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Christopher Leslie
David Kreps (Eds.)

Current Directions in ICT and Society

IFIP TC9 50th Anniversary Anthology

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Preface

In 1974, the first iteration of the Human Choice and Computers (HCC) conference aimed to inspire people throughout the world to take an interest in computing in an effort to ensure that technology would promote important human values, such as meaningful work and peaceful cooperation among nations. This conference demonstrated that it would be possible to form a group to foster insightful critiques of the interactions between computer technology and society. As a result, Technical Committee 9 (TC 9) of the International Federation for Information Processing (IFIP) was formed. Celebrating the 50th Anniversary of HCC in 2024, we offer this volume in the same spirit as the first HCC. The present volume originated in September 2018, when many meetings under the auspices of the International Federation for Information Processing (IFIP) took place concurrently in Poznan, Poland, under the banner of the twenty-fourth IFIP World Computer Congress, including Technical Committee 9's thirteenth Human Choice and Computers conference and the Histories of Computing in Eastern Europe workshop sponsored by TC 9's working group devoted to the history of computing, Working Group 9.7 (WG 9.7). At the TC 9 business meeting, committee chair, David Kreps, proposed that the leaders of TC 9's groups work together to produce an anthology that would introduce TC 9's entities and serve as a sourcebook for others wishing to participate in future TC 9 activities. Christopher Leslie, the chair of WG 9.7, volunteered to organize the anthology. After collecting ideas from the participants at the business meeting, Leslie went home to set up a basic outline for the chapters and suggested a collaborative work process. Each chair followed their own path, but in general they surveyed current members, reviewed past written reports, and conducted interviews to prepare the chapters. There are 10 working groups and one special interest group (SIG) under the umbrella of TC 9. Two groups are currently dormant. A third group, WG 9.6, has been active with eighteen annual iterations of the IFIP Summer School on Privacy and Identity Management, even though they were unfortunately unable to contribute a chapter to this volume. All of the rest, despite many delays, some caused by the COVID-19 pandemic, were able to work together to form the present volume. When we first discussed this project, we imagined it as a sort of handbook for people wishing to conduct research on ICT and Society, but readers will see that it is much more. Due to the longevity of the groups, the chapters also offer an interesting historiography of the topics that are the groups' foci. The chapters help to explain the development of these fields and, in many cases, we can see how important themes have long been central to the thinking of professionals interested in computing.

Christopher Leslie
David Kreps

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Introduction

Legacies of the Formation of IFIP Technical Committee 9

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Abstract. This chapter considers how the organizational structure of the International Federation for Information Processing (IFIP) influenced the format of the first Human Choice and Computers (HCC) conference. Almost 50 years ago, the first HCC conference demonstrated the efficacy of an international, interdisciplinary, multistakeholder process to study the mutual impact of computing technologies and society. This organizational structure has had a lasting impact on IFIP's Technical Committee 9, whose constituent groups are the backbone of the present volume.

Keywords: IFIP · Technical Committee 9 · Human Choice and Computers

The chapters in the present volume come from the working groups affiliated with Technical Committee 9 (TC 9) of the International Federation for Information Processing (IFIP). IFIP's organizational structure, and thus the structure of Technical Committee 9 (TC 9) and its working groups, is somewhat unusual to outsiders, especially the baffling alphanumeric soup of groups and committees. A brief overview of the formation of each will help the reader understand the groups that make up TC 9, as well as some of the details in the following chapters in this volume.

1 Prehistory of IFIP

IFIP was established in tandem with a 1959 computing conference, the International Conference on Information Processing. Under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO), 1,800 participants gathered in Paris. As part of the planning process, the organizers developed a proposal for an international organization built on the foundation of computing societies in various countries. Eighteen national entities offered support for the initial statutes that established the federation. When it was established in 1960, the name of the organization was International Federation of Information Processing Societies. This title reflects the notion that national organizations were the backbone of the organization. The organization changed its name in 1961 to its present designation.

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UNESCO made a small outlay of funds and provided the first secretariat of the organization, but IFIP was successful enough to elect its own leadership and supply its own finances [1]. The formal sponsorship with the United Nations ceased, although IFIP has consultative status (one of 1000 nongovernmental organizations of the "roster" designation that might make "occasional and useful contributions" [2]). This tie to the UN is weaker in the present day, but many affinities to the organizational structure remain.

As Grier points out [3], the organizational structure of IFIP was less than obvious. A more likely setup would have been a "multi-national organization that shared information and promoted the peaceful uses of computing": like other organizations, IFIP could have been organized as a professional association with international membership coming from individuals. Instead, IFIP chose – perhaps with the UN itself in mind – to be a federation of national computing societies. "This approach was the result of nearly 8 years of careful work, study and negotiations" [3, p. 177].

Although some [e.g., 1] have said that the impetus for the conference, and therefore IFIP, was the U.S.'s Joint Computer Conferences, this can be only partially true. It is the case that the founder of IFIP, U.S. researcher Isaac L. Auerbach, served on the organizing committee for the JCCs, but while attending these conferences he started to wonder what was happening outside of the U.S. and UK. With the dream of finding out what was happening elsewhere, in 1955 he lobbied representatives of UNESCO, which lent its support [3, p. 179–8]. As stated by Austrian Heinz Zemanek, who attended the 1959 conference and later became one of IFIP's first presidents:

> In a time period of American predominance in computer technology and in an era of "cold war," I.L. Auerbach conceived and created an instrument of cooperation and mutual understanding (including the "enemy") which was also a tool of peace: people who understand information technology know the importance of global cooperation and are workers for peace. [4]

For Zemanek, computing was a global activity. He points out that there were a few international conferences that inspired him. One was the 1955 GAMM/NTG Conference in Darmstadt, Germany (with presenters from Austria, Belgium, East and West Germany, England, the Netherlands, Sweden, Switzerland, the U.S., and the USSR; the audience also had representatives from Canada, Czechoslovak Socialist Republic, Denmark, Finland, France, Hungary, Italy, Norway, Poland, Spain, and Yugoslavia). Another was the 1958 Congreso Internacional de Automatica in Madrid. The international community was also intriguing to his employer, IBM; after he assumed the presidency, IBM allowed him to use his laboratory resources to support the association. In this way, his research and his professional outreach were always "interwoven" [5, pp. 41, 60–1]. Clearly, the desire for new perspectives from researchers working outside the U.S. was seen as a disruption more than a continuation.

2 Formation of IFIP

The dream of connecting the world's computing researchers via their national affiliations was also based on the fact that there were already many national computing associations already in existence. The restriction on individuals becoming members of IFIP meant that there had to be a significant number of national organizations devoted to computing. In fact, IFIP encouraged countries without national organizations to form them so that their researchers could participate in its activities. The rapid growth in the number of participants after IFIP was formed speaks to this success: 3,000 people from 41 countries attended the 1962 meeting in Munich, which grew to 5,000 people from 50 countries at the 1965 meeting in New York City.

One way that IFIP continues to resemble the UN is that it establishes entities to carry out the work of the organization, known as technical committees (TCs), a name chosen to reflect the organization's overall focus on technology. IFIP's first TC was "Terminology and Symbols," tasked with developing a guide to keywords in computing and easing national differences in vocabulary. This committee was short-lived, but two other TCs were formed in 1962: one related to software and another to education. Each TC carries out its own activities in the form of conferences, and TCs also form working groups that can sponsor their own workshops. For example, the first Working Group of Technical Committee 2 is known as WG 2.1. The TCs and WGs are presumed not to be territorial, and there are several joint groups that show how themes overlap. TCs and WGs resemble *ad hoc* committees; they are created to meet current needs and sometimes dissolved when they fail to attract sufficient interest, creating a gap in the numbering. The first TC related to computer terminology was dissolved after it completed its task; today, a new group with the title of Foundations of Computer Science is designated as TC 1. TC 4, established in 1967 with the theme of Medical Information Processing, split away from IFIP to form the International Medical Informatics Association, which today leaves a gap in the TC sequence.

3 Formation of TC 9

The formation of our technical committee, TC 9, was similar to the formation of IFIP itself in the sense that it was preceded by a successful conference that demonstrated the need for, and potential of, the group. However, it is unlike the other TCs, given its broad focus on computing and society with a non-technical focus. That being said, concerns with humanity are not alien to the organization. From the start of IFIP, organizers noted that the technical and social aspects of computing should not be separated. Speaking from the perspective of UNESCO, Gagliotti [1] notes that reports about technical progress do not always consider negative impacts. The impact of computing on employment is one potential trouble area, but all varieties of the social aspects of computing are absent from the 1965 program. Another potential problem he notes is the fact that 90 percent of the participants come from the developed world. With every advance, Gagliotti notes, the gap from the developing world widens. "The only way to ease the problem is for you to reach back your hands and help the others" (p. 312). Finally, he notes that the guiding principle of UNESCO is peace, leading him to hope that any outcome

"will contribute to the progress and welfare of [humanity] through the development of a scientific and technological society," which will be "the best guarantee of peace" (p. 312). This sentiment reflected a nascent but growing interest in the interdependencies between technology and society.

As IFIP got off the ground, a sea change was underway in the analysis of technology. Consider the contemporary studies that asserted engineering solutions were not independent from human society. The idea that engineering could be directed to serve important human needs – and that the social world could do better at this job of direction – was expressed in Jacques Ellul's *The Technological Society* (1954 and translated into English in 1964) and Jane Jacobs's *Death and Life of Great American Cities* (1961). Thomas Kuhn's epochal *The Structure of Scientific Revolutions* (1962, with an expanded second edition in 1970) vividly demonstrated that what are assumed to be good engineering solutions and sound science depend on social norms. Soon, books like Jean Meynaud's *Technocracy* (1964) and Lewis Mumford's duology *The Myth of the Machine* (*Technics and Human Development*, 1967, and *The Pentagon of Power,* 1970) pointed out the ills of a technological society, if only to suggest that the direction of current development could be turned. Perhaps a culmination of this early stage of development was Bruno Latour and Steve Woolgar's 1979 *Laboratory Life,* which showed how the social world permeates science even before the first experiments are done in an investigation.

These perspectives suggest that a technology is a way of doing things, in the sense that it is a cultural activity; technological devices are not created in a vacuum but are constructed in a way that reflect human culture. Even if a mainstream view was that progress in science and engineering were independent of human society, computing practitioners involved in IFIP seem to have been aware of the mutual interdependency of technology and society.

4 The First Human Choice and Computers Conference

These sentiments about technology and society were simmering for IFIP's first decade, leading to the first conference that considered the interactions between technical development and the social world at a 1974 conference they called Human Choice and Computers (HCC), held in Vienna. The conference was organized by Zemanek who, after his storied technical career, took an interest in the social aspects of computing.

When Zemanek assumed the office of president in 1971, one of his goals was to "foster the human aspect" of computing. He tried unsuccessfully to organize a conference about humans and computers in 1972 and sought to establish a "non technical TC" the following year. In 1974, Zemanek finally found success with the first HCC conference, which helped to convince the general assembly of the value of a new TC [6, p. 395]. As pointed out by Sackman, the initial goals of IFIP – such as international cooperation, human communication, and education – spoke to an interest in what would become the purview of TC 9.

The first HCC conference followed a collaborative and consultative process that is typical of other Internet governance bodies [e.g., 7]. As such, the conference had a backbone of four plenary papers. In response to these, participants divided into eight breakout groups with about 16 members each. These groups met for six, two-hour

seminars where participants discussed their responses to the plenary papers in order to prepare a report for the proceedings. Participants also presented their own papers about computing, which fell into themes regarding management, trade unions, democracy, and the social world. This consultative process, which resulted in recommendations that could be reported back to the IFIP General Assembly, resembled the multistakeholder, deliberative process of the UN.

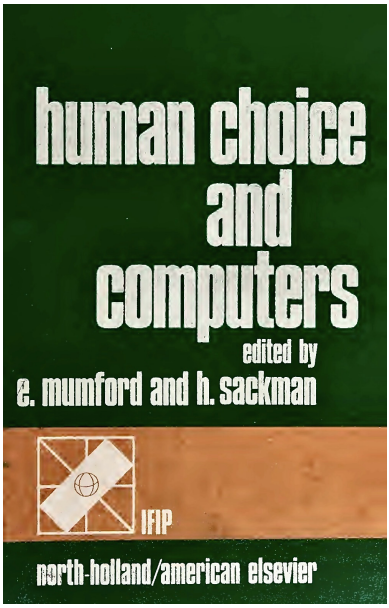

Fig. 1. Cover of the proceedings volume for the first HCC conference in 1974.

In the proceedings volume (Fig. 1), the organizers of HCC state clearly that the conference and the proceedings volume were deliberately aimed at a "broad, international audience" that included "all levels of society" in order to "decide what [society] wants to do with computers for the benefits of everyone." They continue:

> Society should deliberately lead and direct the application of computers in the image of its most cherished values and ideals rather than be the unwitting victim of the vagaries of technology and the fluctuations of the market-place. Toward this end, the issue is *deliberate human choice* and *continuing social accountability* in determining the role of computers in social affairs. [8, p. v]

The organizers for this "first major international conference on the human aspects of computer systems" intentionally brought together "trade unionists, computer technologists and social scientists" so that they could "enter into meaningful discussion with each other" [8, p. 325]. This discussion did not come easily, though. The organizers note how the three groups surprised each other with their assumptions about the others. The computing professionals were surprised to hear that others saw their innovations as anything

but neutral; the trade unionists were focused on large social issues with little interest in improving workplaces that used computers; the sociologists' theoretical approaches designed to understand how computers could be used seemed like covert attacks by management. Each breakout group intentionally included members from each of the three groups, and the final recommendations reflect a consensus. The closing paragraph of the HCC recommendations reports a motion that IFIP establish a committee to guide the implementation of these goals, passed by consent of the people present. As noted by [6], it would take some more politicking before TC 9 was approved by the IFIP general assembly, but in 1976, the committee was approved. The TC was approved with two initial WGs: one focused on work and the other on social accountability. (As seen in Table 1, WG 9.1 is currently dormant but 9.2 has contributed a chapter to this volume.)

The conference recommendations still resonate today, so they are worth repeating in summary form [8, p. 341]:

1. Ensure computing professionals have competency in relevant disciplines in the humanities and management
2. Stimulate the development of technology to meet social, organizational, individual, and economic goals
3. Instill a duty for computing professionals to help outsiders understand their work, especially with respect to the impact on humanity
4. Review innovation with an eye thwarting potential problems of technology choice
5. Disseminate research about the human and organizational aspects of technology
6. Harmonize codes of practice for individuals and organizations. (As can be seen in the chapter in this volume from SIG 9.2.2, the standardization of codes of practice has been completed.)

Table 1. Current constituent groups of Technical Committee 9.

Group	Focus	Status
WG 9.1	Computers and Work	Dormant
WG 9.2	Social Accountability and Computing	Chapter 2
SIG 9.2.2	Framework on Ethics of Computing	Chapter 3
WG 9.3	Intelligent Communities	Dormant
WG 9.4	Social Implications of Computers in Developing Countries	Chapter 4
WG 9.5	Our Digital Lives	Chapter 5
WG 9.6	Information Technology: Misuse and the Law (joint with WG 11.7)	Active, not included
WG 9.7	History of Computing	Chapter 6
WG 9.8	Gender, Diversity and ICT	Chapter 7
WG 9.9	ICT and Sustainable Development	Chapter 8
WG 9.10	ICT Uses in Peace and War	Chapter 9

The first conference became known retroactively as HCC 1, even though it predated the formation of TC 9, following the precedent of IFIP's World Computing Conference. HCC 2, the first conference organized by the new TC 9, was held in 1979. As seen in Table 2, TC 9 has gone on to sponsor 14 additional HCC conferences, and the next HCC is scheduled for September 2024 with the theme "Humans, Technological Innovations and Artificial Intelligence: Opportunities and Consequences" [9].

TC 9's leaders meet every year, although recent meetings started to be held online to accommodate the group's wide geographic spread and, of course, due to travel restrictions during the COVID-19 pandemic. The last 10 HCC conferences have been held every other year, despite the pandemic, and the next instance will be held in the coming year. The focus of the HCC conferences and the activities of the working groups has evolved over the years. As shown in the corpus analysis by Kreps and Fletcher, the initial focus of HCC was on work, but in the 1980s, with the advent of home computing, HCC became "less focused on work and more concerned with the general human situation" [10, p. 373].

As will be seen in the following chapters, TC 9's groups are agile, changing their names and scope as interest in various topics wax and wane. The output of the groups is somewhat inconsistent, depending on the time and energy that individuals have to contribute. Chrisanthi Avgerou, one of TC 9's former chairs, pointed out the difficulties of maintaining consistent outcomes from a volunteer organization. Given that there are now so many other venues that accept work at the intersection of ICT and Society, one might wonder, what is TC 9's role? She concludes:

> unlike the physical sciences which create knowledge more or less cumulatively, social studies need multiple perspectives and streams of thought, and TC9 makes valuable contributions to that end. It is worth all its members' effort to keep it going and striving for high research standards. [11, p. 145]

This is certainly true. In addition, as the foregoing analysis has shown, IFIP has an unusual organizational structure that encourages widespread participation that does not privilege one country over another. TC 9 inherits this structure; as can be seen from the contributors to this volume and the roster of participants at all TC 9 activities IFIP's truly international scope facilitates a rich diversity of nationalities. As well, TC 9 mirrors the process of creating and discussing recommendations through a process of consensus of participants, which is common enough among Internet standards bodies but is rarer in academic circles.

As can be seen in the following chapters, the activities of TC 9 resemble other technical committees of IFIP. First of all, groups take their responsibility to consult and advise seriously. The multiyear effort of SIG 9.2.2 to develop a code of ethics is a cogent example of this duty. Like any scientific endeavor, the conclusion concerns future work. In all of the chapters, one can see how other groups advise their colleagues on the best practices for the future study of ICT and society. In addition, there is an absence of territoriality, which has been an important characteristic of other IFIP technical committees. For instance, many groups have expressed interest in artificial intelligence, which will be the theme of the next HCC conference in 2024. Sustainability takes three different flavors in the chapters by WGs 9.2, 9.4, and 9.9; three working groups address Anthropocene

studies: 9.2, 9.7, and 9.9. The core and periphery model of innovation is challenged by WGs 9.4 and 9.7. Feminism and diversity are addressed by WGs 9.7 and 9.8; WG 9.4, 9.5, and 9.8 analyze postcolonialism. Concerns about policy are addressed by both WG 9.2 and 9.10. These synergies are an important part of TC 9, and they provide for robust discussion and collaboration.

Table 2. Human Choice and Computing conferences.

No. (Year)	Location	Title	Proceedings editor(s)
1 (1974)	Vienna, Austria	Human Choice and Computers (precedes the formation of TC 9)	Mumford, E. & Sackman, H
2 (1979)	Baden, Austria	Human Choice and Computers 2	Mowshowitz, A
3 (1985)	Stockholm, Sweden	Comparative Worldwide National Computer Policies	Sackman, H
4 (1990)	Dublin, Ireland	Information Technology Assessment	Berleur, J. & Drumm, J
5 (1998)	Geneva, Switzerland	Computers and Networks in the Age of Globalization	Rasmussen, L., Beardon, C. and Munari, S
6 (2002)	Montreal, Canada	Issues of Choice and Quality of Life in the Information Society	Brunnstein, K. and Berleur, J
7 (2006)	Maribor, Slovenia	Social Informatics: An Information Society for All? In Remembrance of Rob Kling	Berleur, J., Nurminen, M., and lmpagliazzo, J
8 (2008)	Pretoria, South Africa	Social Dimensions of Information and Communication Technology Policy	Avgerou, C., Smith, M. and van den Besselaar, P
9 (2010)	Brisbane, Australia	What Kind of Information Society? Governance, Virtuality, Surveillance, Sustainability, Resilience	Berleur, J. Hercheui, M.D. and Hilty, L. M
10 (2012)	Amsterdam, The Netherlands	ICT Critical Infrastructures and Society	Herscheui, M., Whitehouse, D., McIver, W., Phahlamohlaka, J
11 (2014)	Turku, Finland	ICT and Society	Kimppa, K., Whitehouse, D., Kuusela, T., Phahlamohlaka, J
12 (2016)	Salford, UK	Technology and Intimacy: Choice or Coercion	Kreps, D, Fletcher, G, and Griffiths, M
13 (2018)	Poznan, Poland	This Changes Everything - ICT and Climate Change: What Can We Do?	Kreps, D., Ess, C. Leenen, L., Kimppa, K

(*continued*)

Table 2. (*continued*)

No. (Year)	Location	Title	Proceedings editor(s)
14 (2020)	Tokyo, Japan (online due to COVID-19)	Human-Centric Computing in a Data-Driven Society	Kreps, D., Komukai, T., Gopal, T., Ishii, K
15 (2022)	Tokyo, Japan	Human Choice and Digital by Default: Autonomy vs Digital Determination	Kreps, D., Davison, R., Komukai, T and Ishii, K
16 (2024)	Phuket, Thailand (upcoming)	Technological Innovations and Artificial Intelligence: Opportunities and Consequences	Davison, R., Kromidha, E., Deesilatham, S., Kreps, D

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Toward an Ethical and Accountable Society

Working Group 9.2: Social Accountability and Computing

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Abstract. From the beginning (established in 1977) of IFIP Working Group 9.2: Social Accountability and Computing (WG 9.2), the aim has been involving people from different backgrounds to work toward a better world by endorsing the responsible and ethical use of computers and information technologies. Computers and other digital technologies have raised different topics during the history of the working group. Society has been facing all the time a growing amount of problematic issues that computers brought to us. Our digitalized society is such that social accountability seems to remain an important approach – or even more important – when we are facing topics such as data economy, artificial intelligence, and sustainability of technology.

Keywords: Social Accountability · Information Systems · History · IFIP · Ethics

1 Overview

The aim of IFIP Working Group 9.2: Social Accountability and Computing (WG 9.2) has always been to endorse the responsible and ethical use of computers and information technology. During the four decades of the existence of WG 9.2, the meaning and impact of computers have moved from rareness to a globally pervasive part of society. As people more and more use technological devices throughout the day, information technology is beginning to have a profound effect on people's psyches as well as a society due to technology becoming pervasive in our everyday life [1]. Considering the effect that information technology has on individuals and the whole society, the need for social accountability is not less than it was in the late 1970s when WG 9.2 was founded.

In section two, a general view of the history of WG 9.2 is provided. In section three, themes of the working group are presented and the main themes – eHealth, eGovernment and ethical sustainability of computing – are briefly presented. Finally, in section four, the themes that are anticipated to become (or already are) an even more important area for social accountability are introduced. Those areas are artificial intelligence, data economy and sustainable computing.

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2 History

By the 1980s, TC 9 was an extremely active body comprising representatives, usually with academic backgrounds, and appointed by the computing societies of countries that were members of IFIP. They were largely of European origin but were geographically dispersed. The representatives discussed developments in information processing within their countries and reported on and researched the impacts of various new and emerging technologies on work, society and the community.

2.1 Early Years of WG 9.2 (1977–1990)

WG 9.1, "Computers and Work," and WG 9.2, "Social Accountability," were both established by TC 9 in 1977. Rob Kling was the first chair of WG 9.2 alongside Klaus Brunnestein, who was chairing the European core of WG 9.2 (see Table 1 for Working Group Chairs).

The early years of the Working Group(s) were challenging, and there were times when no activities were conducted by the American core of WG 9.2, and the European core was also very low with its outcome. There was a discussion about whether WG 9.2 should be disbanded or continued as it lacked activity. TC 9 set up the review committee – chaired by Bernard Levra – to evaluate the situation and inform TC 9 [2]. In the end, WG 9.2 continued to exist and did have only one group instead of separate European and American cores.

Table 1. Chairs of WG 9.2

Years	Chairs
1977–1984	American core chair: Rob Kling
1977–1979	European core chair: Klaus Brunnstein
1980–1985	European core chair: Richard Sizer
1985–1990	Richard Sizer
1991–1996	Jacques Berleur
1997–1999	Colin Beardon
2000–2003	Jan Holvast
2004–2010	Penny Duquenoy
2011–2019	Diane Whitehouse
2020–	Jani Koskinen

By 1985, TC 9 and its WGs included members from different countries. They worked together on tasks and met at meetings and conferences at various locations, usually throughout Europe. This enabled important formal exchanges of research and experience but also for informal discussions and opportunities for understanding differences and forming relationships. The mandate of TC 9 was broad; the topics raised that related

to the development and use of technology were varied. Some had economic and political implications. For example, there were significant concerns about the impacts of technology that included the use of information processing for military purposes. There were scientifically robust discussions (particularly with the representative of the USA) about sensitive issues like "Star Wars" defense technologies.

As the range and reach of information technology developed exponentially, the implications and impacts broadened leading to the identification of new issues. As an example of range discussions and the synergy with the work of the initial WGs, WG 9.1, Computers and Work, held a conference at Humboldt University in East Berlin on System Design for Human Development and Productivity: Participation and Beyond [3]. The conference, which began on 12 May, was preceded by WG meetings just after Chernobyl had exploded on 26 April 1986 and it did collect people together from different countries, an issue that demonstrates the collaborative nature of WG.

During the late 1980s, there were also two SIGs organized [4]. SIG 9.2.1 on Disabilities was chaired by Geoff Bubsy that – however – ended its activities after a couple of years. The other, and still active, was SIG 9.2.2 on ethics, which is currently known as SIG 9.2.2: IFIP Special Interest Group on a Framework for Ethics of Computing. It is important to note, however, that SIG 9.2.2 was established on a special mandate and reports directly to the General Assembly (GA), not to either the WG 9.2 or TC 9.

2.2 1990–2000

TC 9 recognized the need for the greater involvement of governments, the business community, and computing professionals throughout the world in discussions about issues of the development and use of information processing. The industry was forcefully driving technical development and business and governments were rapidly implementing technology before impacts could be independently evaluated or predicted. Consequently, TC 9 sponsored joint working group conferences that involved participants from universities, practitioners, and senior management from business and government organizations, as well as activists in countries outside Europe. For example, in 1989 and 1991, TC 9, WG 9.2, and the Australian Computer Society held the Shaping Organizations, Shaping Technology (SOST) conferences. Members of TC 9 and the WGs supported local organizers. For the first SOST conference, Klaus Brunnstein and Ulrich Briefs from Germany, Hal Sackman from the USA, Jan Holvast from the Netherlands travelled to present papers and discuss the implications with attendees [see 5, 6]. As the impacts of information processing throughout communities increased, the social implications were again noted as being as important as technical challenges. "Almost all other IFIP TCs study areas may produce solutions that may have social impact. This means that the TC 9 community must analyze potential unintended effects and the downstream impact of the IT systems built by following models and recommendations given by other TCs" [7]. This underlined the need for WG 9.2 as a relevant working group.

During the 1990s, WG 9.2 thrived and met twice a year under the chairmanship of Jacques Berleur with Diane Whitehouse as secretary during the years 1990–1996. The Namur Award, given for outstanding contributions in the field of computers and society, was instituted in 1991. The roots of the Namur award-name originate from the place where meetings of the working group were arranged at that time – Namur, Belgium

as Berleur was working at the University of Namur. Berleur's full two terms were followed by the term 1997–1999 chaired by Colin Beardon. Recognizing the need for new researchers and doctoral students, WG 9.2 began a series of summer schools aiming to help the younger generation of researchers. The First IFIP summer school launched in 1991 (and it is still running as a series today) [8]. In 1997, the chair was transferred from Jacques Berleur to Colin Beardon 1997–1999 and the tradition of meeting twice per year continued.

2.3 2000–2010

Jan Holvast followed Colin Beardon as the chair of WG 9.2 during the years 2000–2003 with Penny Duquenoy as the secretary. During his time as a chair, the group was very active and had many members from both academia and industry. Discussions in the group were interesting and sometimes even heated, but the spirit of the group was always warm, and after a long day of content, the group gathered together for friendly and light-hearted dinner discussions. This tradition has always been followed within the group.

Jan Holvast was followed by Penny Duquenoy who was chair from 2004–2010 with Chris Zielinski as vice-chair and Kai Kimppa as secretary. The meetings were held twice per year in different places – the winter meetings were typically held in Namur, Belgium, at the Notre Dame University, where Jacques Berleur served as a professor, and then as emeritus, as had been the case for quite some time.

During the period from 2004 to 2010, WG 9.2 undertook several new projects. Two to mention here were the "Landscapes" book, edited by Chris Zielinski, Penny Duquenoy and Kai Kimppa, the official title of which was *The Information Society: Emerging Landscapes* [9] and another was the proceedings of a conference held at the University of Turku in 2005. Space does not permit a description of the excellent meeting (and heroic barbeque visit to a nearby island), but the result was some twenty very stimulating (and sometimes controversial) papers [10].

The Working Group also held a number of Summer Schools together with WG 9.6/11.7 – WG 9.6 being the driving force – first in Karlstad, Sweden, later also elsewhere – a forum that brought together PhD students and senior researchers in stimulating debates. Also, Special Interest Group (SIG) 9.2.2, Framework on Ethics of Computing, was at least as active as the working group (see Gottesman, this volume). Concrete outcomes were published subsequent to both of these activities [11, 12].

2.4 2010–2020

The 2010s was the decade of Chair Diane Whitehouse (2011–2019). The meetings were held twice a year (when feasible) in different places. During this era, one of the aims was to create a bridge between social accountability and ethical accountability which has been visible with strong collaboration with different working groups and especially with SIG 9.2.2. The aforementioned International IFIP Summer Schools were one of the main outcomes of common efforts between different workshops. In the beginning, these Summer Schools were quite active both from the social and technical side of

issues, but the technical side started to become more emphasized later, and thus WG 9.2 participation has unfortunately dwindled some as of late.

Because SIG 9.2.2 was focusing on analyzing the ethical codes and advancing the discussion, especially between the national representatives of IFIP, there was a need for more general ethical discussions where WG 9.2 was a natural forum for that. However, the cooperation between SIG 9.2.2 and the WG has been strong and there have been several different activities between them.[1] The WG 9.2's area of interest during this era was wide: eHealth, slow tech, teaching, digital divide, security and safety, for example.

At the beginning of 2020, WG 9.2's new chair, Jani Koskinen, started his term. He was elected at the TC 9 meeting held in Stockholm, Sweden, during the European Conference on Information Systems (ECIS 2019). One of the first tasks by the new chair of the new decade was calling up the group to create this chapter for the anthology of TC 9. Covid-19 has been ongoing during this term and the outcome has been that there have not been any physical meetings by WG 9.2. Therefore, instead of physical meetings virtual meetings have been used. Likewise, the planned WG 9.2 workshops in Human Choice and Computers conferences (HCC 14 and HCC 15) could not be held physically as those last two HCC conferences, held in Japan, were changed to virtual ones. One of the future challenges for WG 9.2 is to find new ways of doing things together – virtually and physically.

2.5 SIG 9.2.2: IFIP Special Interest Group on a Framework for Ethics of Computing

As described by Gottesman (this volume), the General Assembly of IFIP set up the Ethics Task Group in 1992, which become a special interest group SIG 9.2.2 for the specific purpose of creating an ethical code for IFIP.[2] Jacques Berleur was tasked with collecting the group, and he did so. The group's first major input was the landscape of ethics book, in which the group mapped the different situations in different IFIP member states they were able to activate how the local computer societies handled ethics, both in the local ethics group and at the codes of ethics level. It was found that ethical codes and modes of practice in the different countries differed considerably, and thus it was thought for a quite long time, that a unified code for IFIP would be difficult, if not impossible to create.

In 2005 a conference, a 20-year update was held in Turku, Finland. Unfortunately, it seemed that the same problem persisted. After this conference, the SIG decided to approach the issue differently. The group decided to map two things: 1) what are the main issues that a national society should at least consider handling in their code of ethics, should they want to create such a code, and 2) how to go about that, i.e., how to create an ethics group for a national society to handle both creating a code of ethics as well as handle other possible ethical issues that might arise for a national society. This was considered, rightly so, a major step forward for IFIP.

