

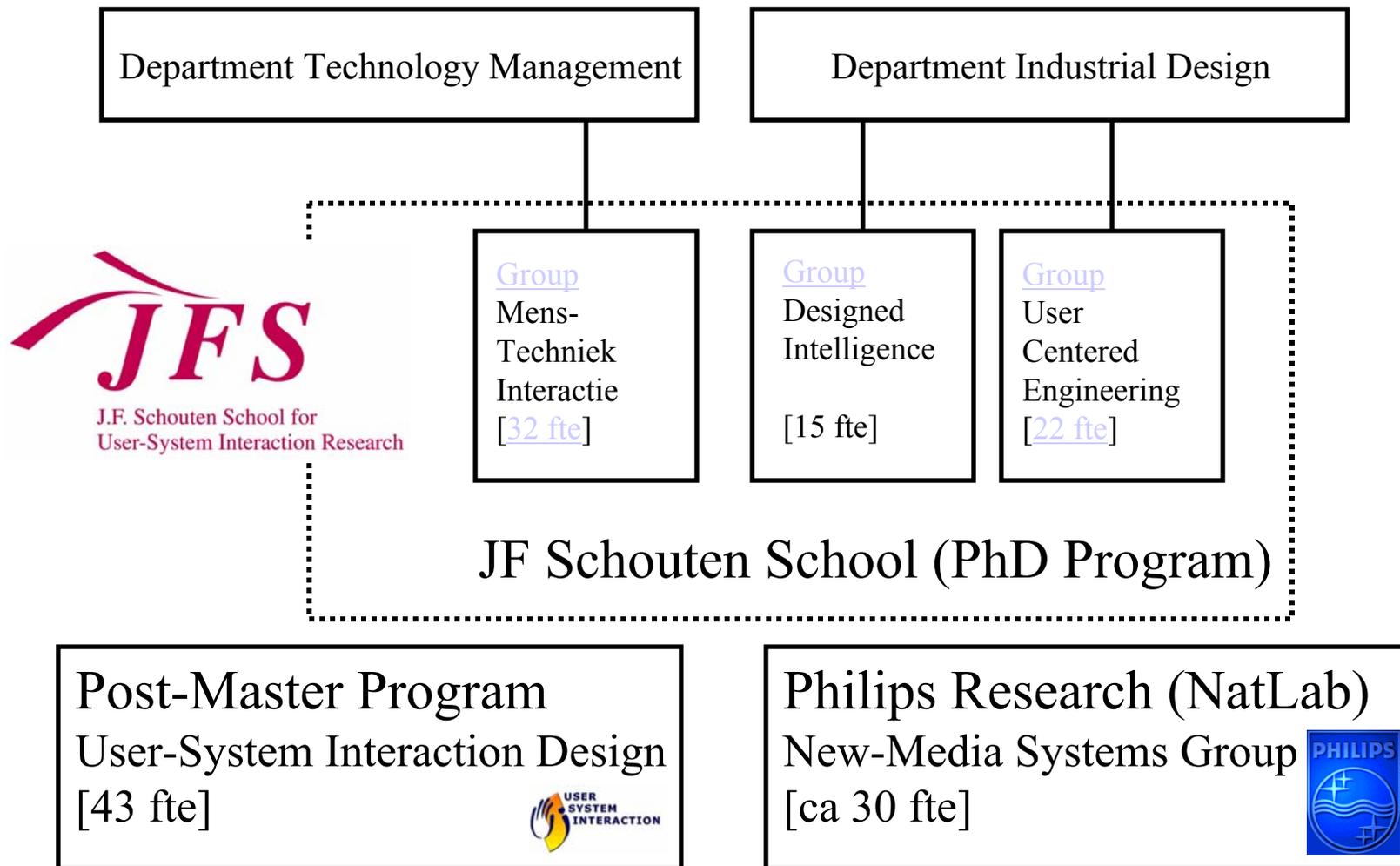


# User-System Interaction Research in Eindhoven

Matthias Rauterberg

Technical University Eindhoven (TU/e)

