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*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.

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David Kreps · Charles Ess  
Louise Leenen · Kai Kimppa (Eds.)

# This Changes Everything – ICT and Climate Change: What Can We Do?

13th IFIP TC 9 International Conference  
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Held at the 24th IFIP World Computer Congress, WCC 2018  
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Proceedings

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# Preface

This book contains the proceedings of the 13th International Human Choice and Computers (HCC13) Conference, held at Poznan University of Technology, Poznan, Poland, during September 19–21, 2018. The conference was held by the International Federation for Information Processing (IFIP) Technical Committee 9 (TC9): Information and Communication Technology (ICT) and Society, as part of the 2018 IFIP World Computer Congress (WCC).

The conference chairs, David Kreps, (Chair of Working Group, WG 9.5, and Chair of TC9), Charles Ess (Guest Program Chair), Kai Kimppa (Finland Representative, Vice Chair of SIG 9.2.2 and Vice Chair TC9), and Louise Leenen (Chair WG 9.10), chose the theme for this year’s conference: “This Changes Everything.” Tracks were advertised in the call for papers addressing a range of concerns across the working groups of TC9, and the accepted papers coalesced into six groups: History of Computing; ICT4D and Improvements of ICTs; ICTs and Sustainability; Gender; Ethical and Legal Considerations; and Philosophy.

The papers selected for this book are based on both academic research and the professional experience of information systems practitioners working in the field. It is the continued intention of TC9 that academics, practitioners, governments, and international organizations alike will benefit from the contributions of these proceedings.

The volume editors have, in addition, contributed an introductory paper “This Changes Everything,” which is divided into two principle parts: the first looking at the nature and outcome of the call for this conference, and the second, subdivided into the six sections, introducing each individual paper in the volume.

Details of the activities of IFIP TC9 are posted at <http://www.ifiptc9.org/>.

July 2018

David Kreps  
Charles Ess  
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# This Changes Everything (Invited Paper)

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## 1 Existential Challenges

“I denied climate change for longer than I cared to admit. Not like Donald Trump and the Tea Partiers going on about how the continued existence of winter proves it’s all a hoax.... I told myself the science was too complicated and the environmentalists were dealing with it.... A great many of us engage in this kind of climate change denial.” Naomi Klein [1]

This Changes Everything. Many of us are likely to associate this phrase with Steve Jobs’ introduction of the iPhone in 2007. To be sure, most of us are enthusiastic about information and communication technology (ICT) precisely because we believe and hope that it will change everything – for the better, we presume. But beyond the iPhone and ICTs more broadly, there are clearly other candidates for the “This.” “This” may be the impact of the oncoming bioinformatics redesign of species - for example, chimeras supplying organ replacements and skin regeneration techniques. “This” could be the fourth industrial revolution of artificially intelligent robots set to upturn our economies with the automation of much un-skilled and semi-skilled work. But “This” is also, without question, the greatest challenge of our age: climate change.

Since 1974, the Human Choice and Computers conference series has consistently fostered innovative thinking about the interfaces between society and technology. Such thinking always reflects the social concerns of a specific time: Globalisation in 1998, Choice and Quality of Life in 2002, An Information Society for All in 2006, What Kind of Information Society in 2010, and Technology and Intimacy in 2016 are key examples. The number and range of challenges facing the world today at the interface between society and technology are not only mounting, but are increasingly doing so at the deepest levels of the existential – not simply in terms of meaning and justice, but, most fundamentally, in terms of the survival of different species and ecology generally.

With the awareness, in particular, that global leadership on the increasingly pressing issue of climate change is in short supply, Human Choice and Computers has turned - among other concerns - to the question: ICT and Climate Change - What Can We Do?

ICTs can play a fundamental role in the improvement of the education, understanding and explanation of climate change and issues of sustainability, the progress on gender equality, medical advances, and in addressing inequalities of access to the benefits of a highly technological society. It is also the site of challenges to individual rights, privacy, and accountability, and the means by which globalization has both spread and exacerbated inequalities. Awareness that the size of the share of the growing economic pie that the majority of us receive has long since stagnated - and even begun to shrink - has led to unfolding seismic shifts in the global order. Electorates (enfranchised and disenfranchised) in the Middle East, Europe and the US in recent years have punished those sections of society that had both benefited most from globalization and yet believed their own rhetoric that, as the pie got larger, everyone's share of it increased. The still more fundamental realization that it is simply not possible, on a finite Earth, to keep growing the pie, is an economics lesson that the planet is teaching us with increasing ferocity. A political economy of finite wants and non-growth, although it seems as far off as it was when Herman Daly wrote of it in 1973 [2], may yet impose itself - necessarily with the vital help of ICTs.

The challenges of climate change are indeed something no one, in any sector, can avoid, and the changes required to combat its effects will require all our efforts. The Chairs of 13th Human Choice and Computers Conference suggest that everyone in the information systems community should be working towards this end - or at the very least, not against it. How do these realizations manifest themselves in the ICT sector specifically, and what other challenges - which change everything - must we address?

