

Lecture Notes in Networks and Systems 223

Nancy L. Black · W. Patrick Neumann ·
Ian Noy *Editors*

Proceedings of the 21st Congress of the International Ergonomics Association (IEA 2021)

Volume V: Methods & Approaches



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Preface

The International Ergonomics Association (IEA) is the organization that unites Human Factors and Ergonomics (HF/E) associations around the world. The mission of the IEA is “to elaborate and advance ergonomics science and practice, and to expand its scope of application and contribution to society to improve the quality of life, working closely with its constituent societies and related international organizations” (IEA, 2021). The IEA hosts a world congress every three years creating the single most important opportunity to exchange knowledge and ideas in the discipline with practitioners and researchers from across the planet. Like other IEA congresses, IEA2021 included an exciting range of research and professional practice cases in the broadest range of Human Factors and Ergonomics (HF/E) applications imaginable. While the conference was not able to host an in-person meeting in Vancouver, Canada, as planned by the host Association of Canadian Ergonomists/*Association canadienne d’ergonomie*, it still featured over 875 presentations and special events with the latest research and most innovative thinkers. For this congress, authors could prepare a chapter for publication, and 60% chose to do so. The breadth and quality of the work available at IEA2021 are second to none—and the research of all authors who prepared their publication for this congress is made available through the five volumes of these proceedings.

The International Ergonomics Association defines Human Factors and Ergonomics (HF/E) synonymously as being:

the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Practitioners of ergonomics and ergonomists contribute to the design and evaluation of tasks, jobs, products, environments and systems in order to make them compatible with the needs, abilities and limitations of people.

Ergonomics helps harmonize things that interact with people in terms of people’s needs, abilities and limitations. (<https://iea.cc/definition-and-domains-of-ergonomics/>)

The breadth of issues and disciplines suggested by this definition gives one pause for thought: what aspect in our lives is not in some way affected by the design and application of HF/E? For designers and managers around the world, a similar realization is growing: every decision made in the design and application of technology has implications for the humans that will interact with that system across its lifecycle. While this can be daunting, the researchers and professionals who participated in IEA2021 understand that, by working together across our disciplines and roles, we can achieve these lofty ambitions. This is especially relevant as we continue our collective journey into an increasingly “interconnected world”—the theme for the 21st IEA Congress. With the rise of a myriad of technologies as promulgated by Industry 4.0 proponents, we need now, more than ever, the skills and knowledge of HF/E researchers and practitioners to ensure that these tools are applied in a human-centric way towards resilient and sustainable systems that provide an enduring and sustainable road to prosperity—as advocated in the new Industry 5.0 Paradigm (Breque et al. 2021). Where the trend of Industry 4.0 aims primarily at encouraging technology purchasing and application, Industry 5.0 includes goals of resiliency and sustainability for both humans and our planet. These proceedings provide examples of research and development projects that illustrate how this brighter, human-centred future can be pursued through “*Ergonomie 4.0*”, as stated in the French theme of the Congress.

While the theme of the Congress concerns human interactions within a rapidly evolving cyber-physical world, the devastating impact of the COVID-19 pandemic has given an added dimension to the Congress theme and its delivery model. As the pandemic began to engulf the world, the traditional in-person Congress became increasingly less viable and gave way to the creation of a hybrid model as a means to enhance international participation. In early 2021, it became clear that holding an in-person event would not be possible; hence, the Congress was converted to a fully virtual event. The uncertainty, mounting challenges and turbulent progression actually created new possibilities to engage the global HF/E community in ways that were never previously explored by the IEA. Indeed, one of the scientific tracks of the congress focuses explicitly on HF/E contributions to cope with COVID-19, and readers will find some submissions to other tracks similarly focus on what HF/E practitioners and researchers bring to the world during this pandemic period. This journey epitomizes broader transformative patterns now underway in society at large and accentuates the urgency for resilience, sustainability, and healthy workplaces. No doubt, the notion of globalization will be redefined in the wake of the pandemic and will have far-reaching implications for the connected world and for future society, and with new paradigms emerge a host of new human factors challenges. The breadth of topics and issues addressed in the proceedings suggests that the HF/E community is already mobilizing and rising to these emerging challenges in this, our connected world.