[1] Joint meeting with SIG9.2.2: "Why good people do wrong and what to do about it" (2013) and workshop with SIG 9.2.2 and BCS ICT ethics specialist group: "The challenges of virtuality and the cloud: the implications of social accountability and professional ethics" (2015)

[2] SIG 9.2.2, however, was already working already late 1980s. See https://www.ifip.org//minutes/GA98/GA98_TC9.htm.

In 2020, the SIG's new chair, Don Gotterbarn, and the group's membership were not content with this approach; instead, a true universally acceptable code of ethics for IFIP and its client societies entered development. The code is practically the same code which an international group of ICT and ethics researchers and practitioners created as the latest ACM code of ethics. This code has already been accepted as a code for several countries, and it is in the process of being accepted in others (e.g., Finland). There is strong reason to believe that it is indeed a suitable code for an internationally acceptable code of ethics, as it is specifically designed by an international group, and in such a manner that it is hard to claim the objectives of the code would not be ethical in any society. Only the future will tell whether the latest step on the special interest group 9.2.2's road will be successful, but it does look promising.

3 Themes

The name of WG 9.2, Social Accountability and Computing, already indicates the wide spectrum of themes that the working group focused on. The themes and topics that have been noted by the group are the following ones: critical infrastructures, speed and communication, materials and their finite nature, markets and changing power relation, growing maturation of citizens' role in shaping society, sustainability of society, personal relations, legitimacy of ICT, technology assessment and its methods, codes of ethics and professionalism, legal and regulatory frameworks, social cohesion and social exclusion, data privacy, human rights issues, globalization and its impact on democracy and culture, and ethics with regard to leading-edge technologies (see Working Group webpage[3]).

Social accountability of computing is a large phenomenon that is needed to achieve a better and more resilient society now, and most likely it will be needed even more in future. Social accountability is commonly seen as engagement between citizens and governmental parties to see and ensure that the actions of public officials and politicians are accountable – that those actions improve the well-being of citizens and protect their rights [13]. Likewise, demands made on companies are an important part of the social accountability of computing, although this is usually called corporate social responsibility. Especially when companies are globalizing, social accountability has global challenges that especially data-based economy has brought to us [14]. Likewise, the possibilities that technology – like IoT, artificial intelligence etc. – brings will set demands for achieving accountability [15].

It is also important to note the individual aspect of social accountability – meaning that individuals need to have accountability for their actions if we want to solve problems that our society is facing. We have environmental challenges and global inequality that should be noted also by individuals. Likewise, relations between people should be improved – especially in online forums, we have seen behaviors that are not sustainable. It is not possible to outsource the responsibilities only to business, governments, and other organizations. However, people also need ways of influencing and possess tools before they can have accountability. Without the possibilities and power to make decisions, one cannot be held accountable. Thus, there is a need for working towards a society where individuals are empowered and are seen as active actors.

[3] See http://ifiptc9.org/9-2/major-themes-of-wor/.

Social accountability is an evolving approach that covers issues such as the citizen oversight of public and/or private sector performance, user-centered public information access and dissemination systems, public complaint and grievance redress mechanisms and citizen participation in actual resource allocation decision-making [16]. Kling already over four decades ago mentioned that accountability in computerized information systems will be a salient issue in society [17]. Today we can agree that he was right and technology has such a profound effect on humans that now we need more than ever accountability implemented throughout the whole society. Next, we present three focus areas that have been central for WG 9.2.

3.1 eHealth

Modern medicine is disease-oriented, and it has become a field that is built on increasing specialization, which causes the fragmentation of the field [18–20] and thus people are easily lost and forgotten. This phenomenon is understandable as medicine and healthcare are so specialized nowadays and healthcare professionals cannot have an understanding of all medical issues since the specialization situation leads towards a narrower view. However, the problem is that people in this situation easily became an object of the treatment or action that the highly specialized healthcare professional is performing and commonly more and more with computers. The real risk in the fragmented healthcare field is that the professionals are losing the opportunity to understand the complete picture of the individual human beings they are encountering.

In order to prevent such alienation, a new approach to healthcare must be brought forward, and patients must be seen as human beings rather than objects. Therefore, it is not surprising that patients' involvement in healthcare has become an important issue for both healthcare professionals and policymakers [21]. Patient-centered healthcare and patient empowerment are seen as critical factors in improving the outcomes of healthcare and supporting the autonomy of the patient [22–25].

As eHealth is so central to medicine and healthcare it is obvious that it has been one of the focus areas for WG 9.2 which has a diversity of topics covered. Duquenoy et al. [25] argue that the use of online services in the health sector is related to patients' perception of respecting their privacy in these services.

Harvie, Eustace and Burmeister [26] have conceptualized and studied how elderly citizens can be included in the digital age. They propose that assistive technology can have an integral role in ensuring good health, social participation and independent living among elderly citizens.

To design domestic care technologies Finken and Mörtberg [27] suggest the concept of intra-action. Contrary to interaction, which perceives humans as subjects and technologies as objects, *intra*-action does not have a such prefixed distinction between subjects and objects. Humans can become objects which are sensed and measured in the context of the smart home as technology simultaneously becomes a subject acting on behalf of humans.

3.2 E-Government

Information and ICT have become ubiquitous parts of the public sector and governmental services [28]. To capture this development in public administration, e-government emerged as a popular term [29]. A new research field developed around it, raising issues of information, technology, and politics [30]. While no universally accepted definition of the e-government concept exists [31], it is often associated in the use of ICT to enhance the access and the delivery of public services for the benefit of citizens, governmental agencies and other stakeholders [32].

In the context of e-government, the relationship between user and provider is different from commercial setting, as citizens' choice of service are limited while governmental service providers have a responsibility to offer services to all citizens [25]. Hence, the question of access and accessibility are highly relevant for e-government services. Citizens' access to e-government relies heavily on their ability to access the internet and suitable devices, hence the use of ICT in the public sector could foster unequal access to public services for some of the citizens. Such an outcome would be largely contradictory to universalism, which is one of the core values of public administration [33]. Hence, digital divides have become a relevant research theme in e-government to study the gap between people, with effective access to digital services, and those with very limited or non-existent access [34]. As digital divides are related to other disparities in a societal sphere, they often reflect existing economical and societal inequalities as is the case with digital disability divides [35] which exist between people with disabilities and people without disabilities due to social, technical, financial and motivational factors.

According to Masiero [36], introducing ICT in a governmental context should aim for improving state-citizen relations. He claims that such improvement would require solving structural problems which may cause unresponsiveness of the state toward its citizens. However, such changes are rarely the focus of digitalizing governmental processes in developing countries. This is unfortunate, as integrating ICT into communities while strengthening social inclusion and avoiding the emergence and deepening of social and economic divides is one of the major challenges for e-government everywhere [37]. For example, Letch and Carrol [33] studied the consequences of an e-government initiative on a marginalized community in Australia. They propose that more efforts would be channeled forecast and evaluate the potential negative impacts of e-government initiatives.

Helbig et al. [38] recommend researchers ask who benefits from e-government and how different groups are influenced. These questions have been of interest for WG 9.2 alongside evaluating e-government initiatives and identifying their impacts on society.

3.3 Ethical Sustainability of Computing

Ethics sustainability has been at core of WG 9.2 and eventually lead to the establishment of SIG 9.2.2, the IFIP Special Interest Group on a Framework for Ethics of Computing. Although SIG 9.2.2 is not under WG 9.2 hierarchically, the aims of both are somewhat overlapping and thus presented here. One of the seminal works on ethicality and computers is Moor's article "What is computer ethics?" [39]. One reason for the lack

of legislation could be the digitalization of society, which radically changed the possibilities for the use of information. In addition to this rapid digitalization, the focus behind developing information systems has mainly been very technologically deterministic. Regulations have generally focused on solving emerging problems rather than being able to seek long-term solutions for the complex phenomenon that computers have brought upon us. This can be seen as a consequence of the Moorian policy vacuum [39].

A policy vacuum is a situation where there are no policies (or where the existent policies are unclear) regarding how information technology should be used [39]. Thus, the situation in which legislation is lagging behind the development of technology is an example of a Moorian policy vacuum – as we have seen with the legislation of AI currently being under formation but AI is already widely used [40].

As technology causes changes in the social system in which it is implemented and these changes are many times unpredictable. When an information system is changed or implemented it will change the organization as well [41–44]. Technological products, such as computers and information systems as larger installations, influence their social context by either through affordances or through constraints, enabling or discouraging certain behavior or use [45]. Brey has analyzed the proper role of technology in society. He shows that technology per se has an effect on society which shapes it towards positive and negative directions instead of technology being neutral. Brey's analysis focuses on defining the criteria for how technologies are contributing to the quality of society. He presents two fundamental values, well-being and justice, and three necessary, instrumental values – freedom, democracy, and sustainability – for a good society, and technologies should be used in a way that contributes toward those values.

Thus, the way that an information system is designed also plays an important role in this unpredictable interaction. As information systems are always designed by human beings that are trying to fulfil certain goals, information systems are never value-free [46, 47].

4 Future Directions

4.1 Data (Economy) Ecosystems

Discourses about the so-called 'data revolution' are steering societies to invest in data to advance economic and social development [48]. The current problem in society is that we have already entered an era of new colonialism: data colonialism, which has normalized the exploitation of humans through the use of their personal data. As Couldry and Mejias noted, we should resist building societies based on total algorithmic control, where we are reducing human beings to a role as data resources for economic purposes. Taking this position does not mean an outright rejection of data use and collection, but it might mean rejecting current data practices. [14] We need the accountability of all data from users to ensure that the rights of individuals are taken into account.

Research studying data economy ecosystems is, however, still in its infancy. There is no consensus about the definitions of the data economy, data ecosystem or data economy. Terminology is also inconsistent when talking about data and its use in present-day society [49]. Today's unclear situation is not helping to create data ecosystems where accountability and ethicality have a central position. Instead, a situation has developed in

which the dominating business corporations have been able to create a world of their own [50]. Thus, we need research about this phenomenon and transparency so that society can respond to the challenges and possibilities that a data economy and data ecosystems are bringing to us. The data economy is the whole phenomenon and the data ecosystem is a viable system, that is part of the data economy which may contain several and possible overlapping ecosystems [49]. From the perspective of social accountability is to seek the basis and justification of rules about how the data economy is put into practice in different ecosystems. There are several projects as IHAN,[4] Mesinfos,[5] Decode,[6] etc. that are aiming at creating new data economy ecosystems or solution for them [51]. Rantanen et al. [52] noted that research has been founded on themes of privacy, accountability, ownership, accessibility, and motivation, but the discussion is fragmented and should be further researched. There are several complex issues to look upon to understand and develop fair and socially just data economy. One of the questions is the ownership of data and how to ethically to justify it. Hummel et al. [53] well present the that ownership is issue where we need not only to think who owns the data but "data ownership is not only the resource of data itself, but societal resources of justice, privacy, self-determination, fairness, inclusion, and the like."

There is a need to go beyond narrow view on data economy and data ecosystems to meet future challenges for society. Private companies are forming ecosystems, most successful western ones being Google, Facebook, Twitter, and Amazon and Baidu, Alibaba, and Tencent in the east [14]. However, situation it that the data is seen as asset for companies to make profit and this hardly leads to situation where the common good is the aim. We should look new ways to govern the data (economy and ecosystems) globally and locally and thus this is the one of the key area for WG 9,2 as it is governing the all previous main themes of WG under one umbrella. Now these globally connected ecosystems currently dominated by global corporations or other strong institutes that may not be the most socially accountable actors.

4.2 Artificial Intelligence

By now, it is very clear that artificial intelligence has, and will have, many implications, effects and impacts on society. This is consequent on the work of such interpreters as Nick Bostrom (Superintelligence: Paths, Dangers, Strategies), public declarations by big-budget technology industrialists like Bill Gates (Microsoft), Elon Musk (PayPal, Tesla, Twitter, OpenAI, etc.) and Reid Hoffman (LinkedIn). AI-driven tools, such as drones and self-driving cars, present new social and ethical challenges documented in a growing literature.

Among the questions facing us are: Is AI set to provide the human race with a bright new future, or is it the harbinger of ultimate doom? Will nano-AI provide new ways of delivering health or will the robots take over? Many possible futures, even wider than the question of AI, have considerable – even existential – social consequences. It is essential to identify them. Accountability is certainly needed, but who will provide

[4] See https://www.sitra.fi/en/topics/fair-data-economy/.

[5] http://mesinfos.fing.org/english/.

[6] https://decodeproject.eu/.

it? Can it be in-built, or do we need watchdogs? What social and ethical structures are needed now and what will be needed in the years to come? A start on considering these questions was made during 13th IFIP TC 9 Human Choice and Computers Conference: "This Changes Everything" held in Poznan, Poland, 17th–21st September 2018 [54]. Undoubtedly, artificial intelligence will be a subject to which the Working Group will return frequently in coming years.

4.3 Sustainable Computing

In recent years, interest toward sustainability has increased in the field of computing among researchers and practitioners, especially because Covid-19 pandemic showed the need to tackle grand challenges that we are facing [55]. Focus have expanded from potential befits enabled by ICT to the sustainability of ICT. Sustainability of ICT can be analyzed by focusing on material consumption, power consumption and e-waste [56]. For example, e-waste is the largest source of hazardous waste in the global scale [57]. To prevent negative environmental impact of ICT and to increase its sustainability, Patrignani and Whitehouse [58] have suggested Slow Tech as prominent research approach to reflect the development and use of ICT from the viewpoint of goodness, cleanness and fairness.

Another approach is suggested by van der Welden [59], who questions the differentiation between the sustainability of ICT and ICT for sustainability in current discourse. She relates this division to concept of Anthropocene – the current epoch which is characterized by a time when human activities have made a greater impact on the planet than natural processes. While this concept has been largely used, it has not yet been formally accepted as a geological period and researchers using it disagree on the time when Anthropocene started. Van der Welden, alongside other researchers, criticizes the concept of Anthropocene for separating humans from the web of life and juxtaposing humans against other species [59]. She encourages others to study the complex and entangled relationship between humans, nature, and technology without reducing it to easy solutions or categories. With such an approach, it is possible to notice that nonhumans are also trapped in the rhythm of progress.

Whether or not one accepts the Anthropocene as ongoing geological period, ICT providers, users and policy makers need to adopt more systematic view which includes both human society and the planet when designing or using new technologies [60].

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A Common Ground for Developing a Global Conscience

SIG 9.2.2: Ethical Frameworks and Codes of Ethics

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Abstract. This paper illustrates the evolution of how a professional organization learned to recognize and manage its social and ethical responsibility with a specific focus on the roles and contributions of IFIP's Ethical Frameworks Special Interest Group (SIG 9.2.2). IFIP's decades-long journey to adopting an international code of computing ethics revealed issues faced by any organization trying to express its moral values in a code of ethics, how to develop them, and how they can be used. Illustrating the development of this code in the rapidly changing ICT profession also uncovers ways to design aspirational codes which can be used in making ethical judgements about how to use technology and which technology to use. Suggestions for how to support a code once it is adopted and code decision-support tools developed in this process are also presented.

Keywords: Computing Ethics · Codes · Decision Making

1 Overview

When IFIP was founded in 1960 under the auspices of UNESCO, it aimed to support the "professional and socially responsible development and application of information and communication technologies" [1].

To meet these goals, an organization IFIP supports and promotes both necessary elements of professionalism; competence in technical skills and the professional ethical judgement used to guide the application of those skills.

IFIP early in its history recognized the need to articulate ethical principles for information and computing technology (ICT) and facilitate careful ethical judgments about the development and applications of ICT.

ICT professionals' actions change the world. To act responsibly, they should reflect upon the wider impacts of their work, consistently supporting the public good. The nature of that impact has been constantly changing. It has moved into many domains such as in the workplace, the home, government, and education, and it will affect sensitive issues such as privacy and professional ethics. The expansion also encompasses all parts of the Earth, particularly developing countries. Such growth must take place in the context of

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historical dimensions and should underscore the accountability of professionals in the field.

As ICT developed, its primary challenges were viewed as technical and very few institutions saw a significant connection between broad social, ethical issues and technology. Ethics was considered a problem created by wrongdoers. It was common for professional codes of ethics to be closely tied to canonical principles that could be legally enforced. This early belief led to measuring effective ethical codes in terms of how well their rules could be legally enforced, requiring a kind of legal/ethical imperialism to enforce the rules internationally across diverse social cultures. As the concept of an international profession developed, so did the understanding of the role of a code of ethics. Ethical judgments are about how various possible actions are consistent with (or conflict with) the code's principles and, thus, expands the meaning of professionalism beyond mere technical competence [2]. IFIP's early focus on its unique nature as a diverse federation led to early difficulties which were overcome when they focused on their common intercultural professionalism. The common professional values in the IFIP Code of Ethics are intended to coexist with any culturally unique elements which may exist in a member society's code.

During IFIP's evolving response to the need for a constant reexamination and restatement of the professional responsibilities of ICT practitioners, Special Interest Group 9.2.2: Ethical Frameworks was created within IFIP's Technical Committee 9's Working Group 9.2 for Social Accountability and Computing. The goals of SIG 9.2.2 are:

- To identify, articulate, and promote ICT professional values that help guide ICT professional practice to positively contribute to society in ways that minimize unintentional ethical mistakes and maximize positive ethical opportunities.
- To provide ethical frameworks for ethical discussion and decision-making in ICT that contributes to society and human well-being, both locally and globally.
- To provide current examples through publication, workshops, and educational tools of how these principles apply to the rapidly changing ways the work of ICT professionals' influences and directs all aspects of society.
- To contribute to, lead, support, and progress IFIP member societies' identifying and responding to the ethical obligations to all those impacted by their work.

The scope of SIG 9.2.2's work is very broad. SIG 9.2.2 provides the ethical support for ICT professional decision-making and how it impacts all stakeholders so it needs to address a broad range of ICT domains including things like e-health, domestic violence, big data, IPv6, Internet of things, artificial intelligence, accountable algorithms, community ideas, social impacts automated systems, and autonomous devices. Subjects at a recent SIG 9.2.2 workshop included papers on digital health, artificial intelligence and safety, and ways to introduce ethical values into ICT education. The SIG works on developing and documenting an intercultural consensus about the values of the ICT profession and sharing that with member societies and the global ICT community (see list of sample publications in the Appendix).

Most ICT decisions impact a range of stakeholders and so have an ethical component. The SIG requires a broad and inclusive approach to its work providing ethical frameworks to address developing technologies in changing situations. The identification of intercultural ethical principles requires consultation with a broad constituency

having a variety of technical, social, and ethical skills. SIG 9.2.2, which aims to provide tools to facilitate and promote computing ethics, draws on members who include philosophers, software developers, project managers, computer consultants, theologians, and academics, as well as representatives from national and local ICT societies. It also draws in, as required, specialists in other areas like medicine and law. SIG 9.2.2 has 25 members representing 11 countries from 4 continents.

The SIG contributes to and supports IFIP conferences such as TC 9's Human Choice and Computers conference series. It also conducts workshops, participates in panels, and presents papers to other conferences. Much of its research on ethics is published in IFIP books and monographs and is included in other anthologies. Most recently is the publication of the IFIP Code of Ethics booklet that contains IFIPs new code of ethics and descriptive material on the code's development.

2 History

SIG 9.2.2 is a product of IFIP's over five-decades-long, evolving commitment to professional ICT, helping practitioners and member societies make appropriate ethical professional choices. In 1976, the IFIP General Assembly, establishing its Technical Committee 9 on relationships between computers and society, judged that two Working Groups would be sufficient to cover the few main questions about society and computers. A year later, in 1977, Working Group 9.2 on Social Accountability and Computing was created and did some work on professional accountability and codes of ethics. These topics were also of interest to other international organizations like the Council of Europe and the Association for Computing Machinery.

At the 1988 New Delhi General Assembly, the development of an international code of ethics was discussed. Harold Sackman (TC 9 Chair 1984–1989 and co-editor of TC 9's Human Choice and Computers Conference 1 proceedings) proposed a project to develop an IFIP Code of Ethics. Under the leadership of Sackman, a draft code [3] was developed, which included many elements beyond ethics. The first section, consistent with other codes like the ACM's, promoted professional responsibility and emphasized the protection of values like privacy, honesty, and competence. The second section on international organizational ethics went into certification standards and the quality of working conditions. The third and fourth sections went beyond ethics into legal informatics, calling for laws to protect intellectual property rights, to establish legal obligations and public law to regulate and protect telecommunications networks, and to establish international computer crime law. The final section called International Public Policy Ethics was a utopian statement of desirable human values [4]. These last two sections, going beyond professional ethics, were a catalyst for significant misdirection working on the code by focusing on cultural differences rather than common professional goals and focusing on issues of enforcement and how a single code of ethics should relate to laws of different nations.

A draft of Sackman's code was circulated before the September 1992 12th World Computer Congress in Toledo. In addition to Sackman's presentation of the draft code to an ethics section at the Madrid conference, there were also several critical papers of the draft code. Issues of concern were the breadth of the code mandating cultural

changes in member countries and mandating laws to other countries. The discussion also emphasized the difference between member nations.

The subject of the proposed "Draft IFIP Code" was the subject of a full afternoon session of the General Assembly in Toledo, which again focused on the issues of legal and cultural diversity. "After turbulent debate the idea of an international code was abandoned in favour of a process that would take more into account the cultural, social and legal diversity of the member Societies" [5].

The GA set up an Ethics Task Group (ETG) (1992–1994) and asked them to carry on the discussion about codes of ethics and suggested that because of these cultural and legal differences the TG might look at "IFIP guidelines" which could be shared with member societies. In December 1992, the newly formed ETG, chaired by Jacques Berleur, requested documents related to ethics from all member societies. The ETG met three times in 1993 and 1994 to review the responses and proposed an analysis of those ethics documents contributed by some IFIP member societies. They also considered work being done by the ACM between 1990–1992 in revising the ACM Code of Ethics and Professional Conduct to understand how and why codes got updated.

The ETG found some major common ethical professional elements in the ethics documents of member societies, such as respectful general attitude, conscientiousness and competence, promotion of privacy and confidentiality, and transparency of information. Unfortunately, the discussion devolved into creating an "enforceable code." Instead of the development of a code based on the common ethical principles of ICT, rather than an educational project identifying the common moral conscience of the profession of ICT their conversation focused on the cultural diversity of the member societies and focused on how they would enforce a single code of ethics. The emphasis shifted from identifying a common set of professional values to the question of how you could enforce sanctions on bad behavior across multiple cultures. The ETG was asked to evaluate drafts of the code "in terms of enforcement in face of diverse economic, social, and cultural backgrounds." Although this was consistent with the multicultural nature of IFIP, the discussion of global governance was a different and distracting question from identifying the conscience of an international profession.

The work of the ETG was reported to the GA in Hamburg on 6 September 1994. The IFIP Ethics Task Group publicly presented the results of its work in 1996 through the publication of the results of an in-depth analysis of nearly 30 codes of ethics/conduct, *Ethics of Computing: Codes, Spaces for Discussion and Law* (1996). Twenty-one of the codes pertained to IFIP national societies, representing twelve countries.

The ETG was addressing three different requirements that had been set: the identification of the ethical conscience of ICT, the identification of a common set of internationally enforceable laws about ICT, and describing a single international culture of ICT. The level of this difficulty is captured in an essay by Jan Holvast in the committee report. Commenting on the effort to develop an IFIP code that met these requirements, he gave as the first lesson from the experience:

> to draft an international code, be it European, does not seem to be a realistic goal. The reason which is often given is the impossibility of enforcing it.

> We have considerable reservation because of the differences between cultures, traditions, and legal frameworks within the international community, and hence we doubt that a universal code of ethics can be written [6].

The ETG's recognition of these difficulties led them to suggest a different focus for the group and a positive thing they would do for IFIP member societies to promote the ongoing discussion of ethics by member societies. The original statement 1994 IFIP GA reads:

> IFIP Technical Assembly Resolution on the 'Codes of Ethics' Project
>
> IFIP Technical Assembly appreciates the efforts which its Task Group on Codes of Ethics has achieved.
>
> In endorsing the Task Group's proposal and recommendations, TA explicitly agrees with the proposal that the implementation of an ongoing discussion process both in IFIP Member Societies and in the international discourse is essential to understand and further develop the 'IFIP Framework on Ethics' in more detail which is also a prerequisite to adapt it to new developments. Therefore, TA agrees that publication of the material, analysis and recommendations is essential to start these processes.
>
> TA welcomes and accepts TC 9's suggestion to continue the Task Group under its umbrella. In dissolving the TA Task Group, TA asks the new TC 9 Special Interest Group (SIG9.2.2 'IFIP Framework on Ethics') to develop a set of case studies which may enlighten essential problems and issues related to ethics. Moreover, SIG9.2.2 will inform TA (within TC 9 reports) about essential achievements and progress in the international discussion, and to discuss and suggest solutions for emerging problems" [7].

The special interest group (SIG 9.2.2) that was established in 1994 aimed to support the creation of "spaces for discussion" where ethical debate could be promoted and supported throughout IFIP and other constituencies.

2.1 Phases of Work

The work of SIG 9.2.2 has changed over the years in response to social and technical changes and the ethical responses required by ICT professionals.

The First Phase of the new SIG was to document the work of ETG that was reported in the GA in 1994. This was accomplished by the publication of *Ethics of Computing*.

SIG 9.2.2, under the leadership of Jacques Berleur, worked to create "spaces for discussion" and to promote national, regional, and international settings where the process of discussion is open and ongoing, to ensure that ethical questions are not obliterated and ethical issues will not be ignored by member societies. The goal of this first phase was to create "spaces for discussion" where deep convictions might be shared and from which principles could be derived.

The SIG took as a basic principle that codes of ethics should not restate existing legislation and should not advocate legislation. The question of a single enforcement policy for multiple member societies was also a problem. The SIG continued its work

advocating for the discussion of ethics by the member societies and providing frameworks and principles for that discussion and that might be used in the member society codes [8].

The SIG then entered the **Second Phase** of analysis to provide tools for member societies to consider ethical issues. The Internet was now a major concern. They looked at ethics and the governance of the Internet. New ethical guidelines were being created from a variety of qualified and unqualified sources. Again, the SIG solicited ethical documents from the national members. Using a grid analysis, they identified the main Internet-related issues that had appeared in these various sources and categorized them using a legal analysis model distinguishing the actors and people concerned, the place where the "law" is applicable, the matters which were covered, and rules including sanctions. Results were published in 1998 in the TC 9 Fifth Human Choice and Computers international conference in Geneva and presented to the 1999 IFIP General Assembly in Kuala Lumpur through a monograph that was distributed to all the member societies to promote discussion inside the IFIP national societies [9]. The SIG also ran a series of workshops. The three main forms of Internet governance were presented: technical controls, self-regulation (that is, norms regulated by professional or trade associations), and legal controls [9, p. 22].

The focus on enforcement including legal enforcements is evident in the conclusions of this second phase. "Our conclusions are that matters of interest to business and commerce tend to have legal force and regulation, but the real principles and issues of ethics tend still to be subject to no legal force. Society needs to confront this."

In the **Third Phase,** in the absence of legal enforcement and the separation of law from codes, the SIG focused on the relationship between ethics and self-regulation. Issues of concern to business and commerce tend to have legal force and regulation, but the real principles and issues of ethics tend still to be subject to no legal force but self-regulation instead. The understanding of "self-regulation" was "norms regulated by professional or trade associations." The methodology of the first two phases continued between 1998 and 2001; the SIG collected and analyzed nearly 40 self-regulation documents in "Self-regulation: Content, Legitimacy and Efficiency: Governance and Ethics" [10]. Based on this analysis, they suggested minimum requirements that must be met and recommendations that must be made on the level of self-regulation to reflect real ethical concerns.

In the **Fourth Phase,** the SIG addressed the question of ICT, justice, and social ex/inclusion, opening spaces for discussion of issues surrounding the digital divide.

The SIG then moved into other areas to support and promote ethics that include the analysis and design of ways to include ethics in computing curricula and developing guidelines for building codes of ethics and identifying shared ethical principles. They also advocated and provided direction for the development of ethics of computing committees in professional computer societies.

They focused on topics with:

> a more ethical content with a pragmatic examination of the questions which were already under discussion (or 'under control') including the protection of the individual (as citizen and as consumer), and the protection of organizations and of society. These questions include ethical content, but there is less emergency. They

> advocated linking these questions to ethical principles especially principles of judgment and choice, the protection of human dignity, the vulnerability of the weakest or the underprivileged, and the sustainability of society" [11].

The work of SIG 9.2.2 on ethics in computing continued, with a range of other publications. After their considerable research, SIG 9.2.2 developed a general framework for building codes of ethics: a "recipe" for making a code. Its primary elements were a broad involvement of stakeholders with transparent development and contributions by those who would be affected. Building a code required the explicit involvement of the stakeholders bound by the code and those impacted by the work of the professionals. Codes must be negotiated in a participatory matter. "The titles and preambles must make explicit the status of those documents, and they must all be negotiated in a participatory manner." The complete "recipe" was presented in Criteria and Procedures for Developing Codes of Ethics or of Conduct in 2004 [12, p. 10].

Very few IFIP national societies or similar professional associations have committees that support and nurture a professional code and develop an ethical culture in their association or organization. To encourage the creation of ethics committees it focused on setting up and running national and/or professional ethics of computing committees and published a monograph on this [13].

After working on the framework of developing ethical codes and advocating the establishment of professional computing ethics committees the SIG returned to its consideration of codes of ethics as a framework for ethical discussion. SIG 9.2.2's analysis of ethics in professional organizations led them to focus on the importance of ethical discussion and facilitating the consideration of ethics by member societies; they wanted to promote spaces where discussion can be raised about harmonizing codes of societies, to prevent restrictions in one country being prejudicial to another. This interest in harmonizing codes was prompted by their emphasis on laws needed to enforce codes. They had now done extensive work on issues of self-regulation and various roles of professional societies computing ethics committees.

The SIG had always maintained that codes do not solve all questions, but they may help to create awareness, supplement the law, and reinforce ethical behavior. Codes offer a "framework on ethics" that may help to maintain openness and fuel the needed dialogue in the "spaces of discussion" [14].

Many changes in technology facilitated a broader understanding of professional intercultural similarities in ICT. When IFIP's discussion of an international code began in 1988, there was no World Wide Web. The Internet now has 3.5 billion people and many applications are used all over the world. These changes introduce new problems for a code of ethics but they also make it easier for the inclusive development and recognition of common professional values in the tangle of minor multicultural differences.

In addition to the change in recognition of professional values having a common foundation, there had also been a change in the view of the primary functions of professional codes of ethics. These changes in primary function were characterized by Ron Anderson [15, p. 44] discussing the ACM's efforts at producing a code.

A primary concern of earlier codes was establishing professional status and asserting a professional commitment by using the standards in a code to punish unethical professional behavior:

> Historically, professional associations have viewed codes of ethics as a mechanism to establish their status as a profession or as a means to regulate their membership and thereby convince the public that they deserve to be self-regulating, Self-regulation depends on ways to deter unethical behavior of the members and a code combined with an ethics review board, was seen as the solution. Codes of Ethics have tended to list possible violations and threaten sanctions for such violations.

One significant distraction about the Sackman IFIP draft code was about how to enforce punishment across international borders without some kind of common international ICT law. The new approach to codes was to treat them as statements of agreed-upon common professional values without getting distracted by irrelevant cultural differences. Codes give voice to common ethical values of a profession that can be used for the education of the public and new members of the profession. They can also be used for guidance in decision-making.

