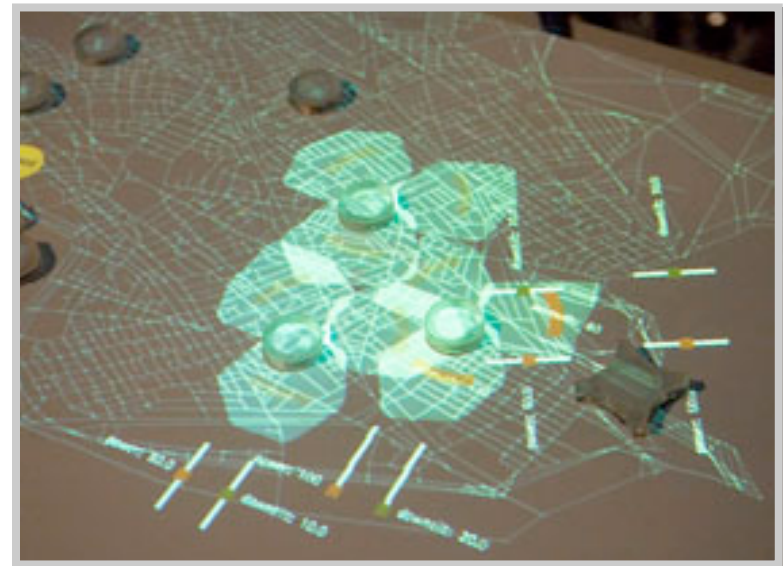
**Pico w/o actuation**  
5 participants



**Pico**  
7 participants



# Any Thoughts?





# I/O Brush

[Ryokai, Marti, & Ishii, 2004]



# Control Condition?



# Staying Open to Interpretation

Engaging Multiple Meanings in Design and Evaluation

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[Sengers & Gaver, 2006]

# Design as Communication

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Design is a conversation between designer and user, even though the designer is no longer present once the user enters the scene.

[Norman, 2004]