IEA2021 proceedings includes papers from 31 scientific tracks and includes participants from 74 countries across 5 continents. The proceedings of the 21st triennial congress of the IEA—IEA2021—exemplify the diversity of HF/E, and of the association, in terms of geography, disciplines represented, application

domains, and aspects of human life cycle and capability being considered. Our diversity mirrors the diversity of humans generally and is a strength as we learn to weave our knowledge, methods, and ideas together to create a more resilient and stronger approach to design than is achievable individually. This is the strength of the IEA congresses, in the past, in the current pandemic-affected 21st occasion, and in the future. There is no other meeting like it.

A substantial number of works were submitted for publication across the Scientific Tracks at IEA2021. This gave us the happy opportunity to group contents by common threads. Each volume presents contents in sections with papers within the track's section presented in alphabetical order by the first author's last name. These proceedings are divided into five volumes as follows:

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Human Factors in Robotics
Human Modelling and Simulation
Neuroergonomics
Working with Computer Systems

These volumes are the result of many hours of work, for authors, Scientific Track Managers and their reviewer teams, student volunteers, and editors. We are grateful to Springer for making it available to you in book form and are confident you will find these works informative and useful in your own efforts to create a better, more human-centred future.

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The original version of the book was revised: The author name in part VI has been amended. The book have been updated with the changes. The correction to the book is available at https://doi.org/10.1007/978-3-030-74614-8_105

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The Organizing Committee is also indebted to those contributors who were instrumental in developing and promoting IEA2021. Joanne Bangs, our freelance Communications Specialist, provided engaging news blogs and other promotional collateral to help get the word out about the Congress. Sadeem Qureshi (Ryerson University), Elizabeth Georgiou, Elaine Fung, and Michelle Lam (Simon Fraser University) helped to create widespread awareness of the Congress as well as the HF/E field and profession through creative use of digital and social media. We are also grateful to those who worked diligently to ensure that the Congress provided meaningful opportunities for students and early career researchers, including Daniel P. Armstrong and Christopher A.B. Moore (University of Waterloo), Owen McCulloch (Simon Fraser University), Dora Hsiao (Galvion, Inc.), Chelsea DeGuzman and Joelle Girgis (University of Toronto), and Larissa Fedorowich (Associate Ergonomist, self-employed). The ePoster presentation option, new to IEA triennial congresses in 2021, was defined with care by Anne-Kristina Arnold (Simon Fraser University). Colleen Dewis (Dalhousie University) was key to

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The organizers are especially grateful to our sponsors, whose generous contributions made the Congress possible and readily accessible to the global HF/E community. Their recognition of the Congress as a valuable opportunity to advance the field of HF/E, as well as their steadfast support throughout a very trying planning period, was critical to the success of the Congress. The IEA 2021 sponsors include:

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Contents

Part I: Affective Design (Edited by Rosemary Ruiz Seva)

Design for UX in Flexible Offices – Bringing Research and Practice Together	3
Antonio Cobaleda-Cordero and Maral Babapour	
Outlining Experience and Well-Being in the Interaction with Social Media Apps	12
Beatriz de Paulo and Manuela Quaresma	
Affective Trash Bin Signage to Promote Waste Segregation	20
Arvidas Kio Dy, Margarita Lazo, Andreana Gabrielle Santos, and Rosemary Seva	
Analysis of Geometric Features of 3D Shapes on Perception of Product Appearance for Visual Brand Affiliation	31
Matthias Sebastian Fischer, Daniel Holder, and Thomas Maier	
Affective – Cognitive – Usability (ACU) Model Incorporating Eye Tracking Analysis for Redesigning the e-Commerce Website	39
Markus Hartono, Argo Hadi Kusumo, and Dwilita Aprilin Asikin	
The Functions of Computer-Mediated Touch at a Distance: An Interactionist Approach	45
Robin Héron, Stéphane Safin, Michael Baker, and Françoise Détienne	
Merging Total Design and User Centered Design for Designing a Mountable Toy: Achieving a Useful, Functional and Desirable Product	54
Julieta María Covarrubias Cruz, María Fernanda De La Rocha Barbosa, Fernanda Santos Rivera, and Pilar Hernández-Grageda	
Behavioral and Cognitive Methods to Assess Users and Assist Physical Point of Sale Experience Design	62
Paulo Eduardo Hauqui Tonin	

