



HAL
open science

Human Work Interaction Design. Designing Engaging Automation

Barbara Rita Barricelli, Virpi Roto, Torkil Clemmensen, Pedro Campos, Arminda Guerra Lopes, Frederica Gonçalves, José Abdelnour-Nocera

► **To cite this version:**

Barbara Rita Barricelli, Virpi Roto, Torkil Clemmensen, Pedro Campos, Arminda Guerra Lopes, et al.. Human Work Interaction Design. Designing Engaging Automation. Springer International Publishing, AICT-544, 2019, IFIP Advances in Information and Communication Technology, 978-3-030-05296-6. 10.1007/978-3-030-05297-3 . hal-02264608

HAL Id: hal-02264608

<https://inria.hal.science/hal-02264608v1>

Submitted on 3 Sep 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Editor-in-Chief

Kai Rannenberg, Goethe University Frankfurt, Germany

Editorial Board

TC 1 – Foundations of Computer Science

Jacques Sakarovitch, Télécom ParisTech, France

TC 2 – Software: Theory and Practice

Michael Goedicke, University of Duisburg-Essen, Germany

TC 3 – Education

Arthur Tatnall, Victoria University, Melbourne, Australia

TC 5 – Information Technology Applications

Erich J. Neuhold, University of Vienna, Austria

TC 6 – Communication Systems

Aiko Pras, University of Twente, Enschede, The Netherlands

TC 7 – System Modeling and Optimization

Fredi Tröltzsch, TU Berlin, Germany

TC 8 – Information Systems

Jan Pries-Heje, Roskilde University, Denmark

TC 9 – ICT and Society

David Kreps, University of Salford, Greater Manchester, UK

TC 10 – Computer Systems Technology

Ricardo Reis, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

TC 11 – Security and Privacy Protection in Information Processing Systems

Steven Furnell, Plymouth University, UK

TC 12 – Artificial Intelligence

Ulrich Furbach, University of Koblenz-Landau, Germany

TC 13 – Human-Computer Interaction

Marco Winckler, University Paul Sabatier, Toulouse, France

TC 14 – Entertainment Computing

Matthias Rauterberg, Eindhoven University of Technology, The Netherlands

IFIP – The International Federation for Information Processing

IFIP was founded in 1960 under the auspices of UNESCO, following the first World Computer Congress held in Paris the previous year. A federation for societies working in information processing, IFIP's aim is two-fold: to support information processing in the countries of its members and to encourage technology transfer to developing nations. As its mission statement clearly states:

IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

IFIP distinguishes three types of institutional membership: Country Representative Members, Members at Large, and Associate Members. The type of organization that can apply for membership is a wide variety and includes national or international societies of individual computer scientists/ICT professionals, associations or federations of such societies, government institutions/government related organizations, national or international research institutes or consortia, universities, academies of sciences, companies, national or international associations or federations of companies.

More information about this series at <http://www.springer.com/series/6102>


Barbara Rita Barricelli · Virpi Roto
Torkil Clemmensen · Pedro Campos
Arminda Lopes · Frederica Gonçalves
José Abdelnour-Nocera (Eds.)

Human Work Interaction Design


Designing Engaging Automation

5th IFIP WG 13.6 Working Conference, HWID 2018
Espoo, Finland, August 20–21, 2018
Revised Selected Papers

Editors

Barbara Rita Barricelli 
University of Milan
Milan, Italy

Virpi Roto 
Aalto University
Aalto, Finland

Torkil Clemmensen 
Copenhagen Business School
Frederiksberg, Denmark

Pedro Campos 
Madeira Interactive Technologies Institute
Funchal, Portugal

Arminda Lopes 
Madeira Interactive Technologies Institute
Funchal, Portugal

Frederica Gonçalves 
Madeira Interactive Technologies Institute
Funchal, Portugal

José Abdelnour-Nocera 
University of West London
London, UK

ISSN 1868-4238

ISSN 1868-422X (electronic)

IFIP Advances in Information and Communication Technology

ISBN 978-3-030-05296-6

ISBN 978-3-030-05297-3 (eBook)

<https://doi.org/10.1007/978-3-030-05297-3>

Library of Congress Control Number: 2018963979

© IFIP International Federation for Information Processing 2019

Chapter “A Worker-Centric Design and Evaluation Framework for Operator 4.0 Solutions that Support Work Well-Being” is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>). For further details see license information in the chapter.