> Now the most important rationale for a code of ethics is an embodiment of a set of commitments of that association's members. ... Recent codes of ethics emphasize socialization or education rather than enforced compliance. ... A major benefit of an educationally oriented code is its contribution to the group by clarifying the professionals' responsibility to society. A code of ethics holds the professional accountable to the public. ... The final and most important function of a code of ethics is its role as an aid to individual decision-making.

This understanding of the roles of codes, providing guidance and setting ethical goals for professional behavior, was used in developing the ACM's 1992 Code of Ethics and Professional Conduct and used in the Software Engineering Code of Ethics and Professional Conduct developed by the IEEE and ACM in 1999.

This new emphasis on aspirational guidance is consistent with some elements of SIG 9.2.2's earlier comparative study of codes. "The codes offer an already experienced 'framework on ethics' which may help to maintain openness and feed the needed dialogue in the 'spaces of discussion." Self-regulation of professions requires ethical guidance. This is recognized in engineering and medicine with ethics boards and case studies to help practitioners.

In 2015, ACM started a 3-year project to update its 1992 Code of Ethics, a code analyzed by SIG 9.2.2. Their goal was to identify and state the global professional values of ICT. Since 1992, the ACM had become a more international organization with regional sections in Europe, China, and India. The inclusive process ACM followed from 2015 to 2018 was consistent with the standards for developing an international code suggested by SIG 9.2.2, especially emphasizing contributions from the global ICT community. There were several IFIP members on the ACM team including Don Gotterbarn, current chair of SIG 9.2.2, who was the chair of the ACM update project. They also followed the newer model for codes emphasizing common professional values using an aspirational positive approach.

Like the early Sackman draft code, the ACM Code of Ethics and the Software Engineering Code of Ethics included an emphasis on the overall social responsibility of

the professional and the leadership of computing organization but did so without tying it to aspirations for an International ICT law. The primary function of a code is to state and support values used in decision-making. This approach avoids the concerns of SIG 9.2.2 created by the earlier requirements that a code of ethics harmonize international laws of multiple countries and eliminates the ad hoc rejecting of specific statements of value because they may be contained in the laws of one nation or another. The code states the intercultural values of ICT advocating the careful reflection by ICT professionals on the wider impacts of their work, constantly supporting the public good regardless of whether those values have been incorporated into member country's laws.

IFIP recognized the need for a reexamination and restatement of the professional responsibilities of ICT practitioners by the international community of ICT professionals. A clear understanding of these ethical principles is needed to help guide ICT professional practice to positively contribute to society in ways that minimize unintentional ethical mistakes and maximize ethical opportunities. One of IFIP's major responses to this need has been the development and support of the International Professional Practice Partnership (IP3), a multi-society consortium formed to promote the professionalization of ICT.

At the 2018 TC 9 meeting at the IFIP World Computer Congress in Poznan, Gotterbarn, SIG 9.2.2 chair, discussed the development of the ACM Code which was consistent with the IFIP model for Code development. ACM had developed the code as a statement of professionalism rather than formulating it as a code for a particular society.

Gotterbarn framed changes in codes of ethics as a move from "ethics as rules" to be followed (or not), to ethics as situated/context-oriented/process-oriented within our approach and our daily activities. He described the updates to the code, its international and cross-organizational promise. ACM was encouraging adaption of the code by other societies as a sign of the shared ICT values. Discussion of ethics codes continued at the SIG 9.2.2 meeting in Poznan. Kai Kimppa, vice-chair of 9.2.2, noted how the code of ethics was consistent with one of the abiding interests of IFIP's Technical Committee 9 (TC 9) on ICT and Society has been the attention paid to the need for an ethical approach to the work of ICT professionals and how a code supported that. It was clear that SIG 9.2.2 and IFIP had moved significantly from its initial charter in Hamburg in 1994 that emphasized the differences of the member societies.

Attention then shifted to the work done by ACM. Later that year at a UNESCO meeting in Geneva, David Kreps, TC 9 chair, and Gotterbarn had discussions with Mike Hinchey (President of IFIP) about the possibility of IFIP developing a code of ethics based on the ACM code.

There were several reasons for adapting the ACM code into an IFIP code. Its development was consistent with the IFIP SIG 9.2.2 Code Writing Framework written under the guidance of Jacques Berleur, and IFIP was well represented in the ACM code development process. Gotterbarn was co-chair of the ACM code update project, and two of the authors of the IFIP Framework, Penny Duquenoy, and Kai Kimppa (WG 9.2 and SIG 9.2.2), were also members of the ACM's update task force. Additionally, the objective of the ACM Code Update Project was to define and articulate ICT's professional obligations to the much broader range of stakeholders impacted by modern

ICT systems, and ACM's requirement for the code to address the intercultural common ethical obligations of its international membership was a good fit for IFIP.

To accomplish this, the committee sought and received international contributions and enabled discussions. As the work progressed, a common set of global ICT values emerged. A transparent multi-year iterative process subject to public review and comment followed, involving a broad range of international specialists, discussion boards, surveys, and other resources. Technology made it easier to follow the Framework's primary directives for broad involvement of stakeholders with transparent development and contributions by those who would be affected.

Consistent with the IFIP Framework's recommendation that there be "a period of consultation and feedback in developing a code," the code was developed over a three-year period that included four major draft-review-revise cycles each involving multiple sublayers of review and revision with a broad base of stakeholders. Major drafts were made available globally in print and on social media to professional societies and the public at large. To facilitate free, open, and honest comments there was no restriction on who might comment, and anonymous comments were encouraged and facilitated on the discussion boards. All comments on draft code principles were cataloged, distributed, and discussed. The results of each major revision, with details about what had been revised and why were published digitally and in print. They remain readily available still. Although organized by ACM, the development of the code was an international project.

At the 2019 TC 9 meetings in Stockholm, the possibility of developing an IFIP code of ethics based on the ACM code was considered and unanimously supported by WG 9.2 and SIG 9.2.2. It was decided that TC 9 should sponsor such a code. As a result of those meetings, SIG 9.2.2 was tasked by TC 9 to deliver a code of ethics for use by governments and ICT societies around the world in the development of their own codes, a practical first step in developing a global ICT conscience. IFIP SIG 9.2.2 retained its responsibility for the framework for ethical computing addressing this task. The results of this process would be presented to the IFIP GA in Kiev in September.

SIG 9.2.2 moved ahead with the IFIP Code presuming that the ACM's three-year international effort generated a code that approximated a common set of principles reflecting the conscience of computing. IFIP's supporting this conclusion provides a "framework" for all national societies' codes.

Gotterbarn presented SIG 9.2.2's work on the code at the October 2019 IFIP General Assembly meeting in Kiev. The GA agreed to establish an IFIP Task & Finish Group, under the leadership of TC 9 Chair David Kreps, to shape the 2018 ACM Code into an IFIP Code of Ethics. The group involved Don Gotterbarn, IP3 Chair Moira de Roche, and Member Societies Assembly representative Margaret Havey. The Task and Finish Group undertook further consultations with Member Societies and with the IFIP Board to produce the final version.

At that time, as Anthony Wong (IFIP vice-president) said, because virtually every sector of society is being impacted, IFIP needed to address a duty of care and accountability "beyond the safety-critical, more than the technically correct." Given the broadening social impacts of ICT and the redirection on intercultural agreement about the ideals of

ICT, it is now clear that a code to educate the aspirations of ICT professionals is not only possible but necessary.

The code and adaption process met the major challenges to the 1988 Sackman draft code. It does not challenge cultural elements contained in Member Society codes. It is not intended to replace codes specific to Member Societies. The code contains elements, however, that might not be included in the Member Society Code. Therefore, the IFIP Code of Ethics can be adopted alongside a Member Society's Code, or Member Societies can modify their code to include those values and guidance not already included in their codes or simply reference it in addition to their codes. The code promotes the continued development of a global conscience within the ICT sector, providing a common ground for international discourse on professional responsibility [16].

The code provides a consistent international statement of ICT values which stands as an argument against those who say there are no real ICT standards, but only multiple local policies. Expressing the intercultural aspects of global ICT, the code is useful in cross-border judicial support. It provides a common ground for international discourse on professional responsibility and a framework for ethical discussion.

The results of the work of the Task and Finish Group, including the code of ethics and supporting documents, was presented to the June 2020 IFIP General Assembly by TC 9 chair David Kreps and was approved.

The code provides content for IFIP's emphasis on ethical standards. It guides practitioners on how to act in a professional way promoting the good of society. The principles help them see ways to improve systems by considering their potential positive impact and reducing their negative ones. The primary function of this code is to help guide the aspirations of computing professionals in doing their work.

2.2 New Work for SIG 9.2.2 After Code Adoption

Consistent with the evolution of IFIP work on the ethics of computing, Phase 5 of SIG 9.2.2's work is focused on using the principles of the code to continue to facilitate ethical discussion and as guidance for approaching the ethics of computing.

- To identify, articulate, and promote ICT professional values that help guide ICT professional practice to positively contribute to society in ways that minimize unintentional ethical mistakes and maximize positive ethical opportunities.
- To provide ethical frameworks for ethical discussion and decision-making in ICT that contributes to society and human well-being both locally and globally.
- To provide current examples through publication, workshops, and educational tools of how these principles apply to the rapidly changing ways the work of ICT professionals' influences and directs all aspects of society.
- To contribute to, lead, support, and progress IFIP member societies identifying and responding to the ethical obligations to all those impacted by their work.

3 Themes

Computing ethics is a broad subject that must be treated holistically. The primary goal is to promote the ethical behavior of ICT professionals and those who use ICT. Codes of ethics can facilitate this in several ways. If they function as a statement of the conscience

of the ICT profession then they clarify what our profession should strive to be: they are a call to action. To aid our ethical ***decision making*** they must express the ***professional shared values.*** Code development must follow an effective ***development framework*** to adequately identify these values and must provide guidance for the decision-making which supports ***the aspirations*** of ethical ICT professionals. A code should be a response to the degree to which the work of ICT professionals in the 21st-century influences and directs all aspects of society.

3.1 Functions of Codes

Codes of ethics have served many functions. Some do not serve "ethics" such as their use to establish a monopoly by using the code to regulate membership and to sanction members, protect some members of the profession from legitimate criticism by other members, or to create a false impression of caring for their stakeholder.

Codes also serve some significant functions to educate practicing and aspiring professionals about what is valued by the profession. The statement of values states the professional's obligation to society at large. It is a public statement of the responsibility to the society it serves. That statement also serves as a moral contract between society and the professional, a contract that holds the professional accountable.

Given the broadening social impacts of ICT and the redirection on intercultural agreement about the ideals of ICT [17], it is now clear that a code to educate the aspirations of ICT professionals is not only possible but necessary. The code should guide and justify professional decisions, establish the public good as the primary focus, help establish a global profession (with the standard of good practice being largely the same anywhere in the world), instruct society about what to expect, and express the conscience of the profession (globally).

3.2 Decision Making Based on Values … and Which Ones?

To aid decision-making globally, a code needs to identify shared values and needs to identify which values contribute to a better world. ICT professionals have more in common than separates them. Different nationalities have diverse cultures, but multinational organizations based on a common profession share significant values. ICT professionals from different nationalities may disagree about how many times you kiss on the cheek in greetings but they will not disagree about the significance of testing a pacemaker's software. Those common values are the values to be embodied in a code. Professional ethics is not relative as a code based on cultural differences would imply. A good professional code articulates the global values of the profession not the differences of the cultures. Intercultural global values we have in common establish foundations on which we can make decisions [17, 18].

The values identified should not be subject or whim or convenience. A code should clearly state what is essential to professional life. The first problem is how to identify those values. SIG 9.2.2's framework to identify shared values provides the recipe to solve this problem. The development of the IFIP code is consistent with the frameworks for code development established by SIG 9.2.2. The development process can serve as a model for other professional code development. SIG 9.2.2 "strongly recommends a

period of consultation and feedback in developing a code." It also mandates that those who will be guided by a code should participate in its development. The code ACM produced was a three-year (2015–2018) multinational project. From the beginning, the primary goal was to create an international code for computing professionals.

The code was developed in a draft comment review redraft cycle. The code had three published drafts distributed to all ACM members and made available publicly for comments between each draft. The publications contained the described revisions and why they were made. These revised drafts were spaced six months apart to allow for comment. The drafts were distributed to an international task force and with a file showing line-by-line changes supporting development transparency.

The publication of each draft was followed by a public response period. Feedback was gathered via email and an open comment Discourse website. Draft 3 of the updated code was the subject of a survey of 100,000 ACM members. The comments were anonymous to encourage openness. The development process managed by ACM was inclusive. The existence of social media extended the reach of the comments.

Technology and public interest supported inclusion. The updated project had three organized review committees with increasing membership and corresponding increasing international involvement. The three committees had an Executive Committee (EC) with five or six members managing the process; including two IFIP members, and equal representation from academe and industry. The EC worked closely with the International Task Force (ITF) of twenty-one working volunteers. There were also two of the SIG 9.2.2 recipe's authors on the code drafting committee. All suggested changes in multiple iterations between publications were reviewed by the ITF and by any subgroups they organized. A larger Extended Task Force (ETF) included individuals, society representatives, and corporate representatives. These groups also saw multiple iterations of the Code between formal publications of numbered drafts.

Many IFIP members worked on the code and they also consulted with their contacts and professional networks before making comments. Several professional societies and companies participated and formed sub-groups in the ITF and ETF. ACM declares their "reach" is 4 million people through publication and social media. The code was also made available on public media and there were discussions on Twitter, Reddit, and other outlets. The effort had international interest and contributions. Several IFIP members were involved in each of these groups.

There is some evidence that this process led to an agreement amongst ICT professionals. The average approval rating for each principle of the code was 96%, with no principle lower than 91%. These numbers are a little misleading because some of the disapproval came from reviewers who felt the principle did not state the principle strongly enough. Unlike some early IFIP work that focused on the multicultural differences, a focus now on intercultural professional values of ICT had a much wider agreement and showed the effectiveness of the framework in identifying shared values.

3.3 How to Make Ethical Decisions

We make ethical decisions daily when we make any decision that impacts other people. Most of those decisions are relatively easy. Given the complexity and far-reaching impact of the ICT profession, many of those decisions require careful deliberation ethical

analysis evaluating alternative solutions. That analysis applies principles in an ethical reasoning process. The Code, like many modern codes, provides ethical principles that are to be taken as a whole. Considering a single principle often leads to incomplete responses to complex questions. Used holistically, the Code is an inspiring guide.

However, one should keep in mind that using a code this way requires individual skilled professionals to make ethical judgments about how various possible actions are consistent with (or conflict with) the code's principles and, thus, expands the meaning of professionalism beyond mere technical competence. The code principles provide a framework that reflects the conscience of the global ICT profession and its obligations to all stakeholders.

The code should provide some decision-making guidance in difficult situations but also should, consistent with the Framework for Developing Codes, respect the autonomy of the individual professionals, encouraging careful evaluation. One might use a guided decision process like Proactive CARE [19] that leads to informed decisions among alternative solutions to the situation which uses a set of questions to help the professional think through issues.

- CONSIDER who might be affected and how
- ANALYZE the situation's details
- REVIEW other obligations and limitations
- EVALUATE the best course of action

Each step has a series of questions the analyst should ask in determining the best solution [20].

Principles Should Not Be Categorical or Unconditional. Older codes of ethics contained specific imperatives or benchmarks which could be used to determine failure to follow a particular code imperative. Codes with fixed benchmarks, however, are of little help in a rapidly changing ICT environment and do not help practitioners make proactive decisions in complex situations.

Unthinking obedience to a single imperative, such as "All software must be developed with a waterfall model," is rarely helpful in a complicated professional situation. If a code relies on imperatives that mandate a particular technical approach, it will quickly be out of date. Given the rapidly changing ICT situation, any list of imperatives will be incomplete. Even an imperative like "cause no harm" has ethical exceptions, like when a knife is used by a surgeon to remove cancerous cells.

Ethical principles do not require categorical imperatives. Ethics can maintain universal claims without turning into moral imperialism. The code is positive, not a list of don'ts. Intercultural global values we have in common establish discursive ethics on which we can all make decisions.

Aspirations Follow the Spirit of the Code. Meeting these needs requires aspirational guidance that can accommodate a rapidly changing profession. Instead of legislating fixed rules associated with particular technologies, the code used an aspirational model setting targets professionals can aspire toward. These ethical markers of professionalism were presented as goals and ideals to which the morally responsible professional practitioner should aspire. The ICT profession has a common intercultural view about a common conscience of computing: a homogenous view about the appropriate ethical aspirations of an IT professional. Given the broadening social impacts of ICT and

the redirection of intercultural agreement about the ethical ideals of ICT, it was clear that a code to educate the aspirations of ICT professionals is not only possible but necessary. An aspirational code is an answer to avoid ethical imperialism. [21] The question of "how" replaced specific rules that mandated following specific technologies.

The aspirational structure also avoids the completeness problem. The code makes clear that it cannot contain specific answers to every future problem but an ICT profession can follow the spirit of the code holistically. The Code is an aspirational code that identifies ethical behavioral objectives.

These ethical behavioral objectives need to be presented in a reasonably achievable fashion. Instead of fixed rules, the Code, therefore, is based on an aspirational model setting ethical targets rather than tying an ethical value to the use of a particular technological solution. These ethical markers of professionalism are presented as goals and ideals to which the morally responsible professional practitioner aspires. The code provides some guidance in decision making in unclear and difficult situations but it also respects the autonomy of the individual professional. The primary goal in the code is to establish the public good as the primary focus of our profession.

Paramountcy. As situations change, different principles assume priority in a decision. There may be some situations in which two or more principles appear to be in conflict or tension. The preamble also suggests ways to apply these values to the constantly changing situations in ICT. The preamble points to a maxim that should be used to frame any decision made using the Code, "the public good is the paramount consideration." The common conscience of the profession is that our work should contribute to society and human well-being, acknowledging that all people are stakeholders in computing. The code applies that global principle.

This is sometimes called the paramountcy clause of decision-making. It provides some hierarchy when clauses appear to compete or in situations where principles are in tension. Computing professionals should understand that "the public good is the paramount consideration."

3.4 Code Enforcement Localized

The Code is a guide to proactive action that helps us, as a profession, promote the good. Code enforcement procedures are not rightly part of a code of ethics but are a policy or procedure developed in support of the principles of the code. Code enforcement is sometimes done to protect the profession against internal criticism. It is sometimes done to set a minimum standard for membership in the profession to elevate the status of the profession.

There is sometimes confusion between ethics and law. Some people believe, in order to maintain the distinction, that anything that is included in law does not belong in a code of ethics. This belief led to difficulties in early attempts to develop an IFIP code of ethics. In many cases law and ethics overlap; when an ethical belief reaches is a certain level of importance like "do not kill," then it frequently is also legislated and an act of murder may be both illegal and unethical [22]. However, failure to test a safety-critical system is unethical, but it may or may not violate local laws.

The code of ethics states a common set of professional values. In the IFIP code, there are only two principles that mention enforcement and they are pointers to an IFIP

member society's local policy and procedure on how to determine if a particular code violation warrants enforcement and what that enforcement will be.

The common professional values in the IFIP Code of Ethics are intended to co-exist with any culturally unique elements which may exist in a member society's code. These values are interculturally significant. There is a common standard for professionals to appeal to when resisting unethical pressures.

3.5 People Can Misuse Codes

Sometimes people selectively misuse or blatantly ignore codes. This does not show that the code is a failure, but merely an indication of problems in promoting the code or an indication of a failure of some human being.

4 Future Directions

4.1 Education

SIG 9.2.2 has looked at academic curricula about computing ethics. Material needs to be developed to include a discussion of professional responsibility as a part of all ICT technical course. The focus on skill training that ignores the ethical and social impacts of the work is misguided and needs to be addressed.

In the commercial sector, there is a significant absence of training materials and case studies that promote responsible development in the commercial sector. The race to market means testing is ignored for profit, putting all stakeholders at risk.

The materials currently available, especially in conferences, are not directed at 16–19-year-olds. High school students need infographics and short case studies.

4.2 Decision-Making

We need more decision-making models that are illustrated for different sectors. For instance, education software has to consider a different group of stakeholders and set of constraints than software to direct cancer surgery. Both have the same set of ethical principles, but their decision-making method may vary. We need decision-making heuristics for different sectors.

Appendix: Publications of the IFIP Task Group on Ethics of Computing and Its Special Interest Group, IFIP SIG 9.2.2

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Past Practices, Current Debates and Disputes: Future Engagements and Opportunities Regarding Digital Transformation for Sustainable Development

Working Group 9.4: Implications of Information and Digital Technologies for Development

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Abstract. This chapter provides a historical account of the development of Working Group 9.4 from its inception in 1988 to the present day. The intellectual and practical issues that have drawn our attention, as well as the debates and disputes that we have had for over thirty years, are elicited and discussed. More attention is paid to the current opportunities and challenges that enthuse us, and to the impacts that we hope to exert through our work. The chapter concludes with an eye to the future and how the working group may yet develop. The sixteen co-authors of the chapter reflect on how the field of development has morphed over time and on the directions that are opening up.

Keywords: Development · Digital · Practice · Impact · ICT4D

Working Group 9.4 (WG 9.4) focuses on the implications of information and digital technologies for development. WG 9.4 was established in 1989 following a successful inaugural conference under the auspices of IFIP in New Delhi in 1988. The aims of WG 9.4 are fourfold:

- To collect, exchange and disseminate experiences of information and communications technology (ICT) implementation in developing countries;
- To develop a consciousness amongst professionals, policy makers and the public on the social implications of ICT in developing nations;
- To develop criteria, theory, methods, and guidelines for design and implementation of culturally adapted information systems;
- To create a greater interest in professionals from industrialized countries to focus on issues of special relevance to developing countries through joint activities with other IFIP technical committees.

Since our first conference, we have held a further sixteen working conferences, six regional conferences and two joint working conferences. Our regular working conferences move around the global south so as to ensure that members in different locations can travel to a global event that is held locally at least occasionally (see Table 1). Regional Conferences are a relatively recent phenomenon, and are organized by regional representatives (see Table 2). Finally, a joint WG 8.2 and 9.4 conference was held in Athens, Greece (2003); a joint WG 8.2, 9.1 and 9.4 conference was held in Hyderabad, India (2020); and a joint WG 8.2 and 9.4 conference will be held in 2023.

WG 9.4 currently boasts 105 members, each of whom has attended at least two conferences in the last 5 years (see Table 3). These 105 members hail from 29 countries. We also maintain a mailing list of 683 people who have attended at least one conference during our 35-year history.

Table 1. Working conference locations.

Year	Location	Year	Location
1988	New Delhi, India	2007	Sao Paulo, Brazil
1992	Nairobi, Kenya	2009	Dubai, UAE
1994	Havana, Cuba	2011	Kathmandu, Nepal
1996	Cairo, Egypt	2013	Ocho Rios, Jamaica
1998	Bangkok, Thailand	2015	Negombo, Sri Lanka
2000	Cape Town, South Africa	2017	Yogyakarta, Indonesia
2002	Bangalore, India	2019	Dar es Salaam, Tanzania
2005	Abuja, Nigeria	2022	Lima, Peru (Virtual)

Table 2. Regional conference locations.

Year	Location
2014	Aberdeen, Scotland
2014	Belo Horizonte, Brazil
2014	Centurion, South Africa
2018	Tirana, Albania
2018	Pretoria, South Africa
2020	Salford, UK

Table 3. Membership of WG 9.4.

Country	Members	Country	Members	Country	Members
Albania	1	Ireland	4	South Korea	2
Australia	2	Jamaica	1	Sri Lanka	1
Bahrain	1	Macau	1	Sweden	3
Brazil	3	Malawi	1	Tanzania	3
Canada	1	Netherlands	1	Uganda	1
Colombia	1	New Zealand	1	UK	29
Ethiopia	3	Nigeria	3	USA	3
Finland	1	Norway	18	Zambia	1
Hong Kong	1	Peru	2	Zimbabwe	2
India	4	South Africa	10		

In reviewing the development, current state and possible future trajectory of WG 9.4, an invitation was sent to all members in late 2019. Fifteen members responded by contributing information and ideas and all are listed as co-authors of this chapter. The core material in the chapter thus reflects the integrated thoughts of many members. Editing the material into shape has been the responsibility of Robert Davison, the current chair of WG 9.4.

1 Historical Developments

Reviewing the history of the group, Walsham [1] divides time into three periods: early beginnings (mid-1980s to mid-1990s), expanding horizons (mid-1990s to mid-2000s) and proliferation (mid-2000s onwards). In the first decade, which covers the time when WG 9.4 was established, much of the research involved themes from mainstream information systems (IS) that were applied to developing countries.

Subhash Bhatnagar was the first chair of the WG 9.4 (1989–1995). He edited a quarterly newsletter for the group (no longer online), which was published from 1991 to 2016 and which complemented the proceedings of the WG 9.4 conferences (since 1990) and the journal *Information Technology for Development* (since 1986) as the only publication opportunities available to researchers. Many of the researchers at this time were located in developed countries. At the first conference [2], the importance of context was recognized, Robey et al. [3] arguing that "cultural barriers to implementation present more difficult problems than technological issues because they provide the social context within which IS are interpreted and given meaning." Meanwhile, Korpela [4] emphasized the need for cooperative design in computer-related projects, where the participants should include both experts and users. Another prominent theme that is still with us today relates to indigenous practices. Bhatnagar [5] argued that while developing countries can appropriate technology, they also need to develop their own technology for their own needs. In the early years, conference participants from developing countries were optimistic and enthusiastic about the possibility that ICT would help in the development of their countries. Indeed, many papers reported on these kinds of positive impacts, but the same papers tended to be descriptive rather than analytical and generally did not consider longer-term issues or the institutionalization of the technology.

Walsham's [1] second decade witnessed major changes in the technology (notably the World Wide Web) and thus the range and scope of research that was undertaken. Although some descriptive studies were still undertaken, a shift towards a more analytical and critical stance became apparent, with assessments of the meaning of development, for instance. Two open access journals were established: the *Electronic Journal of Information Systems in Developing Countries* (since 2000) and *IT and International Development* (2003–2020). Increasingly, we saw researchers in developing countries making their presence felt at conferences and in journal submissions.

Key issues in this second decade include the way local actors adapt ICTs to meet their needs and in-depth studies of particular ICT-based phenomena such as geographical information systems, e-government, information kiosks, telecentres, and increasingly healthcare applications following the initiation of the Health Information Systems Project (HISP) at the University of Oslo in 1994. However, by far the major area of focus was how to provide access to ICT, including reducing the inequalities of access, with a strong focus on the shared-access model offered by telecentres and information kiosks. While one view is that such initiatives failed because of their unsustainable business models, they served their purpose of introducing and domesticating ICTs, thus meeting short-term demands and seeding future opportunities.

From the mid-2000s onwards, we have seen a vast expansion of the field [6] with increasing numbers of researchers who are located in developing countries contributing high quality papers and new research groups emerging around the world. In 2020, we revised our aims and objectives and also changed the name of the working group. The former name referred explicitly to developing countries, but the new name focuses firmly on development: implications of information and digital technologies for development. As a group, we felt that this was an important change to make that reflects current thinking in the field.

Some mainstream journals (e.g., *Information Systems Journal, Journal of the AIS, Journal of Information Technology,* and *MIS Quarterly*) have published special issues on developing countries and ICT4D more generally, some of these drawing on papers first presented at WG 9.4 events. The last decade has also witnessed the broadening of theoretical perspectives that guided our research. Among other theoretical perspectives, members of the WG 9.4 community relied on activity theory [7], actor-network theory [8], institutional theory [9], practice theory [10] and structuration theory [11] to study the ICT4D phenomenon.

Researchers have also adopted an increasingly critical tone, challenging many of the assumptions that we took for granted in the early years. Numerous studies have been undertaken into the impact of the mobile phone in a wide range of application contexts, many of which involve non-urban populations engaged in farming, fishing, and the informal economy. The use of the mobile phone as a device that can access e-banking applications and help to bank the unbanked at the bottom of the pyramid has also been prominent since the development of M-Pesa in 2007.

While the dominant development narratives relating to mobile communication technologies have emphasized their use and usefulness in narrowing the socio-economic disparities across genders, countries and regions, Stark and Wamala Larsson [12] argue that digital and communication divides are influenced by age, gender, socio-economic status, education, geography and language. Meanwhile, Sen's [13] capability approach proved to be influential, with many scholars examining its applicability in the ICT4D space. For instance, Zheng and Walsham [14] used it to challenge the assumptions of living in an idealized information society. By the time of the 2019 conference, the breadth of the field was far more considerable than had been the case 30 years previously. No fewer than 12 tracks were in place:

1. Digital platforms for development
2. FinTech and development
3. ICT4D for the indigenous, by the indigenous and of the indigenous
4. Recognizing African expression of technology
5. Harnessing agriculture
6. Land administration and public financial management for ICT4D
7. ICT for displaced populations: How it helps? How it hurts?
8. Communities, ICT-enabled networks and development
9. Pushing the boundaries: New research methods, theory and philosophy in ICT4D
10. Southern-driven human-computer interaction
11. Locally developed process and method innovations in ICT4D
12. Sustainable ICT, informatics, education and learning in a 'turbulent' world: "Doing the safari way"

Healthcare contexts still occupy much of the focus of our research, now propelled further by the ongoing COVID-19 pandemic. Solutions to challenges like pandemics

may lie at the confluence of many disciplines such as medical science, computational science, engineering, management and social science, and organizational studies. However, information systems approaches, involving mapping models and predictions based on big data analyses and machine learning, can help reduce complexity sufficiently to enable the identification of potential solutions. The advancement and increasing availability of big data and the rise of artificial intelligence [15], combined with the ubiquity of mobile phones and the rollout of fiber and 4G networks across the global south, will have the potential to empower governments, organizations, individuals and communities. As a result, we could see greater social change, an improved quality of life and strengthened public health and education systems. This critical mass of infrastructure presents the possibility of addressing many of the challenges outlined in the United Nations' sustainable development goals [16] including the eradication of poverty, zero hunger and good health. However, the operative word here is *potential*.

2 Current Debates

In this section, we review some of the topics that are currently popular and yet where members of the community are debating what kind of research we should be undertaking. The topics include: open data for development; north-south, south-south and triangular cooperation for ICT4D initiatives; the role of digital technology to support sustainable development goals; indigenous worldviews in ICT4D research; the dark side of ICT use, and making the world a better place with ICTs.

The theme of our 2019 conference was "Strengthening Southern-Driven Cooperation as a Catalyst for ICT4D." Geoff Walsham delivered a keynote speech devoted to South-South and Triangular Cooperation [17]. Walsham is critical of the UNDP's [18] position, viz.: "Southern-driven partnerships between two or more developing countries, supported by a developed country(ies) or multilateral organization(s) to implement development cooperation programmes and practices." As Walsham [17] observes, while the objectives seem laudable, there are unaddressed concerns, notably that of power: "what are the power relations between the 'equal' partners?" He suggests that it is necessary to dig much deeper into who controls the sources of funding before pronouncing on the equality of the erstwhile partners.

Considering bibliographic studies on the contribution of scholars from the global south based on three premier journals in the area of ICT4D, Bai [19] found southern scholars to be generally underrepresented. The findings are supported by van Biljon and Renaud [20], who investigated human-computer interaction for development publications and found that the number of first authors and second authors from some southern countries were disproportionately lower than might be expected given the number of studies conducted in those countries. There is no simple explanation for why the contribution of southern researchers is lagging in terms of the recorded publication scope and impact, but power asymmetries should be considered as one of the reasons. Nevertheless, we expect that southern-driven, south-south and triangular cooperation arrangements will persist and will also be the subject of research investigations. We suggest that researchers should adopt a critical approach in these matters and be sensitive to the potential for inequalities to be perpetuated.