Design Process of a Mountable Toy Based on Total Design and User Centered Design Methodologies 71
 Ana Sofía Olivares Jiménez, María Inés Ibarra Caballero,
 Lilia Atziri Urías Dueñas, and Pilar Hernández-Grageda

Part II: Anthropometry (Edited by Karen Bredenkamp)

Anthropometric Indices and Nutritional Status of Infants in Nigeria – A Preliminary Study 81
 Echezona Nelson Dominic Ekechukwu, Chiamaka Chinyere Anyaene,
 Ogechukwu Ikefuna, Emmanuel Nwabueze Aguwa,
 Israel Chijioke Iroezindu, Theodora A. Okeke, and Susan U. Arinze-Onyia

Mexican Older-Adult Sitting and Standing Anthropometric Dimensions. Comparison with Other Populations 96
 Elvia Luz González-Muñoz, Rosalio Avila Chaurand,
 John A. Rey Galindo, and Gabriel Ibarra Mejia

Firefighters’ Anthropometrics: A Comparison Between Two Portuguese Fire Brigades 105
 Anna S. P. Moraes, Miguel A. F. Carvalho, Rachel S. Boldt,
 Fernando B. N. Ferreira, Susan P. Ashdown, and Linsey Griffin

A Motion Capture System for Hand Movement Recognition 114
 Graciela Rodríguez-Vega, Dora Aydee Rodríguez-Vega,
 Xiomara Penelope Zaldívar-Colado, Ulises Zaldívar-Colado,
 and Rafael Castillo-Ortega

Hand Shape Modeling for the Mexican Population 122
 Graciela Rodríguez-Vega, Xiomara Penelope Zaldívar-Colado,
 Ulises Zaldívar-Colado, Enrique Javier De la Vega-Bustillos,
 and Dora Aydee Rodríguez-Vega

Part III: Biomechanics (Edited by Rauf Iqbal)

Effects of a Back-Support Exoskeleton on Pelvis-Thorax Kinematics and Coordination During Lifting 131
 Sivan Almosnino, Rong Huangfu, and Jessica Cappelletto

Measurement of Work-Related Physical Workloads - Proposal for a Body Region-Related Categorization System 139
 Rolf Ellegast, Britta Weber, Christoph Schiefer, Kai Heinrich,
 and Ingo Hermanns-Truxius

Optimization of Product Handle Material Mechanical Properties for Improved Ergonomics Using Finite Element Method and Subjective Response 148
 Gregor Harih, Andrej Cupar, Jasmin Kaljun, and Bojan Dolšak

**Evaluation of Force Exertion Strategies During Repetitive Lifting/
Lowering Tasks Based on Time-Frequency Analysis 155**
Kazuki Hiranai, Miho Yaji, and Akihiko Seo

**A Wearable Device to Assess the Spine Biomechanical Overload
in a Sample of Loggers 162**
Federica Masci, Giovanna Spatari, Concetto Mario Giorgianni,
Sara Bortolotti, John Rosecrance, and Claudio Colosio

**Relationship of Floor Material and Fall Risk Assessment During
Descending Stairs 171**
Takeshi Sato, Mizuki Nakajima, Ryota Murano, Macky Kato,
and Kimie Nakajima

**PEPPA - Exchange Platform for Measurements of Occupational
Physical Activity and Physical Workload 175**
Christoph Schiefer, Vera Schellewald, Stefan Heßling,
Ingo Hermanns-Truxius, Kévin Desbrosses, Marjolein Douwes,
Francesco Draicchio, Henrik Enquist, Mikael Forsman, Nidhi Gupta,
Andreas Holtermann, Reinier Konemann, Norbert Lechner, Peter Loewis,
Satu Mänttäre, Svend Erik Mathiassen, Andrew Pinder, Peter Schams,
Marianne Schust, Michaela Streb, Kaj Bo Veiersted, Britta Weber,
and Rolf Ellegast

**Biomechanical Simulation and a Detailed Analysis
of the Roadside Cleaning Activity 183**
Neelesh K. Sharma, Mayank Tiwari, Atul Thakur,
and Anindya K. Ganguli

