The Management of Risks and Benefits when Engineering Interactive Digital Systems

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ABSTRACT

Traditionally, most UX designers, computer scientists and software engineers have not had to consider risks to the public from using their systems. However, the current evolution of digital systems in terms of the increasing number of users, their growing complexity and the pervasiveness of Artificial Intelligence techniques allow common HCI designers and engineers to build systems that create risks for the individual, groups of people, or event to the entire society.

In this workshop, we aim at collecting the views and the current practice in the management of the risks and benefits in the engineering of interactive digital systems. Such a view will draw the way for new research, methods, and tools to incorporate the risk analysis into the current engineering and design practices.

The workshop is proposed on behalf of the IFIP Working Groups 2.7/13.4 on User Interface Engineering.

CCS CONCEPTS

• **Human-centered computing** → **Interactive systems and tools**.

KEYWORDS

risk management, safety-critical, engineering interactive systems

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1 BACKGROUND

Traditionally, most UX designers have not had to consider risks to the public from using their systems. They could focus on the benefits of their designs: better user experience, better efficiency, more fun. Some HCI areas are an exception - e.g., flight control user interfaces, interfaces in nuclear reactors - and these are traditionally under the aegis of professional engineers.

Two recent trends have changed this: the scale of the systems (in terms of users and complexity) and machine learning. These lead "normal" HCI designers to be developing systems that create risks to the individual, to people more broadly, and even to the structure of society at large. Digital systems can induce dangerous behaviours or amplify divisions between social groups. An interesting example is the development of apps for fighting the Covid-19 pandemics. Most of the applications developed in the EU focused on automatic contact tracing, relying on Bluetooth technologies. This exposes the solution to potential errors in evaluating the distance among persons, and it also poses privacy issues, both real or perceived as such by the users. In addition, all of them required a large adoption (estimated around 60%) for being effective, another risk to consider in their development. Instead, the app developed in New Zealand focused first on creating a diary of the visited places. It now also includes bluetooth tracing. The approach seemed focused more on solving the personal problem of remembering the visited places, requiring a conscious action instead of relying on phone automation. Of course, the application requires that people are committed to registering their movements, and they are affected by the risk of human errors. All these risks have not been effectively considered and lead to the ubiquitous technologies' overall failure in such a task.

These undesirable effects have already started to affect how digital technologies can contribute to society and can now lead to rejection if not properly understood and addressed. Consequently, our practice for the engineering of interactive systems requires UX designers to consider risks and implications, and HCI scientists to inform society about the appropriate risk/benefit balances of every design pattern. Techniques need to be developed to identify risks, identify tradeoffs, understand the value of systems, and ultimately mitigate risks.

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In the safety domain, risk analysis is a key phase in product and system development. For instance, NASA uses a risk assessment matrix pairing the likelihood of events alongside their consequences [2]. Similarly, SAGE, the UK scientific group advising the government on Covid-19, uses a four-level assessment of potential non-pharmaceutical interventions [3]: low, medium, high, very high under three headings Covid transmission, deaths and non-Covid impact (social and psychological; excluding economic).

In this workshop, we aim at collecting the views and the current practice on the management of risks and benefits in the engineering of interactive digital systems. In particular, we are interested in the following:

- Exploring the risks in digital system interaction and their implications. In particular, we would like to identify the risks drivers and to build a categorization of the risks they produce.
- Factors that impact the risk-benefit analysis and the information required. In this category, we would like to list the available scientific theories, the techniques for building a shared knowledge on such factors (e.g., databases, models and tools).
- Accounting the risks put by the application of Artificial Intelligence algorithms in digital interactive systems. They include (but not limited to): transparency, interactive control, controllability and automation, explainability, biases in algorithms and data, decision support design, accountability, fairness and digital sobriety.
- Techniques and interfaces for helping and/or nudging people on perceiving and understanding the risks in interacting with digital systems.

The aspects mentioned above are not properly covered enough by the current research, methods and tools for engineering digital systems. Different communities and disciplines are involved in developing such a topic, both in the research and in the development practice. Besides the UI engineering community, we expect relevant contributions by designers, safety and privacy experts, sociologists, psychologists, ethicists, etc. The workshop's ultimate goal is to set-up a shared view on the risks related to the interaction, their severity, and their likelihood.

2 FORMAT AND ORGANIZATION

2.1 Soliciting Contributions and Participation

We will solicit contributions from different communities. First of all, the ones form the Human-Computer Interaction Engineering community that elicited the workshop idea. Besides, we will involve other communities related to interest topics, disseminating a contribution call into usual channels such as mailing lists, conferences, social media, call for paper repositories and personal contacts. The communities that we would like to target are the following: engineers, designers, data scientists, privacy experts, UI development practitioners, policymakers and experts in social sciences.

Prospective participants will be asked to submit a two-page abstract describing their view and identifying the risks in one or more workshop topics. They will also be encouraged to propose further applications of risk management in engineering interactive digital systems. The abstract may include the description of a major challenge or opportunity set by risk management and/or the analysis of related work in the literature (including participants' own work if appropriate). Such a position will serve as the basis for the discussion during the workshop.