When these partnerships turn out to be unequal, we may witness one of the many dark sides to ICT. Emerging evidence suggests that people in the global south may be subjected to structural asymmetries that make them even more susceptible to the dark side [21]. There are numerous examples of dark side phenomena: identity theft, cyber bullying, data injustice [22, 23] and the panopticon of surveillance technologies employed by governments to monitor and control, to name but a few. Surveillance technologies provide those who are collecting data with the power to control those whose data is being collected. Collectively, these issues raise ethical concerns related to the invasion of privacy, mismanagement of data and use of data for purposes for which it was never intended when initially collected, whether permission was granted for it to be collected or not. Two other major concerns for developing countries are the ways in which digital platforms can enable new forms of pervasive exploitation (e.g., the gig economy) and the role of algorithmic interference in decision making processes (e.g., approving bank loans).

In a related vein, we perhaps naïvely used to imagine that if only we could give everyone in Africa access to a computer, what it would do for education, economic development, emancipation, freedom. Today, every (second) African has a mobile phone with 10 times the power and memory of the one laptop per child (OLPC) project (first envisioned in 2005 by Nicholas Negroponte at the world economic forum in Davos), with a camera, and Internet access to all human knowledge (via Wikipedia) and high-quality education (via MOOCs). Nevertheless, the hoped-for development failed to materialize. Despite the high-flown rhetoric, it turns out that we humans are, after all, all pretty much the same: educational activities compete with taking selfies, gossiping with our friends, surfing for porn, falling for scams and generally wasting time. As a result, the hoped-for impact, whether economic, gender, educational, creative, or entrepreneurial, has not yet been manifested.

Exploiting technologies in this way pushes problems from one dimension to another, perhaps solving one yet simultaneously creating another. The Internet is a good example because while it greatly facilitates global integration, it also provides an efficient platform for the undertaking of activities and dissemination of information that, although perfectly legal in one jurisdiction are illegal elsewhere [24]. For instance, it is not always easy to distinguish between real and fake news, with the consequence that the Internet itself is contributing to what we now term a ‘development paradox’: the widespread diffusion of Internet-based ICTs (mostly mobile but also others such as the cloud) that has not resulted in the expected sharply-upward development trajectory.

Slowly we have come to realize that it is wildly inappropriate to give a drought-stricken farmer or an abused wife a mobile phone with ‘our’ custom-developed app and expect ‘their’ problem to be solved. Their situation is far more complex than we realize, interlinked with norms and culture far beyond our ken, and thus needs to be approached in a much more holistic way that fully recognizes contextual details. As Davison and Martinsons [25] note, context is critically important to the successful practice of research. However, across many developing countries some authors have developed the view that a sufficient contribution to knowledge can be achieved by peddling North-derived theories in local spaces without any attempt to contextualize in or theorize for the local situation. Thus, we see the technology acceptance model (TAM), the universal theory

of the adoption and use of technology (UTAUT) and countless other similar northern theories tested *ad nauseam* by researchers in developing countries without any attempt to identify or measure locally relevant variables. The resulting research is utterly a-contextual: we learn nothing about the local context, there is no useful contribution to knowledge and as a rule these papers are firmly rejected. The EJISDC, for instance, has guidelines for authors [26] that specifically proscribe the submission of these papers, but still they keep coming!

Even worse, this very same excess of replication studies in the global south informed by models developed in the global north constitutes an instance of academic neo-colonialism, albeit one that is unconsciously reproduced by the colonized not the colonizers! By willfully and unreflectively accepting imported models as universal truths, many researchers in the global south inadvertently adopt a subordinated position in the mistaken belief that they are adding supposedly scientific rigor to their studies. Through no effort or intention of their own, the dominant discourses are continuously reinforced. On occasion, the authors themselves exhibit puzzlement that their supposedly rigorous articles are rejected. As Davison and Martinsons [25] narrate, when a team of authors from India were asked why they had not bothered to provide explicit information about the context where they undertook their research, they replied that a) no one is interested in India, and b) the results are globally generalizable, so it does not matter where the research was undertaken. Alas, this kind of perspective is all too commonly encountered in research designs with the result that the research itself is generally unpublishable in conferences or journals, such as those affiliated with WG 9.4, whose editors do believe context to be of critical importance.

Notwithstanding this dark side, there is increasing recognition in many contexts of the need for local design, local theory, local champions and context awareness more generally. Post-colonial and decolonial research approaches are being used. Furthermore, in much of the work that we do an implicit goal is to make the world a better place. This is an abiding theme for the WG 9.4 community and can even be considered an existential issue. Walsham [27] first formalized the notion that we should be trying to make the world a better place in a research debate that attracted a number of commentaries. We recognize that there are many ways to achieve the goal and while we celebrate each instance of making the world a better place, we are nevertheless reluctant to dictate how it should be undertaken.

3 Current Disputes

It can be argued that WG 9.4 needs to be more critical with respect to the way it engages with the context of development since research in the WG 9.4 community has been dominated by western paradigms such as positivism, interpretivism and, to a lesser but emerging extent, critical realism. Heeks and Wall [28] similarly observe that the field of ICT4D has been dominated for many years by the philosophical duopoly of positivism and interpretivism. They too suggest that there are many advantages to the increased adoption of the "third way" research paradigm of critical realism in ICT4D. However, the indigenous paradigms of the developing countries themselves, such as *pūrākau* and *buen vivir* [29] have been ignored, even by the people who live in contexts

where these paradigms are practiced, and so who should be best placed (socially, culturally, linguistically) to undertake investigations that are sensitive to these indigenous paradigms.

There is clearly a need to be more critical. Global capitalism and the developmental paradigm adopted by the dominant world groups have presented and promoted the increasing adoption of ICTs by developing countries as an enabler for faster development [30]. While this view may be consistent with the expectations of developed countries, it is also imbued with rationalist and uncritical premises of how business must be managed in the new interconnected economy [31, 32]. However, there is increasing evidence to suggest that this view of development is too simplistic and fails to take into consideration the specific nuances of local contexts, cultures and social structures [33, 34]. In other words, while the meaning of the word *development* is consistent with the developmental paradigm adopted by the developed countries, it is inconsistent with the specific reality of the developing countries themselves. It is also dangerous because it invites the development of a cargo cult mentality [32] where some people in developing countries expect technological solutions to be delivered without either much effort on their part or indeed any attempt to ensure that the same technological solutions are in any way relevant for their local needs. As a result, perhaps we should abandon the 'developing countries' label altogether, not least because many members of the WG 9.4 community conduct research in the so-called 'developed countries', where enormous pockets of deprivation reveal profound inequalities. As Escobar [35] convincingly argues, the construction of the 'developing world' presupposes an asymmetric relationship. It is germane to note here that:

> The reproduction of western hegemony is assured through long established practices of production and dissemination of knowledge. The criteria of what counts as knowledge continue to be defined in the academic centres of the West. The dissemination of this knowledge is based on notions of transfer of knowledge from the West to the South [36, p.16].

This view is consistent with the above narrative (development, developing countries) and thus prompts critical debate about the nature of ICT4D research itself. In similar vein, Walsham [17] trenchantly asks: Who is doing the driving in ICT4D projects? Who benefits? Are the poor and disadvantaged included in the project? Why is Southern-driven research not well represented in the top journals? Are our methods and theories still appropriate? These are the questions that lead us into the next section: the work that remains to be done.

4 Future Engagements and Opportunities

Avgerou et al. [37, p. 332] propose some questions for ICT4D research that need attention, as follows: How do micro-level achievements scale up to lead to long-lasting developmental changes of the socio-political circumstances of developing countries? How does the ICT innovation capacity of specific user communities of developing countries enable them to improve their position in the political economy of a globalized world?

How does their ICT innovation capacity articulate with the dynamics of the relentless ICT-driven transformation of industrialized countries?

Regarding the first question, Walsham [17] recounts how, as a volunteer in the Philippines in the mid-1960s, he was "often assured that 'trickle down theory' would work and that therefore the gap between rich and poor would lessen." Half a century later, he remarked that trickle down theory is insufficient, and instead we need to focus much more on the people at the bottom of the pyramid. At our 2013 conference in Jamaica, the organizers enabled participants to visit field projects demonstrating how ICT4D research makes a difference to such people, many of whom work in informal businesses [38]. The NGOs and CBOs running these projects are the practitioners with whom we should be working as we consider the SDGs and their impact in local communities. It is critical for these information systems to be designed such that they meet the needs and match the abilities of ordinary citizens, who may not be qualified to navigate the labyrinthine morass of legal rules and specifications common to government websites. Unfortunately, it is easier for system designers to follow the technical advice of project funders, decision makers and specialists, some of whom are scarcely aware either of the levels of knowledge and ability among the ordinary citizens who will be directly affected by the project, or about local realities on the ground.

However, given the possibility that the north drives the research agenda, with potential power imbalances resulting, we need to challenge systemic inequalities and create new paradigms for research that place the stakeholders at the bottom of the pyramid firmly in the driving seat. In doing so, we also need to consider how this research can exert more influence on politicians, policy makers and research funders, in all contexts. To achieve this objective, we need to deconstruct our disciplinary silo and share our (few) lessons learned with experts in other disciplines. We may usefully theorize why what works, works: a theory of action that leads to a body of knowledge about what to do in order to achieve a specific outcome. Needless to say, this theorization should be undertaken from the perspective of the stakeholders at the bottom of the pyramid, not the researchers in the North eager to line their curricula vitae with more publications! At our 2019 conference [39], a track was organized on indigenous perspectives of ICT4D. This is all too apposite since it is important to develop localized knowledge that pertains to the phenomena we study, framed by contextually-developed lenses [25]. A special issue on indigenous theory was recently published in the Information Systems Journal [40], with papers describing indigenous theories among digital entrepreneurs in China [41], among Māori IT professionals in New Zealand [42] and among digital entrepreneurs in South Africa [43].

We need to reconsider how we assess these projects, considering that the extent to which ICT4D interventions achieve their intended long-term development goals often remains largely unanswered. Existing assessments tend to be generic (broad) or focused (e.g., gender equality, technology centric or discipline centric). None of the assessment frameworks are multi-level so we need to develop impact assessment frameworks that may be used to systematically and longitudinally evaluate ICT4D outcomes, including social, political, economic, and institutional implications.

- Concerning the second question and in line with critiques of development, an emerging theme at WG 9.4 relates to the way we see ourselves. We may have been too

dependent on the WG chair for ideas, suggesting that more grassroots initiatives are needed. In the next few paragraphs, we outline one such initiative.

- For some time, there has been debate about the name of WG 9.4. Although 'social implications of computers in developing countries' is not an incorrect description of what we investigate (notwithstanding the suggestion that we let go of the term 'developing countries'), there is much else that we are engaged in. We can expand our ambit to investigate the political, economic, legal, ethical, environmental, emancipatory and inclusive implications of these technologies, not only in developing countries, but also in the developing regions of developed countries.

Meanwhile, the development of a consciousness of the social implications of ICTs beyond the academic world, i.e., amongst "professionals, policymakers and the public" as our principles state, has acquired a whole new importance since digitality has become part of development policies worldwide. A wide variety of 'new' topics have landed on our plate, including: the datafication of governance, digital development policies, new routes to e-commerce, digital work and socially motivated outsourcing, and digital platforms for socio-economic development, the last of which is also the focus of a special issue [44]. These new topics reveal the mutual shaping of development trajectories and digitality, and position WG 9.4 as an active citizen in the digital development landscape. Interactions of academic work with practice and civil society are an important embodiment of this principle. We experienced these first hand with field visits during our conference in Jamaica. More recently, WG 9.4 has established a blog (https://ifip94.wordpress.com/), which shares research from members of the group with the world. Since March 2020, this blog has been running a series of posts on COVID19, aimed at sharing ICT4D best practices for health emergency management. These COVID19-related posts narrate struggles of economic, social and redistributional natures, including impacts on informal workers, digital laborers and more vulnerable communities in the global south.

Concerning the third question and taking the new digital perspective further, we may challenge, reshape and reimagine activities further by creating new opportunities for development, specifically calling on the emerging paradigm of digital transformation, which may rupture how ICT projects, initiatives, impacts and research are conceptualized and undertaken. While prior research has used new technologies to complement existing activities, digital transformation presents new opportunities that can change activities and institutions. Digital transformation in the 'developing country' context is slowly becoming a reality and is the subject of special issues that focuses on the African [45] and Latin American [46] contexts. Whether this digital transformation should be considered a new dawn or merely an aspect of ICT4D remains to be seen. It is likely to incorporate the many mobile technologies that proliferate in 'developing countries' as well as emerging technologies such as artificial intelligence for development (AI4D), and big data for development (BD4D). It is also central to the ever-evolving phenomenon of healthcare IS.

As digital transformation comes to the fore, with AI4D and BD4D, we expect that we will need to increase our engagement with ethics and the "ethical turn" in ICT4D [28] which has primarily been driven by the use of Sen's [13] work and the renewed interest in ethics and social justice within the wider development community [47, 48]. This engagement will grow as the increasing use of the transformative technologies brings

new and challenging ethical issues and concerns. Thus, practical tools and frameworks which can be applied to digital projects in the Global South that have the ability to highlight, visualize and resolve any ethical issues which may arise are needed. These tools will need to be inclusive, iterative and responsive and ideally be designed by, or in collaboration with, researchers in the global south. Further, we note that many countries in the global south do not have legal frameworks to cover AI application contexts, with the consequent potential for ethical violations to take place.

Another aspect of digital transformation, though on the dark side, is the surveillance that is undertaken by governments, private organizations and their proxies. This surveillance of citizens is common; moreover, citizens usually are not aware that they are being surveilled. In the Global South, the situation is more serious because concerns about ethics and loss of privacy often come second to the personal benefits that may be realized through the use of the technology. Often users remain blissfully unaware of how their data might be used or whether there is any recourse for them to take if and when their data is misused and/or mismanaged. This is very different to the situation in Europe where the GDPR offers a measure of protection to citizens. Most of the global south lacks robust laws to protect the privacy of citizens. Nevertheless, citizens can also engage in sousveillance, i.e., the reverse monitoring of those in power through the use of social media [49]. Sousveillance is a form of both resistance against control initiatives and subversion of the same. Nyabola [50] has illustrated how citizens in Kenya have used social media such as Twitter to organize, participate and hold elected authorities to account and/or to challenge them. Dwyer and Molony [51] indicate that social media and smartphones are increasingly playing an important role in African politics which allows grassroots to organize, share ideas and participate in politics. This has led to some African states imposing a ban on social media use. Chad is one such example which had a 16-month social media ban for alleged security concerns [52].

Our final topic for the future is also one of our oldest topics: healthcare. Dating back to the HISP that was initiated in 1994, one of the essential themes in ICT4D is exploring the theoretical links between ICTs and public health. A huge diversity of technologies has been discussed in applications to enhance development outcomes, such as health information systems [53], mHealth [54], and telemedicine [55]. Increased affordability of digital technologies and innovations for health is exerting a profound effect on the delivery of health services in local communities [56, 57], the management of national health systems [53, 58] and the contextualization of design in health systems [59]. The emerging use of ICTs in epidemiology and public health is critical for providing opportunities for ICTD researchers to expand their horizons and provide contextual understanding of ICTs. We argue that much collaborative work remains to be done by WG 9.4 researchers with experts in other disciplines such as public health and development studies, in order to provide an analytical framework, contextual understanding, and deeper critical insights that will continue to make the world a better place.

5 Conclusions

As WG 9.4 enters its fourth decade, it is important that we not only understand where we have come from, but also evaluate where we might be going. In this chapter, both aspects of the journey have been considered. Existential questions about the very nature

of WG 9.4 have been asked and thus suggestions have also been made as to how we might change our name to reflect our current and emerging ethos more accurately. We can argue that 'making the world a better place with ICTs' is our quintessential goal, and that we have had some modest success in achieving it. However, we are not alone in the ICT4D space: other groups are emerging and the ubiquity of digital technology, ICTs, mobile devices and information systems more generally means that just about anyone can claim that they are undertaking ICT4D research, irrespective of whether that research actually contributes to making the world a better place or not.

Thus, one of our challenges is to redefine our niche in such a way that we build on our many achievements, yet also look ahead to future opportunities that will demonstrate our continued relevance. One idea is to rebrand WG 9.4 as "digital transformation for sustainable development." The UN's sustainable development goals, which many of our members take very seriously, are similarly not restricted to the Global South. Poverty and disadvantage may be particularly prominent characteristics of the global South, but they are by no means limited to it. There are many examples of impoverished and disadvantaged communities within ostensibly developed countries. The act of rebranding will provide us with the opportunity to create a more accurate description of the context in which we conduct our research. It will also allow us to ensure that ICT4D research moves from the periphery to the mainstream. This is important because, at least in some quarters, the label *developing countries* still evokes the idea of marginality, with the consequence that it is deemed to have very little relevance.

Beyond our identity, the last topic that I wish to engage with in this chapter concerns our members. Currently about 60% of our 105 members either live in the Global South or were born there before relocating northwards. This figure is certainly higher than was the case in the past, yet while some of these people take up leadership positions in the group, we need to create more opportunities for them to do so. A more detailed analysis of the members in the global south suggests that many come from Anglophone countries, with the Francophone, Lusophone, and other indigenous languages represented to a much lesser extent. I hope that we can develop a more inclusive group and reach out to a wider base of researchers in the Global South.

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From Technology and Virtuality to "Our Digital Lives"
Working Group 9.5: Our Digital Lives

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Abstract. Following the work of scholars who see technology as intertwined with society, in this chapter we start with the history of our revamped working group, WG 9.5: Our Digital Lives, summarizing main activities by each chair, followed by a discussion of themes that we see as relevant to our group today. The chapter continues with some thoughts on future research about 'our digital lives' and our thoughts on what we could achieve in the future.

Keywords: Digitalization · Digital Work · Digital Lives

Building on a tradition of mainly qualitative and pluralistic research on the relationship of technology with society, the revamped (as of autumn 2019) IFIP WG 9.5: Our Digital Lives views digital technologies as strongly intertwined with most aspects of everyday life. Through our various activities, in the form of workshops, participation in larger conferences (e.g., Technical Committee (TC) 9's flagship conference, Human Choice and Computers (HCC)), and a series of blogposts, we aim to bring together academics, practitioners and others interested in how the digital influences our lives and society at large, what opportunities and challenges it presents, how it can be managed, and how it can influence the future of our lives.

We see our WG as providing a space for interdisciplinary dialogue and mutual exchange from a diverse set of disciplines (e.g., computing, information systems (IS), media studies, social theory, philosophy, anthropology, psychology, organizational studies, gender studies, politics and ethics, among others) interested in different aspects of the digital. Given our interest in a multiplicity of empirical sites and social phenomena associated with the digital, we explicitly encourage contributions in areas such as social media and online communities, connectivity and technology-enabled ways of working, emerging technologies and artificial intelligence (AI), and human enhancement, among many others. We explore some of these areas in more depth later.

We begin the remainder of this chapter with an overview of the WG's history, starting with its conception in 1989 – an era when digital technology was very different to what it

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is today – through to its awakening in 2006 and its further transformation in the last few years. We then discuss some of the themes that we see as strongly linked to our interests as a WG, including some of the themes mentioned above, and continue with a list of suggested areas for future research. We then close the chapter with a reflection on the WG in a context of rapid advances of digital technologies and an unprecedented impact on our (digital) lives that we are experiencing today; at a time following a widespread transition into technology-enabled ways of working due to the recent Covid-19 pandemic, and the emergence of generative AI. We hope that the chapter will be useful to a wide range of individuals; not only academics, but also practitioners, policy makers and educators who might be interested in finding out more about our activities and who may even want to consider becoming members and contributing to our growth and potential future impacts on our digital lives.

1 History

WG 9.5 has been around for a long time (since 1989) and its name, aims and scope were last updated in 2019 following earlier updates in 2008 and 2006. Digital technologies have evolved significantly during the last decade, with researchers and practitioners speaking about the digital rather than the virtual which was the case at the time. Moving away from a focus on virtuality, therefore, our most recent update, presented also below, also meant a change in terms of areas of focus, shifting our attention from older topics (e.g., computer-mediated communication) to more recent ones (e.g., online communities, AI) impacting also our identity as a group. In the following sub-sections, we provide a helicopter view of the history of the WG from its inception until the present. Each sub-section is named after the then WG's chair and the years of his/her tenure as chair in parentheses. Not all sub-sections are equally detailed as we were not able to retrieve information to the required extent for all different periods.

1.1 Klaus Brunnstein (1990–1995)

WG 9.5 was established in 1989 by Klaus Brunnstein as a group that would study technology from an informatics / designer perspective. Unfortunately, there is no further information as to the activities that took place during that time.

1.2 Years 1995–2006

According to IFIP's online records, and TC 9 online reports in particular, we have identified that Guenther Cyranek was chair of the WG in 1998. The WG's name was Applications and Social Implications of Virtual Worlds. During that period, its focus was on digital media and virtuality and their influence on culture in particular. Two workshops were planned in the year 1999: one in Germany (Virtual Environments 1999 in Stuttgart) and one in Brazil (Virtual University Autumn 1999, Fortaleza, State of Ceará, Brazil) [1]. As per information retrieved from the 2000 TC 9 report, two years later, Carolien Metselaar is mentioned as a member who leaves the WG, presumably as an earlier chair [2].

1.3 Niki Panteli (2006–2009)

Professor Niki Panteli (then senior lecturer in IS, University of Bath) served as the chair of the WG between 2006 and 2009. This was a newly revamped and renamed international WG introduced by IFIP TC 9, whose then chair (Professor Chrisanthi Avgerou) subsequently invited her to lead it due to her expertise in the area of virtuality (e.g., virtual teams, virtual collaborations). During her three-year tenure, Panteli set up clear strategies for the development of the WG, which included the organization of international workshops, an official launch, an international conference, and business meetings. Specifically, she launched the WG by organizing the First International WG 9.5 Workshop on Virtuality & Society (on June 16, 2006 at the London School of Economics and Political Science in London, UK) and she promoted attendance at international IFIP events, such as in Portland/Oregon, 2007, where a business meeting was also held. In addition, she played a lead role in the running of the First International Conference on Virtuality & Society: Massive Virtual Communities (organized with Warnke on July 1–2, 2008 at Leuphana University in Lüneburg, Germany), and an WG 9.5 International Workshop on Images of Virtuality (on April 23–24, 2009 at the Athens University of Economics and Business in Athens, Greece). During her tenure, the WG attracted members from around the world and from no members in 2006, grew to 60 by 2009, including well-known researchers in the field from leading Universities in the USA, such as the Massachusetts Institute of Technology (MIT), Stanford University and Boston University.

1.4 Martin Warnke (2010–2013)

In 2010, Professor Martin Warnke became chair of WG 9.5, David Kreps was vice-Chair, and Claus Pias secretary. The three chaired a track of the 9th HCC conference, part of the IFIP World Computer Congress in Brisbane, Australia, in September 2010. Jacques Berleur (TC 9 Chair 1999–2004) and Magda Herschui were the HCC 9 chairs, and Kreps, Warnke, and Pias were the chairs of Track 2: Virtual Technologies and Social Shaping. 2010 was the last year that Chrisanthi Avgerou was Chair of TC 9, after which she handed over to Jackie Phahlamohlaka, the South Africa Representative of TC 9.

In July 2011, Kreps hosted a "virtual" WG 9.5 conference at the ThinkLab, University of Salford, with members of the working group joining over videoconferencing. A small number of us (including Niki Panteli) were physically present; the rest dialed in. Sadly, this was the last WG 9.5 event for some time. In the same year, Warnke and Kreps made arrangements for a special issue in the *Information Systems Journal*, which in the end did not go ahead. Warnke became the German Representative of TC 9, and Pias dropped out due to personal reasons, whilst the popularity of the term "virtuality" itself began to wane. All WGs across IFIP seem to have a "shelf-life" and it began to feel that WG 9.5's "virtuality" incarnation had reached another fork in the road.

Magda David Hercheui, Diane Whitehouse, William J. McIver Jr., and Jackie Phahlamohlaka chaired HCC 10 in Amsterdam 2012, and, led by Martin Warnke, WG 9.5 contributed a Track – Session 5 (Section 4 of the Proceedings): Citizens' Involvement, Citizens' Rights and Information and Communication Technology (ICT) – Privacy and Security Challenges.

In 2012, Warnke and Kreps did a membership survey by email, and based upon the responses attempted to change the name of the WG, via the IFIP Technical Assembly Meeting that took place in September 2012, from "Virtuality and Society" to "Virtuality, Digital and Social Media." Unfortunately, there were objections from other TC chairs, and this idea was knocked back.

1.5 David Kreps (2013–2018)

In January 2013, Dr David Kreps became chair of WG 9.5 with Marie Griffiths, a colleague of his at Salford, became vice-chair, and Petros Chamakiotis, a former PhD student of Niki Panteli's, joined as secretary. Kreps kept the website up-to-date, and attended meetings of TC 9 in Kolding, Denmark in 2013 (alongside ETHICOMP), in Turku, Finland in 2014 (alongside HCC 11), in the UK in both 2015 (Leicester, alongside ETHICOMP) and 2016 (Salford, alongside HCC 12), and in Turin, Italy in 2017 (alongside ETHCOMP), but there were no meetings of the WG itself, which led Kreps to engage with HCC from that point on.

Along with HCC 11 Chair Kai Kimppa, Finnish representative of TC 9, Kreps secured a special issue in *Information Technology & People*, with Kimppa serving as a Guest Editor. The special issue was published in 2015. By this time (since 2014), Whitehouse had taken over the chair of TC 9 from Phahlamohlaka – who continued to be the South Africa national representative of TC 9 – and, following Kreps's involvement with HCC 11 through the aforementioned special issue, at the TC meeting in 2014, Whitehouse asked for volunteers to host HCC 12. Kreps, Griffiths, and another colleague of theirs from Salford, Gordon Fletcher, organized and hosted the 12th HCC conference at Salford in September 2016. At the subsequent TC meeting, the need to reboot several of the WGs of TC 9 – including WG 9.5 – was discussed and Kreps became the lead for a WG reboot initiative, to unfold over the coming years, focused on engaging people in contributing to HCC 13, proposed to take place as part of the proposed World Computer Congress to take place in Poznań, Poland, in 2018. Kreps's tenure as chair of WG 9.5 ended with him agreeing to replace Whitehouse as chair of TC 9, following her suggestion.

1.6 Petros Chamakiotis (2018–2021)

At the HCC in Poznań, Poland, Kreps passed on the baton to Petros Chamakiotis, chair, and Brad McKenna, vice-chair. Chamakiotis had been involved as secretary of the WG since 2013 and was then a lecturer in IS at the University of Sussex. McKenna was a lecturer in IS at the University of East Anglia. Chamakiotis and McKenna organized a track at that HCC, titled "Our Digital Lives," which is where they met Kathrin Bednar, a PhD student from the Vienna University of Economics and Business, whom they invited to join as the WG as secretary. Bednar enthusiastically agreed following an initial discussion at the conference dinner and a follow-up Skype call a few weeks later.

Since taking over from Kreps in Poland, Chamakiotis, McKenna and Bednar worked closely together to revamp the WG, updating its name, scope, interests, and members. The WG officially changed its name and scope the following year, in the autumn of 2019, due to technicalities, while the leadership of the WG made the relevant updates to the WG's website and the membership list. During the academic year 2019–2020, the

WG organized a workshop for the following HCC which had been planned to take place in Tokyo, Japan in September 2020. Although the organization of the workshop developed successfully and an eclectic number of high-quality submissions were accepted, the HCC was cancelled due to the Covid-19 pandemic. Although the conference itself was cancelled, the selected papers were scheduled to appear in the book of conference proceedings.

At the end of 2019, Chamakiotis moved from the University of Sussex in the UK to the Madrid Campus of ESCP Business School and recommended a workshop in Madrid that could take place in the academic year 2020–2021. Sadly, this could not go ahead because of the global restrictions due to the pandemic. In 2021, the WG offered a track (Track 5: Our Digital Lives) as part of the WG 9.4 Virtual Conference 2021, organized by IFIP WG 9.4 on "Implications of Information and Digital Technologies for Development." The conference theme was "Resilient Information and Communication Technologies for Development" (ICT4D) and the conference was held online on May 26–28, 2021.

Chamakiotis relaunched an earlier series of blogposts to ensure that some sort of contact with WG members could be reestablished. Given the limited opportunities for face-to-face (F2F) interaction in the context of lockdowns and social distancing, the blogposts were a great opportunity to keep the conversation going. The six blogs published during his tenure on the WG 9.5 website (and communicated to the members) focused on remote working (by earlier chair Panteli; April 2020); (dis)connectivity (by the then vice-chair McKenna; July 2020); digital health and activism (by Dimitra Petrakaki, September 2020), digital platforms (by Christos Begkos and Katerina Antonopoulou; December 2020); gender bias in IS academia (by Silvia Masiero; April 2021), and incivility and work email (by Emma Russell; July 2021).

1.7 Brad McKenna (2021–present)

In September 2021, at the TC 9 annual meeting, McKenna was confirmed as the chair for WG 9.5, Bednar became vice-chair, and the role of secretary remained vacant. It was a turbulent year due to the Covid-19 pandemic, so activities in 2021 remained limited. The HCC conference, originally planned for 2020, was rescheduled to 2022 in Tokyo and a WG 9.5 track at the conference was planned. Unfortunately, due to the on-going pandemic, it was not possible for the HCC conference to proceed in person. Therefore, conference tracks were merged with the main conference, and there were no specific WG 9.5 activities at the conference.

In 2022, McKenna organized a special issue of the *Journal of Business Research* titled "Virtual Influencers a New Frontier in Interdisciplinary Research," co-sponsored by WG 9.5 and the UK Academy for Information Systems (UKAIS). The theme of the special issue is on non-human social media influencers which are constructed and implemented with computer generated graphics, AI, chatbots, and other technologies. The deadline for the special issue was 15 February 2023 and it received 60 submissions. At the time of the final revisions of this chapter, the reviews of the submissions are ongoing. Also in 2022, Hameed Chughtai, senior lecturer at Lancaster University, became the WG secretary.

In 2023, McKenna, Bednar, and Chughtai, alongside the current secretary of WG 9.4 (The Implications of Information and Digital Technologies for Development), are running a joint WG 9.4 and 9.5 workshop at the European Conference on Information Systems (ECIS) in Kristiansand, Norway on June 13, 2023. The workshop is titled "Current Issues in the Digital Society" and explores themes around tackling the data-for-development orthodoxy and the ways digital technologies shape our everyday interactions.

2 Themes

In this section, we present a list of themes that we see as relevant to our WG today. These themes are not conclusive; they are meant to serve as a guide of some of the themes that – at the time of writing and revising this chapter – are viewed as current, relevant to the WG, worthy of investigation, and with potential for impact outside academia. In what follows, we review key literature of each of these themes.

2.1 Social Media and Online Communities

Social media platforms – such as Facebook, Twitter, Instagram, and WeChat – provide online spaces for friends, family members, business partners, or other individuals to communicate and exchange information [3]. The features of these platforms are designed to allow users to interact, coordinate, and form networks of different kinds of relationships [4]. There are many different types of social media platforms with various interactive communication methods [5] and are now an often critical and accurate way to support information flows and networks within our daily lives [6]. Social media are also becoming an alternative to traditional communication methods such as television and radio for receiving news and streaming of live events [4].

The use of social media has generated a large amount of research interest in recent years. Examples include the use of social media for customer engagement [7], social media and branding [8], and word of mouth [9]. These examples influence the ways in which customers make decisions [10], and has changed the ways in which companies and customers communicate with each other and has altered business strategies [11].