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Human Work Interaction Design (HWID) was established in September 2005 as the sixth working group (WG 13.6) of the IFIP Technical Committee 13 on Human-Computer Interaction (HCI). The scope of this group is the analysis and interaction design of a variety of complex work and life contexts found in different business and application domains. For this purpose, it is important to establish relationships between extensive empirical work domain studies and HCI design. WG 13.6 aims to provide the basis for an improved cross-disciplinary cooperation and mutual inspiration among researchers from the many disciplines that by nature are involved in the deep analysis of a work domain. Complexity is hence a key notion in the activities of this working group, but it is not a priori defined or limited to any particular domains. WG 13.6 initiates and fosters new research initiatives and developments, as well as an increased awareness of HWID in the HCI curriculum.

This volume presents chapters extending the papers presented at the 5th HWID working conference that was held at the University of Aalto (Espoo, Finland) during August 20–21, 2018. In continuation of the series of the Human Work Interaction Design working conferences, the fifth edition was aimed at investigating the theme “Designing Engaging Automation.”

Interaction design for work engagement has recently started to gather more attention, especially in designing tools for employees. Work engagement takes usability of interactive systems to the next level by providing employees with pleasurable and meaningful experiences via the tools used at work. The theme of HWID 2018 emphasized the need for providing these experiences also when parts of the work are automated.

Examples of relevant questions we posed during the conference include: Is automation making work less interesting or more engaging? How can we improve work engagement by automation? How can we share work optimally between humans and automation? How can we maintain operator vigilance in highly automated environments? How can we support situation and/or automation awareness? How can we evaluate the impact of automation on work engagement?

The chapters in this book focus on answering these questions to support professionals, academics, national labs, and industry engaged in human work analysis and interaction design for the workplace. The first section of the book collects the chapters

that present cases of HWID in practice, while the second is focused on the chapters that present methodological discussion.

October 2018

Barbara Rita Barricelli
Virpi Roto
Torkil Clemmensen
Pedro Campos
Arminda Lopes
Frederica Gonçalves
José Abdelnour-Nocera

Organization

General Chairs

Virpi Roto
Pedro Campos

Aalto University, Finland
Madeira-ITI, University of Madeira, Portugal

Program Chairs

Barbara Rita Barricelli
Torkil Clemmensen
Arminda Lopes

Università degli Studi di Milano, Italy
Copenhagen Business School, Denmark
Madeira-ITI, University of Madeira, Portugal

Poster Chairs

Frederica Gonçalves
Jose Abdelnour-Nocera

Madeira-ITI, University of Madeira, Portugal
University of West London, UK;
Madeira-ITI, University of Madeira, Portugal

Social Chair

Yiying Wu

Aalto University, Finland

Sponsorship Chair

Hannu Karvonen

VTT, Finland

Student Volunteers

Maria Huusko
Elli Ala-Karvia

Aalto University, Finland
Aalto University, Finland

Program Committee

Paola Amaldi
Nathalie Aquino

Hertfordshire University, UK
Universidad Católica Nuestra Señora de la Asunción,
Paraguay

Marjahan Begum
Anant Bhaskar Garg

Copenhagen Business School, Denmark
HaritaDhara Research Development and Education
Foundation, India

Ganesh Bhutkar
Catherine Burns
Serena Di Gaetano

VIT, India
University of Waterloo, Canada
Università degli Studi di Milano, Italy