## HCI Research at the Technical University Eindhoven

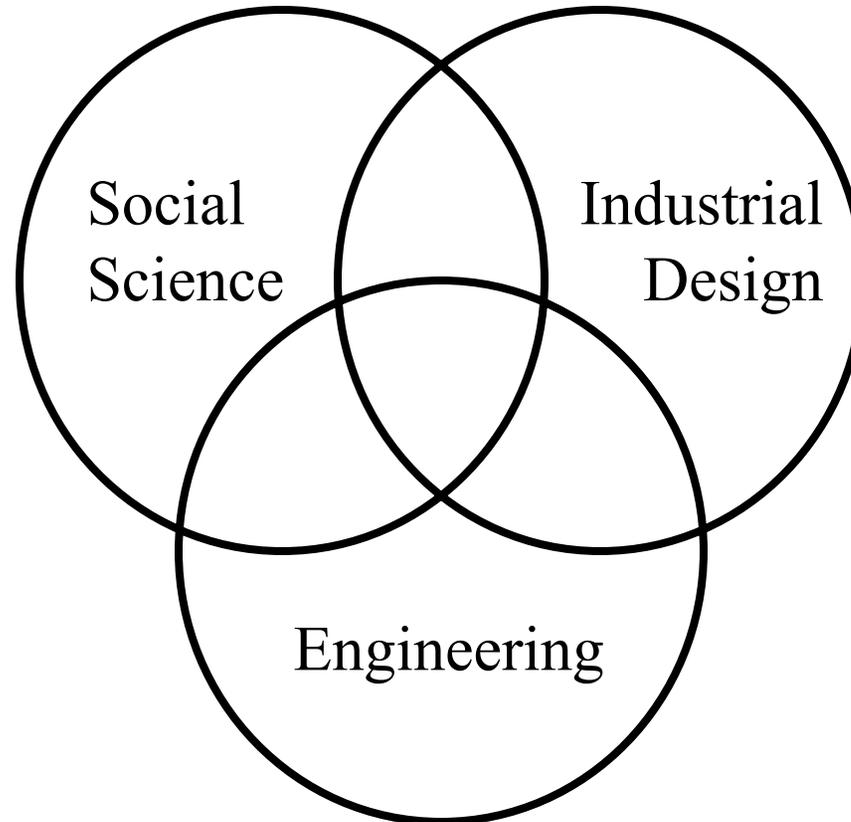


# Mission of JF Schouten School

- Communication, Choice and Control  
(the human)
- User Interface Engineering &  
Design Methodology  
(the interface)
- Virtual and Augmented Environments  
(the experience)