**Kerbside Waste Collection Round Risk Assessment by Means
of Physiological Parameters: sEMG and Heart Rate 191**
Alessio Silvetti, Lorenzo Fiori, Antonella Tatarelli, Alberto Ranavolo,
and Francesco Draicchio

**Using Complex Biomechanics Models to Communicate
Simple Messages 200**
Carrie Taylor and Josie Blake

**Overview of Measurement-Based Assessment Approaches
from the MEGAPHYS Project 206**
Britta Weber, Kai Heinrich, David H. Seidel, Ingo Hermanns-Truxius,
Ulrike Hoehne-Hückstädt, Dirk Ditchen, Matthias Jäger, Lope H. Barrero,
and Rolf Ellegast

**Part IV: Ergonomics in Advanced Imaging
(Edited by Jukka Häkkinen)**

Effects of Avatars on Street Crossing Tasks in Virtual Reality 215
Philipp Maruhn and Simon Hurst

**Estimating Time to Contact in Virtual Reality:
Does Contrast Matter?** 224
Sonja Schneider, Mariam Salloum, Katharina Gundel, and Annika Boos

**Part V: Human Factors in Robotics (Edited by Sascha Wischniewski
and Patricia H. Rosen)**

**Three-Stage Evaluation for Defining the Potential of an Industrial
Exoskeleton in a Specific Job** 235
Michiel de Looze, Aijse de Vries, Frank Krause, and Saskia Baltrusch

**Human-Robot Collaboration During Assembly Tasks: The Cognitive
Effects of Collaborative Workstation Features** 242
Federico Fraboni, Luca Gualtieri, Francesco Millo, Matteo De Marchi,
Luca Pietrantoni, and Erwin Rauch

**Evaluation of Physiological Costs Using Standardized Analysis
Methods During Simulated Overhead Work with
and Without Exoskeleton** 250
Sandra Groos, Nils Darwin Abele, Petra Fischer, Michael Hefferle,
and Karsten Kluth

**Development of a Multifunctional Test Station and a Reproducible
Test Design for the Evaluation of Stress and Strain During Overhead
Work with and Without Upper Body Exoskeletons** 258
Sandra Groos, Nils Darwin Abele, Kevin Kruse, Petra Fischer,
Michael Hefferle, and Karsten Kluth

**Evaluation of Variables of Cognitive Ergonomics in Industrial
Human-Robot Collaborative Assembly Systems** 266
Luca Gualtieri, Federico Fraboni, Matteo De Marchi, and Erwin Rauch

**Optimizing Force Transfer in a Soft Exoskeleton Using
Biomechanical Modeling** 274
Christina M. Harbauer, Martin Fleischer, Cerys E. M. Bandmann,
and Klaus Bengler

**How User Presence Impacts Perceptions and Operation Routines
of Robotic Vacuum Cleaners – a ‘Stay at Home’ Experiment** 282
Shanee Honig and Tal Oron-Gilad

**Evaluation of Different Degrees of Support in Human-Robot
Cooperation at an Assembly Workstation Regarding Physiological
Strain and Perceived Team Fluency** 291
Verena Klaer, Hendrik Groll, Jurij Wakula, and Tim Steinebach

**Field Study to Objectify the Stress and Strain on Male Workers
During Car Wheel Changes in the Course of Using an Active
Exoskeleton** 300
Karsten Kluth and Michael Hefferle

Using Multimodal Data to Predict Surgeon Situation Awareness 308
 Aurelien Lechappe, Mathieu Chollet, Jerome Rigaud,
 and Caroline G. L. Cao

**Preliminary Requirements of a Soft Upper-Limb Exoskeleton
 for Industrial Overhead Tasks Based on Biomechanical Analysis 317**
 Dario Panariello, Stanislao Grazioso, Teodorico Caporaso,
 Giuseppe Di Gironimo, and Antonio Lanzotti

**A Pilot Study on Auditory Feedback for a Lower-Limb Exoskeleton
 to Increase Walking Safety 325**
 Jing Qiu, Yilin Wang, Hong Cheng, Lu Wang, and Xiao Yang