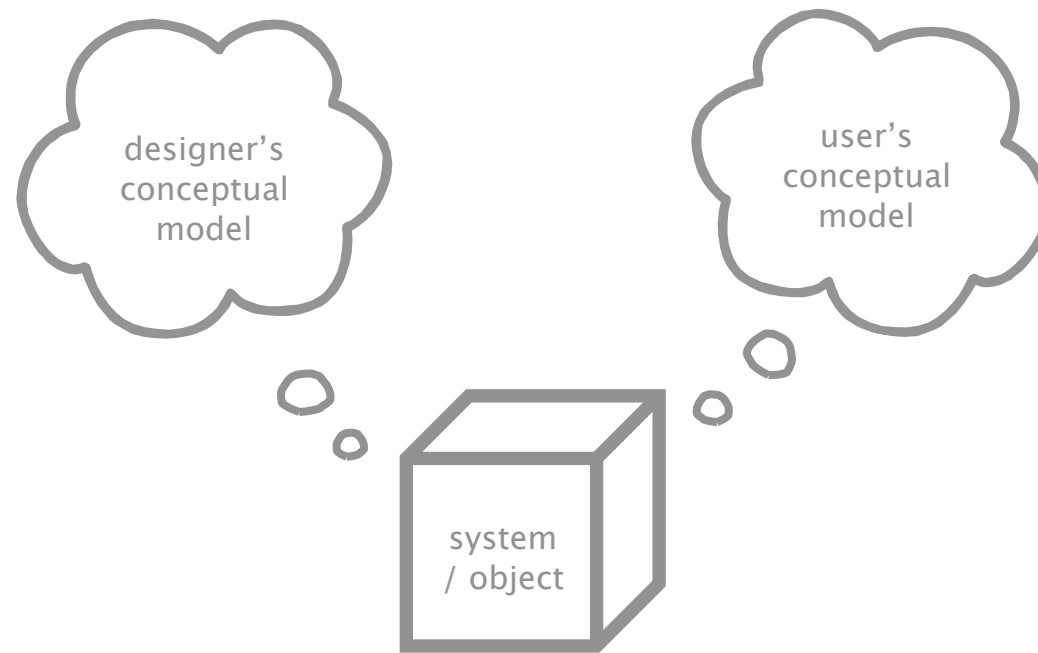


# Design as Communication

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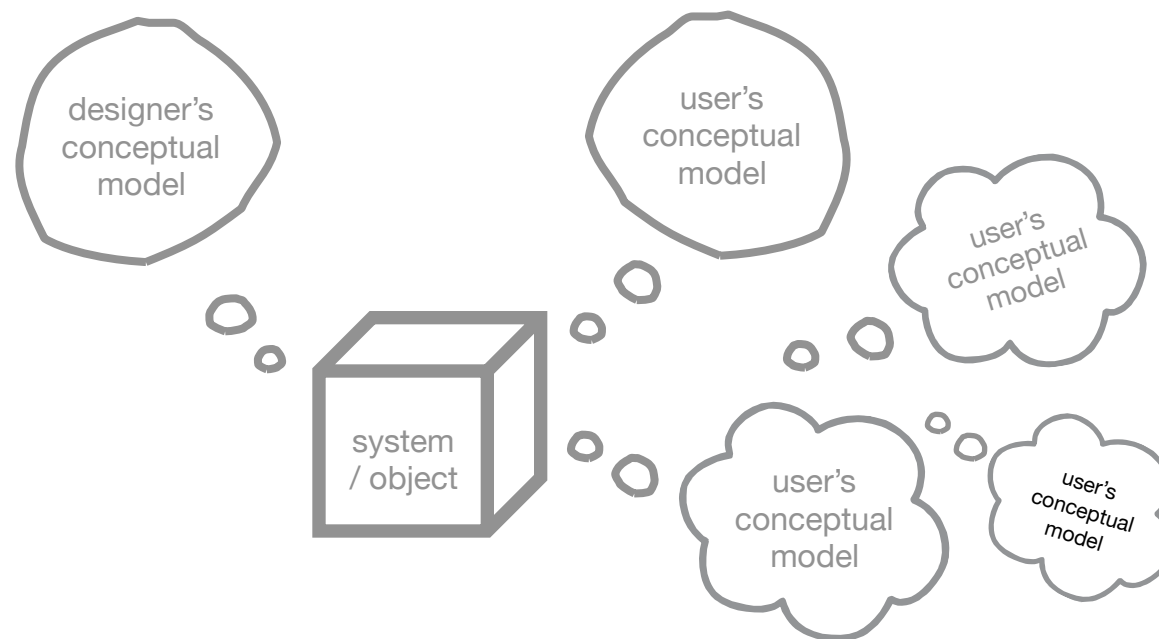
[Norman, 2004]



# Open to Interpretations

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“No single one of these perspectives may necessarily be ‘correct;’ instead, all may be useful in highlighting aspects of how systems will be understood, be used, and find roles in individual’s and community’s lives.” [Sengers & Gaver, 2006]



# Levels of Interpretations

**High level:** “What does it mean to me, my social group, my society, my culture?” (social & cultural)

**Mid level:** “What activities is it appropriate for?”  
“What role can it play in my everyday life?”

**Low level:** “Is this a button?” “What does this button do?” “How do I do this task?”

# License to Interpret

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Let individual users define their own meanings for them, rather than merely accept those imposed by designers.

Let people play a substantial role in determining the meaning of systems. This implies that they will be **actively engaged** in the process of understanding both **the system** and its **context of use**.

[Sengers & Gaver, 2006]

# Meaning Making Process

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Design shifts from deciding on and communicating an interpretation to **supporting and intervening in the processes of designer, system, user, and community meaning-making.**

[Sengers & Gaver, 2006]

