


Editor-in-Chief

Kai Rannenber, Goethe University Frankfurt, Germany

Editorial Board Members

TC 1 – Foundations of Computer Science

Luís Soares Barbosa , University of Minho, Braga, Portugal

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

Burkhard Stiller, University of Zurich, Zürich, Switzerland


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 , National University of Ireland, Galway, Ireland

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

Eunika Mercier-Laurent , University of Reims Champagne-Ardenne, Reims, France

TC 13 – Human-Computer Interaction

Marco Winckler , University of Nice Sophia Antipolis, France

TC 14 – Entertainment Computing

Rainer Malaka, University of Bremen, Germany

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 <https://link.springer.com/bookseries/6102>

Nathan Clarke · Steven Furnell (Eds.)

Human Aspects of Information Security and Assurance

16th IFIP WG 11.12 International Symposium, HAISA 2022
Mytilene, Lesbos, Greece, July 6–8, 2022
Proceedings

Editors

Nathan Clarke 
University of Plymouth
Plymouth, UK

Steven Furnell 
University of Nottingham
Nottingham, UK

ISSN 1868-4238

ISSN 1868-422X (electronic)

IFIP Advances in Information and Communication Technology

ISBN 978-3-031-12171-5

ISBN 978-3-031-12172-2 (eBook)

<https://doi.org/10.1007/978-3-031-12172-2>

© IFIP International Federation for Information Processing 2022

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, expressed 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

It is now widely recognized that technology alone cannot provide the answer to cyber security problems. A significant aspect of protection comes down to the attitudes, awareness, behavior, and capabilities of the people involved, and they often need support in order to get it right. Factors such as lack of awareness and understanding, combined with unreasonable demands from security technologies, can dramatically impede their ability to act securely and comply with policies. Ensuring appropriate attention to the needs of users is therefore a vital element of a successful security strategy, and they need to understand how the issues may apply to them and how to use the available technology to protect their systems.

With all of the above in mind, the Human Aspects of Information Security and Assurance (HAISA) symposium series specifically addresses information security issues that relate to people. It concerns the methods that inform and guide users' understanding of security, and the technologies that can benefit and support them in achieving protection.

This book presents the proceedings from the sixteenth event in the series, held virtually due to the COVID-19 pandemic, during July 2022. A total of 25 reviewed papers are included, spanning a range of topics including security management, cyber security education and training, culture, and privacy. All of the papers were subject to double-blind peer review, with each being reviewed by at least two members of the International Program Committee. We are grateful to all of the authors for submitting their work and sharing their findings. We are also grateful to Spyros Kokolakis, from the University of the Aegean, for being the keynote speaker for this year's event.

The HAISA symposium is the official event of IFIP Working Group 11.12 on Human Aspects of Information Security and Assurance, and we would like to thank Kerry-Lynn Thomson for supporting the event as the Working Group 11.12 chair. We would also like to acknowledge the significant work undertaken by our International Program Committee, and recognize their efforts in reviewing the submissions and ensuring the quality of the resulting event and proceedings. Finally, we would like to thank Christos Kalloniatis and the organizing team for making all the necessary arrangements to enable this symposium to take place.

July 2022

Nathan Clarke
Steven Furnell

Organization

General Chairs

Nathan Clarke	University of Plymouth, UK
Steven Furnell	University of Nottingham, UK

IFIP WG 11.12 Conference Chair

Kerry-Lynn Thomson	Nelson Mandela University, South Africa
--------------------	---

Local Organizing Chair

Christos Kalloniatis	University of the Aegean, Greece
----------------------	----------------------------------

Publicity Chair

Fudong Li	University of Portsmouth, UK
-----------	------------------------------

International Program Committee

Sal Aurigemma	University of Tulsa, USA
Maria Bada	University of Cambridge, UK
Peter Bednar	University of Portsmouth, UK
Matt Bishop	University of California, Davis, USA
Patrick Bours	Norwegian University of Science and Technology, Norway
William Buchanan	Edinburgh Napier University, UK
Mauro Cherubini	University of Lausanne, Switzerland
Emily Colins	Cardiff University, UK
Jeff Crume	IBM, USA
Adele Da Veiga	University of South Africa, South Africa
Dionysios Demetis	University of Hull, UK
Ronald Dodge	Palo Alto Networks, USA
Paul Dowland	Edith Cowan University, Australia
Jan Eloff	University of Pretoria, South Africa
Simone Fischer-Huebner	Karlstad University, Sweden
Stephen Flowerday	Rhodes University, South Africa
Lynn Fitcher	Nelson Mandela University, South Africa
Stefanos Gritzalis	University of Piraeus, Greece
Julie Haney	NIST, USA
Karen Hedström	Örebro University, Sweden
Kiris Helkala	Norwegian Defence University College, Norway