**Human-Robot Collaboration (HRC) Technologies for Reducing
 Work-Related Musculoskeletal Diseases in Industry 4.0 335**
 Alberto Ranavolo, Giorgia Chini, Francesco Draicchio, Alessio Silveti,
 Tiwana Varrecchia, Lorenzo Fiori, Antonella Tatarelli,
 Patricia Helen Rosen, Sascha Wischniewski, Philipp Albrecht, Lydia Vogt,
 Matteo Bianchi, Giuseppe Averta, Andrea Cherubini, Lars Fritzsche,
 Massimo Sartori, Bram Vanderborght, Renee Govaerts,
 and Arash Ajoudani

**Results from the Third European Survey of Enterprises
 on New and Emerging Risks on Human-Robot Interaction 343**
 Sascha Wischniewski, Eva Heinold, and Patricia Helen Rosen

**Part VI: Human Modelling and Simulation (Edited by Gunther Paul,
 Gregor Harih and Sofia Scataglini)**

**A Digital Human Modelling-Based Optimization Framework
 to Minimize Low Back Cumulative Loading During Design
 of Lifting Tasks 349**
 Sivan Almosnino

**Assessing the Efficiency of Industrial Exoskeletons with Biomechanical
 Modelling – Comparison of Experimental and Simulation Results 353**
 Lars Fritzsche, Christian Gärtner, Michael Spitzhirn, Pavel E. Galibarov,
 Michael Damsgaard, Pauline Maurice, and Jan Babič

**Current Trends in Research and Application of Digital
 Human Modeling 358**
 Lars Hanson, Dan Högberg, Erik Brolin, Erik Billing,
 Aitor Iriondo Pascual, and Maurice Lamb

**Validation of an Inverse Kinematic VR Manikin in Seated Tasks:
 Application in Ergonomics Training 367**
 Mohammad Homayounpour, Dorien Butter, Saaransh Vasta,
 and Andrew Merryweather

Multi-objective Optimization of Ergonomics and Productivity by Using an Optimization Framework 374
Aitor Iriondo Pascual, Dan Högberg, Anna Syberfeldt, Erik Brolin, Estela Perez Luque, Lars Hanson, and Dan Lämku

Demographic Effects on Mid-Air Gesture Preference for Control of Devices: Implications for Design 379
Haoyan Jiang, Mark Chignell, Sachi Mizobuchi, Farzin Farhadi Niaki, Zhe Liu, Wei Zhou, and Wei Li

A Human-Centered Design Procedure for Conceptualization Using Virtual Reality Prototyping Applied in an Inflight Lavatory 387
Meng Li, Doris Aschenbrenner, Daniëlle van Tol, Daan van Eijk, and Peter Vink

Automated Segmentation of 3D Digital Human Model for Area and Volume Measurement 394
Flavia Cristine Hofstetter Pastura, Tales Fernandes Costa, Gabriel de Aguiar Mendonça, Thatiane dos Santos Lopes, and Maria Cristina Palmer Lima Zamberlan

A Conceptual Framework of DHM Enablers for Ergonomics 4.0 403
Gunther Paul and Leyde Briceno

Characterizing Adaptive Display Interventions for Attentional Tunneling 407
Kayla Pedret and Greg A. Jamieson

Digital Production Planning of Manual and Semi-automatic Tasks in Industry Using the EMA Software Suite 415
Michael Spitzhirn, Lars Fritzsche, and Sebastian Bauer

Probabilistic Human-System-Integration (HSI) Models: Review and Extension 420
Ephraim Suhir and Gunther Paul

Assessment of Biomechanical Risk Factors During Lifting Tasks in a Spacesuit Using Singular Value Decomposition 429
Linh Q. Vu, Han K. Kim, and Sudhakar L. Rajulu

A Preliminary Study on the Effects of Foam and Seat Pan Inclination on the Deformation of the Seated Buttocks Using MRI 434
Xuguang Wang, Léo Savonnet, and Sonia Duprey

Tool Development for Ergonomic Design of Automated Vehicles 439
Hans-Joachim Wirsching and Martin Fleischer

Simplifying Ergonomic Assessment for Designers: A User-Product Interaction-Modelling Framework in CAD 447
 Alexander Wolf, Yvonne Wagner, Marius Oßwald, Jörg Miehl, and Sandro Wartack