# Open to Interpretations

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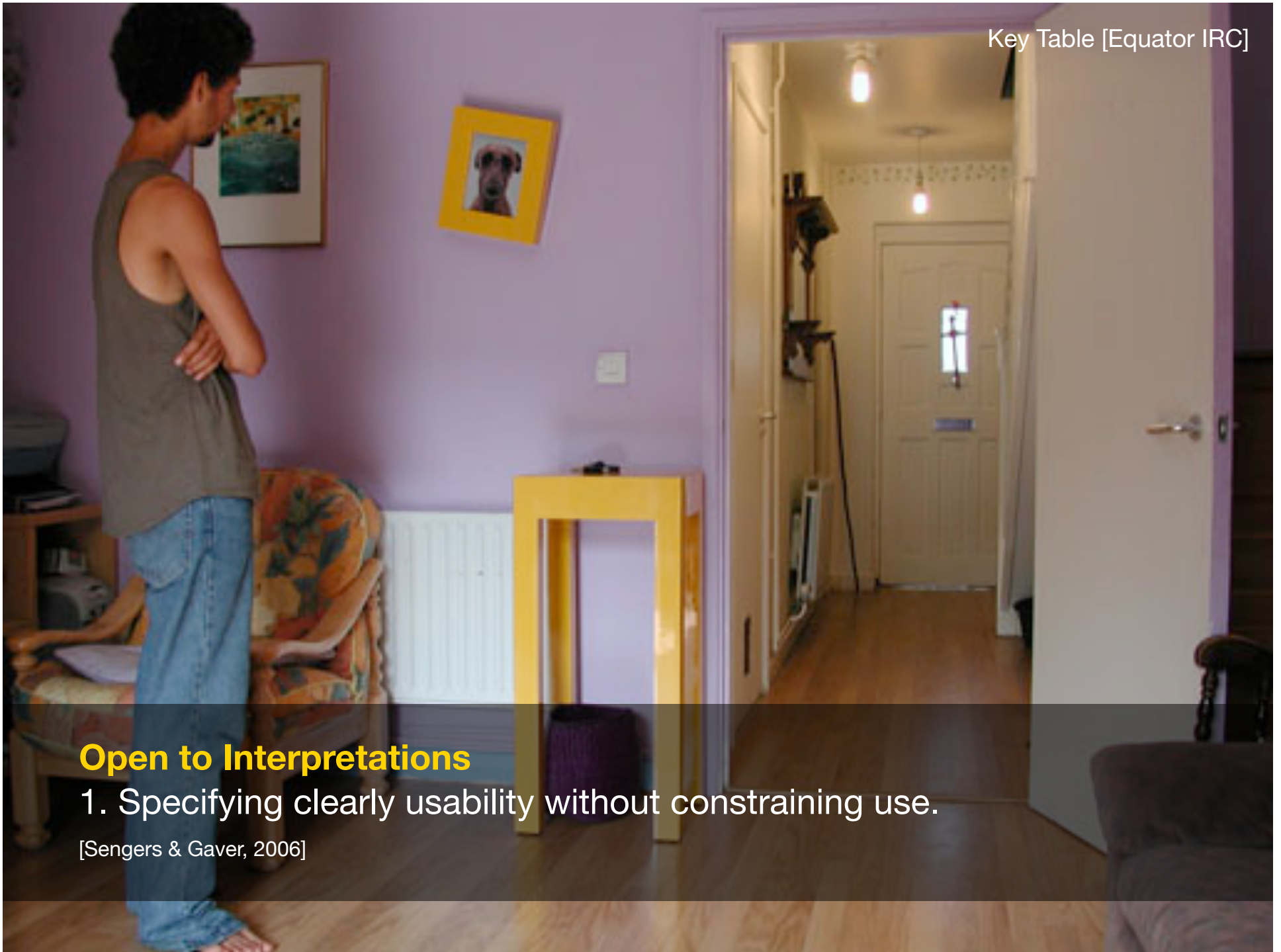
1. Specifying clearly usability without constraining use.
2. Supporting a space of interpretations around a topic.
3. Stimulating reinterpretations by blocking expected ones.
4. Unfolding new opportunities for interpretation.
5. Making space by downplaying system authority.
6. Thwarting any consistent interpretation.

[Sengers & Gaver, 2006]

## Open to Interpretations

1. Specifying clearly usability without constraining use.

[Sengers & Gaver, 2006]







## Open to Interpretations

2. Supporting a space of interpretations around a topic.

[Sengers & Gaver, 2006]



Drift Table [Chalmers et al., 2003]

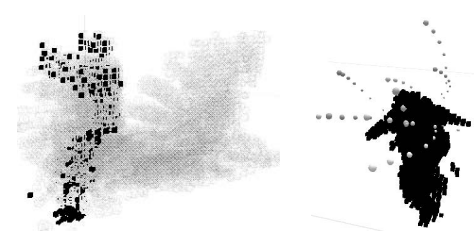


## Open to Interpretations

3. Stimulating reinterpretations by blocking expected ones.

[Sengers & Gaver, 2006]