However, the use of social media is not uniform around the world. In the Western world, apps such as Facebook, Twitter, YouTube, and Instagram dominate. However, because these companies have been banned in China [12], other platforms have been developed to take their place. For example, Weibo replaces Twitter, and Youku replaces YouTube. WeChat, however, has arguably become the most important social media platform in China [13]. Chinese cultural values may also be inherent in the design of this social media application [14]. Social media platforms based in Asia tend to have tighter or closed social networks and relationships which reflects the less open self-disclosure and indirect communication styles more common in Chinese culture. This contrasts with Western style social media, which allow for wider social networks, more direct communication, and bolder forms of self-disclosure [15].

Traditional social media platforms, as well as digital platforms more generally, can also be used for the purposes of social movements and the development of online communities [16, 17]. In fact, social movements can also exist in virtual worlds such as

Second Life and World of Warcraft and have become platforms where online communities and social movements can recruit new members or participants and promote their online activities. Because virtual worlds are also more immersive than traditional social media platforms such as Facebook and Twitter [18], they allow for a broader range of social activities, for example, virtual parades [19], and where online communities can thrive [20, 21]. Online communities have also been found to enable a form of "digital activism" enabling globally dispersed individuals to come together and work towards a joint goal for the common good. This is the case with MedicineAfrica for example; a digital platform that hosts an online community of medical professionals and students from the UK and poorly resourced countries, such as Somaliland. Chamakiotis et al. [22] found that the purpose of creating social value by improving medical knowledge and clinical practice is underprivileged regions was enough to give rise to digital activism. New activities will likely arise as the Metaverse becomes more ubiquitous in society [23].

Lesbian, Gay, Bisexual, Transgender/Transsexual plus (LGBT+) social movements and online communities based in World of Warcraft demonstrate that the affordances of the game can be used by the players to create desired outcomes for online social movements, based on their goals and desires, and community involvement [20]. Power was exercised on the LGBT+ community by the developers of the game, and the online community managed to resisted the power [21]. They observed some similarities and differences between the LGBT+ movement and other online movements such as #MeToo. The #MeToo movement was similar in that social media were used to empower people to share personal stories of sexual abuse [24]. The difference, however, was that the #MeToo movement arose quite rapidly following the allegations of Harvey Weinstein whilst the LGBT+ movement grew slowly over several years. This demonstrates the nature of social media use can be vastly different depending on the goals and motivations of the users, but also that social media can provide for the collective power of individuals to come together and spread awareness [21].

In recent times, society has become more aware of the negative consequences of social media. Social media connect people from all parts of society together; however, this may have some negative consequences. One of these consequences is cyber bullying [25]. This has increased rates of anxiety, negative feelings, and depression which in the worst case scenario may result in outcomes like suicide [26]. Compared with traditional forms of bullying such as a small group of students in a school, cyberbullying has a far greater reach of victims. Traditional bullying may have little evidence as proof. However, for cyber cullying, victims can be humiliated online which increases the visibility to a broader group of people such as friends, friends of friends, family, and also unknown others, as videos can spread around various social media platforms which makes numbers difficult to estimate [25].

There are several other areas of concern relating to social media and our digital lives. One such example is fake news [27] and the emergence of deepfake technologies [28] which can spread rapidly around social media platforms and has been shown to influence in democratic elections [29]. A second area of concern privacy of user data. It was revealed that Cambridge Analytica was given personally identifiable information from 87 million Facebook users and has raised greater concerns for privacy protection

[30]. New privacy issues are emerging with contemporary social media platforms such as TikTok [31]. A third area of concern is social media bots. For example, Twitter bots [32] have been used to spread debates, such as the Covid-19 vaccine debates [33], or events like elections [34]. Although this list of concerns is not intended to be exhaustive, it demonstrates that as a society we need to be aware of how social media impact on our digital lives, both positively and potentially negatively and encourages us to think critically about its daily use.

2.2 Augmented Reality (AR)/Virtual Reality (VR)

AR is a technology which allows users to view the physical world in real time with virtual objects superimposed on it, thus augmenting the user's view, rather than replacing it [35]. The aim of AR is to simplify the user's life by augmenting the user's immediate surroundings with virtual information, thus enhancing the user's view of and interaction with the physical world [36]. AR has gained in popularity alongside the development of smartphones with enhanced cameras, GPS trackers, and other sensors which enable AR services for users [37]. There are many applications of AR for our digital lives, some of which are discussed below.

A popular use of AR is for gaming. The most well-known mobile AR game is Pokémon Go where users are asked to find virtual creatures (Pokémon) hidden in real-world locations [38]. There is potential for AR games to have an impact on our digital lives through changing consumer behavior practices and new marketing opportunities [39, 40], augmenting sports games [41] as well as health benefits [42].

Tourism is another area which AR has made a significant impact because it enables tourists to have an enhanced exploration of their surroundings [43]. In particular, because they have limited knowledge of their destination, AR helps tourists to increase their awareness [37]. Other areas of interest are AR for heritage sites [44], theme parks [45], urban destinations [46], mood maintenance [47], and its impact on senior tourists [48].

Another important area for AR and our digital lives is to understand its use in business. For business opportunities, AR can provide additional information which changes the way in which people work and shop [49]. Some recent examples include advertising effectiveness [50], decision making [51], enhancing online rapport [52], multi-sensory aspects in online retailing [53], time convenience and emotions [54], and virtual try-ons [55].

While AR integrates the physical world and the virtual world, VR fully immerses the user into a synthetic without seeing the real world. VR is a complete, computer-generated 3D virtual representation of a physical space and objects within it [49]. Users can navigate and interact with the virtual environment in real time [56]. There are three key elements of VR:

1. Visualization, where users can look around and explore a virtual world using a head-mounted display;
2. Immersion, where users are fully immersed into the virtual world without any real-world view;
3. Interactivity, where users have control over their experience using gestures, joysticks, keyboards or, some other input device [57].

There are plenty of applications for VR in our digital lives, for example, education and training [49]. VR has the advantage of interactions with objects and events that are physically out of reach in a safe environment [58]. Businesses can also use VR to find new ways to engage with their customers through immersive marketing campaigns [49]. For example, measuring the emotional responses to products [59], how VR stores can shape consumer purchase decisions [60], customer loyalty in VR [61], and virtual showrooms [62]. In the tourism sector, marketing was the most prevalent topic, followed by education, tourism experience enhancement, food and beverage, and meetings/conferences [57].

VR may also be used for a wide variety of serious games. One area is that of rehabilitation. VR has been used in games for rehabilitation for people with neurological conditions [63], stroke [64], motor disorders [65], and musculoskeletal disorders [66]. Other areas of healthcare where VR has been applied is for training of surgical techniques such as laparoscopy [67], increasing physical activity in children [68], the treatment of arachnophobia [69], life support training [70], and for exposure therapy for fear of driving following a motor vehicle accident [71].

AR and VR are related technologies but differ in their use of virtuality continuum [72] from the real-world on one side, and the virtual environment on the opposite side of the continuum. AR falls within the real-world side as the user views the real-world and is augmented with virtual objects. While users of VR are immersed fully into virtual environments and totally lose sense of the real world, they are situated in. As illustrated above, both AR and VR have important roles in our digital lives.

2.3 Digital Tourism

Technology is becoming increasingly important in tourism [73], and has transformed the experiences tourists have on holiday [74]. People take 38% more gadgets with them on holiday than they do during their daily life [75]. Information Technology (IT) plays a significant role in value creation for tourists [76]. This is due to the increasing digitalization of tourism experiences. For example, the use of online services for trip planning [77], and the ability of tourists to use multiple devices, e.g., laptop, smartphone, or tablet to find information or make bookings [78]. Smartphones are arguably the most used technology by tourists [79], and they have altered the way in which tourists interact with each other [80]. The use of social media has also changed the holiday experience as tourists are motivated to share their experiences [81].

Cai et al. [82] reviewed the digital tourism literature related to the theme of technology use. They found a number of uses of technology in tourism contexts. For example, the ability to enable co-creation of tourism experiences and the ability to share information [83], and to understand the needs of tourists [84]. The increasing ability to share information online has impacted the development of destination image [85] and destination image formation [86]. The ability to find more information through an increasing number of channels has helped tourists to have more profound travel experiences [87]. This also includes the use of electronic word of mouth through sites such as TripAdvisor, as well as mobile technologies and social media [81, 88].

The conversation above has mostly focused the use of technology by individuals (e.g., tourists). However, Cai et al. [89] also explored the use of technology from an

organizational perspective (e.g., tourism providers). From the perspective of tourism and hospitality organizations, technologies are often used as a strategic tool to gain competitive advantage [90], support decision making [91], and to develop marketing strategies [92]. Technologies such as virtual worlds [93], AR [94], and automated service robots in hotels [95] have helped tourism organizations to provide a wide range of user experiences and marketing opportunities. Other uses of technology in tourism organizations include using business intelligence [96], knowledge management [97] social networks [98], e-marketing [99], and for sustainability [100] to help gain competitive advantages. The Metaverse is also expected to have an impact on digital tourism [101].

More recently, people are becoming more aware of technology blurring the boundaries of home and away [102]. Due to modern society living in a state of constant connectivity, tourists are increasingly looking for ways to balance their digital lives with the need to escape their commitments back home while on holiday. This desire has created concept of digital-free travel [82, 103, 104]. Disconnecting is not always easy. Millennials, for example, have a desire for digital-free travel, but due to fear of missing out on important social or work commitments they may be reluctant to disconnect [103]. Once tourists do disconnect, many first suffer from anxiety, feelings of isolation, and frustration. However, these feelings soon pass and on the whole tourists enjoy their holiday more [82], and they build their character strengths [105]. Therefore, it is important for tourists to understand their motivations for travelling digitally free [106], and to balance their needs of enjoying their holiday, against their needs to maintain connected for commitments back home, or to be fully integrated into an increasingly digitalized tourism industry.

2.4 Connectivity

We focus on the topic of *connectivity*, a term that was first discussed as a technical capability, from a socio-technical perspective [107]. Our interest here is in understanding not only the technical capabilities of certain technologies, but how individuals themselves make use of, and manage, the connectivity afforded by the technologies they use and its influences on our lives both within and outside work [108]. Some of this literature has looked at the practices [e.g., 109] individuals develop to manage connectivity with an emphasis on connectivity after hours [110].

Connectivity – also referred to as ubiquitous connectivity – is the result of the widespread use of ICTs and is seen as affecting our private and social lives in many ways. The diversification of ICTs has led to the establishment of research fields that focus on specific technologies, e.g., the Internet, email, mobile phones, smartphones, and social media. While a plethora of theoretical and conceptual frameworks has been suggested for explaining the adoption and use of social media, qualitative studies promoting socio-material understandings of connectivity and its management are particularly encouraged [e.g., 111].

Empirical studies have reported that high use of ICTs is associated with lower subjective well-being, poor sleep quality and stress [112]. Social factors are especially important to consider when looking into how these technologies affect wellbeing. For example, Shakya and Christakis [113] report that the negative impact of online interactions on subjective wellbeing is greater than the positive impact of offline social networks.

Correspondingly, it was found that smartphone use reduces the quality of face-to-face interactions and thus their positive impact on wellbeing [114]. Qualitative findings by Bednar and Spiekermann [115] suggest that through the use of ICTs, personal reunions decrease and real interactions are perceived as unsatisfactory. Moreover, being connected and reachable continuously has the negative effects of inducing a fear of missing out, evoking addictive behaviors as well as stress. It is not surprising then that social media use has been associated with decreased subjective wellbeing in a longitudinal study [113] and with depression in adult samples [116] as well as in samples of young adults [117]. Primack et al. [118] argue that it is the number of used social media platforms rather than the time spent on these platforms that causes this association.

It has to be noted that many empirical studies use a cross-sectional design and are therefore limited in making claims about the direction of effects and causality. Therefore, they can only report associations and cautiously suggest directions of causality.

2.5 From Online Collaboration and Virtual Teams to Hybrid Working

Scholars from a number of fields, including IS and general management, organization studies and human resources (HR), as well as practitioners and policy makers, have used numerous terms to refer to technology-enabled ways of working. Some of the early writings in this then new phenomenon of technology-enabled working, within the IS community in particular, include computer-mediated communication (CMC) [119] and computer-supported cooperative work (CSCW) [120]. This literature grew significantly with the rise of virtual teams in particular, in the late 1990s and early 2000s. Virtual teams are known in the literature as teams of (often globally) dispersed coworkers that use ICTs to accomplish an organizational task or a project [121]. Different types of virtual teams have been recognized: for example, Griffith et al. [122] make the distinction between purely virtual teams with no F2F contact and hybrid ones that may have some F2F contact during their lifecycle. Similarly, virtual teams may differ in terms of degree of geographical (global vs. local), temporal (based on the time differences separating team members) and organizational (inter- vs. intra-organizational) dispersion. Evidently, not all virtual teams are the same, and therefore their management has to be tailored to their unique characteristics.

The traditional virtual team literature dealt with the benefits of virtual teams for both the employer and the employee, reduction of transportation costs, and access to global talent irrespective of boundaries. However, virtual teams are also known for their challenges. Dominant position within this literature have the challenges of developing trust—which has been seen as harder to achieve due to the lack of F2F communication between geographically remote members [123]; adopting suitable leadership styles or practices [124], and how leadership can be exercised to enhance and support virtual team creativity [125]. More recently, there has been an emphasis on ensuring that virtual team members are engaged [126] and happy in terms of their well-being [127].

In March 2020, the lockdowns around the world due to the Covid-19 pandemic led to a widespread transition into virtual ways of working, including virtual teams. As a result, we saw an explosion of research from numerous fields into how workers with no preparation could work in this fashion, with scholars highlighting that virtual teams were now different, and leaders of virtual teams had to look after their members' sense of

well-being and work-life boundaries as many of us juggled work, domestic, family and other responsibilities at the same time while working from home during the lockdowns [128, 129]. More than three years later, today, we see that technology-enabled ways of working have become pervasive and terms like "hybrid working" – largely referring to working partly from the office and partly from other locations such as one's home – have gained popularity and researchers [e.g., 130] and practitioners [e.g., 131] are interested in finding out how traditional management practices should be revamped.

2.6 Emerging Technologies

In the last decade, a variety of available devices and applications has made our lives increasingly more digital. Emerging technologies such as affective computing, AI, bio-electronics, and human-machine symbiosis [132] are expected to further increase the digitalization of many aspects of our lives. But the rapid pace of scientific discoveries and technological innovation poses several challenges for the definition and identification of emerging technologies [132, 133], the critical assessment of their likely impact on individuals and society [132, 134, 135], and the regulation and adaptation of their design [136–138]. These challenges have gained attention in several disciplines, including information systems, philosophy, science and technology studies, as well as law, and have inspired interdisciplinary frameworks for a better understanding of emerging technologies and their impact on individuals and societies [e.g., 139].

While there is a lack of conceptual clarity of the terms "technology" and "emergence" [132], emerging technologies generally refer to technologies that are being developed or are expected to be developed within the next 10 to 15 years [132]. Emerging technologies can be characterized through their radical novelty, fast growth, coherence over time, prominent impact, uncertainty and ambiguity [133]. Especially because emerging technologies are difficult to predict, they seem to be an elusive object to assess [140], with undetermined affordances and uses [141].

Technologies actively shape our social context [142] and mediate how we perceive our environment and thereby our relation to the world [143]. However, many individuals find it difficult to control their use of technologies and thus rely on legislation to monitor the influence of technology on their digital lives and handle negative effects [115]. The impact of emerging technologies cannot easily be estimated and monitored [144]. Also, it takes time for legal measures to come into effect, which is why regulation often lags behind technological innovation. It has been suggested that an ethical assessment of a technology's impact needs to take the concept of uncertainty into account [145] and should take place at an early stage in the product development life cycle [136], when product characteristics can still easily be adapted.

This challenge has inspired numerous ethical frameworks for the assessment and design of technologies, such as the Technolife approach [134] or the anticipatory technology ethics approach [135]. As regulators are often overwhelmed with anticipating the implications of emerging technologies, technology firms have been charged with the responsibility to address ethical challenges already in the design phase [137]. However, the lack of time and resources in traditional system development often results in a lack of motivation to tackle ethical issues [146]. Design methods that try to anticipate a technology's impact and protect human needs and values throughout the design phase

offer a promising alternative here [138]. Making use of ethical technology assessment and design frameworks can help to "keep technology from slipping beyond our control" [139].

2.7 Artificial Intelligence (AI)

AI is often enlisted as one of the core drivers of new and emerging technologies. However, AI has a longer history than the current hype suggests. In 1955, John McCarthy et al. [147] first attracted attention with his conjecture that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it" (p. 12). His idea formed the basis for a conference in Dartmouth on AI, which coined the first use of the term. Since then, the debate on AI has spurred various thought experiments and arguments in philosophy and has led to significant technological developments. After several initial hype cycles, AI entered a period of reduced interest and funding in the 1970s and 1980s (often referred to as "AI winter" [148]), of which it has risen in the past decade to experience yet another hype cycle with increased funding and investment. AI as a discipline includes several subfields such as machine learning, robotics, and natural language processing, and is thus difficult to assess as one idea or phenomenon.

Today, skeptical and pessimist [149] views coincide with almost ubiquitous applications of AI. This inconsistency often departs from different understandings of the feasibility and risks of AI. Several performance measures have been defined for AI, including thinking rationally, thinking humanly, acting rationally, and acting humanly [150]. While some applications of AI are already in wide use, others might not even be theoretically possible. Different attributions of what AI is capable of have led the differentiation between "weak AI" or "narrow AI," which refers to the simulation of intelligence or its application to a limited range of tasks, and "strong AI" or "human-level AI," which refers to computers actually *having* mental states and *understanding* cognitive tasks [151, 152].

Weak or narrow AI has long made it into our everyday lives in the form of speech assistants, recommendation systems, navigation systems, health data tracking, etc. These functionalities and applications have opened up new possibilities and support us in many activities, but have also lead to a range of issues, including discrimination based on biased algorithms [153] and technological unemployment through automation [154].

The feasibility of strong AI is met with different expectations and opinions. In philosophy, many arguments have been presented that speak against the possibility of machines understanding and experiencing as humans do. For example, the Chinese room argument [151] shows that a computer can follow rules that make it seem as if the computer understands Chinese, while the computer does not understand Chinese at all. Thus, intelligent or human-like behavior of a computer cannot show that the computer has a mind, understanding, or consciousness. Contrary to the basic idea of the Turing test, which assesses an AI based on whether a person can differentiate it from a human or not [155], the human might not be the most appropriate comparison for computational performance. Not all successful problem-solving needs to be human-like, which speaks against humanly measures of AI. Still, there are opponents of the view that a human-level AI will be achieved in the upcoming decades [156].

These different expectations and views of AI show that AI is a double-edged sword [157]: it has the potential to advance achievements of global goals through increased productivity, income growth, and more socially inclusive and environmentally responsible practices, but also bears the risk to create a dystopian world with higher inequality and declined incomes for many. Thus, further research and discussions on AI needs not only a clear definition of AI, but also a clear and critical view of both technological feasibility and potential social and environmental implications.

2.8 Good Digital Society in an AI Landscape

New and emerging technologies such as AI can be empowering, but they can also be oppressive [158, 159]. Recent advances in data-driven solutions reveal the double-edged nature of AI-based information technologies. When users surrender agency to AI, or when AI subvert user agency, AI systems can become oppressive, constraining users' rationality. AI systems are designed by ordinary human beings, people with convictions and worldviews [160]. The conscious and subconscious values of designers and developers influence AI systems in implicit and explicit ways. While people, as users of technology, experience digital content at the individual level, the AI systems in most digital tools (such as those related to recommendations and moderation) are developed using the guidelines at the community or platform level. For example, when developing an algorithm for recommendations, a system may be designed in a way to (unintentionally) foster certain social divisions by adhering to the specific social practices including language and social norms. This may result in an indirect suppression of the other groups or individuals. In this way, a system may enforce online community guidelines of dominant power structures while further suppressing the suppressed [161, 162]. This is problematic because it means that there is a high risk of excluding the voices and experiences of those who interpret and experience the world differently from those without a certain worldview (say an Indigenous person): AI entrenches bias.

Many of us are familiar with the idea that AI systems are regularly making apparently benign decisions at the individual level, like purchase recommendations on Instagram or viewings recommendations on Netflix. AI systems are also slowly becoming key players in developing solutions to address broader social issues, like AI-driven activism [163]. The emergence of AI-based digital technologies in our everyday practices discloses the Janus face of AI: on the one hand, AI can be inclusive and engaging as new (AI-based) digital technologies provide socially marginalized people with a means through which they can make their voices heard [164]. For example, Indigenous people, considered some of the most marginalized people in the world, have started to use digital technologies to collaborate in order to support their communities [165]. On the other hand, the same technologies can be disengaging and exclude marginalized people as dominant forces, and power structures appropriate digital tools in ways that further marginalize the marginalized [166, 167]. Given the apparent double-edged nature of AI, and it is empowering as well as oppressive potential, we start by discussing the positive potential first – this is what is referred as the "good AI society" [168].

A good AI society is one of inclusivity in which AI is used to develop technologies that work toward social good in ways that allow the social, information, and biosphere to co-evolve and flourish together. In a broader sense, we are exploring the avenues towards

a digital good society. To do so, what is required is "more inclusivity of various voices influencing the development" of new digital technologies [168]. An inclusive approach requires moving away "from research on people, to research with them" [169]. We see inclusive approaches as those where marginalized people's voices are integrated in the main research. In the development of a good digital society [170], we hope that researchers and policymakers will involve people "whose voices have not traditionally been heard, who have felt some anger or distrust of their treatment by services and research" (p. 86). Instead of a single worldview, we are calling for a good digital society is one world where many worlds fit [171]. Some attempts have been made to bring technologies like AI closer to the people such as "AI4People" in order to develop ethical foundations for AI that is grounded in everyday life [168]. However, much work remains to be done as marginalized groups are still not involved in all cases. Without a nuanced understanding of the societal issues and a world stage where many voices can be heard, AI solutions risk becoming biased and prone to oppressive predispositions.

A socially inclusive approach, which values diverse perspectives and voices, brings forth the question of agency and engagement. While new technologies have made it possible for marginal voices to move to the center of the public discourse [172], it also reveals that "one's own identity, voice, and moral agency are a work in progress" (p. 433). Much work is needed to explore these issues further.

2.9 Demarginalization and Decolonization Issues

In an emerging theme, we are calling to shape the digital society to include decolonized approaches to the design and development of technologies that builds on everyday practices, and that acknowledges the intimate relationship with technologies from the perspective of marginalized social groups [173]. Decolonial approaches to the digital phenomena seek to examine and dismantle the ways knowledge is produced using the dominant power structures and coloniality [174]. For instance, often a theory or research developed using the Western epistemologies is applied to the non-Western context [173]. Such approaches are uncritical as they assume the universality of a theory or method and ignores the local contexts. For instance, MedicineAfrica (a digital platform discussed earlier in Sect. 2.1) provides online tutorials to medical professionals and students in poorly resourced countries with the purpose of transferring knowledge and ultimately improving how medical care is delivered; Petrakaki et al. [175] found that at the same time MedicineAfrica unintentionally produces a form of "epistemic colonialism" which ignores local needs, equipment and language. The decolonial approaches call for using local ways of being and doing. For MedicineAfrica, the above authors argue that the platform itself may provide the means in the future to address colonialism, by having local participants serving as tutors (thus, participants who have been trained by Western medical professionals through MedicineAfrica, but who speak the local language and are aware of the local circumstances). Another example shows how the Chinese concept of Qinghuai can inform the study of digital entrepreneurship [176]. Another example is using Japanese Animism as a way to develop cyber governance strategies [177] and how the Māori Indigenous concept of *ako* reveals new ways of knowing in everyday digital interactions [178]. By embracing under-represented approaches to research, we can answer questions not easily addressed through traditional methods of scientific inquiry.

New digital technologies are giving Indigenous peoples around the world a means through which they can make their voices heard on a global stage [179, 180]. By using technologies such as social media and the Internet, people are able to coordinate their campaigns and protests to spur change [165]. These social movements, while varied, often center around two key themes: cultural identity restoration and natural resource preservation. Increasingly, Indigenous peoples from around the world are no longer working in isolation but are collaborating across social media, attracting international attention. A recent example is the "Idle No More" campaign originating in Canada. This campaign started out as a local movement to protect the Indigenous environment and culture but spread as far as Hawai'i and New Zealand where other Indigenous communities appropriated the #idlenomore theme to address cultural and environmental issues. While the #idlenomore movement continues to develop, there are subtle background issues that may be unbeknownst to the marginalized people. It is still unclear how algorithms relate to the promotion of the cause of marginalized people and how different algorithms influence the ways of engagement and their use of digital technologies to raise their voices.

Recent research has reported that marginalized people are most likely to trust a digital solution that is related to and supported by the dominant power structures [181]. A key finding is that marginalized people not only preferred but honestly believed that the digital artefacts given by the foreign researchers were superior to their own devices (even when it was not the case). We also know that data-driven solutions powered by AI tools are often influenced by existing power structures and can contribute to further enforcing certain social structures that could lead to further marginalization in society [182].

Technologies such as AI and the sophisticated use of algorithms can be used to disseminate content on social media that distorts the causes of a social movement, threatening both the legitimacy of the movement and the social standing of affiliated actors. In this perspective, a social group can deploy digital technologies in ways that are beneficial to their members but detrimental to society at large. Social media and other digital technologies can be used to promote extreme views that lack the common ground necessary for collaboration within diverse groups and the building of a tolerant society [183]. We stress the empirical context of the marginalized people (such as a postcolonial political context) needs to be considered to address problems of marginalization in the studies of our digital lives and the development of a good digital society.

2.10 Human Enhancement

Many new and emerging technologies aim at enhancing human capabilities and could thus influence the human constitution. This has led to debates on human enhancement and whether the use of technologies for enhancing human capabilities is desirable, morally acceptable or to be condemned. Optimists welcome and celebrate human enhancement through the means of emerging technologies, while pessimists are very critical of it. Others question that there is something fixed that constitutes human nature and with it the strict separation of the human and technology.

Those who recognize that there is something fixed that defines humans attribute different roles to the human body. Some argue that the body naturally constitutes and

characterizes humans and thus want to protect it and with it the boundaries between humans and technology [e.g., 184]. They support "natural" strategies for human development and personal growth, such as education, and criticize technological developments and innovations that alter human capabilities and characteristics. Because of this conservative view, they have been referred to as "bio-" or "infoconservatives" [185, 186]. Others consider the human body as a mere biological substrate of the mind and welcome emerging technologies and their application not only for treatment, but also for enhancement purposes [e.g., 187]. In their view, the physical vulnerability of the human body is a weakness that technology could and should help to overcome. While they support different degrees of human enhancement through technology, they all endorse a liberal view on applying emerging technologies such as bio-technologies for self-modification and self-improvement [185]. In extreme versions such as transhumanism, the transcendence of human boundaries and limitations is even considered as the ultimate goal of human development [187].

These two opposing positions on biotechnologies are both based on the view that there is a fixed human nature. In addition to the liberal/transhumanist and bio/infoconservative position, there are existential-phenomenological accounts that see the influence of technology on "human nature" as more complex and negate a clear border between what is natural and technology [186]. Positions that focus on human nature imply that the human is naturally determined as a unique creature that is separated from animals, the natural environment, or technology [185]. These "humanist" positions [185] are misleading as they do not discuss *how* human beings are influenced by technology [186]. It has been argued that technological enhancement will always produce new vulnerability and thus cannot help to "overcome" human weakness [186]. Based on this reasoning, the categories of the human and technology and their relation need to be considered outside of a dichotomous view. The philosophy of technology has long emphasized that human nature is never purely "natural" but always includes "technological" aspects [188]. Following these lines of thinking can help to move away from a restricted view of both humans and technology and reconsider how technology influences humans and what implications this influence has for human development.

3 Future Directions

In this last section, we build on some of the themes discussed earlier and outline directions for future research that we think deserve academic attention and may be of value to our WG and the wider IS community in the years to come. These may be existing areas that have seen some attention already and require updating or expansion, or completely new areas of research.

3.1 Technology-Enabled Ways of Working and Wider Implications

The business landscape has changed drastically due to recent transitions into technology-enabled ways of working. Although some of these forms of work, e.g., virtual teams [189], have existed for a long time, newer ways of working with technology, such hybrid working as working from home, are impacting our lives in unprecedented ways, raising new types of challenges for many of us. Leaders of virtual teams are now expected to ensure – among other new responsibilities – that their members' engagement remains

high while working from home [129], HR professionals need to develop new policies as to how employees should manage connectivity to work after hours [110], and individual workers need to look after their well-being [190]. Contrary to literature that explains how we work from home in emergency situations, such as the recent pandemic [128, 191], a better understanding of how some of these new technology-enabled working environments should be managed is required. At present, we have seen attempts to capture some of these issues, for example, with the emergence of special issues in academic journals, organized to develop knowledge around hybrid working as a standard everyday practice [130]. However, much more can be done to expand recent research by scholars working across disciplines and/or in collaboration with practitioners. Some important areas include onboarding processes in online work, unpacking what hybrid working means beyond current understandings influenced by the pandemic, and exploring security and privacy issues in online work.

3.2 Ethical Approaches to Technology Design

Since the advent of the Internet, the variety of digital devices and applications has kept increasing. This has opened up a market for IT products through the digitization of previously analogue products as well as through new technologies and innovation.

IS shape our work and social lives by supporting us in our daily activities and interactions. However, IS do not only have the potential to improve information access and facilitate communication; they can also cause harms on the individual as well as on the societal level. Empirical studies have reported negative effects of new technologies or media on psychological well-being, such as poor sleep quality and stress [112]. Reports of millions of records being exposed because of digital privacy breaches [192] have fueled an unease among citizens who fear that they may lose control over their personal data to third party companies or the government [193, 194]. In 2018, the Facebook–Cambridge Analytica scandal triggered discussions on the power of digital monopolies and the potentially dangerous impact of social media platforms on democracy. Similarly, the Covid-19 pandemic was used as an opportunity for fake news and deepfake technologies to flourish through the Internet. Recent research shows that humans cannot always detect AI-generated content [e.g., 195]. Thus, the emergence of generative AI technologies raises truly unprecedented challenges in relation to how IS can impact our societies. These events indicate that we need to acknowledge a technology's effects at the individual and societal level to protect individuals' well-being, allow sustainable business models, and to ensure that technologies do not damage our democracies.

Alternative approaches to technology design and innovation have tried to answer to this call for an ethically responsible interaction of humans and technology. Human-centered design [196] focuses on designing enjoyable experiences instead of mere functionality. Related approaches strive to integrate human goals (e.g., goal-directed design [197]) or values (e.g., value sensitive design [198]) into technological systems or focus on including the stakeholders in the design process (e.g., through participatory design [199]). All these approaches share an empathic attitude towards human needs and values that they seek to include in the design of technology.

However, "values" have a moral foundation that distinguishes them from other concepts such as "needs" or "goals" [200]: Values represent ethical principles of the "ought-to-be" [201], that is, as Shilton [202] puts it, they "distinguish that which should be, as

opposed to that which is" (p. 128). Thus, values form a promising concept that can help to bridge ethics and design, especially when applied within a pluralist ethical framework [203].

3.3 Reconceptualizing Addiction

There is growing research interest in framing excessive use of ICTs as a form of addiction in order to capture better its effects on the individual. However, theories propose different objects, causes, and consequences of addiction and set the level of pathology at different levels [204–211]. No general theory has been agreed on yet and it is not clear why people keep using the Internet despite its negative effects [204]. This unclear theoretical grounding of empirical research makes it difficult to produce consistent findings. Therefore, there is ongoing research interest in redefining the concept of addiction with regard to digital services and devices, and reconsider the evaluation of the effects that using ICTs has on us.