Our call was as broad as one can possibly imagine for a set of fields that are essentially driven by precise and minute details (of engineering specifications, requirements of specific coding languages, OSs, information architectures, and so on). Not surprisingly the papers submitted to and accepted, through peer review and revision, by the Chairs of the conference, and gathered together in this volume, display a strong tension between our participants' training and experience in the specific and the precise, and the perhaps maximally broad demands of addressing our larger themes. The inherent difficulty of keeping one's eye upon the detail of means whilst retaining the vision of broader ends has gathered together a range of papers at various points along that spectrum. This volume, therefore, we believe, is successful in the primary aim of encouraging colleagues across the range of ICT concerns to take on these larger themes. We hope, further, that it inspires more - both in detail and breadth - across the fields and disciplines HCC represents.

There are many themes which we could pick out from the papers gathered in this volume, before addressing them more closely. In particular, however, we would like to highlight the occasional mention of the existential - as a way of pointing towards a resurgence of interest in existential philosophy as a framework for dealing with - well - existential questions in a world in which traditional religious frameworks have largely lost their purchase [3]. Of course, we are still faced with the multiple existential moments imposed upon us as still mortal beings, beginning with our vulnerability and mortality - both individual and, as the climate crisis foregrounds, collectively.

All of this leads to the larger point: part of the “everything” that “this” changes is precisely the traditional epistemological and thereby disciplinary assumptions that separated out the natural sciences and the humanities in the 19th century - the alleged “fact/value” distinction, among other examples. Consideration of how climate change affects ICTs, and ICTs’ role within it, in fact promotes deep and searching questions about the very foundations of our field [4]. As Frantz Rowe, editor of the *European Journal of Information Systems* has said in a recent Editorial [5], critical and philosophical assessment of why as well as what we do in this field, is of increasingly paramount importance, and the boundaries of our disciplines must be questioned, and broadened, and many of our assumptions thereby irrevocably changed.

What we now know from over a century of post-positivist thought (including names familiar to IS scholars such as Latour, [6], Barad [7] and others; critical realist philosophers such as Roy Bhaskar [8] and process philosophers Henri Bergson [9] and Alfred North Whitehead [10]; feminist critiques of positivist science; and many others) is that many of the distinctions we have in the past taken for granted are, at best, heuristic and metaphorical. We can further point to examples of engineers, including computer scientists and network engineers (e.g. Bendert Zevenbergen [11]) who are now explicitly espousing virtue ethics and care ethics as required for the practices of engineering: with great power comes great responsibility - to care, to paraphrase him.

So the efforts in play in the conference, displayed in this volume, to likewise bridge these gaps, contribute to these broader developments - and these broader developments suggest that there is much more to be done, not only at the practical levels of designing new ICTs, etc., but at the more theoretical/foundational levels: our disciplines and their guiding assumptions have to be rethought - in particular, in order to take centrally on board the ethical and social responsibilities of those empowered and entrusted with the design of ICTs.

## **2 Summary of Papers**

The conference was initially advertised in a Call for Papers with a wide series of different Tracks, reflecting the variety of concerns of the various Working Groups of Technical Committee 9. Each track called for papers that engaged somehow with the broader theme - what is ‘changing everything’ in the particular arena of focus for that Working Group? Gathered together, the papers therefore fall into a series of distinct groups focused not just, as described above, upon the detailed minutiae of solutions, but on a specific slant or aspect of the wide field of ICTs and Society. Nonetheless, as a whole, the main theme and grander concerns remain clear.

### **2.1 History of computing: ‘This Changed Everything’**

The papers in this category reflect on “where we came from” in terms of ICT developments that shaped our current interaction with computers. Ambrosetti and Cantamesse consider the “technological democratization” brought about by the

introduction of PCs in the late nineteen-seventies and early eighties. The introduction of PCs to the general public marked “a watershed between a former, professional only (military, academic, or corporate) use of computers, and a later diffusion to a vast and not necessarily skilled public”. The authors also analyze the gap between the skills of the average user and the expert user from the mainframe era through to the post-PC era.

Pyle narrates an example of a software development project in the mainframe era, a classified UK Defense project that ran from 1969 to 1973. This project established basic principles for Software Engineering but due to secrecy restrictions details could not be published. It brought about changes in the discipline by individuals who worked on the project and subsequently passed on the learning.

Tatnall narrates the Australian contribution to the building of computers, looking at the people who were involved in these projects, the culture that drove these developments and the resulting technologies.

## **2.2 ICT4D and Improvement of ICTs**

Perhaps in no other area are the changes being wrought by ICTs so fast and so fundamental than in developing countries, where the ‘leapfrog’ phenomenon is bringing the advanced online economic activity of G7 economies to the furthest corners of the world. Takavarasha, Cilliers and Chinyamurindi investigate obstacles in developing countries for students in gaining access to technologies, while Steyn, de Villiers and Twinomurinzi consider the requirements for potential entrepreneurs to access and use ICTs. Van Biljon and Naude consider ICT4D from a research perspective. They give an overview of collaborative research patterns of South African ICT4D researchers with the aim of appealing for collaboration between researchers from different institutions as a mechanism of inclusion. Pathirana presents a digital merchant platform requiring only a smartphone and an internet connection. This allows merchants in developing countries easy access to the digital economy.