Usability Study on a New Assembly of 3D Interactive Gestures for Human-Computer Interaction 453
 Bohan Wu, Gang Zhang, Xuegang Zhang, Shibo Mei, Jinduo Wu, Hongting Li, and Zhen Yang

Combining a Wearable IMU Mocap System with REBA and RULA for Ergonomic Assessment of Container Lashing Teams 462
 Sander Zelck, Stijn Verwulgen, Lenie Denteneer, Hanne Vanden Bossche, and Sofia Scataglini

Development of Guidelines for the Ergonomic Evaluation of Human Work in Digital Factory Tools 466
 Gert Zülch

Part VII: Neuroergonomics (Edited by Echezona Nelson Dominic Ekechukwu)

Cognitive Aspects in Control Rooms: Anticipated Response to Adverse Situations 473
 Juan Alberto Castillo-M and Maria Constanza Trillos Ch.

Independent Driving Improved the Self-esteem and Health Related Quality of Life of a Polio Survivor 481
 Olumide Olasunkanmi Dada, Femi Abolaji Ogundapo, Olusegun Adeyemi Adejare, Chidozie Emmanuel Mbada, and Echezona Nelson Dominic Ekechukwu

Disability and Community Reintegration Among Community Dwelling Persons Living with Stroke, Spinal Cord Injury and Limb Amputation – A Comparative Study 487
 Echezona Nelson Dominic Ekechukwu, Chinwendu Obi Nwokocho, Blessing Chiagozikam Atuenyi, Antoninus Obinna Ezeukwu, and Olumide Olasunkanmi Dada

Virtual Reality, a Neuroergonomic and Neurorehabilitation Tool for Promoting Neuroplasticity in Stroke Survivors: A Systematic Review with Meta-analysis 495
 Echezona Nelson Dominic Ekechukwu, Ikenna Collins Nzeakuba, Olumide Olasunkanmi Dada, Kingsley Obumneme Nwankwo, Paul Olowoyo, Victor Adimabua Utti, and Mayowa Ojo Owolabi

Are the Psychosocial and Physical Disabilities of Stroke Survivors Ageing Related? 509
 Echezona Nelson Dominic Ekechukwu, Nelson Okogba,
 Kingsley Obumneme Nwankwo, Nmachukwu Ifeoma Ekechukwu,
 Amaka Gloria Mgbеojedo, Olusegun Adeyemi Adejare,
 Uchenna Prosper Okonkwo, and Victor Adimabua Utti

Analyzing the Effect of Visual Cue on Physiological Hand Tremor Using Wearable Accelerometer Sensors 517
 Vishal Kannan, K. Adalarasu, Priyadarshini Natarajan,
 and Venkatesh Balasubramanian

Perceived Barriers and Facilitators of Return to Driving Among a Sample of Nigerian Stroke Survivors - A Qualitative Study 537
 Kingsley Obumneme Nwankwo, Olubukola Adebisi Olaleye,
 Tal’hatu Kolapo Hamzat, and Echezona Nelson Dominic Ekechukwu

VR Application for Vestibular System Training (Pilot Study) 552
 Daria Plotnikova, Aleksandr Volosiuk, Gleb Tikhonov,
 Aleksandr Tsynchenko, Anastasiia Luneva, and Artem Smolin

Determination of the Influence of Music on Working Memory Performance Using EEG Analysis 559
 Minerva Rajendran, Tanya Malaiya, and Venkatesh Balasubramanian

**Part VIII: Working with Computer Systems
 (Edited by Nicole Jochems)**

Empirical Comparison of the Effects of Symmetrical and Asymmetrical Video Game Console Controllers on Players Performance 569
 Asma Alfargani and Ahamed Altaboli

A Novel 3D Editor for Gesture Design Based on Labanotation 577
 Kathleen Anderson, Børge Kordts, and Andreas Schrader

Advancing Towards Automated Ergonomic Assessment: A Panel of Perspectives 585
 Daniel P. Armstrong, Christopher A. B. Moore, Lora A. Cavuoto,
 Sean Gallagher, SangHyun Lee, Michael W. Sonne,
 and Steven L. Fischer

From Globalization to Circular Economy, Which Issues for Health and Safety at Work? 592
 Agnès Aublet-Cuvelier, Michel Hery, and Marc Malenfer