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The Future of the History of Computing

Working Group 9.7: History of Computing

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Abstract. Founded in 1992, IFIP Working Group 9.7 is dedicated to three themes in the history of computing: pedagogy, regional/transnational histories, and public engagement. The synergies among the three suggest a novel aspect of the working group. For instance, local museums and archives can improve the stories about regional histories. What is more, educators can enhance the experience of their students by using museums and archival materials in the classroom. Our future work will be to increase our visibility in these three domains, developing pedagogies that use museum and archival collections, helping to overcome some of the biases that prevent engagement with solutions to climate change, and enhancing attention to diversity, equity, and inclusion.

Keywords: History of Computing · Archives · Museums · Pedagogy · Regional Histories

International Federation for Information Processing (IFIP) Working Group 9.7 (WG 9.7) facilitates interdisciplinary conversations to provide a robust history of computing. We are uncomfortable with the notion that a computer is an opaque box lacking a history. We welcome technical practitioners in computer science and information technology who have an interest in history, academic historians who have an interest in computing (from various fields, such as history and the social sciences), public historians, and archivists (including those at corporations). Technical experts in information and computer technology (ICT) benefit from academic discussions about analyzing and preparing historical materials. Simultaneously, professional historians benefit from an audience better versed in technical details. Our heterogeneity means that all members benefit from complementary competencies.

Because it is part of IFIP, WG 9.7 is different from other professional groups dedicated to the study of computing. IFIP's technical committees are strongly connected to computing professionals and technical experts, so we are imbricated with technological culture. IFIP's decidedly international character ensures we draw our members from a cosmopolitan coalition. Finally, because we are situated within TC 9, we benefit from interactions with other working groups and their focus on ethics, diversity, and sustainable development.

As detailed below, WG 9.7's activities fall into three broad focus areas: pedagogy, regional/transnational histories, and public engagement. Anyone interested in the history

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of computing is welcome to participate. However, the group's most compelling work is providing case studies, public outreach, and educational opportunities that support the international scope of the development of computing. In this way, synergies among the three focus areas are clear: for instance, the work done by museums and archives supports research into regional histories, and the desire to document teaching experiences in widespread contexts often results in contributions to museum collections and calls for international accounts of computing. WG 9.7's activities differ from other national and international research groups due to its cosmopolitan membership and the reinforcing action shaping the three focus areas.

1 Goals and Activities

WG 9.7 recognizes that there are few training opportunities in the history of computing, let alone the history of technology. In fact, generalist histories often take the computer as given and focus on the completed product's use in affluent societies. Due to a lack of public understanding of the history of technology, misinformation about the history of computing can easily be perpetuated. It is all too easy to draw a simplistic line of causation and lineal progress connecting Gottfried Leibniz, Ada Lovelace, Colossus, Alan Turing, Grace Hopper, SAGE missile defense, the various people claiming to be the "father" of the Internet, etc. WG 9.7 aims to promote historical awareness that returns the contingency and human values to these stories. This is not to say that we are all in agreement, but we are unified in bringing wider attention to good scholarship and creating a platform for new developments.

WG 9.7 believes that a better understanding of the history of computing helps us understand our society's current status and various social issues. Shedding light on the path of innovation that brought about our contemporary computing culture, we promote and broadcast essential aspects of the history of computing and why they are relevant today. History provides context for current initiatives. In addition to documenting the path of innovation, we also are interested in the paths that should have been taken. This analysis demonstrates the social mechanisms through which potential can be lost. For instance, we can show the success of the Web as opposed to more powerful hypermedia models available at the time that have since been forgotten, teaching children using textual languages instead of visual programming language paradigms, and so on.

Our primary activity is our English-language workshops, typically held every other year. The topics for our workshops have resulted in accessible, go-to reference works in English on the history of computing in various regions. In this effort, we seek to promote a better understanding of the social impact of computing. Within the broad historical trends in computing technology and practice development, we examine the role of industry, national governments, and the international community in guiding research, setting standards, and conceptual and technical innovations of use to practitioners. Students and faculty in computing and related fields, such as electrical engineering, need to know the basics of the history of computing that has a consensus. Within IFIP, WG 9.7 seeks to promote historical awareness. IFIP has played an essential role in the international development of technical standards and new technical solutions. Given the fast pace of change in the development of technology, historical action may be quickly lost or

forgotten. Thus, the group has an opportunity and obligation to preserve the historical memory of the professionals in IFIP.

Our practice has been to require draft papers for potential workshop participants. A panel of peer reviewers makes decisions about acceptances and provides comments to the authors. About a month before the workshop, authors circulate their revised drafts to ensure a lively conversation at the workshop. After the workshop, authors have a few weeks to revise their papers before submitting them for consideration in the hard-cover anthology of selected, revised articles, which Springer Nature currently publishes. In addition to the workshop and resulting proceedings volumes, members keep in touch more spontaneously, sometimes under the auspices of national computer societies. E-mail communication by the group provide an important outreach about upcoming opportunities and keep the conversation going. We all benefit from a platform that allows us to exchange experiences and seek advice from a group with a global perspective.

2 Brief History of WG 9.7

2.1 Prehistory and Formation

The founding chair of WG 9.7 was John A. N. Lee, a professor of computer science at Virginia Polytechnic Institute. He was one of the people in the 1970s who first defined the history of computing as a field. At this early stage, the history of computing was conducted by computing professionals who wished to improve research outcomes by applying history. Looking back on those years when electronic computers were barely thirty years old, Lee [1] points out that the history of any aspect of computer science could be told relatively succinctly. Also, it was possible to face disdain from colleagues who felt that anyone interested in history, social consequences, or pedagogy was past their prime, given the belief that computer science was about inventing the future. Institutionally, organizations like university archives had the opinion that computer science was not old enough to need historical treatment.

In 1973, one of the first attempts to establish the history of computing was the Los Alamos Conference on the History of Computing in the Twentieth Century. Nick Metropolis was the organizer, and Richard Hamming offered a keynote. In 1978, Lee was the administrative chair of this conference, a member of the program committee, and chair of several panels for the first ACM SIGPLAN History of Programming Languages (HOPL) held in Los Angeles. Grace Hopper was the keynote speaker [1]. An outgrowth of the Los Alamos conferences, it was the first history conference organized by a professional society [2]. As much as possible, these early conferences moved away from a simple chronological list of events and sought to record what practitioners were thinking and the context for their decisions.

Lee's involvement with IFIP came about indirectly through the American Federation of Information Processing Societies (AFIPS), the U.S. representative when IFIP was founded. AFIPS was also an early sponsor of the history of computing. For instance, between 1967 and 1974, AFIPS contributed $130,000 to the Smithsonian, which was used to collect oral histories [3]. Starting in 1974, AFIPS began a tradition of Pioneer Days at their National Computing Conference (NCC). Each day was organized around a particular theme and invited participants to speak about their experiences. Twelve

of these workshops were organized under the auspices of AFIPS. A group of organizers for each year's Pioneer Day conducted a "research program" that culminated with a "mini-conference" [4]. The first Pioneer Day was devoted to the Dartmouth Time-Sharing System and BASIC. In 1979, AFIPS published the first *Annals of the History of Computing* issue. Lee organized the AFIPS's Pioneer Day in 1982 to celebrate the twenty-fifth anniversary of FORTRAN at the NCC meeting in Houston (Fig. 1). Lee then co-edited a special issue of *Annals* based on this event in 1984 (vol. 6, iss. 1). As AFIPS turned over publication duties to Springer-Verlag in 1987, the founding editor also stepped down. Lee took over as editor of vol. 9, iss. 2, a position he would hold for nine years.

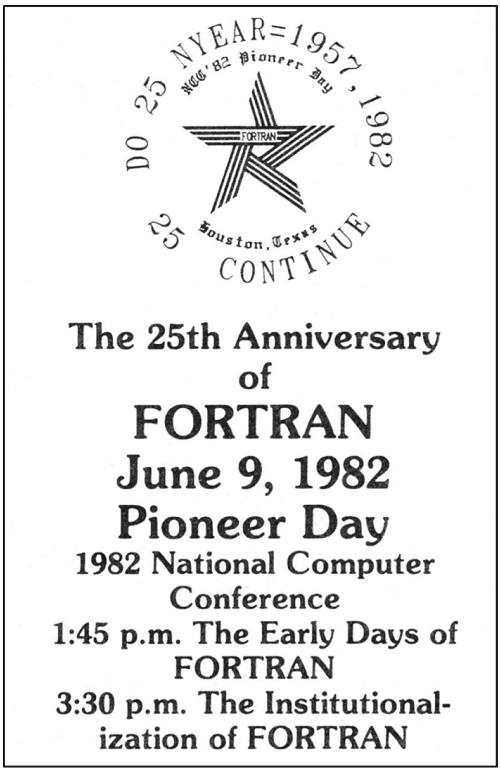

Fig. 1. Advertisement for an early Pioneer Day celebrating FORTRAN

At the end of his term, the *Annals* published a special issue in 1996 edited by Betty Campbell to commemorate the fiftieth anniversary of ENIAC. Dedicated to women in computing, the five articles ran from Ada Lovelace to the future synergy between women's studies and computer science [5]. At that time, computer science faculty were often members of mathematics or science departments. Computer science experts were already facing a credibility problem – computing was often considered an auxiliary task by skilled staff, not an academic discipline.

AFIPS, which had been the representative of the United States in the formation of IFIP in 1960, was itself an umbrella organization for three groups: the Association for Computing Machinery (ACM), the American Institute of Electrical Engineers (AIEE), and the Institute of Radio Engineers (IRE). The latter two merged in 1963 to form the Institute of Electrical and Electronics Engineers (IEEE). AFIPS abruptly dissolved in 1990, leaving behind its constituent organizations. IEEE took over the publication of the *Annals*, and ACM took over AFIPS's position as the United States delegate for IFIP.

When AFIPS ceased its activities, Pioneer Days no longer had a venue. Consequently, Lee approached IFIP's Technical Committee 9 as a possible sponsor. In 1992, TC 9 formed a new working group, 9.7, which would be responsible for Pioneer Days and have Lee as chair. As seen in Fig. 2, six more Pioneer Days were organized for the hosts of IFIP's World Computer Conferences to promote their countries' contributions to the history of computing, and the many years of coordinating recognition of important figures in the history of computing led Lee to publish an anthology, *Computer Pioneers,* in 1995.

Year	Description
1994	Germany, honoring Konrad Zuse
1996	Australia
1998	Austria/Hungary, Mailüfterl (May Breeze) computer in 1958
2000	China
2002	Montreal
2004	France

Fig. 2. WG 9.7 Pioneer Days at IFIP World Computing Conferences.

2.2 Expansion

The second chair of Working Group 9.7 was John Impagliazzo, who was also an early promoter of the history of computing. In 1988, he organized a conference on the legacy of John von Neuman at Hofstra University. He then began to incorporate history into his computing classes [6]. Impagliazzo invited Lee to be a speaker at a 1996 ACM conference on computing education. That same year, at the WCC in Australia, they devised a plan to create a guide for teaching history as part of the computing curriculum. Impagliazzo became the chair of an ad-hoc committee to create a report; the other members were Lee; Gordon Davies, the chair of IFIP TC3 on education; and historians Michael Williams and Martin Campbell-Kelly. The final report, approved by TC 3 and TC 9 in 1998, was entitled "History in the Computing Curriculum" and published in the *IEEE Annals of the History of Computing* the following year.

Impagliazzo took over as chair of WG 9.7 in 2001. At the time, there were only a few members. Impagliazzo, though, had a vision of widening the membership. Starting in 2003, he organized the first WG 9.7 workshop. As seen in Fig. 3, this resulted in a series of workshops focused on Nordic and Soviet computing and workshops on computing education.

Year	Description	Editors
Education and Computing		
1998	History in the Computing Curriculum IFIP TC3 / TC9 Joint Task Group *Annals of the History of Computing*, January 1999	John Impagliazzo
2004	"History of Computing and Education" World Computer Congress, Toulouse, France	John A. N. Lee, John Impagliazzo
2006	"History of Computing and Education 2" World Computer Congress, Santiago, Chile	John Impagliazzo
2008	"History of Computing and Education 3" World Computer Congress, Milan, Italy	John Impagliazzo.
2014	"Reflections on the History of Computers in Education: Early Use of Computers and Teaching about Computing in Schools"	Arthur Tatnall, Bill Davey
Nordic Computing		
2003	"History of Nordic Computing" Trondheim, Norway	Janis Bubenko, John Impagliazzo, Arne Soelvberg
2007	"History of Nordic Computing 2" Turku, Finland	John Impagliazzo, Timo Järvi, Petri Paju
2010	"History of Nordic Computing 3" Stockholm, Sweden	John Impagliazzo, Per Lundin, Benkt Wangler
2014	"History of Nordic Computing 4" Copenhagen, Denmark	Christian Gram, Per Rasmussen, Søren Duus Østergaard
Computing in Russia and Eastern Europe		
2006	"Perspectives on Soviet and Russian Computing" Petrozavodsk, Russia.	John Impagliazzo, Eduard Proydakov
2018	"Histories of Computing in Eastern Europe" 24th IFIP World Computer Congress in Poznań, Poland	Christopher Leslie, Martin Schmitt
Generalist and Public Engagement		
2010	"History of Computing: Learning from the Past" Brisbane, Australia	Arthur Tatnall
2012	"Reflections on the History of Computing: Preserving Memories and Sharing Stories" Survey Subline of IFIP AICT	Arthur Tatnall
2013	"Making the History of Computing Relevant" London, England	Arthur Tatnall, Tilly Blyth, Roger Johnson
2016	"International Communities of Invention and Innovation" New York City, United States	Arthur Tatnall, Christopher Leslie

Fig. 3. Working Group 9.7 workshops and publications

During Impagliazzo's tenure, WG 9.7 membership increased from six to sixty members [6]. The protocol of the early days when Lee was chair persisted, with each workshop continuing the collaborative process. Draft papers were circulated before the workshop,

and participants received comments from their peers that they could use to revise their papers for the post-workshop proceedings.

In 2007, Arthur Tatnall took over as chair of the working group, presiding over a successful workshop in Brisbane and another at the London Science Museum, which included an excursion to Bletchley Park. In 2012, Tatnall edited the first "survey" volume in the Springer subseries of AICT; a second volume of this type appeared in 2014 (see Fig. 1). Tatnall recruited the current chair, Christopher Leslie, to host a workshop at New York University. Participants in this workshop visited Google's New York offices and Nokia Bell Labs in New Jersey. Leslie became chair in 2017 and oversaw a workshop about computing in eastern Europe concurrent with IFIP's World Computer Congress in 2018. The group's plan for the 2020 workshop focusing on the history of computing in Asia has been delayed by COVID-19.

3 WG 9.7 Themes

The group has focused on three focus areas: pedagogy, regional/transnational histories, and public engagement. Our workshops and proceedings volumes typically offer papers from all three themes.

3.1 Pedagogy

One of the first publications from WG 9.7 was the report of the history task force, which was published in the *Annals* in 1999 [7]. At the time, some professional associations had guidelines regarding including social contexts or ethics of computing for computer science undergraduates. Still, these guidelines should have paid more attention to the history of computing. The report advocated the inclusion of standalone courses or modules for students studying computing and history of computing courses for students outside of computing majors.

At the time, few full-length books were suitable for this endeavor – such as Augarten [8], Campbell-Kelly and Asprey [9], Freiberger [10], Levy [11], Pugh [12], Williams [13], and Stern [14] – so the report authors advocated for the inclusion of articles from the *Annals* to supplement coursework. This early pedagogical consideration sought to develop a basic curriculum that briefly but accurately covered the fundamental themes of history, suitable for introductory or even advanced computer science or electrical engineering courses. From the start, it was clear that history could be incorporated into computing curricula in several ways, including developing online resources [15].

The pedagogical angle of WG 9.7's activities can be construed in one of two ways. The initial focus was on how history can be used in the training of computing professionals. Soon, though, the chronicle of how computing was introduced as a discipline became an additional focus. These two topics overlap to a certain extent. The study of how and why computers were introduced as a topic of study in universities, for instance, is not quite the same as how computers developed as a technology. The history of attempts to educate computing students has resulted in amazing stories at WG 9.7 workshops over the years. For instance, Szabó [16] documented how "chalk programming" was used to overcome the lack of computers at the University of Szeged in postwar Hungary.

The proceedings volumes have, to a certain extent, fulfilled the desire of John A. N. Lee and John Impagliazzo to have resources for teaching and learning about the broad history of computing. Consider how these clusters of articles could improve the understanding of computing for undergraduates:

- A pair of articles on the Nordic project to computerize graphic production in the 1980s [17, 18]. Following their desire to include workers in all phases of the innovation process, computing professionals worked with the workers who would eventually use this system. Pelle Ehn's use of simulated "cardboard computers" is an excellent example of what has come to be known as participatory, democratic, or feminist design.
- A collection of articles considering the complexity of technology transfer and the failure of determinist notions about technology, which suggests that devices are inseparable from their social contexts. Sikora, for instance, writes about Poland's unenviable position in the middle of CoCom and COMECON countries [19]. Leslie describes the failure of determinist interpretations of technology transfer that informed CoCom [20].
- A set of articles about international experiences. Jiménez et al. [21] write about computer science in Cuba before 1990. Torro writes about the early use of computers in Chilean education [22].
- The importance of international collaboration in the development of the Internet. Lundh [23] and Spilling [24] discuss early TCP/IP connections to Norway.
- A cluster of articles about the history of international collaboration in computing. Fet [25] describes Norbert Weiner's visit to Russia in 1960. Dittmann [26] describes an experimental network connection across the Iron Curtain in 1977, when the U.S. conducted the three-network test that was the proof of concept for TCP/IP. Schmitt [27] writes about when East Germany imported a U.S. army computer for its financial system.

3.2 Regional and Transnational Histories

Because of the international makeup of IFIP, WG 9.7 has successfully incorporated non-US participants into the overall history of computing. Our proceedings volumes record events that are only sometimes submitted to other venues. They also challenge preconceptions lurking in the background of other well-known works. Significantly, these English-language volumes facilitate international conversations, helping scholars from different countries become aware of significant developments and new thinking that might be harder to access if published in local languages.

The proceedings of WG 9.7 workshops are not comprehensive volumes that provide authoritative overviews of computing. As such, they do not purport to orient readers to a single interpretation of the field; the only organizing theme is a desire to broaden the understanding of the history of computing, resulting in a reference work with an assortment of points of view. Although they may need a more comprehensive scope, in an impressionistic fashion, they provide insights not available elsewhere and citations to texts that can help new research in the field. The various national settings allow us to reconsider the importance of national projects that need to be more well-known internationally.

One important lesson from these local histories is how national and regional priorities influence what kind of computing projects are funded and attempted. For instance, perusing the four volumes of Nordic Computing proceedings shows the region's commitment to human welfare when SAGE was adapted for the SABRE airline reservation system. These volumes document the many uses of time-sharing systems for purposes related to socialized medicine, such as patient information, prescriptions, reporting of test results, and more, long before the Internet came to be. These stories serve as a reminder of the cultural pull on innovation, providing funding and leadership for projects that fit in with a region's ideological priorities.

Another critical theme running through the regional WG 9.7 workshops is reconsidering the notion of failure. Telling the history of computing from a core to the supposed periphery leads to the impression that the success of companies like IBM and networks like the TCP/IP Internet resulted from a technical equivalent of natural selection. WG 9.7 papers challenge this simplistic notion of a one-way transfer of technology and the nationalist bias in histories that presume there are simple winners and losers in the technological ecosystem. For instance, at the first Nordic computing workshop, Petri Paju [28] argued that the supposed failure of Finland's ESKO computer project should be reconsidered. To some, Paju notes, the single computer that emerged in 1960 was "out-dated" (p. 80) or "irrelevant" (p. 81). The fact that IBM exported working computers to Finland has led to that company's assertion that they were the progenitor of Finland's computing industry. Paju counters with observations about how the project trained the first group of computing experts in the country, who were then available for other projects, helping to provide IBM Finland with workers that helped them become the country's biggest supplier of computing services. Additionally, an offshoot of this project "evolved into the Electronics Department of the Nokia Company" (p. 93). In the same volume, Carlsson [29] notes that Sweden's effort to develop computing devices in the early years might be viewed as a failure because it did not result in a national computer industry. However, another viewpoint is that computers were tools for establishing computing practices. Early computing as a social activity, where experts studied, learned, and met with international counterparts, were successes. In this way, the research helped universities develop expertise in training programmers and setting up organizations. He concludes:

> I wish to stress the importance of seeing the computers as tools for the renewal of the engineering profession and of scientific research and the society as a whole in the years immediately after World War II, rather than techno-scientific ends in themselves or, for that matter, as purely military tools. [30, p. 106]

This theme has often been repeated. For instance, in the 2018 workshop in Poznan, Kitova and Kitov [30, 31] challenged the notion that computing in the former Soviet Union was a failure. The "InterNyet" concept [32], as alluring as it might be, does not fit the lived experience of computing in the USSR. By studying the insights offered by WG 9.7 workshops, one sees that the proliferation of devices and market dominance are not the sole criteria for success or failure.

One way WG 9.7 workshops challenge popular thinking in the history of computing is that technological devices are only transported from one national context to another with

adaptation and development. For instance, one consistent theme in the Nordic Computing workshops was how interaction with IBM had indirect and unexpected consequences. Imported computing technology must be modified to fit local contexts. In this way, the papers published in WG 9.7 can help improve the understanding of technology transfer.

The tendency to think of computing and the Internet as primarily a result of U.S. innovations has resulted in a bias in typical histories. However, this predisposition provides WG 9.7 members an opportunity to rethink those stories. Tatarchenko [33], for instance, points to a 1966 cooperation agreement between France and the USSR, which fit in with both countries' desire to break through U.S. hegemony in computing. The first-person accounts in our proceedings volumes describe how innovation and technology transfer occur. Baehrs [34], for instance, describes the MRAMOR Workstation for the production of *Pravda.* Other phototypesetters were inadequate for the Russian language and, for that matter, the language of other Soviet countries. The new system could produce magazines in different languages on one workstation.

These regional and transnational narratives serve an essential function. As computers become ubiquitous and integrated with daily life, it is crucial to build up stores of narratives that help people understand their significance and contingency. Like any other technical achievement, computing technology is not developed in a vacuum. Local pressures and interests impact its development, which is an important lesson for future innovators and analysts of computing devices.

3.3 Public Engagement

The third broad theme addressed by Working Group 9.7 relates to efforts to educate the public about the history of computing. Many WG 9.7 workshops have papers from museum curators and other professionals interested in the public understanding of computing history. Still, a few workshops and proceedings volumes consider this theme in full.

In 2013, the Working Group sponsored a robust, well-attended workshop at the London Science Museum, which Google sponsored. In addition to paper presentations, delegates could view an exhibit about Alan Turing at the museum. Delegates also visited Bletchley Park, the site of England's codebreaking team during World War II and now the home of the National Computing Museum. We saw a demonstration of the (rebuilt) Colossus computer designed to crack wartime ciphers there. This allowed historians to learn about the opportunities and challenges related to engaging the public with the history of computing. The proceedings volume [35] contains many papers associated with curating museum exhibits, using primary sources, and utilizing artifacts for public education.

Other proceedings volumes contain papers helpful in developing or managing museum collections outside well-known institutions like the London Science Museum or the Computer History Museum in Mountain View, California. Among several papers at the second History of Nordic Computing workshop was a paper describing the collaborative effort to preserve source materials relating to Swedish computing from 1950 to 1980. The author noted the committee structure used to negotiate between the practitioners and historians [36]. Another example of this type of paper is a survey of strategies for gaining funding for computer history museums conducted to aid institutions in Latvia. It

also provides insight to professionals at any organization hoping to expand the scope of their support [37]. In this way, WG 9.7 workshops help professionals with networking and information sharing that can help support the international history of computing.

In tandem with Working Group 9.7's regional histories, our support for international museums and exhibitions is essential to preserve the many efforts at computerization that might otherwise fall by the wayside. For instance, the Monash Museum of Computing History preserves the MONECS project, which successfully provided hands-on programming experience to students when there were limited computing resources in the 1970s [38]. Similarly, the Polytechnic Museum in Moscow holds the only extant Ural-1 computer, one of hundreds of devices developed in the 1960s in the shadow of CoCom export restrictions that prohibited technology transfer to countries aligned with the Soviet Union [39]. Through our workshop proceedings, one can learn about collections and archives that contain relevant research material that cannot be obtained elsewhere.

To reach a broader audience, our delegates have described their efforts to establish virtual museums, creating opportunities for the international community to use archival and other materials to expand their historical analyses. Edward Proydakov's Virtual Computer Museum, created in 1997, and other online sites were described in 2009 [40]; an update on this project was provided on the site's twentieth anniversary [41]. The curators of these resources state their importance directly: one reason to construct virtual museums of computing history is that a western perspective often dominates classrooms, leaving out perspectives on Soviet and eastern European computing. Through the Web, the curators hope to make a broader range of research material available to historians interested in international histories [42]. The imprimatur of major institutions and the ease of access afforded by the Web should make it more likely that these resources will be used.

4 Future Directions

The delegates to Working Group 9.7 expect our future activities to remain within the three focus areas that have been its core competencies, even though we know that we must adapt and improve. Examining the history of the working group provides clues to how we can improve the history of computing with a flair particular to the already established traditions. In addition, we will benefit from the other working groups in Technical Committee 9 and the committee's leadership overall.

4.1 Increasing Breadth and Visibility

Working Group 9.7's workshops and proceedings volumes have added depth and complexity to the historical study of computing. A goal for the coming years should be to increase the scope and impact of this research.

To be truly international, WG 9.7 must continue its effort to broaden the locations and topics of its workshops. Partnering with IFIP member societies in each country is a reasonable approach, as well as tapping our delegates to serve as hosts. The lessons learned during the COVID-19 pandemic have clarified that hybrid conferences are viable

and allow participation from people who find it difficult to travel. Although in-person meetings provide some advantages for networking, it would be possible to invite professionals from various regions to share their research even if they cannot attend in person.

Regarding greater visibility and a higher number of citations, the WG might consider guest-edited editions of relevant academic journals for selected papers from its workshops. Our proceedings volumes consist of selected, peer-reviewed articles. They are published in Springer's Advances in Information and Computer Technology, ranked by SCI (in the subsets SCIE and SSCI [43]). Even though our members produce excellent work, including the word "proceedings" in our volume titles precludes some academic departments from considering the publications for appointments and promotions. WG leadership should work with the delegates who have advanced research to publish shorter, workshop versions of their papers in the proceedings and then expand and revise papers in relevant journals.

4.2 Archives and Museums in STEM Curricula

The constituent groups of WG 9.7 – with innovation in history, pedagogy, and public engagement – demonstrate novel synergies that can provide insight into future work. Using artifacts found in museums and archives not only can improve scholarly work but also have the potential to improve students' experiences in the classroom.

The so-called maker culture has captivated the attention of programs seeking to educate the next generation of scientists and engineers. Students in science and engineering are now accustomed to more hands-on, project-based activities. Finding ways to do so in the humanities is necessary for the history of computing to remain accessible to those student populations. A tempting line of inquiry could lead to innovation in teaching history. Archive-based research is also an avenue.

Delegates to WG 9.7 have already been forging a path into this domain. In recent years, WG 9.7 members have shown innovation in how teaching can use history. For instance, at the 2013 London workshop, Cignoni and Gadducci [44] described their techniques for using older computers in education through rebuilding or simulation. Breaking new ground in historical awareness, some members of our group are part of the rising wave of "retrocomputing," i.e., the rise of retro machine clubs, websites, and YouTube channels. We promote the use of growing museums and extensive private collections. Museums and significant private collections are growing, and the prices of machines with parameters lower than the modern refrigerator reach thousands of dollars at online auctions [44, 45]. Using historical artifacts also interesting in the way they show how contexts and definitions shape development [38, p. 116].

Using archival material to improve STEM education is another possibility already considered. This modality is particularly intriguing given the work by WG 9.7 delegates to digitize and promote their archival collections. The present author has demonstrated using archival material in classes for engineering students (e.g., suggestions for classroom use are found in [46]). These activities do not have to be sponsored by large entities; [47] describes efforts originated by a university archivist with ordinary institutional holdings. Librarians and archivists have increased their attention to the aspects of

their collections that might interest STEM educators [48]. This could and should lead to crafting more innovation in the history of computing classrooms.

In this domain, the working group recognizes that all entities have a role to play. Indeed, extensive, established computing museums often started as small collections. Smaller collections, therefore, have critical aspirational goals. In addition, many smaller groups do important, regional STEM outreach that larger institutions cannot. WG 9.7 welcomes contributions from these entities, encouraging them to learn from each other and working historians. In addition to their role in STEM outreach, hobbyist groups and smaller collections can capture local narratives that might not otherwise be recorded and preserved.

This theme offers possible synergies with IFIP TC 3.

4.3 Computing Histories in the Anthropocene

TC 9's Human Choice and Computers 14 conference with the theme "This Changes Everything" made it clear that there is vigorous interest in topics at the intersection of sustainability and ICT [49]. This urgent theme should be one aspect of WG 9.7's future work. Historical studies have an essential role to play: ensuring that the histories we tell prepare our audiences for the collective, long-term efforts required to face climate change.

Geologists have proposed that human activity has dramatically impacted the current epoch and that a new period should be named the Anthropocene. Although there is no current consensus on when this period began – human activities as early as the cultivation of crops to as late as the detonation of nuclear weapons have been proposed [50] – the impact of human activity has outpaced the forces of nature. The Anthropocene is marked by the loss of biodiversity, rising sea levels, and the release of greenhouse gasses by cultivating livestock and burning fossil fuels.

The history of computing might seem far removed from these biological and geological concerns, but scholars in the humanities have pointed out how historical methodologies need to be revised in order to generate support for global, multi-generational action. Helping people adopt a mindset encompassing geologic timeframes can be a role for the humanities. Some critics, like Chakrabarty [51], suggest that typical historical approaches must be reexamined in light of the planet's challenges. Metanarratives about the emergence of the modern individual and human freedom coincide with the increasing use of fossil fuel: "Our freedoms so far have been energy intensive." Chakrabarty suggests that the path into the Anthropocene was not inevitable. Still, now that humanity has arrived, "the way out of our current predicament cannot but refer to the idea of deploying reason in global, collective public life" (pp. 32, 34). The sense of progress, including technological progress, is tied up with the exploitation of the planet, even though only fifteen or so nations representing just one-fifth of humanity are "historically responsible for most of the emissions of greenhouse gases" (p. 57). One thing needed to tackle this situation is understanding that the connection between globalization and fossil fuels was a technological choice by a small swath of humanity, not an inevitable stage in the globe's development. Historians of technology have the opportunity to describe this notion of choice and inculcate an appreciation for the consequences of choices.

Ghosh [52] has made further suggestions on how the humanities could better equip world citizens to face the challenges of the Anthropocene. He evokes the notion of "derangement" to describe how little the humanities shed light on the planet's crisis. Imagining a future time when the consequences of climate change will be keenly felt, he warns scholars and artists that future citizens are likely to look back on present-day works of art and the humanities as "modes of concealment that prevented people from recognizing the realities of their plight" (p. 11). To prevent this occurrence, Ghosh makes a critique of the ways novels conceal the climate crisis: settings are concealing when they suggest each location is isolated from the rest of the world, and actions are concealing when they can be resolved within a few years of an individual's lifespan. These insights can be extrapolated to the practice of history.