# Three Paradigms

**Psychology  
Cognitive Science**



**Philips  
Design**

**TU Delft  
Faculty IO**

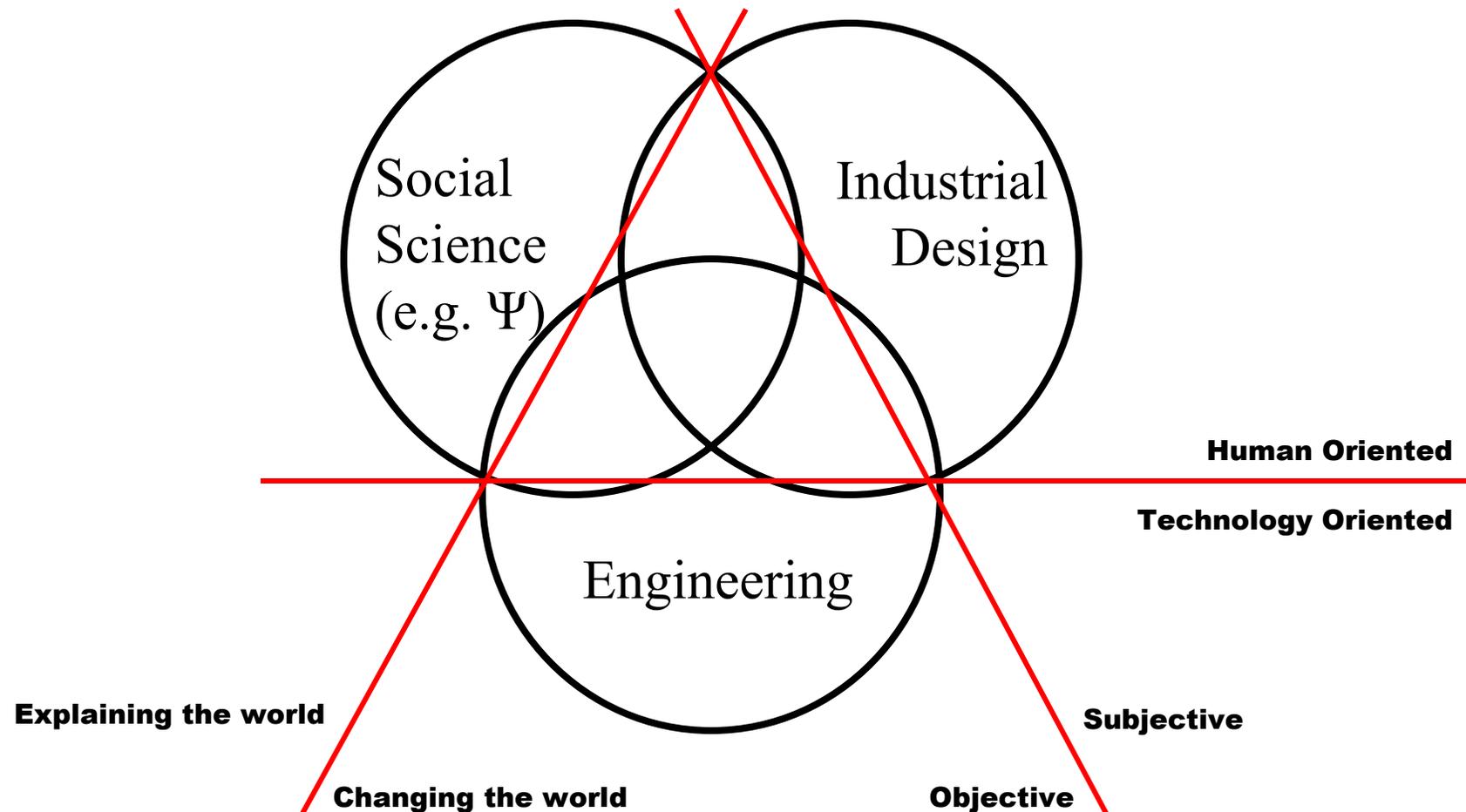
**Royal College  
of Art**

**Computing  
Science**

**Electrical  
Engineering**

**Mechanical  
Engineering**

# Three Major Barriers





# Technical University Eindhoven

## Department Industrial Design

### *Designed Intelligence* Research Group



#### **Staff:**

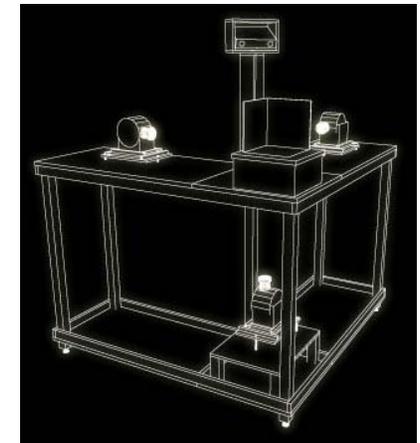
2 full-time professors

1 associate professor and 4 assistant professors

3 PostDocs, and 5 PhD students

#### **Core Competencies:**

- adaptive systems
- ambient intelligence
- emotion and design, funology
- autonomous systems, robotics





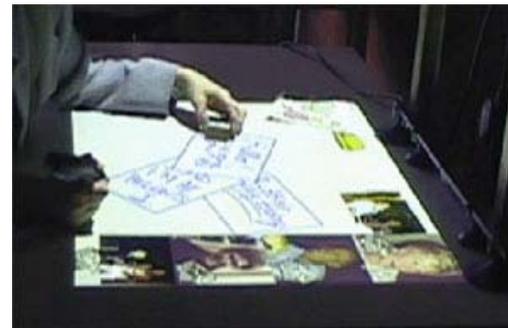
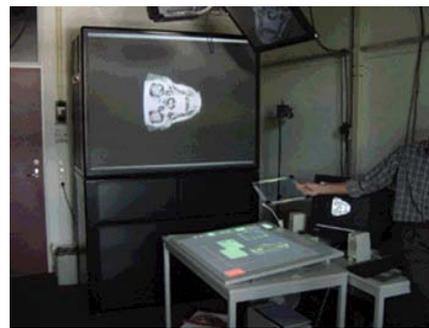
#### **Staff:**

1 full-time professor and 2 part-time professors  
2 associate professors and 3 assistant professors  
4 PostDocs, and 12 PhD students



#### **Core Competencies:**

- usability engineering and usability testing
- user requirement and task analysis
- advanced interactive technology (gesture, speech, etc.)
- multi-modal interface design (e.g., children, elderly, etc)



## Full Prof Dr Matthias Rauterberg



### Biography:

Prof. dr. Matthias Rauterberg has held teaching and research positions at the Technical University of Hamburg-Harburg (Germany), University of Oldenburg (Germany), and Swiss Federal Institute of Technology ETH (Switzerland). He was a senior lecturer for "usability engineering" in computer science and industrial engineering at the Swiss Federal Institute of Technology (ETH) in Zurich. He was the head of the Man-Machine Interaction research group (MMI) of the Institute for Hygiene and Applied Physiology (IHA) at the Department of Industrial Engineering (ETH). He holds a Diploma Degree (M.Sc.) in Computer Science, a Diploma Degree (M.Sc.) in Psychology and a Bachelor Degree (B.A.) in Philosophy. He finished his PhD in Mathematics/Computer Science at the University of Zurich (Switzerland). Since 1998, he is fulltime professor for "Human Communication Technology" at the [Departement of Industrial Design](#) at the [Technical University Eindhoven](#) (The Netherlands).