Collaborative Robotics and Industry 4.0: An Engineering, Sociology and Activity-Centered Ergonomics Cross-Experience 597
 Flore Barcellini, Willy Buchmann, Richard Béarée,
 Tahar-Hakim Benchekroun, Mouad Bounouar, Gérard Dubey,
 Caroline Moricot, Anne-Cecile Lafeuillade, Celine Rosselin-Bareille,
 Marco Saraceno, and Ali Siadat

Trade-offs of Users and Non-users of Life-Logging – Desire for Support vs. Potential Barriers 605
 Laura Burbach, Chantal Lidynia, Philipp Brauner, and Martina Ziefle

Enabling Collaborative Situations in 4.0 Industry: Multiple Case Study 614
 Nathan Compan, Fabien Coutarel, Daniel Brissaud,
 and Géraldine Rix-Lièvre

The Impact of Expertise on Query Formulation Strategies During Complex Learning Task Solving: A Study with Students in Medicine and Computer Science 621
 Cheyenne Dosso, Lynda Tamine, Pierre-Vincent Paubel,
 and Aline Chevalier

Artificial Intelligence (AI) in the Workplace: A Study of Stakeholders’ Views on Benefits, Issues and Challenges of AI Systems 628
 Tamari Gamkrelidze, Moustafa Zouinar, and Flore Barcellini

The Remanufacturing Activity: Skills to Develop and Productive Organizations to Rethink 636
 Kevin Guelle, Sandrine Caroly, and Aurélie Landry

Steady Hands - An Evaluation on the Use of Hand Tracking in Virtual Reality Training in Nursing 643
 Tino Hentschel and Jan A. Neuhöfer

Supporting Pain Management for Mechanically Ventilated Intensive Care Patients Using a Novel Communication Tool 650
 Jan Patrick Kopetz and Nicole Jochems

Users’ Error Recovery Strategies in the Interaction with Voice Assistants (VAs) 658
 Isabela Motta and Manuela Quaresma

User Needs for Digital Creativity Support Systems in an Occupational Context 667
 Lorenz Prasch, Lena aus dem Bruch, and Klaus Bengler

An Empirical Study on Automation Transparency (i.e., seeing-into) of an Automated Decision Aid System for Condition-Based Maintenance 675
 Fahimeh Rajabiyazdi, Greg A. Jamieson, and David Quispe Guanolusia

A User Study to Evaluate the Customization of Automatically Generated GUIs 683
David Raneburger, Roman Popp, and Hermann Kaindl

A Framework for Future Navigation Aids 691
Adam J. Reiner, Greg A. Jamieson, and Justin G. Hollands

Explainable AI for Entertainment: Issues on Video on Demand Platforms 699
Cinthia Ruiz and Manuela Quaresma

Reliability of Heuristic Evaluation During Usability Analysis 708
Thomas J. Smith and Cindy Kheng

Clinical Usability Studies – Clash of Cultures? Study Design Proposal from Lessons Learned 715
Thomas Stüdeli and Limor Hochberg

Collaborating with Communities in Participatory System Development 725
Torben Volkman, Michael Sengpiel, and Nicole Jochems

Making Tax eForms Less Taxing—Comparing Evaluation Measures of User-Experience, Usability, and Acceptance in Public Sector eForms 735
Mourad Zoubir, Daniel Wessel, Tim Schrills, Thomas Franke, and Moreen Heine

Part IX: Ergonomic Work Analysis and Training (EWAT) – Addendum (Edited by Catherine Delgoulet and Marta Santos)

Learning Scenarios for the Improvement of Operating Safety of Machine Tools 749
Leif Goldhahn and Robert Eckardt

Developing a Training Action for Primary School Teachers by Doubly Considering (Their) Work 758
Ana Rodrigues, Maria Cadilhe, Filipa Ferreira, Cláudia Pereira, and Marta Santos

Part X: HF/E Education and Professional Certification Development – Addendum (Edited by Chien-Chi (Max) Chang and Maggie Graf)

Applications and Implications of the Brazilian Ergonomics Regulatory Standard (NR17) 767
Lia Buarque de Macedo Guimarães, Marcia Gemari Derenevich, and Rosimeire Sedrez Bitencourt