Joanne Hinds	University of Bath, UK
Yuxiang Hong	Hangzhou Dianzi University, China
John Howie	Cloud Security Alliance, USA
Kévin Huguenin	University of Lausanne, Switzerland
William Hutchinson	Edith Cowan University, Australia
Murray Jennex	San Diego State University, USA
Andy Jones	University of Suffolk, UK
Fredrik Karlsson	Örebro University, Sweden
Vasilios Katos	Bournemouth University, UK
Sokratis Katsikas	Open University of Cyprus, Cyprus
Joakim Kavrestad	University of Skövde, Sweden
Stewart Kowalski	Norwegian University of Science and Technology, Norway
Hennie Kruger	North-West University, South Africa
Costas Lambrinoudakis	University of Piraeus, Greece
Michael Lavine	Johns Hopkins University, USA
Gabriele Lenzini	University of Luxembourg, Luxembourg
Shujun Li	University of Kent, UK
Javier Lopez	University of Malaga, Spain
George Magklaras	University of Oslo, Norway
Herb Mattord	Kennesaw State University, USA
Abbas Moallem	San Jose State University, USA
Haris Mouratidis	University of Brighton, UK
Marcus Nohlberg	University of Skövde, Sweden
Jason Nurse	University of Kent, UK
Malcolm Pattinson	University of Adelaide, Australia
Jacques Ophoff	Abertay University, UK
Awais Rashid	University of Bristol, UK
Nathalie Rebe	University of Burgundy, France
Karen Renaud	University of Strathclyde, UK
Nader Sohrabi Safa	University of Wolverhampton, UK
Rossouw Von Solms	Nelson Mandela University, South Africa
Theo Tryfonas	University of Bristol, UK
Aggeliki Tsohou	Ionian University, Greece
Jeremy Ward	Security Consultant, UK
Merrill Warkentin	Mississippi State University, USA
Naomi Woods	University of Jyväskylä, Finland
Zihang Xiao	Palo Alto Networks, USA
Wei Yan	Trend Micro, USA
Ibrahim Zincir	Izmir University of Economics, Turkey

Contents

Cyber Security Education and Training

Visual Programming in Cyber Range Training to Improve Skill Development	3
<i>Magdalena Glas, Manfred Vielberth, Tobias Reitinger, Fabian Böhm, and Günther Pernul</i>	
Survey of Users' Willingness to Adopt and Pay for Cybersecurity Training	14
<i>Joakim Kävrestad, Martin Gellerstedt, Marcus Nohlberg, and Jana Rambusch</i>	
A Thematic Content Analysis of the Cybersecurity Skills Demand in South Africa	24
<i>Madri Kruger, Lynn Futcher, and Kerry-Lynn Thomson</i>	
Applying PDCA to Security, Education, Training and Awareness Programs	39
<i>Olivier de Casanove, Nicolas Leleu, and Florence Sèdes</i>	
Exploring CyBOK with Topic Modeling Techniques	49
<i>Ana I. González-Tablas and Mohammed Rashed</i>	
COLTRANE – Towards a Methodology and Platform Supported Educational Basis for Cybersecurity Education	66
<i>Jerry Andriessen, Steven Furnell, Gregor Langner, Carmela Luciano, Gerald Quirchmayr, Vittorio Scarano, and Teemu Johannes Tokola</i>	
An Investigation into Educational Process Models for Teaching Secure Programming	77
<i>Vuyolwethu Mdunyelwa, Lynn Futcher, and Johan van Niekerk</i>	
Cybersecurity Knowledge Requirements for a Water Sector Employee.	91
<i>R. Thomani, A. Marnewick, S. von Solms, and M. Malatji</i>	
CAP: Patching the Human Vulnerability	106
<i>Thaddeus Eze and Neil Hawker</i>	
A Novel Framework for the Development of Age Appropriate Information Security Serious Games	120
<i>Rudi Serfontein and Riana Serfontein</i>	

Cyber Security Culture

Security Culture in Industrial Control Systems Organisations: A Literature Review	133
<i>Stefanos Evripidou, Uchenna D. Ani, Jeremy D McK. Watson, and Stephen Hailes</i>	
Systematic Review of Factors that Influence the Cybersecurity Culture	147
<i>Emilia N. Mwim and Jabu Mtsweni</i>	
Cyber4Dev Security Culture Model for African Countries	173
<i>Victor Reppoh and Adéle da Veiga</i>	
A Model for Information Security Culture with Innovation and Creativity as Enablers.	186
<i>Adéle da Veiga</i>	
Understanding Phishing in Mobile Instant Messaging: A Study into User Behaviour Toward Shared Links	197
<i>Rufai Ahmad and Sotirios Terzis</i>	

Privacy

How Privacy Concerns Impact Swedish Citizens' Willingness to Report Crimes.	209
<i>Gunnar Lindqvist and Joakim Kävrestad</i>	
"Your Cookie Disclaimer is Not in Line with the Ideas of the GDPR. Why?"	218
<i>Anne Hennig, Heike Dietmann, Franz Lehr, Miriam Mutter, Melanie Volkamer, and Peter Mayer</i>	
A Survey of Australian Attitudes Towards Privacy: Some Preliminary Results	228
<i>Leah Shanley, Michael N. Johnstone, Patryk Szewczyk, and Michael Crowley</i>	
Designing and Evaluating a Prototype for Data-Related Privacy Controls in a Smart Home.	240
<i>Chola Chhetri and Vivian Motti</i>	

Cyber Security Management

An Exploratory Factor Analysis of Personality Factors: An Insider Threat Perspective.	253
<i>Keshnee Padayachee</i>	

Policy Components - A Conceptual Model for Tailoring Information Security Policies	265
<i>Elham Rostami, Fredrik Karlsson, and Shang Gao</i>	
Security Fatigue: A Case Study of Data Specialists	275
<i>Anusha Bhana and Jacques Ophoff</i>	
Factors Influencing Cybercrime Reporting Behaviour in South African State-Owned Entities	285
<i>Karabo Pilane, Zainab Ruhwanya, and Irwin Brown</i>	
Online Security Attack Experience and Worries of Young Adults in the United Kingdom	300
<i>Najla Aldaraani, Helen Petrie, and Siamak F. Shahandashti</i>	
PowerQoPE: A Personal Quality of Internet Protection and Experience Configurator	310
<i>Enock Samuel Mbewe, Taveesh Sharma, and Josiah Chavula</i>	
Author Index	329