### Publications:

He is author of over 200 articles in the field of [human-computer interaction](#), [cognitive ergonomics](#), and [usability engineering](#). He is also co-author of the book "Benutzer-orientierte Softwareentwicklung" ("User oriented software development", [Teubner Press](#) und [vdf Press](#) 1994), and author of the book "Ein Konzept zur Quantifizierung software-ergonomischer Richtlinien" ([PhD](#), "A methodology to quantify usability criteria", IfAP-ETH Press 1995).

### Technical Expertise:

He is an expert in the field human-computer interaction, software ergonomics, usability engineering, and cognitive engineering.

### Teaching Experience:

Several courses (one day, one week, full-fledged lecture) in "Introduction to Human-Computer Interaction", "Design of Graphical User Interfaces", "Design of Multi-Media Interfaces", "User Centered Design", "Usability Engineering", "Interaction Design".

### Current Interests:

Design of the next generation of user interfaces ("beyond the desktop"), ubiquitous computing, interaction design, emotional design, adaptive systems, active forms.



# Full Prof Dr Rene Collier



## **Biography:**

René Collier studied linguistics and literature of Germanic languages at the University of Leuven, Belgium, from 1963 to 1968. In 1970 he signed a 4-year contract with the Belgian National Science Foundation and started a research project on the acoustical and perceptual properties of Dutch intonation, which he carried out at IPO (Institute for Perception Research, Eindhoven).

This work led to his Ph.D. degree in 1972. In 1973-74 Collier was a post-doctoral research fellow at Haskins Laboratories, New Haven, Conn. (USA), where he studied the physiological correlates of pitch in speech. Upon returning from the USA, he became Professor of Linguistics and Phonetics at the University of Antwerp, Belgium. In the period 1975-1987 he continued his collaboration with the IPO and Haskins Labs as a visiting scientist. In 1988 Collier joined Philips Research Laboratories in Eindhoven and was stationed at IPO, where he became head of the Speech and Hearing Department. In 1989 he was appointed part-time Professor of Experimental Linguistics at the Eindhoven University of Technology. From 1997 to 2000 he led a research group on User-System Interaction Technology in Philips Research. Presently he is Innovation Manager for Philips' international research program in "content interaction". He is part-time professor in the Section of User-Centered Engineering and chairman of the Innovative Research Program on Man-Machine Interaction (IOP-MMI) of the Dutch Ministry of Economic Affairs.

## **Technical Expertise:**

His expertise involves linguistics, experimental phonetics (speech production, acoustics and perception), speech technology (in particular text-to-speech conversion) and the use of speech in user interfaces.



# Full Prof Dr Yibin Hou



## **Biography:**

Yibin HOU studied computer science and technology (Xi'an Jiaotong University, Xi'an, China) and Electrical Engineering (Eindhoven University of Technology, Eindhoven, The Netherlands). He received the M.Sc. degree in computer science and engineering from Xi'an Jiaotong University in 1982 and the Ph.D. degree from Eindhoven University of Technology in 1986 with a dissertation on the full-decomposition of sequential machines, a mathematical method for digital system design automation. He joined the staff of Computer Science and Engineering Department at the Xi'an Jiaotong University where he became associate professor in 1987, and full professor in 1989. Hou is now working at Xi'an Jiaotong University as depute rector of The Academy of Engineering and Science and director of Computer and Information Technology Institute. He was an honorary senior research fellow at The Birmingham University, UK from 1994 to 1996. He joined again Eindhoven University of Technology as a visiting professor at IPO and the Faculty of Electrical Engineering since 1998. Legislator Hou Yibin is now deputy president of [Beijing](#) University of Technology.

## **Publications and Patents:**

He is author of over 80 articles in the field of Chinese information processing, digital system design, and human-computer interaction. He is also the holder of two patents in information technology.

## **Technical Expertise:**

He is an expert in the field of computer and information technology. Contributions were made to the invention of new input method for Chinese character and non-keyboard-input technique, to the exploring of mathematical method for digital system design automation and to the development of human-to-human interaction over the Internet. He is member of Director Board of Society of Chinese Information Processing of China, member of Director Board of Society of Computer Engineering and Application of China, member of Editorial Committee of Journal of Xi'an Jiaotong University, member of Editorial Committee of Journal of Microcomputer Applications. He was an invited speaker for International Conference on Chinese Information Processing (ICCIP'92) and co-chair of International Symposium on Information Science & Technology (ISIST'96). He was warded as "Special Allowance for Outstanding Scientist" by State Department of China, "Outstanding Contribution Young Scientist" by Personnel Ministry of China, Research Prize approved by Hong Kong Fork Yong Dung Foundation, and "Award of China Scientific Industry Pioneer" by China Youth Association.