Modern science and technology studies, emphasizing continuities and non-linear development paths, fit in with Ghosh's suggestion that the arts and humanities should promote a sense of interconnectedness, breaking national boundaries. Stories based on individuals in isolated environments reflect and reinforce the loss of collective destinies. He writes, "The acceleration in carbon emissions and the turn away from the collective are both … effects of that aspect of modernity that sees time [as] … a continuous and irreversible forward movement, led by an avant-garde" (p. 79). The current "carbon economy" that is precipitating the climate crisis is not unified. However, it is characterized by "admixture and interbreeding" (p. 108). Ghosh's insights are consonant with any history of technology, especially when incorporating insights from discussions seen in WG 9.7. Our proceedings volumes are full of papers describing how technological progress is not inevitable but interconnected, characterized by many efforts across time from people all over the globe. There is little feeling that individuals in a few elite countries created disruptive innovations and that individuals in other countries had no innovative contributions. Scholars also enjoy pointing out precursors to current devices, demonstrating the influence of multi-generational efforts. These themes deserve greater emphasis moving forward. The future history of computing should encourage historical analysis that shows the long-term, concerted effort in technological advance.

Scholars can and should also draw attention to how imperialism's inertia impacts technological development and exacerbates inequality. As an exemplar, consider the work of Starosielski [53], who was a guest speaker at our New York workshop. The network of undersea cables that is the backbone of international ICT follows the lanes of former shipping and communication networks. This legacy can be used to show how modern infrastructure, at the very least, benefits from former carbon-intensive activities.

The culture surrounding undersea cables challenges thinking that these regions are on the periphery of technological development. Craig Santos Perez, a poet born in Guam, has expressed his distrust for emotional responses to vulnerable island nations' plight. They are not "simply victims of the Anthropocene," Perez [54] writes; "the islands have produced, and continue to produce, the Anthropocene." Because of their relative isolation and low visibility, the islands have repeatedly been used to support planet-changing human activities such as "plantations, nuclear testing grounds, military bases, extraction sites, etc." (p. 430). Guam's history has been intertwined with globalization, initially as a waystation for ships crossing the Pacific where they could resupply themselves with coal. The first trans-Pacific telegraph cable was laid in 1903, running through Guam. The

island's historical role as a waypoint meant that Guam became the telecommunication juncture between the U.S. and China, the Philippines, and Japan in the Internet era. Santos writes that bringing attention to this legacy can be an impetus toward the islands' sense that their communities can impact technological choice.

As seen in the other chapters in this volume, Anthropocene studies suggests future collaboration with WG 9.2 and WG 9.9.

4.4 Diversity, Inclusion, and Equity

Another place where WG 9.7 is poised to lead histories of computing is the recent efforts to support diversity, equity, and inclusion (DEI) in the professions, particularly in science and engineering. A curious fact about diversity in computing is that many women were involved in the advent of digital computers. Soon, they were systematically denied access to the professions by degree requirements and other professional hurdles (for an overview, see [55]). Kleiman [56] has recently published a study of the women who made ENIAC a practical success. Historians and other humanities professionals are well-positioned to address DEI in concert with other efforts in their domains.

DEI has not been an explicit theme of the group, but it is clear that it has been on the minds of delegates. The first chair of Working Group 9.7, John A. N. Lee, started his career as a civil engineer and needed the help of a computer – a woman with a calculating device – to complete his research. Looking back on those days, Lee remembers how he failed to give credit in his thesis to the woman who did the calculations to solve the partial differential equations he relied on [5]. His work to correct mistakes in computing history, including his effort to remind the profession that women like Ada Lovelace and Grace Hopper played irreplaceable roles in computing, coincided with the early years of WG 9.7.

In addition, one can find papers that shed light on this theme in the proceedings volumes. For instance, the first workshop on Nordic Computing included the personal reflections of the first woman in Sweden to receive a Ph.D. in information science in 1979. Lindencrona [57] points out that, as she was looking for her first job, it seemed like there was an "implicit or explicit" assumption that men would have long-term careers, but this was not true for women. Also, papers about providing educational access through computers are implicitly, although not always directly, tied to a desire to support DEI. Those themes could be directly addressed in the future.

The history of computing also allows us to enhance the understanding of DEI. For instance, the U.S. notion that white and Asian men are disproportionately represented in science, engineering, and computing needs some nuance. This truism may apply to students, professors, and professionals with ties to China, India, Korea, and Japan. Nevertheless, it must be revised when considering individuals from southeast Asia (e.g., Cambodia, Thailand, and Laos). Although the latter are in Asia, their engineers find different success in obtaining access to education and jobs. Regional histories can play a role, then, in helping to refine the understanding of inequality and shape efforts to ameliorate it.

This future work indicates an opportunity to collaborate with Working Group 9.8 (Gender, Diversity, and ICT). Also, working with Working Group 9.4 (Social Implications of Computers in Developing Countries) would be beneficial.

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From *Women* to *Gender and Diversity*

Working Group 9.8: Gender, Diversity, and ICT

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Abstract. In this chapter, we look carefully into the genealogy and formation of WG 9.8: Gender, Diversity, and ICT. In our inquiry, we have looked into proceedings available online and via university libraries, read yearly reports from the working group, and reached out to prior participants who have played a part in forming and consolidating the working group by way of organizing the Work and Computerization (WWC) conference. The WG 9.8 has, since its early formation in the beginning of the 1980s, been concerned about women's experiences and conditions in relation to an automated and digitalized working life. This focus has prevailed in the lifespan of the working group and has been accompanied by other foci, such as gender and power relations. Thus, in unfolding the history of the working group, we come across technological phenomena and theoretical concepts that are still in use and/or are revived. We will, for example, meet the timely concept 'invisible work' and we will meet former conversations about the technology 'Artificial Intelligence'. With such reading of the history of WG 9.8 we will encounter a history where technology is deeply intertwined with the social, the cultural, and the political.

Keywords: Diversity · Feminism · Gender · Women in Computing

1 Foundational Activities

WG 9.8. Gender, Diversity, and ICT's early formation took place at the Work and Computerization (WWC) conference, which was held as part of WG 9.1's *Computers and Work*. The first WWC conference took place in Riva del Sole, Italy, 17–21 September 1984. In the proceedings, we can read that: "The rapid introduction of new computer based technologies is threatening women's jobs and transforming the roles women play in the workplace" [1, p. 3]. The impact of computerization on women's work and conditions had been brought up in various contexts including WG 9.1. At a meeting held in Stockholm, Sweden, Boel Carlsson and Ingela Larsson proposed a conference on Women, Work and Computerization at a meeting of the working group Computers and Work (IFIP TC 9 WG 9.1) in May 1983 in Stockholm" [1, pp. 3–6]. At this meeting,

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a tentative decision was made, which enabled the organizers to continue with the plans working for a WWC conference to be held in 1984. The final decision to support the WWC conference was made at the TC 9 meeting held 16–18 September 1983 in Paris. This meeting was held in conjunction with the IFIP 9th World Computer Congress (personal communication with Ingela Larsson).

Including the program committee (8 people) and organizing committee (4 people), 94 attendees were registered at the first WWC conference. Most participants were from a European country with a predominance of Nordic participants. Participants from the USA and Australia also took part. The conference revolved around seven themes: conference report; office automation, work, and skill; remote work or telecommuting; manufacturing – women and computers in industrial work; practice and participation in systems design; education and training; country reports. Twenty-eight contributions, including reports from three working groups, are presented in the proceedings assigned to the above-mentioned themes. Gunilla Bradley (now professor emerita), for example, presented her paper "Computer and Work Content, Work Load and Stress: Analyses and Women's Participation Strategies" under the theme Practice and Participation in Systems Design. Bradley has participated in HCC conferences, in the working groups 9.2, 9.8, and 9.10. In 1998, Bradley received the IFIP Naumar Award. Ina Wagner, a member of the program committee, presented her paper "Women in Automated Office Contradictory Experiences: Individual and Collective Coping Strategies." Professor emerita Ina Wagner attended several WWC conferences as member of organizing/program committees, keynote presenter, and as presenter of papers. She was the chair of WG 9.1 between 1992–95 as well.

Reading the proceedings, it becomes obvious how the contributions at the conference highlight women's experiences and conditions due to the computerization of working life. These are issues that were rather invisible in research and discussions of the time. This is also apparent in the country reports presented at the conference. Reports from six countries – Austria, France, Denmark, Finland, Norway, Sweden – were presented along commentaries from Ina Wagner's [1, pp. 301–2]. Wagner notes four shared concerns included in the reports:

- "the specific implications of computerization for the work of women have been neglected"
- "the dominance of the male model in assessing computerization, the perception of computer applications is restricted to traditional patterns of dealing with questions of work"
- "the unions as the central institutions that carry the political-moral obligation to cover these neglected issues"
- "there is an alarming lack of meaningful statistical data in all countries, both on the diffusion of specific computer technologies in different areas of the economy and on the implications of computerization for working women and (men)."

Subsequent WWC conferences were held in Dublin, Ireland in 1986 (second) and in Amsterdam in 1988 (third). Boel Carlsson and Ingela Larsson were also involved in organizing the second WWC conference. A proceedings volume was not published from the second WWC conference. Ina Wagner's reflection from the second conference is that it "may have been a bit too early after the first one because we received few submissions"

(personal communication). The submissions to the third conference Women, Work, and Computerization: Forming New Alliances were published in [2].

At the fourth WWC conference, which was held in Helsinki, Finland, 125 persons participated. Most of the attendees were from Finland (29) whereas 15 came from other parts of the Nordic countries and 47 from other countries in Europe. Seven participants were from USA and Canada, three from Australia, one from Africa, and one from Asia. Seven themes were included in the conference program: improving the quality of women's work, labor markets within forms, division of labor, and computerization in different countries; female orientation in systems design; training and education; women in EDP jobs; gender, symbols and technology [3].

The keynote contributions presented in Helsinki were, e.g., Sara Heinämaa's with the title "Women's Place in Artificial Intelligence: Observations on Metaphors of Thought and Knowledge" and Swasti Mitter's "Computer-Aided Manufacturing and Women's employment: A Global Critique of Post-Fordism." Thus, Heinämaa highlighted AI of that time and Mitter positioned her talk in a global context. Both topics are still relevant. Invisible work addressed in Leigh Star's paper is an appearing theme at the conference as well as in later research in, e.g., Feminist/Gender research, Science and Technology Studies, Computer Supported Cooperative Work. Further, Joan Greenbaum paid attention to Participatory Design in her keynote. She has been a frequent participant at the WWC conferences. Another frequent scholar invited to WWC conferences is Lucy Suchman who closed the fourth WWC conference with Closing Remarks on the 4th Conference on Women, Work and Computerization: Identities and Differences.

In the fourth WWC conference, the organizers followed the tradition established at the first WWC conference to share working group reports from each theme. Individual contributions to be mentioned are Marja Vehviläinen's who has been involved in a number of WWC conferences as a member of organizing committees/program committees, responsible for panels, and a presenter of papers. In Helsinki she presented her paper "Gender in Information Systems Development: A Women Office Worker's Standpoint" [4].

Cecilie Crutzen, who was the chair of WG 9.8 between 2009–2011, also attended several WWC conferences. Her paper *Women in Informatics at the Open University of Netherlands* was presented in Helsinki [5]. The papers "Structural Factors which Condition the Computerization of Women's Labour in Spain" [6] and "Women's Work and Challenges of Computerization: The Nigerian Case" [7] extended the conference to include papers from other countries in Europe and Africa beyond the Nordic countries and the UK.

In the introduction to the proceedings of the fifth WWC conference, Alison Adam and Jenny Owen [8, p. 2] write:

> Clearly this collection of papers contains a very mixed picture, regarding gender – both in the descriptive accounts of ongoing projects, and in the more theoretical contributions. However, the increasing confidence with which women and men are prepared to approach these issues coupled with the positive way that many of the authors tackle their subject, means that the tone of the conference is most definitely upbeat regarding the aim of "breaking old boundaries and building new forms."

The mixed picture is illustrated in the invited keynotes with participation of scholars (Joan Greenbaum, Lucy Suchman, Ina Wagner, and Christina Preston) and a representative from a computer company (Anita Borg). An Open Day a cooperation with the grassroot organization Women in Computing (WiC) with seven contributions was another activity to demonstrate the openness created in previous WWC conferences and also IFIP's idea of building communities between various practitioners. Fifty-two contributions including a workshop were divided in five themes: community, communication and information networks; information technology, flexibility and restructuring; information systems design and user-centered perspectives; education, training and learning; feminist theoretical perspectives on power, knowledge, and technology. This shows a rich variety in topics in addition to contributions located in various contexts. The papers were published [8].

A mixed picture, as Adam and Owen describe the contributions to the fifth WWC, can also be used to characterize the papers presented at the subsequent WWC conferences held in Bonn (1997) and Vancouver (2000) respectively: gender, gendered, feminist, feminist approach, women's, women were included in the titles. The contributions to the sixth WWC conference were published in [9].

2 A New Working Group

In 1998 it was decided to establish a new working group within IFIP Technical Committee 9: WG 9.8, Women and Information Technology.

In the annual report, Pertti Järvinen writes: "The next WWC (Women, Work and Computerization) conference will be organized in Vancouver, probably end of May in the year 2000. The WG 9.1 supports the founding of the new working group (WWC) within TC 9. The WWC group is preparing the new WG" [10]. However, the new working group was pending until 2001 when the decision was accomplished in the new WG, Women and Information Technology. Computerization/computers were thus replaced by information technology to reflect a new established concept due to the development of technology.

The seventh WWC conference was held in Vancouver, Canada [11]. The plan was to continue with the WWC conference. However, it is unclear where it was supposed to be held – in some annual reports Australia is mentioned and in others, India. It is also unclear why the plan to continue with WWC conference was not realized. Professor Ellen Balka, the chair of the seventh conference, did not remember where the next WWC conference was supposed to be held. However, she shared the following reflection:

> One of the other points that came up for discussion in relation to subsequent meetings was whether or not we still needed WWC in that it was becoming easier for people to find places to publish feminist work or work about women. Interestingly, some women also felt they received more credit academically when they published work in venues which did not focus on women, so between the cost financially, the potential availability of other places to publish and the perceived advantage in the academic credit machine of publishing in an outlet not focused on women were probably all significant contributors to the end of WWC. (Personal communication)

Regardless of whether the conference was organized or not, the new working group could have held activities. However, it seems to have been difficulties to continue with activities in WG 9.8 when the organization of WWC conference did not continue. This is highlighted by Chrisanth Avergou who writes: "WG 9.8, although it had its origin in an active core of members which had organized very successful conferences as a specialist group of WG9.1, did not manage to organize any events since its establishment as a Working Group in 2001" [12, p. 138].

Due to an inactive working group Avergou made efforts to revive the group. The efforts are presented in the following way:

> The revival of WG 9.8 on Women ant IT was more protracted. The TC's communication with the Group's chairperson was completely broken by 2006 and I invited one of the WG members that I knew to be particularly keen on the cause of IT and women to re-launch the Group. Unfortunately she too was overburdened with her academic duties and unable to devote time to this task; she resigned two years later without making progress. I then approached Marja Vehviläinen, who agreed to organize a WG 9.8 meeting at the 5th European Symposium on Gender & ICT in Bremen, in March 2009. The meeting proved successful; not one, but a team of women undertook the task of re-launching WG9.8., with Cecile Crutzen acting at present as chair. This collective responsibility is a welcome innovation in the TC, breaking the hierarchical officers' structure. The Group change its name to ICT and Gender Diversity and redrew its aims and scope accordingly. The have a similar policy to WG9.1, of joint conferences with other established IT and women conferences. [12, p. 142]

It is unclear whether WG 9.8 has had any activities after the meeting held in Bremen in 2009. However, a meeting was held in Umeå in connection with the 6th European Symposium on Gender & ICT. It was held depending on Cecilie Crutzen's, the chair of WG 9.8, retirement. One outcome of the meeting was to nominate persons to be a candidate to chair the WG 9.8. The nominations were supposed to be sent to Cecile Crutzen before September 1, 2011 (Crutzen, 2011, minutes of the WG 9.8 meeting in Umeå). However, it is unclear whether there were any nominations of a chair or if the team that was selected in Bremen continue with the revival of the working group.

Of the annual reports and above all Diane Whitehouse's, chair of TC 9 between 2014–17, efforts, it took several years to find persons who were willing to be responsible as a chair, co-chair, and secretary of WG 9.8.

Diane Whitehouse, chair of TC 9 between 2014–17, concerns regarding the WG 9.8 is expressed in the 2014's annual report: "There is every evidence that the gender diversity and ICT working group can be revived, based on current interaction between Hilde Corneliussen (Norway), Christina Mörtberg (Sweden), and new individual members (Felienne Hermans)." In 2016's report, she writes:

> Gender and computing (9.9). Dormant. NB. There is the possibility that two Swedish academics will seek to revive what may be proposed as a merger of 9.3 and 9.9, with a focus on ICT, its use in the care professions and environments, and its implications for gendered workforces (i.e., nurses; care workers) as well

as older, vulnerable, frail populations, including many women). Skype meeting planned for end September 2016 with TC9 chair.

In 2017's report, Whitehouse expressed hopes that WG 9.8 will be re-launched: "Gender and computing (9.8). Dormant. Two Swedish and one Danish academic are considering re-launching the group off the back of HCC13. All were put into contact with the "Women in IT" task force run by Brenda AYNSLEY and Gabriela MARIN.

Finally in David Kreps', chair of TC 9 from 2018, annual report from 2018, we read: "9.8 Gender, Diversity and ICT. Relaunching early 2019. Three Swedish academics, who have been Chairing the Track on this topic in HCC13, are seeking to revive this WG early in 2019. Further discussions and confirmation planned as part of the TC9 meeting."

3 Revival

The revival of the working group was formally decided in Poznan in 2018 where Sisse Finken (Denmark), was appointed as the chair, Johanna Sefyrin (Sweden) as the co-chair, and Charles Ess (Norway) as the secretary. With the revival the working group lead added and re-named the group to "Gender, Diversity, and ICT" in an effort to signify the importance of diversity both in terms of inclusiveness of working group members and in terms of creating awareness of *diversity* when concerned about use and design of digital technologies. In line with this, we read on the WG 9.8 webpage [13] that the group is concerned about, amongst other things, transitions from traditional gendered life to new gendered perspectives:

> The topics cover the transitions from traditional gendered work to work based on modern digital technologies, from communication within personal communities to virtual communities, from traditional gendered life to new gendered perspectives. Digitalization is understood in the narrow sense of digital systems as well as in the broader sense which includes the organisational, ethical, social and material contexts of design and usage.
>
> Discourses are linked to:

- the analysis of the deep entanglement of human beings with digital technologies, with other species, and with the world in which we live,
- the analysis of opportunities and risks of digital technologies for work in the paid labor force, in domestic and public spheres, and in national and global societies,
- the analysis of gender perspectives in the formative and constructive processes of computers and information systems,
- the analysis of gender in computing education and educational strategies.

While it was a pleasure to meet and revive the working group in 2019, the Covid-19 pandemic was prevailing during 2020–2022, which affected the HCC conferences in Tokyo, Japan. The pandemic also shaped a workshop hosted by WG 9.8 (on 16 April, Linköping University, Sweden), which was held online under the title: "Work, Place, Mobility and embodiment: <<RECOVERY>> or REPAIRMENT in a Covid and eventually post-covid world."

4 WG 9.8's Transformation to Gender and Diversity

The attentive reader might have noticed the changing concepts (e.g., women, gender diversity, gender, diversity, computerization, digitalization) when reading through the history of WG 9.8. In the following we briefly delineate such moves and changes with respect to the life span of the working group.

The Working Group 9.8 Gender, Diversity, and ICT has its origin in the Women, Work and Computerization (WWC) conference held as part of the WG 9.1 Computers and Work. In 1998 it was decided to establish a new WG, WG 9.8 Women and Information Technology. However, it was pending until 2001 when the decision was accomplished in the new WG, Women and Information Technology.

The topics included in the first WWC conference held in 1984 revolved around office automation, telecommuting, remote work, systems design/development with a specific focus on women's work., skills, workload, and stress. Thus, the development of the WCC conference as well as the working group Women and Information Technology took place at the same time as Women's Studies were growing. Departments/units were founded at universities in 1970s or 1980s, e.g. as early as in 1974 Women's Studies was founded at University of California, Santa Cruz.[1] Thus, the research and education performed at that time were united under the term Women's Studies.

Women's studies were instituted concurrently with the emergence of women's movement with its focus on women's conditions and power relations in the society. Women's scholars and women's movements activists collaborated aiming for a change of women's conditions and power. Furthermore, gender equality became also a growing political issue in 1970s with a focus on gender equality legislation. For example, in Sweden the first Gender Equality Act was enacted in 1976. And in 1980 the Gender Equality Ombudsman was founded in Sweden.[2] Gender equality is a political issue, but gender/feminist research provides knowledge to be used by policy makers and to be included in gender equality policies and measures.

The focus on women and women's experiences can be characterized as the construction project or the positive project with the use of Aino Saarinen's [14] notions. To highlight women's experience, work, and activities resulted in new knowledge about women by the formulation of new questions and concepts. So, what was explored and what scholars paid attention to in 1970s and 1980s made visible women's experiences and abilities gained in their everyday life.

Although new knowledge about women's experiences and conditions were created, Harding recognized the risk embedded in the women's perspective, she argued: "Thus to focus on *women's* world view, or the *feminine* world view, paradoxically supports a masculinist conceptual scheme" [15, p. 173]. Harding's argument and other scholars' discussions together with activities at universities with the establishment of Women's Studies entailed a conceptual and theoretical move from the woman question to focusing on gender relations and as well as epistemological issues; e.g., [15, 16]. Joan Scott defines gender as "a constitutive element of social relationships based on perceived differences

[1] https://feministstudies.ucsc.edu/about/index.html. Today the department is called Feminist Studies.

[2] Today, Equality Ombudsman (Diskrimineringsombudsman).

between the sexes, and gender is a primary way of signifying relationships of power" [17, p. 1067].

A transition from the woman question to analysis of gender relations including power relations became also evident in some of the contributions presented at the WWC conferences held 1991 in Helsinki. For example, gendered division of labor, gender perspectives, gender issues, and gender were included in some titles. The move became even more noticeable in the contributions presented at the fifth WWC conference held 1994 in Manchester where a variety of theories and concepts became visible such as: feminist practice, feminist approach, feminist epistemology, feminist study, gender, women, women's work. The move was also highlighted in the theme Feminist Theoretical Perspectives on Power, Knowledge, and Technology - one of five themes included in the conference, with Alison Adam's "Who Knows How? Who Knows That? Feminist Epistemology and Artificial Intelligence" [18].

In addition to gender and feminist researchers' development of various concepts and theories, the technology was also developed since the first WWC conference was held in 1984. Computers or computerization were the dominating technologies used in the contributions presented in 1984 and at the sixth WWC conference technologies such as the Internet, information systems, virtual environments, cyberspace, virtual worlds were also paid attention to in the papers. That, together with the body of knowledge created by feminist scholars also actualized the co-construction of gender and technology. Judy Wajcman argued: "we now work from the basis that neither masculinity, femininity nor technology are fixed, unitary categories, but that they contain multiple possibilities and are constructed in relation to each other" [19, p. 460].

During the years when WG 9.8 was inactive, a variety of meanings, concepts, and theories were outcomes of the growing gender and feminist communities. Examples are social construction/constructivism of gender, doing gender, gender performativity, queer theories, intersectionality, feminist technoscience, posthumanism, postcolonialism. Diversity in terms of concepts and theories used by gender and feminist researchers is also reflected in the WG 9.8's change of name from Women and Information Technology to Gender, Diversity, and ICT where the commas around diversity have come to form a semantic field of importance in the scope of the working group and in its approaches to design and use of digital technologies.

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Rethinking the Role of ICT for Sustainable Development: From Incremental Improvements Towards Sustainable Societal Transformation

Working Group 9.9: ICT and Sustainable Development

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Abstract. This chapter provides an overview of past, present and future perspectives on the relationship between ICT and sustainable development in research, with a focus on perspectives adopted within WG 9.9. While early research concentrated on the adverse effects of ICT on the environment, including energy usage, hazardous chemicals in production, and electronic waste, the discourse has evolved to emphasize the potential of ICT to promote sustainable development and offer economic, social, and environmental benefits. WG 9.9 emphasizes that ICT can indeed offer sustainability-related benefits, such as dematerialization and optimization. However, technology, including ICT, is currently not geared towards sustainability, and incremental improvements are not sufficient to promote sustainable futures. Instead, a narrow and individualistic focus risks reinforcing an unsustainable status quo. Researchers interested in ICT and sustainable development should take a more critical stance and promote radical societal transformations towards sustainable futures. Among other things, this includes questioning growth, both in terms of technology and the economy, adhering to planetary boundaries, energy and resource limits, and promoting sustainable practices, rather than imposing behavioral changes.

Keywords: ICT · Sustainable Development · WG 9.9 · Planetary Boundaries · Sustainability Transitions · Societal Transformation

Since the first industrial revolution, our largely fossil-based economy has produced much material wealth and development throughout the world. However, as we have realized in the last few decades, this rapid development has brought upon us many negative side effects, not least climate change due to the emissions of carbon dioxide (CO_2) and other greenhouse gases (GHGs) [1]. The rapid pace of climate change is leading to a rise in droughts, floods, and heat waves that are becoming increasingly frequent and unpredictable globally [2]. Researchers claim that we have recently entered a new geological epoch – *the Anthropocene* – where "humanity has become the major force in shaping the future of the Earth system as a whole" [3]. In the Anthropocene, our actions are "challenging the biosphere foundation for a prosperous development of civilizations," and the resilience of the Earth's systems is threatened [3–5].

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The rapid development of technologies has accelerated the impact of human activity on the planet. While it has contributed immensely to the well-being and health of millions of people, problems such as resource scarcity, toxic waste, and climate change would not be such acute global problems without this development. Furthermore, policymakers, researchers, and politicians alike often promote the role of technology to slow down, halt, or even reverse these problems [6]. Not least, information and communication technologies (ICTs) have been claimed to have the potential to facilitate positive change towards sustainability [7]. The relation between sustainable development and technology in general – and ICT in particular – is a complex one.

For a long time, ICT was considered a rather clean and fair technology, at least compared with other technologies used for transportation, resource extraction and electricity production [8]. However, it is now common knowledge that ICT contributes with negative consequences for social and environmental sustainability throughout its value chain [9]. The issue stems from the material nature of ICT, which requires energy and resource intensive production and manufacturing, electricity for usage, and eventual disposal. The current ICT value chain is unsustainable due to its negative impacts, such as CO_2 emissions and toxic waste generation, usage of conflict minerals, unacceptable labor conditions, and e-waste [8, 10]. Many of these problems are well known by the industry and governments, and some of them have been solved or at least alleviated: individual ICT products are getting smaller, and each product now consumes less resources and energy compared with a few decades ago. ICT companies have policies and regulations to follow concerning conflict minerals (known as 3TG: tin, tungsten, tantalum and gold). The amount of electronic waste (e-waste) generated by the west has finally started to decrease. There are also other examples of positive developments towards increased sustainability within the ICT sector that show how directed attention can have successful outcomes. Despite some positive developments, sustainability issues related to ICT overall have grown and continue to grow, particularly with increasing geopolitical instability in Europe and the world following the ongoing invasion of Ukraine.

While there are certainly many problems to solve in regard to how already existing sustainability problems with ICT should be solved, the main focus for research within ICT and sustainable development is how ICT can be used in order to make other parts of society and other industries more sustainable [9]. It is often assumed, for example, that ICT-based systems can be implemented to reduce energy and resource consumption and waste in production processes, improve education in impoverished parts of the world, promote dematerialization of physical goods, reduce the need for carbon intensive travel, and more [11]. While the potential to use ICT for sustainability-related purposes is certainly substantial, ICT is nowadays more often used by companies for other purposes, such as to increase economic profits. Furthermore, the implementation of ICT to solve different sustainability-related problems can result in negative rebound effects, which risk offsetting any positive results [12].

The fact that ICT has a dual character, contributing to environmental and societal problems on one hand and being a solution on the other, makes the relationship between ICT and sustainable development a crucial area of both research and practice. IFIP Working Group (WG) 9.9: ICT and Sustainable Development, which has existed since 2005, aims to contribute to the development of an information society that meets the

human needs of the present without compromising the ability of future generations to meet their own needs. The rest of the chapter will provide a brief overview of the history of research in the field of ICT and sustainable development, along with its traditional research methods. Based on this summary and the research conducted by the WG members, potential avenues for future research in ICT and sustainable development will be highlighted.

1 A Brief History of ICT and Sustainable Development Research

While research on issues related to sustainability and related concepts can be traced back to the late 1980s, entire research fields devoted to these subjects were first formed around the mid 2000s. This was the result of what Tomlinson [13] called a "critical juncture" between an intensified environmental discourse, following the *Brundtland Report* in 1987 [14], rapid technological development, and the insight that ICT contributed to a substantial part of the global CO_2 emissions [15].

One of the first fields of research and practice related to ICT and sustainable development that emerged from this critical juncture was *green IT,* where the negative environmental effects of ICT were emphasized. Within green IT, the main objective was to look into how to mitigate negative direct, first-order, effects along the ICT value chain [12]. Resource and water consumption in production processes, electricity consumption in the use phase, and problems related to waste in the disposal phase are examples of such effects.

While early research focused mainly on how the value chain of ICT could become more environmentally sustainable, the researchers soon realized that it was also important to emphasize the "greening potential" of the technology [9, 16]. In 2008, Global e-Sustainability Initiative (GeSI) published their report *SMART 2020 – Enabling the low-carbon economy in the information age* [11]. In this report, the main message was that despite the fact that ICT contributed to many negative sustainability-related effects, ICT could also be *used* to promote sustainability in different ways, for example to boost agricultural yields by 30 percent until 2020 and reduce the emissions of carbon dioxide equivalents (CO_2e) by 20 percent until 2030—all of the while continuing to contribute to economic growth [11]. As to be expected, the report was well received by the ICT industry and also read and cited by academics and policymakers. Critics contended that the report was excessively optimistic and that it would be challenging to fully leverage the potential of ICT for sustainability as rapidly as proposed without the aid of supportive policies and regulations. As we approach 2030 without any substantial decreases in CO_2 emissions due to ICT implementation, it appears these concerns were justified. However, many researchers embraced the discourse that the net sustainability effects of ICT could in fact be positive rather than negative, and researchers started to focus more on how to use ICT in different applications in order to improve the environmental sustainability of other parts of society.

In 2011, Lorenz Hilty and his colleagues concluded that three fields that were focusing on environmental sustainability had emerged, namely *environmental informatics*, *green IT*, and *human-computer interaction* (HCI) [17]. However, sustainable development is not only concerned with the environment, but also with social aspects such as

education, health and safety – issues that *ICT for Development* (ICT4D) had focused on for at least a decade by then [18]. A few years after the introduction of green IT, practitioners, policymakers and researchers started to change their vocabulary in order to also take into account aspects related to social sustainability and ICT and incorporated aspects traditionally related to ICT4D. In Sweden, for example, *The Swedish Institute for Standards* (SIS) started working on a standard for green IT in the early 2010s, but it decided to change the name of the standard to *sustainable ICT* for the final release [19]. The shift in focus from green to sustainability broadened the scope of green IT, leading to the emergence of new areas of study such as *sustainable HCI* (SHCI), *ICT for sustainability* (ICT4S), *computing within limits* (LIMITS), and others.

In SHCI, researchers focus on how humans and computers are related in the context of sustainability. According to Blevis, who in his article *Sustainable Interaction Design* laid the foundation for the research field, such research could focus on, for example, how humans acquire, use (or misuse) and dispose of technology in relation to sustainability [20]. Mankoff et al., also an early contributor to the emerging field of research, suggested that such research could either focus on *sustainability through design* or *sustainability in design* [21]. This basically means that we could either focus on how ICT products can be produced, used and disposed of in a more sustainable way, or focus on how ICT products can be used to make other parts of society more sustainable. Similar distinctions emerged also in other related fields, not least in green IT where researchers distinguished between greening of IT and greening by IT. In summary, to make ICT sustainable, it was emphasized that ICT products must be manufactured ethically and sustainably, and also utilized in a manner that minimizes harmful impacts and maximizes positive sustainability outcomes. However, as highlighted by Brynjarsdóttir et al. [22] in a famous article, research within SHCI tended to focus on the latter, and in a quite narrow sense. In their article, they claim that SHCI researchers mainly focus on developing *persuasive technologies*, i.e., products and applications that aim to provoke sustainable behaviors among their users, for example recycling and sustainable forms of [23]. Their main critique was that such a focus risks promoting less unsustainable activities rather than leveraging the full potential of ICT to create entirely new and sustainable practices.