Ebba Hvannberg
Dinesh Katre
Yichen Lu
Xiangang Qin
Stefano Valtolina

University of Iceland, Iceland
C-DAC, India
Aalto University, Finland
Copenhagen Business School, Denmark
Università degli Studi di Milano, Italy

Contents

Practice

Prototype Design of Android App for Mothers of Preterm Infants	3
<i>Abhilash Patil, Ganesh Bhutkar, Mihir Pendse, Amod Tawade, Aniruddha Bodkhe, Shubham Shaha, and Shahaji Deshmukh</i>	
Enhancing Your Mental Well-Being and Creativity While Writing: A Crowdsourced-Based Approach	17
<i>Frederica Gonçalves and Pedro Campos</i>	
Using Task Descriptions with Explicit Representation of Allocation of Functions, Authority and Responsibility to Design and Assess Automation . . .	36
<i>Elodie Bouzekri, Alexandre Canny, Célia Martinie, Philippe Palanque, and Christine Gris</i>	
Improving the Tourists' Experience	57
<i>Frederica Gonçalves, João C. Ferreira, and Pedro Campos</i>	
Unraveling the Influence of the Interplay Between Mobile Phones' and Users' Awareness on the User Experience (UX) of Using Mobile Phones . . .	69
<i>Xiangang Qin, Chee-Wee Tan, and Torkil Clemmensen</i>	
Automating Engineering Educational Practical Electronics Laboratories for Designing Engaging Learning Experiences	85
<i>Anmol Srivastava and Pradeep Yammiyavar</i>	
Testing Augmented Reality Systems for Spotting Sub-Surface Impurities	103
<i>Kasper Hald, Matthias Rehm, and Thomas B. Moeslund</i>	
ESISTE: Supporting Inclusion of Students with Special Needs in Mainstream Classrooms	113
<i>Barbara Rita Barricelli, Alessandro Rizzi, Stefano Valtolina, and Claudio Manfredini</i>	
Exploring Potential of Traditionally Crafted Textiles to Transform into e-Wearables for Use in Socio-cultural Space	123
<i>Pradeep Yammiyavar and Deepshikha</i>	
Human-Computer Interaction – Game-Based Learning	140
<i>Arminda Guerra Lopes and Maria Joao Lopes</i>	
Engaging Automation at Work – A Literature Review	158
<i>Virpi Roto, Philippe Palanque, and Hannu Karvonen</i>	

Methodological

Artificial Intelligence Awareness in Work Environments 175
Hannu Karvonen, Eetu Heikkilä, and Mikael Wahlström

An Initial Generic Assessment Framework for the Consideration of Risk
in the Implementation of Autonomous Systems. 186
K. Tara Smith, Lynne Coventry, and Robert GreenSmith

A Methodology to Involve Domain Experts and Machine Learning
Techniques in the Design of Human-Centered Algorithms 200
*Tom Seymoens, Femke Ongenaë, An Jacobs, Stijn Verstichel,
and Ann Ackaert*

A Framework for Understanding Human Factors Issues in Border
Control Automation. 215
Minna Kulju, Mari Ylikauppila, Sirra Toivonen, and Laura Salmela

Research Methods – What Is Best for Developing and Evaluating
Human Computer Interaction and Interactive Artistic Installations? 229
Arminda Guerra Lopes

Theorizing About Socio-Technical Approaches to HCI 242
José Abdelnour-Nocera and Torkil Clemmensen

A Worker-Centric Design and Evaluation Framework for Operator 4.0
Solutions that Support Work Well-Being 263
*Eija Kaasinen, Marja Liinasuo, Franziska Schmalfuß, Hanna Koskinen,
Susanna Aromaa, Päivi Heikkilä, Anita Honka, Sebastian Mach,
and Timo Malm*

Techno-Trust and Rational Trust in Technology – A Conceptual
Investigation. 283
Pertti Saariluoma, Hannu Karvonen, and Rebekah Rousi

Author Index 295