## Assoc Prof Dr Jacques Terken



### Background:

He studied experimental psychology at the University of Utrecht, The Netherlands. He received the Master's degree (Drs.) in 1979. From 1979 till 1983 he was employed at the Institute for Perception Research (IPO), Eindhoven. In 1985 he received the Ph.D. degree from Leijden University on a thesis about *Communicative functions of pitch accents*. In 1985 and 1986 he worked at the Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. In 1986 he joined the Speech research group of IPO again.

### Current Interests:

- Application of speech i/o in man-machine interaction (e.g. the [COMRIS](#) project).
- Speech in multi-modal interfaces (e.g. the [MATIS](#) project).
- Speaking styles in human and synthetic speech (cf. [COST258](#), Naturalness of Synthetic Speech).
- Learning effects in the comprehension of synthetic speech.

### Publications:

[Papers](#) on the prosody of human and synthetic speech, and on usability aspects of speech interfaces and multi-modal interfaces.

### Technical Expertise:

His expertise includes prosody of human and synthetic speech, psycholinguistics and usability aspects of speech interfaces.

### Teaching Experience:

- A course in the design of command & control speech interfaces, and several seminars in the domain of prosodic characteristics of human and synthetic speech
- A course in the design of speech interfaces
- A Course on Introduction User Interface Design
- A course on Cognitive Ergonomics
- A course on design of multi-modal interfaces



## Assoc Prof Dr Jean-Bernard Martens

### **Background:**

Jean-Bernard Martens has obtained his PhD degree from Gent University, Belgium, on a thesis entitled Algorithms for the Calculation of Discrete Convolutions and Fourier Transformations, and has published some 10 papers on this subject. From 1984 to 2000, he has conducted research on image quality, visual psychophysics and psychometrics, image coding and processing, within the Institute for Perception Research of the Eindhoven University of Technology. He has (co-)authored several papers and one textbook on these subjects. He is now an associate professor in the field of Visual Interaction at the Faculty Industrial Design. His current research focus is on developing and testing new augmented-reality interaction styles in which working with images (sketches, photos, etc) is an important component. Some of these new interaction styles are based on applying visual pattern recognition. More information on Visual Interaction and the infrastructure developed for this research (i.e., the Visual Interaction Platform) can be found through the VIP website.

### **Current Interests:**

- Application of 3D i/o in man-machine interaction (eg. The [VIP Project](#)).

### **Publications:**

Papers on image processing and multi-modal interfaces.

### **Technical Expertise:**

His expertise includes image processing, sensor technology in aware environments and usability aspects of multimodal interfaces.

## Assistant Professors in UCE



Dr ir. Rene Ahn is a member of the User Centered Engineering research group. He also teaches a course on agents for the Computer Science department. Rene's main interest is in computational intelligence and man machine communication. In the past, he has participated in research projects that involve machine inference, context representation, and natural language dialogue, first at Philips Research Laboratories and later at Tilburg University.



Dr ir. Mathilde Bekker is a member of the User Centered Engineering research group. She is involved in the Designing and Evaluating Technologies for Children project . She works on the development of user centered design methods. For the past three years her research has focused mainly on how to involve children in design. She has conducted case studies to assess the success of early user requirements techniques and has conducted comparison studies to determine the relative quality of evaluation methods. She has worked on projects on educational computer games, technologies for families and interactive toys. For the last five years she has been also been teaching about user centered design and evaluation methods. She has also done research on the usability of speech controlled interfaces.