## Traces [Penny et al., 2001]

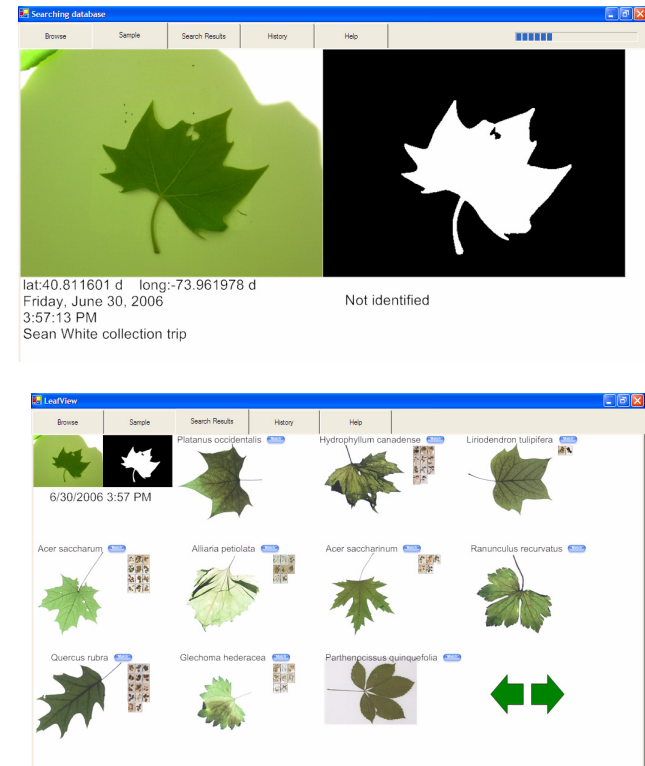


### Open to Interpretations

4. Unfolding new opportunities for interpretation.

[Sengers & Gaver, 2006]

## LeafView [White et al., 2007]



### Open to Interpretations

5. Designs can make space for user re-interpretation by downplaying the system's authority. [Sengers & Gaver, 2006]

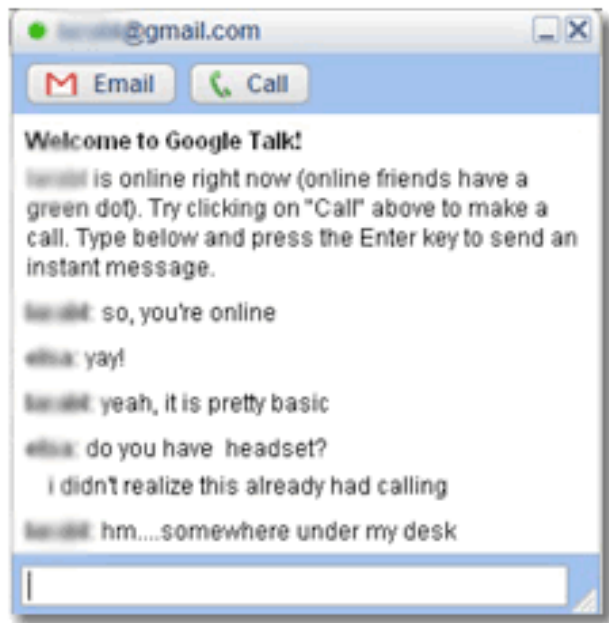


Image from: <http://reviews.zdnet.co.uk>

## Open to Interpretations

### 6. Designs that thwart any consistent interpretation.

[Sengers & Gaver, 2006]

# Evaluation Techniques

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Instead of asking “Did the preferred interpretation take hold with users?” ask “How many different interpretations does a particular ‘blank canvas’ generate, and why?” or “Do users feel both stimulated and empowered to develop their own interpretations?”

[Sengers & Gaver, 2006]

# Research through Design

Method for Interaction Design Research in HCI

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[Zimmerman et al., 2007]

# Evaluation Techniques

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1. Process
2. Invention
3. Relevance
4. Extensibility

[Zimmerman, 2007]

A set of criteria, or four lenses for evaluating an interaction design research contribution

**Process** • Invention • Relevance • Extensibility

# 1. Process

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“The rigor applied to the methods and the rationale for the selection of specific methods. In documenting their contributions, interaction design researchers must provide enough detail that the process they employed can be reproduced. In addition, they must provide a rationale for their selection of the specific methods they employed.”

[Zimmerman et al., 2007]



Process • **Invention** • Relevance • Extensibility

## 2. Invention

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“Interaction design researchers must demonstrate that they have produced a novel integration of various subject matters to address a specific situation. An extensive literature review must be performed that situates the work and details the aspects that demonstrate how their contribution advances the current state of the art in the research community.”

[Zimmerman et al., 2007]

Process • Invention • **Relevance** • Extensibility

## 3. Relevance

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“The work must be documented in such a way that peers can reproduce the results. Also articulate the preferred state their design attempts to achieve and provide support for **why the community should consider this state to be preferred**. Without this critical component, a research through design approach appears to be a self-indulgent, personal exploration that informs the researcher but makes no promise to impact the world.”

[Zimmerman et al., 2007]

Process • Invention • Relevance • **Extensibility**

## 4. Extensibility

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The design research should be described and documented in a way that the community can leverage the knowledge derived from the work.

[Zimmerman et al., 2007]