Our growing reliance on technology results in skills shortages. This issue is addressed in papers by Hyrynsalmi, Rantanen & Hyrynsalmi as well as Jansen van Vuuren and Leenen. The first paper considers the harm that ICT skills shortages are likely to have on growth and innovation in Finnish ICT businesses. The latter paper focuses on how skills shortages in cybersecurity can be addressed in South Africa.

As a consequence of technological advances, virtual teams are becoming increasingly common in the modern workplace. Gomez et al. found that team composition in devising information strategies influences team cohesion in virtual environments. Such team cohesion has been shown to improve team learning.

## **2.3 ICTs and Sustainability**

At the heart of the main conference theme, papers focused upon how ICTs can be developed and used sustainably address some the key issues of the transformations now underway.

Nyström and Mustaquim argue that the inclusive innovation framework (IIF) and strategies of open innovation can be helpful for designing a sustainable HCI system. Several papers address the dual roles ICTs play in terms of contributing to sustainability and contributing to entropy. Van der Velden investigates the relationship between sustainability and ICT by critically considering two sustainability frameworks. Patrignani & Kavathatzopolous reflect on the challenges of designing sustainable ICT systems from the perspective of the designers of these systems, specifically on their ethical competencies and how these competencies can be acquired. Junge and van der Velden analyze discourses on planned obsolescence of technology in the Norwegian media with the aim of finding the root causes for the “technology is neutral” perspective - a belief that can undermine policy and interventions to support sustainable technology.

Bednar & Spiekermann argue that the ICT community can only respond to the call for sustainable and value-based design of technologies if there is an understanding of how ICTs affect users. Their study on the changes ICTs have brought to a group of students’ lives aims at providing a starting point for future value-based designs of ICTs.

## **2.4 Gender**

The four papers in this category highlight different ways in which cognition of feminist approaches can benefit ICT development and design.

Sefyrin, Mörtberg and Elovaara describe a planned study that will explore how gender science, specifically feminist technoscience, can contribute to science practice challenges. This study will serve as a theoretical resource for the integration of gender equality in Swedish Higher education in IT.

Fiscarelli and Van Herck classify computer science conferences with the aim of identifying gender-based patterns for career length, collaboration, interdisciplinary research, and publication growth rates. Their findings provide insight into the participation of female authors in computer science research, and specifically consider the low percentage of female publishers in this discipline.

Male dominance in the ICT industry results in software and technologies that may not be representative of the wider population. Corneliussen, Herman and Gajjala analyze three case studies in different cultures to posit the benefit of a feminist gaze on ICT production.

Finken, Mörtberg and Elovaara argue for the inclusion of feminist technoscience in Participatory Design (PD) to benefit PD-based practices.

## **2.5 Ethical and Legal considerations**

Five papers focus on the ethical development and use of ICTs. Heimo, Rantanen and Kimppa studied the effect of a Finnish school information system from a sociotechnical perspective. The system resulted in some unintended negative uses. The authors make recommendations for improvements that will promote values such as openness and fairness. Murata, Orito and Takubo explore the exploitation of social media users who openly and honestly share personal information. The authors propose policies to address and limit this exploitation. Kavathatzopoulos and Asai argue that the

philosophical method of deliberative thinking, by focusing on the process of thinking, is the grounds on which to ensure ethical decision making for ICTs. Reijers et al. present a formal framework for the discussion of ethical issues that should be considered in the development of ICTs. Poulsen, Burmeister and Kreps study the ethical considerations of the elderly giving their trust to an untested robot. Although the study was based on a theoretical care robot model, the authors found that the robot inspired trust even when participants lacked an understanding of the model's ethical decision-making process.

Legislation to ensure ethical behavior of data is the focus of two papers. Komukai and Ozaki present an approach to improve cross-border investigation by considering the rights of states that control the data as well as individuals in the context of international law and human rights. Ishii explores legal issues regarding portability.

## 2.6 Philosophy

Philosophy - as we saw at the beginning of this editorial - is becoming an increasingly important arena in the Information Systems community, and the wider consideration of the creation and use of ICTs. Galanos argues that terms such as "AI" (artificial intelligence) and "robot" are not well defined, at least not when used in the media or public discourses. The consequence of this is that it "...appears that propositions about AI are neither right nor wrong: they are meaningless". The author calls for researchers in this field to work towards the improvement of public understanding in this field.

Rantanen and Koskinen also focus on the importance of a shared understanding of terminology; they discuss different definitions of the term "Public Health Record." This brings about challenges in having a rational discourse between patients, citizens, health care providers, system developers and policy makers.

Kajtazi and Haftor raise the need for a coherent theory of information inadequacy by analyzing 50 instances of information inadequacy.

## 3 Conclusion

In sum, the papers presented in this volume each – in their own specific and detailed focus – and collectively, represent what the editors believe to be a turning point in the research community around ICTs: the multiple challenges facing society in 2018 are so broad, profound, and pressing, that *this really changes everything*.

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