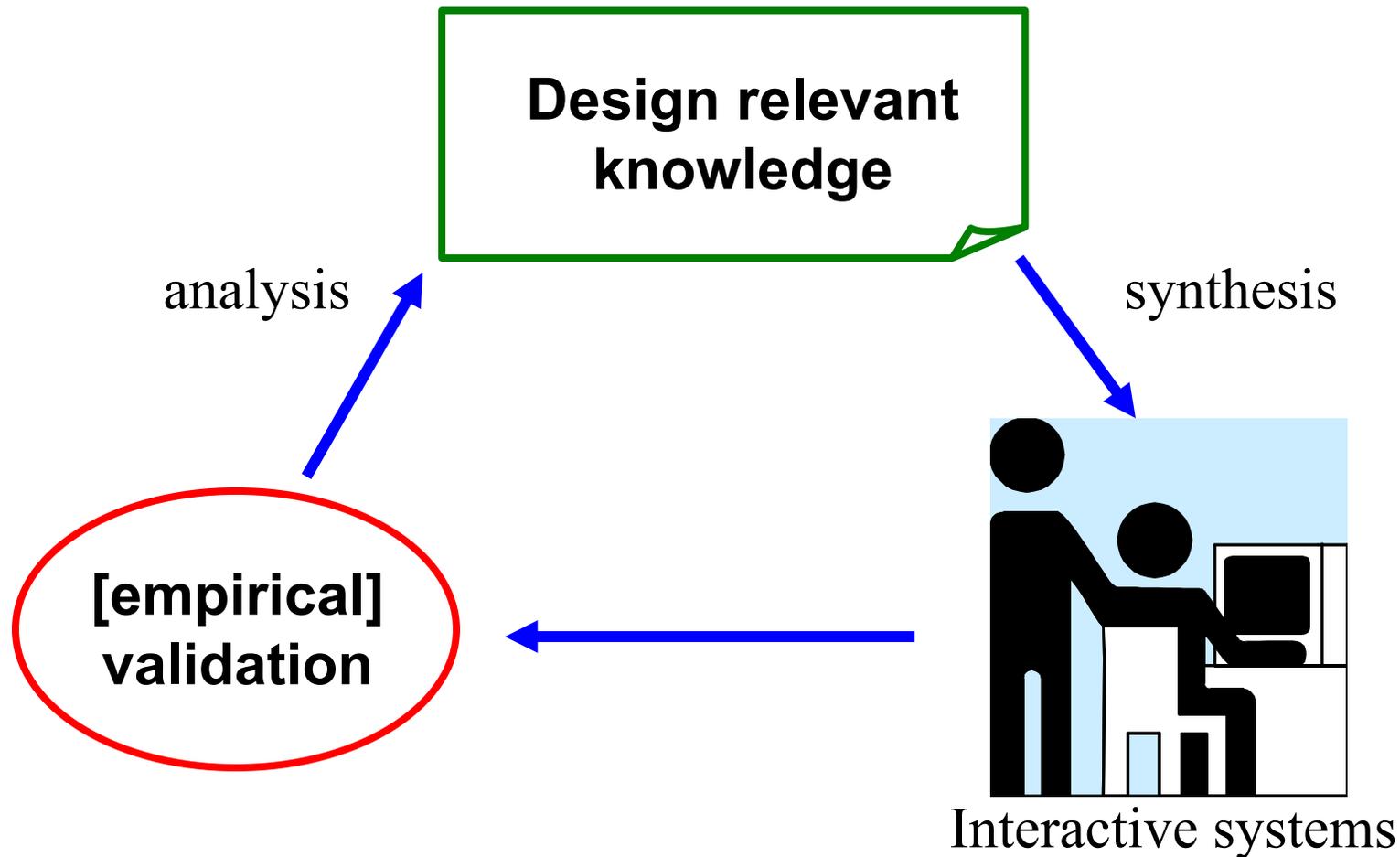
Dr ir. Panos Markopoulos is member of the User Centered Engineering research group. He is involved in the Designing and evaluating technologies for children project. Panos is doing research in interaction issues relating to ambient intelligence. This research focuses on technologies for the home, ethnographic techniques for user studies, the issues of awareness and control of ambient intelligence environment, particularly with respect to ensuring trust in the system for protecting private data. Further, he is interested in interaction styles for young children and usability testing methods for children, and supervises two research projects on the human computer interaction issues relating to e-Commerce. Earlier research covers diverse topics such as task analysis and modelling, model-based design of user interfaces, UML, ethnographic methods of inquiry, interaction styles, software architectures of user interfaces, and formal specification and verification of interactive systems.

## Mission of UCE Research Group

The User-Centered Engineering group (UCE) conducts research and provides education in the area of Interaction Design. Objective is to develop, test and demonstrate innovative concepts for human-computer interaction. 'Testing' in this context refers to evaluation of the concepts through empirical user tests.

- **Multimodal interaction:** Under this heading we conduct research concerning possibilities for combining multiple input and output modalities in the interaction between humans and computers. More concretely, the research addresses concerning ways to combine speech, direct manipulation, information obtained from camera's and so forth with the objective to make the interaction more natural, dependent on the context and the platform (e.g. desktop versus handheld).
- **Aware environments:** This topic extends the topic Multimodal Interaction. Crucial about aware environments is that different systems in the environment monitor the behavior of people in that environment and exchange information about this behavior, so that an adaptive environment is created that can tune to the needs, desires, capabilities and limitations of people, circumventing the need for the user to provide all information to the system consciously and manually.
- **Design methodology:** In all stages of the design, the research in the previous themes often requires methods to elicit information from and about users that are not as such available. It concerns both methods to obtain information about needs, desires, capabilities and limitations of people in an early stage of the design process, and methods for validating/evaluating the design in later stages of the creation process.