**Part XI: Organisation Design and Management (ODAM) – Addendum
(Edited by Laerte Idal Szelwar)**

**Occupational Safety and Protection Against Infection in Times
of the Pandemic: Challenges for Human Factors and Regulation 777**

Thomas Alexander, Lars Adolph, and Stefan Voss

Presenteeism and Voice: Ergonomic Factors for Sports Coaches 783

Katie Buckley, Jennifer Oates, Paul O’Halloran, Mandy Ruddock-Hudson,
and Lindsay Carey

Ergo@Large: Collaborating for the Benefits of HF/E 791

Jeanne Guérin

**A Synthesis of Subjective Scales Which Assess Worker Fatigue:
Building a Simple, Reliable, and Effective Evaluative Instrument 797**

Gabriella M. Hancock, Mira Gruber, Uyen D. Bui, Jessica Blay-Moreira,
Yvette Apatiga, Christian E. Schmitz, and Peter A. Hancock

**Heat Stress Management in the Construction Industry:
A Socio-technical Systems Perspective 804**

Damithri Gayashini Melagoda and Steve Rowlinson

Attitude Towards Artificial Intelligence in a Leadership Role 811

Deborah Petrat

**Macroergonomics-Based Approach for a Management Trainee
Program in the Utilities Industry 820**

Yogi Tri Prasetyo and Johnamae Khow

Part XII: Systems HF/E – Addendum (Edited by Paul M. Salmon)

**Human Factors Effects on a Human-Robot Collaboration System:
A Modelling Approach 829**

Guilherme Deola Borges, Paula Carneiro, and Pedro Arezes

**Part XIII: Slips, Trips and Falls – Addendum
(Edited by Richard Bowman)**

The Future of Footwear Friction 841

Kurt E. Beschorner, Yue (Sophia) Li, Takeshi Yamaguchi, William Ells,
and Richard Bowman

**Effects of Foot–Floor Friction on Trip-Induced Falls During Shuffling
Gait: A Simulation Study 856**

Takeshi Yamaguchi, Kenichi Nakatani, Tomoki Hirose, Takashi Yoshida,
and Kei Masani

**Correction to: Proceedings of the 21st Congress of the International
Ergonomics Association (IEA 2021) C1**

Nancy L. Black, W. Patrick Neumann, and Ian Noy

Author Index 861

**Part I: Affective Design (Edited
by Rosemary Ruiz Seva)**



Design for UX in Flexible Offices – Bringing Research and Practice Together

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Abstract. A growing number of organisations are relocating from traditional office environments to flexible office environments (FOEs) such as ‘combi’ or ‘activity-based’ offices. Research efforts are being dedicated to understanding the challenges and benefits that these office designs represent. Yet, there is a gap between design research and practice that limits innovations in FOE design and smears the overall user experience at work. This paper addresses the exploration of design opportunities for artefacts and spaces enabling positive user experience (UX) in FOEs together with experts from a relevant European actor in the office furniture sector. First, an explorative workshop was conducted to understand practitioners’ perspective and priorities when designing for FOEs. Findings from previous research work by the authors plus the workshop results were used to propose and discuss four ‘Design for UX’ areas worth of further exploration. Among these, the UX of control in FOEs was chosen, and a subsequent workshop was conducted to deepen into the matter. The last session concluded with the formulation of a specific UX proposal to be developed in the near future. The value and originality of this paper reside in two aspects: (i) a UX approach that relies on the ‘innovation of meaning’ and splits from a creative problem-solving mainstream; and (ii) a collaboration between user-centered design research and product development practice that enable the alignment of resources and strategies in the benefit of users and innovation.

Keywords: User experience · Design for UX · Exploratory sessions · Design opportunities · Flexible offices · User research · Product development

1 Introduction

Flexible office environments (FOEs) where employees can switch between different types of workstations and spaces depending on the activity at hand have become increasingly popular [1]. Further, many organisations plan and dimension their flexible offices assuming that not everyone will be at the office every day, nor need a desk at the same time [2]. In comparison to traditional offices, this represents a paradigmatic change in terms of design qualities that determine the preconditions for distinct user experiences (UXs) at work. However, whether these experiences are meaningful or taxing for users remains debatable [3].