We will select the contributions according to their quality, trying to maintain diversity in the background of the selected views, thus fostering ideas from multiple disciplines.

2.2 Pre-Workshop Activities

We will compile and publish the list of elicited challenges and opportunities before the workshop, grouping together the selected contribution according to the opportunity or challenge they address or their position similarity. We will encourage the writing of conjunct position papers (up to 5 pages) to be uploaded to the workshop website before the event. Such an exercise will foster a preliminary discussion among the workshop participants and a synthesis of the elicited topics. We will circulate the position papers among the other participants one week before the workshop to understand the mutual views and provide a starting point for the discussion.

2.3 Workshop Structure and Schedule

The workshop will last one day. We will start with a brief introduction of the elicited topics and a sequence of presentations of the different position papers in the first half. The second half will contain group activities for reaching a global consensus among the participants, which will result in the draft of a joint position paper, authored by all participants, which will depict the challenges and the opportunities raised in the discussion and the group's view on future research in future risk and benefits management for interactive system engineering. The finalised version of such paper will be submitted for publication in an HCI journal.

2.4 Operational Requirements

We will organize the workshop in completely remote mode. We will set up the meeting using a teleconferencing application (e.g., MS Teams) and a collaborative editing environment such as shared text documents (e.g., Google Docs), shared whiteboards (e.g., Google Jamboard) and so on. We will try to facilitate the participation from different time-zones finding compromises in the workshop schedule (e.g., trying to accommodate the starting and the ending time feasible for most participants) and backing-up with recorded presentations for allowing participants to arrive late or leave early. We will also record all the workshop sessions (with the participants' consent) for allowing people to watch the parts they missed.

3 POST-WORKSHOP PLANS

The workshop results will be available on the workshop website. We will also include the material provided by the participants (e.g., presentation slides or recording). We plan to publish the position papers in dedicated volume on CEUR workshop proceedings[1]. We will also produce a publication summarizing the group position on risk management and benefits to be submitted to an HCI journal, which will express the research agenda's view on this topic. The

[1] http://ceur-ws.org

results will also serve as input to future work and discussions in the IFIP Working Group on User Interface Engineering [1].

4 ORGANIZERS

José Creissac Campos. is the chair of IFIP WG 2.7/13.4 on User Interface Engineering. He is an Associate Professor of Informatics at the University of Minho, and a senior researcher at HASLab/INESC TEC. José chairs the Steering Committee of the ACM SIGCHI Symposium on Engineering Interactive Computing Systems (EICS) and is a member of the Editorial Board of the ACM Proceedings in Human-Computer Interaction journal. He has served in several organizing committees, including several ACM SIGCHI EICS, IFIP TC13 INTERACT 2011 and Formal Methods Week 2019. He regularly serves on the Program Committees of EICS, INTERACT and IUI, among others.

T.C. Nicholas Graham. is a Professor at the School of Computing at Queen's University in Canada. He directs the EQUIS Lab, devoted to the design, engineering, and evaluation of digital games. His current focus is on games supporting physical activity and social interaction for children with neurodevelopmental disorders. He is a member and former chair of IFIP Working Group 2.7/13.4 on User Interface Engineering.

Lucio Davide Spano. is an Associate Professor at the University of Cagliari, Italy since January 2012. He got his PhD at the University of Pisa, Italy, in 2013. He previously worked at the HIIS lab at ISTI-CNR from 2007 to 2012. He wrote several papers on novel interaction techniques and visualisations, gestural interaction, intelligent user interfaces, virtual and augmented reality, mobile museum guides and end-user development. He has been a member of the Model-Based User Interface Working Group of the World Wide Web Consortium (W3C). He has been the Programme Chair for the ACM IUI Conference in 2020 and the General Chair for CHItaly 2017. He is a senior programme committee member in different international conferences in HCI (INTERACT, IUI, NordiCHI, EICS, AVI). He currently teaches introductory and advanced courses in HCI at the University of Cagliari.

Jan Van Den Bergh. is a post-doctoral researcher in computer science, specialized in human-machine interaction, at Expertise Centre for Digital Media, UHasselt and Flanders Make. His research is focused on user-centered design and engineering of context-aware interactive applications in diverse settings ranging from tools for translators in office-settings over mobile apps in e-health settings to human-machine and human-robot applications in the manufacturing industry. He is a member of the IFIP Working Group 13.2 on Methodology for User-Centred System Design.

REFERENCES

[1] IFIP WG2.7/13.4. [n.d.]. Working Group on User Interface Engineering. http://ui-engineering.org/index.html Accessed 03-05-2021.
[2] National Aeronautics and Space Administration (NASA). 2009. Goddard Technical Standard GSFC-STD-0002, Risk Management Reporting. http://everyspec.com/NASA/NASA-GSFC/GSFC-STD/download.php?spec=GSFC-STD-0002.020175.PDF#page=9 Accessed 03-05-2021.
[3] Scientific Advisory Group for Emergencies (SAGE) . 2020. Non-pharmaceutical interventions (NPIs) table. https://www.gov.uk/government/publications/npis-table-17-september-2020 Accessed 03-05-2021.