# USI Research Line



# Laboratory Infrastructure

## MuseLab



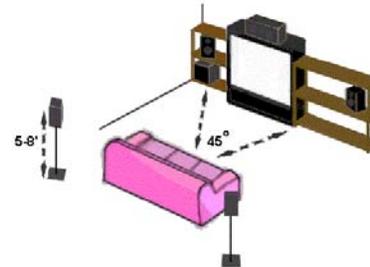
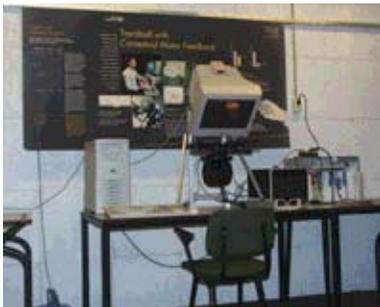
## SoundLab



## KidLab



## UsabilityLab



# Finished PhDs at JFS

Table 1: Numbers of started and completed dissertation projects and their duration in months during the period 1992-2001. Duration has not been given for projects still running.

<i>Year</i>	<i>PhD projects started</i>	<i>PhD thesis</i>	<i>Project duration (in months)</i>	<i>Unsuccessful projects</i>	<i>Current PhD projects</i>
<b>1992</b>	2	2	57		0
<b>1993</b>	9	9	58		0
<b>1994</b>	8	7	54	1	0
<b>1995</b>	2	1	48	1	0
<b>1996</b>	6	3	59	1	2
<b>1997</b>	3	0			3
<b>1998</b>	8	1	39		7
<b>1999</b>	7	0		1	6
<b>2000</b>	7	0			7
<b>2001</b>	1	0			1
<b>Total</b>	51	23	56	4	26

# Publication Output of JFS

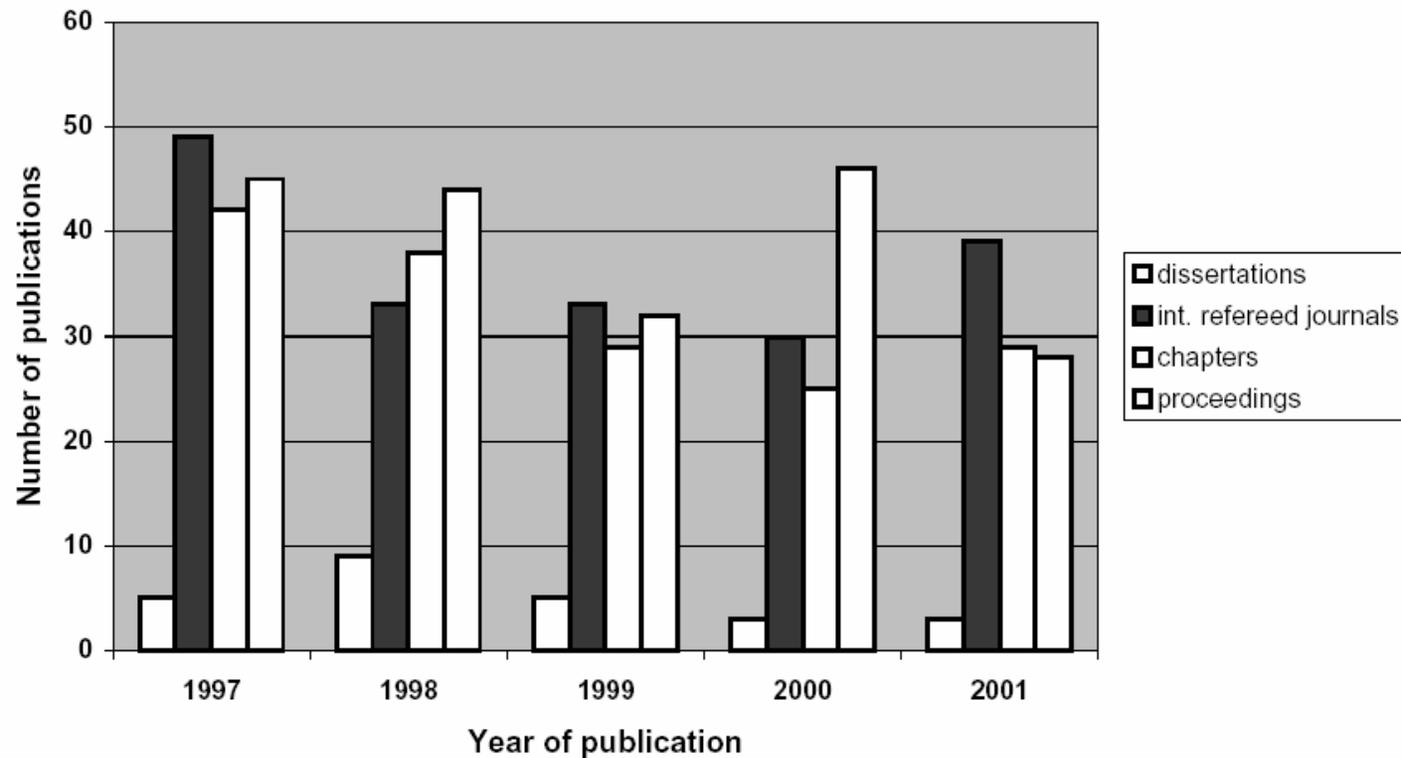


Figure 1. **Publication output** of the J.F. Schouten School over the period 1997-2001, separately shown for dissertations, refereed articles, book chapters and proceedings. The data for 2001 include forthcoming publications.

# Output Performance per JFS Staff

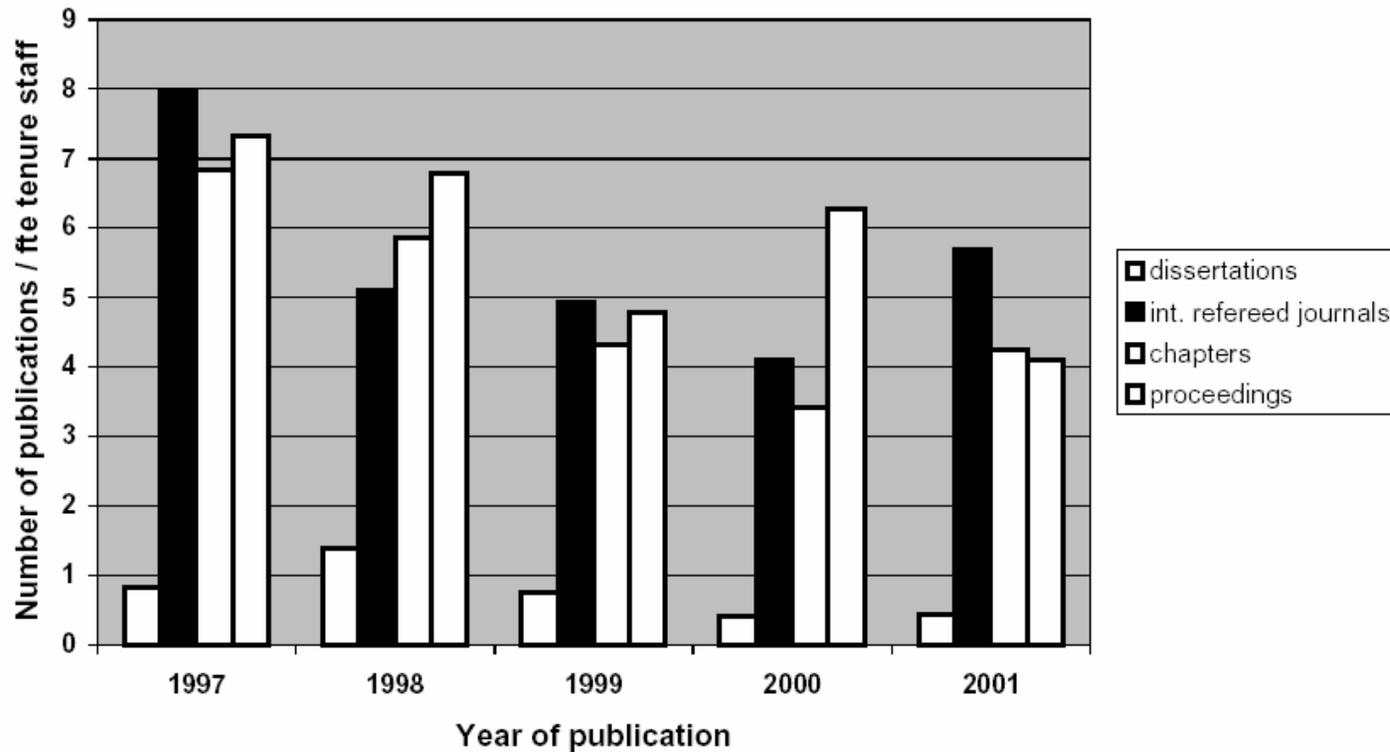


Figure 2. **Number of publications per full time equivalent tenure staff** over the period 1997-2001, shown separately for completed dissertations, refereed articles, book chapters and conference proceedings. Data for 2001 include forthcoming publications.

# Future of USI/HCI and JFS

- **JF Schouten School for User-System Interaction Research:  
Request for [re-]recognition as a research school by the Royal  
Netherlands Academy of Arts and Sciences (KNAW)  
[December 2001]**
- **Self-evaluation report for the peer review committee:  
Tommy Gärling, Göteborg University (Sweden)  
Daniel Gopher, Technion Institute of Technology (Israel)  
Neville Moray, University of Surrey (United Kingdom)  
Ryohei Nakatsu, ATR Laboratories (Japan)  
[October 2001]**
- **Re-Recognition of JFS by the Royal Netherlands Academy of  
Arts and Sciences in 2002 till 2007**