ICT4S is another influential field of research that started as a conference in 2013 and has much in common with SHCI. Research within ICT4S is described as focused around the effects of ICT on sustainability, and in particular the development of more sustainable ICT systems. Anything that would fall within the realm of SHCI would therefore also fit within ICT4S, but the latter encompasses a much wider scope of research. ICT4S, in their annual conference, also emphasize the role not only of research but also that of industrial and governmental actors, and NGOs. While researchers who contribute to SHCI are usually scholars within computing, ICT4S has a somewhat broader audience and accepts social science research in addition to more technical research. According to Hilty and Aebischer [7], ICT4S differentiates itself from other research fields within computing with its "critical perspective that challenges every technological solution by assessing its impact at the societal level." The ICT4S conference is organized by among others Lorenz Hilty, who was previously a member of the WG 9.9. However, some critique has been aimed towards this field of research in recent years, not least from

Mann et al., arguing that much research within ICT4S is focusing on optimizing major unsustainabilities rather than on the transformation to a more sustainable society [24].

To be fair, although much research on ICT and sustainable development is done with good intentions within the above-mentioned fields of research, much of it is built on prevailing assumptions of continued economic growth and technological development, assumptions that do not properly take into consideration planetary boundaries and the inherent contradictions between sustainability and economic growth [9, 24, 25]. Rather than supporting sustainable transitions from, among other things, unsustainable modes of production and consumption, such research risks maintaining a less unsustainable, but not completely sustainable, status quo [9, 26]. Before outlining the more progressive perspectives that guide our work in WG 9.9, I need to briefly address the concerns that research in ICT and sustainable development typically addresses.

2 Conventional Approaches to ICT and Sustainable Development Research

As briefly mentioned in the introduction of this chapter, ICT has traditionally been seen as a rather clean technology with few ethical and sustainability-related implications [8]. Thankfully, this is no longer the prevalent view in research fields that focus on ICT and sustainable development, and it is now widely recognized that there are sustainability-related challenges all along the ICT value chain [27]. Therefore, there is still much potential in focusing on the *sustainability of ICT* (or *greening of ICT*). The most important problems are summarized in Table 1, but there are also other problems related to more specific technologies or hardware.

Most of the above-mentioned aspects have been investigated extensively, not only by scholars within disciplines such as green IT and ICT4D, but also by policymakers and non-governmental organizations (NGOs). The environmental and human rights movements, not least Greenpeace and Amnesty International, have focused on several of these aspects and have been in the forefront of emphasizing problems occurring in the ICT value chain. Amnesty International, in a recent report [30], highlights for example that digital surveillance technologies are being exported from Europe to China where the technology is used to restrict human rights, and the Enough Project have emphasized problems related to the use of conflict minerals in ICT products [31]. Greenpeace Sweden were also very early in criticizing the ICT industry for the use of toxic chemicals in the production of ICT products [32]. These initiatives have had real, positive consequences on ICT-related policy, both in the EU and the US [33], and led to sustainable change within the ICT industry itself [34].

Many of the problems presented in Table 1 are related to some unique properties of ICTs today, such as the rapidly increased demand for ICT products (such as smartphones and laptops), their relatively short useful life, and the complex material composition making them both difficult to produce, repair, refurbish and recycle. Furthermore, the concept of unequal exchange is central to the global nature of the ICT value chain [28, 35], referring to the fact that the benefits of ICT products are mainly enjoyed by the developed part of the world, while most negative side effects such as e-waste and social issues are problems that the developing world have to deal with. As ethics and sustainability are

Table 1. Summary of potential sustainability-related problems along the ICT value chain. Adapted from Fors [9]

Value chain phase	Sustainability-related problems
Extraction of raw materials	Working conditions such as slave labor, child labor, inadequate safety equipment, extended working hours, prohibition of unionization, hazardous waste, usage of harmful chemicals. Emission of GHGs and other air pollutants, reliance on conflict minerals, unequal exchange [28], geopolitical issues associated with REEs and other critical materials, resource depletion, corruption, etc
Transportation and manufacturing	Working conditions (slave labor, child labor, lack of safety equipment, use of hazardous chemicals, long working hours, prohibition of unionization, etc.), hazardous waste, emissions of GHGs, corruption, etc
Use	Electricity use (especially in data centres) and emissions of GHGs, online fraud and harassment, privacy, censorship and corruption, algorithmic bias, accountability and transparency, etc
Disposal	Working conditions related to informal recycling (slave labor, child labor, lack of safety equipment, use of hazardous chemicals, unequal exchange, etc.) [29]. Problems related to recirculation (e.g., repair, reuse, refurbishing and recycling) due to design and policy problems, leading to increased waste and emissions of GHGs, etc

naturally intertwined concepts [36], these aspects are not only emphasized by researchers within WG 9.9, but also discussed in WG 9.6, WG 9.7 and WG 9.10.

The flexibility of ICTs afforded by the complexity of these technologies is also what makes ICT potentially beneficial *for* sustainable development (or *greening by ICT*) [37], as previously mentioned. According to Zapico [38], there are three broad categories of research and practice that aim to make ICT useful for achieving sustainable development (or *greening by ICT*), namely *optimization*, *dematerialization* and the *use of ICT to promote sustainable behaviors and practices*.

Optimization is about increasing the efficiency of a process, for example a production process, to require less energy or resources for the same outcome. ICT is a technology frequently used to increase the performance and the efficiency of different processes, but often in terms of making work, the production of good and everyday life more efficient in terms of time and money [7]. ICTs can be used for optimization by either incrementally improving existing processes (for example, automatic route planning for transportation [39]) or by radically changing the process completely (for example, digital communication through videoconferencing software). Regardless, it is widely believed that an optimized process is more sustainable than an unoptimized one, and that ICT has specific characteristics that make it an appropriate technology for improving resource

and energy efficiency [40]. This may hold true in the short term, but it has become a highly debated topic, not least since much research within fields related to ICT and sustainable development have traditionally focused on improving inefficient processes. Hilty et al. [41], for example, show how optimization often leads to an increased output (of products) rather than a decreased input (of energy and/or resources). While not inherently negative *per se*, it demonstrates that higher efficiency does not necessarily equate to greater sustainability. This is usually referred to as the Jevons paradox, which states that when technology improves and increases the efficiency of resource usage, it can lead to an overall increase in resource consumption instead of a reduction. This is due to increased demand created by lower resource prices and improved efficiency. Hilty [40], for instance, demonstrates how the increased energy efficiency of vending machines in Japan made a more widespread installation economically feasible, resulting in a rise in overall energy and material consumption. These kinds of effects are usually referred to as rebound effects and are well documented in research on ICT and sustainable development (see, for example, [42]).

Dematerialization is the second category of research and practices that is often discussed in relation to sustainability within ICT and sustainable development. Dematerialization refers to the activity of replacing energy and resource intensive products with digital options through the use of ICT. This can reduce the need for costly and unsustainable production of goods and therefore reduce waste and pollution. Dematerialization is seen as a key aspect of decoupling economic growth from resource and energy consumption because, in theory, digital products can be endlessly replicated without using additional resources. Previously, dematerialization was considered to be the most important contribution of ICT to lower the emissions of CO_2 from other industries [11] Music, movies, newspapers and video games are examples of digital products that have been dematerialized [43], but it is difficult to say whether this has led to a decrease of energy and resource consumption, as demonstrated by Santarius et al. [44]. As demonstrated during the Covid-19 pandemic in 2020 and 2021, digital services such as virtual meetings, webinars, and online conferences can to a certain extent substitute physical travel. This is sometimes termed "presence dematerialization" [45]. According to Quéré et al. [46], CO_2 emissions have increased steadily by approximately one percent per year during the past century; yet during the pandemic, there was a significant decrease in emissions partly due to decreased travel opportunities. During these years, presence dematerialization helped many people to work from home and attend international conferences and meeting without the need for physical travelling. Still, the drastic decrease during the pandemic was but "a bleep" according to the International Monetary Fund (IMF) [47], and after the pandemic ended emissions started to yet again increase drastically.

Furthermore, there are rebound effects related to other forms of dematerialization that we need to take into consideration. Not only has dematerialization allowed for new ways of consuming media such as music, movies, video games and television series, but it has also had a big impact on our consumption practices in general. The energy demand of the internet is growing quickly, and it is estimated that by 2030 it will account for around 21 percent of the global electricity demand. According to Widdicks et al. [48], around 50 percent of the total data traffic is used by streaming services, and the demand is quickly increasing due to changed watching behaviors and practices. The consumption

practices have changed dramatically since streaming has become the new normal. Multi-watching, or media multitasking, is one such new phenomena, and means that people watch multiple streams simultaneously on several different devices. Suski et al. show that high-quality video streaming on, for example, a smart TV is up to ten times as CO_2 intense as streaming on a smartphone, emphasizing the potential of promoting sustainable streaming behaviors [49]. In the Greenpeace report *Click Green 2017* [50], it is emphasized that the power consumption of data centers is not only growing, but many ICT firms still rely on non-renewable energy sources to power their data centers, contributing to climate change. Another phenomenon related to dematerialization is the emergence of cryptocurrencies, which are extremely electricity-demanding to maintain. It is estimated that Bitcoin alone consumes as much electricity as the Netherlands [51], and much hardware (especially graphics processing units, GPUs) are devoted solely to cryptocurrency "mining," which in itself is problematic [52]. As energy prices are increasing as a result of the ongoing war in Ukraine, and the value of Bitcoin and other cryptocurrencies are decreasing, new and more efficient ways of maintaining these currencies are being developed which may help to resolve issues with energy and resource consumption [53].

In summary, dematerialization has traditionally been one main focus within research on ICT and sustainable development. While we have yet to see product dematerialization contributing to the decoupling of economic growth and CO_2 emissions, we can see many beneficial effects from presence dematerialization due to the Covid-19 pandemic. The conflict in Ukraine and the associated surge in energy prices highlight the need to prioritize energy efficiency through ICT in research. However, it is crucial to recognize that while energy optimization can offer both short-term and long-term energy savings, a sole focus on optimization may limit opportunities for more substantial, transformative change [9, 24].

The third and last category of conventional approaches to ICT and sustainable development, according to Zapico [38], is research promoting sustainable behaviors and practices, or as Verbeek [54] puts it, "behavior-influencing technologies," for sustainability. Behavior-influencing technologies are hardware and software with the purpose of influencing personal behaviors or social practices. Such technologies have always existed; in fact, it is difficult to imagine a technology without properties that aim to influence one or several behaviors. Take, for example, Latour's example [55] of a hotel keychain, which is produced to be as clunky and hard to bring with you as possible, because the hotel management wants you to leave the key in the lobby when you leave the hotel. In this example, the keychain is used to persuade hotel guests into a particular behavior, and many behavior-influencing technologies are often also persuasive technologies. For research on ICT in particular, Fogg's [56, 57] work on computers as persuasive technologies became central in the mid 2000s. In the early 2010s, researchers started to apply this research in order to evoke what the designers saw as sustainable behaviors, for example recycling or reducing food waste. There are many different theories of how to best promote such sustainable behaviors. *Eco-feedback* can provide real-time feedback on for example your use of electricity which gives you a hint to how this can be decreased. *Sustainable gamification* aims to make sustainable behavior more fun and enjoyable by awarding such behaviors with points and badges within an app or a video game [23].

There are also other related concepts, such as nudging, that researchers often within the field of SCHI use to promote these kinds of solutions.

Despite the popularity of behavior-influencing technologies, however, the idea of making people become more sustainable through persuasion and similar techniques has been criticized, not least by Brynjarsdóttir et al. [22]. First of all, we need to realize that all technological products, regardless of purpose, have an influence on us as soon as we enter into a relationship with them. As Verbeek [54] puts it, "as soon as a technology is being used, it helps to establish a relation between users and their environment, and the result of that will mediate human actions and perceptions." However, when it comes to behavior-influencing technologies for sustainability, this purpose is clear and explicit: this product is going to make you act more in line with what we think is sustainable. Brynjarsdóttir et al. [22] argue that sustainability is being pushed onto the users in a top-down fashion by such technologies, and that it is not up to the designers of these technologies to decide what is sustainable or not. Furthermore, the perception of sustainability in these applications is often limited to just resource efficiency, making it unlikely for individual actions to drive the significant societal changes required. Many fun and interesting applications are being developed based on these assumptions that might very well contribute to more sustainable individual behaviors. Still, such initiatives make sustainability seen as a complex problem to solve for individual consumers [26], rather than a process which requires more transformational, societal change [24, 58, 59]. However, ICT has the potential to support the adoption of sustainable practices that replace current unsustainable ones and facilitate sustainable transitions, not least in the realm of consumption [60]. Examples of such practices include sharing [61], repairing [62], and second-hand shopping [63]. These practices, driven by ICT, advance innovative forms of resource- and energy-efficient and socially responsible consumption that greatly diverge from conventional practices [64, 65].

3 New and Promising Perspectives on ICT and Sustainable Development Research

In the previous section, I presented conventional perspectives on ICT and sustainable development in research and practice. While we understand that ICT is now an unavoidable part of our professional and private lives, and that there are ways in which ICT can guide our societies towards more sustainable trajectories, there are many assumptions and understandings within ICT and sustainable development research that need to be problematized [9]. This can be worked on within existing fields, such as ICT4S [24], or through the creation of new organizations, such as LIMITS. In the remainder of this chapter, I will present some streams of thought and fields of research that guide the research and the discussions within WG 9.9.

Within LIMITS, another important critique of conventional ICT and sustainable development research and practice is presented, which is related to what a sustainable future might entail. In conventional discourses on sustainability, i.e., sustainable development, Nardi et al. [66] argue, it is assumed that future sustainable societies will resemble current societies, but with reduced waste and emissions. This implies that rapid technological development, economic growth and consumption can and must continue

indefinitely. There is no need for radical transformation of our societies, or new understandings of what we can expect out of sustainable futures. However, as these researchers and WG 9.9 recognize, there are certain ecological, material, and energy limitations that must be considered [3]. The primary questions that arise then center on how to utilize ICT to sustain or enhance the well-being of individuals within these non-negotiable limits. Constrained by such limits, researchers follow three key principles: question growth, consider models of scarcity, and reduce energy and material consumption [66]. Hjorth Warlenius [67] distinguishes two primary categories of economic theories that question economic growth: the trans-Atlantic school, which includes steady-state economics [68] and doughnut economics [25], and the Mediterranean school, which includes degrowth [69]. These two schools of thought have their similarities and they are both influential in research on ICT for sustainable development that promote transformative system change over incremental progress towards a less unsustainable status quo [9, 24]. Hjorth Warlenius explains that the principal distinction between the two schools is that the trans-Atlantic school generally posits that a smaller economy can be realized within the framework of capitalism, whereas the Mediterranean school adopts a more radical stance, asserting that de-growth can only be achieved through a different economic system [67]. The previous chair of WG 9.9, Maja van Der Velden, however, shows that while doughnut economics presents a more holistic approach to research than the sustainable development discourse, it remains firmly rooted within the discourse of the Anthropocene [70]. Santarius et al. [44] also argues that ICT alone cannot reduce the environmental impacts of a growing economy, and that research on ICT and sustainable development should rather focus on how to make use of ICT to foster sustainable post-growth or de-growth. Concerning how research should consider models of scarcity and reduce energy and material consumption, Bergmark and Zachrisson stress the need for establishing a new approach to Life Cycle Assessment based on planetary boundaries [71].

Within ICT4S, Mann et al. [24] argue that research on ICT and sustainable development is oftentimes "ill positioned with regard to the complexity of transforming society in such a way that people and environmental ecologies can coexist in a sustainable system." In line with my discussion above, they argue that such research often focuses on a small subset of sustainability-related parameters (for example, resource efficiency) and ignores the large system in which this is an issue. Therefore, research within fields interested in ICT and sustainable development should rather focus on transformational change towards sustainable futures (see [9]). In order to shift the needle and focus on such change, they developed a "sustainability-based transformational mindset" useful in research on ICT and sustainable development (Table 2).

In *Against Nature*, Kreps [26] writes about ICT and its relation to nature, by drawing on process philosophy. He argues that technological development in general, and ICT development in particular, is currently not geared towards sustainability but rather towards maintaining an unsustainable status quo where we as humans are individualized and alienated from each other and from nature. This is partly because research on ICT (and sustainable development) tends to be grounded in a positivist research paradigm, based on reductionist assumptions about humans as rational and independent, technology as instrumental or deterministic, and sustainability as optimization of resources.

Table 2. The sustainability-based transformation mindset, adapted from [24, 72].

Mindset	Explanation
1. Socioecological restoration over economic justification	Economic development or reasoning is not dismissed, but seen as a means to achieve social, cultural and environmental benefits
2. Transformative system change over small steps to keep business as usual	Transformational systems change means to move beyond the assumption that sustainability can be achieved through (many) marginal lifestyle changes
3. Holistic perspectives over narrow focus	Broader perspective that encompasses considerations of time, space, boundaries, methods, and more [24]
4. Equity and diversity over homogeneity	Diverse systems are resilient systems [24]
5. Respectful, collaborative responsibility over selfish othering	Research should focus on supporting collective action rather than to focus on the role of the individual
6. Action in the face of fear over paralysis or willful ignorance	Complex, "wicked" problems related to sustainability require long-term solutions, and ICT4S can contribute with such solutions
7. Values change over behavior modification	Persuasive technologies have been extensively researched within SHCI and ICT4S for decades now; however, the effectiveness of such applications to contribute to radically transform our society towards sustainable futures is unclear. Rather, we need to work with embedding sustainability as a core cultural value in social systems
8. Empowering engagement over imposed solutions	Empowering individuals and groups and fostering their involvement increases the likelihood of success for any actions taken, compared to solutions imposed by external experts [24]
9. Living positive futures over bleak predictions	To strive for sustainable futures, it is crucial to understand the gravity of the situation and the necessary steps to shift from unsustainable paths. However, it is even more essential to concentrate on potential solutions that enable us to exist within planetary boundaries and other restrictions
10. Humility and desire to learn over fixed knowledge sets	Sustainability is not a "complex problem to solve" [59]. We cannot hope to achieve complete knowledge about the problem or the solutions, but we need to keep up the desire to learn, and to keep challenging conventional underlying assumptions and understandings (see [9])

In short, Kreps [26] argues, "the underlying philosophy and much of [the outcome of computing] runs counter to the health of the environment: it is *against nature.*" Kreps introduces the concept of systemic individualization, which implies a perspective to ICT and sustainable development (based on the assumptions presented above) where individual "consumers" can contribute to sustainability through rational, sustainable choices. Such perspectives on ICT and sustainable development research are criticized throughout this chapter. One main conclusion of the book is the argument that we need to resume the philosophical scrutiny of ICT and challenge the underlying positivist philosophy that affects much contemporary computing research. David Kreps was previously chair of TC 9 and a member of WG 9.9 at the time of writing this chapter.

In a similar manner, Fors [9] concerns himself with how ICT should be understood, designed and mobilized for sustainability purposes. The main argument is that ICT for sustainable development research is based on assumptions and understanding that need to be problematized and reformulated. In this thesis, Fors presents and problematizes three abstractions of ICT and sustainable development research and practice, namely the technological, the social, and the sustainable. He argues that research exaggerates the "purely technological" aspects of ICT and sustainable development in terms of their potential for sustainability and therefore often falls into deterministic and essentialist conceptions of technology. He furthermore argues that much research disregards non-technical aspects of ICT (especially research on optimization and dematerialization) but also that research that focuses on *the social* aspects – for example research on persuasive technologies – often reduces human behavior to that of the rational and individualist *homo oeconomicus* (cf. [26]). Such research rarely leads to meaningful transformations towards sustainability, but rather to individualist conceptions of it. The final abstraction, the sustainable, in such research is often imbued with a pro-growth, technology-optimistic, western-centric and neoliberal ideology [73] that many would argue is inherently incompatible with sustainability [74]. By problematizing sustainable ICT, Fors opens up to a radical rethinking of the theoretical and philosophical underpinnings of the subject. His conclusion is that sustainable ICT research should aim to influence collective action and futurescaping (cf. 5, 8 and 9 in Table 2) through the mobilization of politically charged discourses about our co-existence in futures of scarcity and environmental strain (cf. [66]), and practices that aim to change how we related to and dwell in them. Per Fors is the chair of WG 9.9 by the time of writing this chapter.

Although the researchers interested in the activities of WG 9.9 hold similar assumptions about the connection between ICT and sustainable development, they vary in the specific empirical topics they investigate in the field. However, some interests are shared among several of these researchers, including interest in the role of digital economies (such as the sharing economy and the second-hand economy) for sustainable development [61, 75, 76], the role of ICT in education for sustainable development (ESD) [77, 78], resource scarcity [28, 79], e-waste [62, 80, 81], sustainable design and design for sustainability [82, 83], and more.

To sum up, studies regarding the relationship between ICT and sustainable development within WG 9.9 are frequently impacted by one or more of the perspectives outlined in this section of the chapter. These perspectives are often critical and acknowledge among other things ecological, material, and energy boundaries. Furthermore,

this research challenge assumptions concerning economic and technological expansion, referring to both quantity ("technomass") and the trajectories of development [35]. Finally, although recognizing that every individual has a responsibility to incorporate sustainable behaviors into their personal lives, research on ICT and sustainable development influenced by the theoretical perspectives outlined in this section puts more emphasis on the role of ICT for societal transformations and transitions towards sustainable futures.

4 Concluding Discussion

In recent decades, there has been a significant increase in research that examines the relationship between ICT and sustainability-related factors within our society. Initially, research primarily concentrated on the adverse effects of ICT on the environment, specifically in terms of electricity usage, the hazardous chemicals employed in production, and electronic waste. This perspective was prevalent in the early stages of green IT. However, as researchers and practitioners recognized that ICT has the potential to promote sustainable development and offer economic, social, and environmental advantages, the discourse swiftly changed. Instead, ICT was presented not mainly as an obstacle for sustainable development, but as a silver bullet for many sustainability-related problems, such as CO_2 emissions, energy use, waste, poverty, unemployment, and more. The main focus areas for research adhering to this positive discourse are optimization, dematerialization and the role of ICT to promote sustainable behaviors and practices. Nonetheless, while acknowledging the potential of such research and practice, WG 9.9 adheres to more critical perspectives that acknowledge the failure of conventional perspectives to promote sustainability in these ways. WG 9.9 argues that concentrating solely on narrow and individual dimensions of sustainability, such as energy efficiency, is not only ineffective but also risks undermining more radical, and needed, change, by promoting technological fixes that reinforce an unsustainable status quo. As noted by Kreps [26], technology in general, and ICT in particular, is generally not geared towards sustainability but rather the opposite: not only are there negative sustainability-effects throughout the value chain of ICT (see Table 1), ICT is also mainly adopted for purposes other than sustainability that contributes to negative environmental and social effects.

WG 9.9 strongly supports the idea that ICT can play a vital role in promoting transitions towards more environmentally, socially, and economically sustainable futures. While the discourse concerning the role for ICT to contribute to sustainability is still overly optimistic, my main ambition in this chapter has been to present a sample of new and promising perspectives on ICT and sustainable development that, in contrast to conventional research, has the potential to drive more radical societal transformations rather than to uphold an unsustainable status quo.

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Cyber, Disinformation and AI: Evolving Uses of ICT in Peace and Conflict

Working Group 9.10: ICT Uses in Peace and War

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Abstract. Working Group 9.10 is the newest group under Technical Committee 9, and it has a focus on ICT and its impact and uses in promoting and maintaining peace, as well as the use of ICTs in conflict and war. The focus of the working group's activities thus far has related to cybersecurity and cyberwarfare, with members being involved in organizing conference and specialist tracks, with other book projects and activities with related communities. After giving an introduction and history to the working group, the chapter covers some of the major themes and recent developments that are related to the themes of the working group.

Keywords: Autonomous Weapons · Critical Infrastructure Protection · Cyberwarfare · Cybersecurity · Online Advocacy

1 Overview

The aim of Working Group 9.10: ICT Uses in Peace and War is to provide a focused effort from multiple stakeholders to seek solutions to questions and areas of investigation in the primary field of study of the group. The group provides a platform to facilitate discussion, collaborative research, and development and presentation or publication of the research, lessons learnt, use cases, risk/impact assessments, and case studies [1].

The scope of the working group includes the effect, threats, and influences posed by ICTs at international, national, societal and individual levels, with particular relevance to activities of maintaining peace and during times of conflict. The scope also extends to how the various hierarchical levels of society perceive these threats, impacts and influences. Emerging from this, the following themes are considered core (although not exhaustive) to the working group, and are listed in alphabetical order:

- Artificial intelligence and machine learning in conflict and cyber security
- Autonomous weapons systems
- Cyber warfare
- Cyber security awareness
- Forensic applications and solutions
- Governance and standards

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- Hacking, cracking, and other technical challenges
- ICT, critical infrastructure, and society
- ICT impacts on international relations and international security
- ICT strategies from a holistic, peaceful, and humane perspective
- ICT uses to prevent conflicts and contribute to peace
- ICT uses from a military perspective
- Legal, ethical, and social issues related to information security
- Promotion of democratic practices through ICT use
- Research and education on the impact of ICT in peace and war
- Social aspects of critical infrastructure protection
- Social networking
- Socio-technical aspects of ICT uses in peace and war
- Strategic information security
- Threat assessments
- Vulnerability assessments

The activities of the working group have included specialist tracks and round-table discussions at international conferences and collaborative research amongst its members.

2 History

Working Group 9.10 is the youngest of the working groups under Technical Committee 9 (TC 9), and was formally established in 2014 by Louise Leenen, with Leigh Armistead as vice-chair and Brett van Niekerk as secretary. At the beginning of 2020, Joey Jansen van Vuuren stepped in as vice-chair, Leigh Armistead moved to secretary, and Brett van Niekerk moved to chair the group. The working group has membership hailing from 18 countries.

The primary activities of the working group are specialist tracks at international conferences, such as the International Conference on Cyber Warfare and Security (ICCWS), the European Conference on Cyber Warfare and Security (ECCWS), and the IFIP TC 9 Human Choice in Computing (HCC). In 2015 and 2019, the working group chair was also co-chair of ICCWS. In 2020, the chair and vice-chair were co-editors for a special issue of the *Journal of Information Warfare* related to themes of the working group. There have also been numerous papers in journals and conferences that were collaboration amongst two or more members of the working group.

Other notable achievements from member of the working group include four making the Top 50 Women in Cybersecurity in Africa list in 2020 [2], and the chair and two members collaborating and winning the Global Cyberpeace Challenge policy and strategy track in 2021 [3].

3 Themes

Communications have played an important role in adverting crises and during conflict. The Allied effort to break the German and Japanese encryption during World War II and the implementation of a ‘hotline’ between Washington, D.C. and Moscow following the Cuban missile crisis illustrate this importance. The key theme in terms of current trends that is related to the working group relates to cybersecurity, and the increasing prevalence of cybersecurity in international security.

3.1 Cybersecurity and Cyber Operations in International Security

A Brief History of Major Cyber-Attacks. With the growing prevalence of computers and the Internet, it was not long before espionage and computer attacks were being seen. This section provides a summary, while not exhaustive, that illustrates the major trends of cyber-attacks in an international security context.

Initially, there was primarily espionage related activity, such as MOONLIGHT MAZE (1998) and TITAN RAIN (2003) [4, 5]. The first major disruptive attacks were denial-of-service attacks against Estonia (2007) and Georgia (2008) [6, 7]. The attacks against Georgia were of particular interest as they came prior to a physical military operation [7].

Whilst there was concern about the possibility of a cyber-attack against critical infrastructure which was driving research into cybersecurity, there was little to confirm these fears until the Stuxnet attack was uncovered in 2010, where the malware was used to target and damage centrifuges in Iran's nuclear enrichment facility. This particular attack is often cited as an example of the possibilities of cyber-warfare due to its relative sophistication and its ability to create physical damage by affecting industrial control systems [8, 9]. In December 2015, another cyber-attack attributed to state-baked actors (known and Sandworm) resulted in physical affects: in December 2015 the Ukrainian power grid experienced outages due to the BlackEnergy malware [10, 11].

Where Stuxnet and BlackEnergy targeted 'traditional' industrial controls systems, hyper-connectivity of devices, known as the Internet of Things (IoT) also began to pose security risks due to numerous insecure devices accessible over the Internet. The most notable incident was the Mirai botnet, which controlled compromised CCTV devices for the purposes of DDoS attacks. Two major attacks were attributed to Mirai botnets: in October 2016 the infrastructure and service provider Dyn was targeted, resulting in widespread outages of major social media and webpages in the U.S. [12]; and then against one of Liberia's major telecommunications organizations, effectively blocking the nation's Internet access [13].

In 2016, a group calling themselves the Shadow Brokers emerged, trying to auction cyber-attack tools, claimed to be stolen from a nation state. After the auction failed, the group leaked various tools online [14]. One of these, EternalBlue, was used in the two 2017 ransomware worm incidents: WannaCry and NotPetya, both of which were attributed to nation-states [15, 16]. These two incidents were of particular importance as they were the first ransomware variants with worm capability; they were also notable due to the disruption they wreaked on hospitals and major international organizations. During 2020, amidst the COVID-19 pandemic, ransomware again became consistent problem as they affected hospitals that were already burdened by the growing infections [17, 18]. Whilst these attacks were not attributed to state or state-backed actors, it illustrated how disruptive non-state actors could be when interfering with already constrained social systems. In addition to these attacks, there were reports of state of state-backed espionage targeting medical research, particularly those related to vaccine development [19].

In December 2020, reports began emerging of numerous organizations that had been affected by a cyber-attack; it was eventually discovered that a vendor providing network management solutions, SolarWinds, had been compromised, and the software updates deployed malware allowing the attackers to gain access to their targets [20]. This attack

is the best illustration of a supply-chain attack at the time of writing and is notable in the number of major technology and government departments that were compromised by the attack. A few months later, another major attack was discovered, exploiting a vulnerability in Microsoft Exchange servers. While organizations hurried to patch their systems, numerous hacking groups, including those associated with nation-states, were leveraging off the vulnerability to conduct espionage and data exfiltration [21].

In January 2022, Russian forces entered Ukraine in what was termed a 'special military operation'. There was an expectation of significant cyber-operations; however, initially there appeared to have been limited activity in the cyber domain. Details began emerging of the various cyber incidents related to the conflict, and a tracker by the CyberPeace Institute has recorded 918 cyber incidents as of 13 January 2023 – a year into the conflict [102].

Where this section gave an overview of cyber-attacks related to international security, there is also a diplomatic perspective. The next section discusses the international relations aspects to cyber-security.

Developments in Cyber Diplomacy and International Law. With the growing prevalence of activity on the Internet that has negatively impacts security, be it nation-state, criminal, or other actors, there have been attempts for the diplomatic and international law communities to respond to the growing threats. This section provides an overview of the efforts and studies that focus on these perspectives.

The first major attempt for international coherence was the Council of Europe's Convention on Cybercrime, more commonly known as the Budapest Convention. The focus was to provide a degree of consistency to the response to cybercrime, and also provide mechanisms for mutual assistance and collaboration amongst nations in their investigations into online criminal activity [22]. The African Union also established a Convention on Cybercrime and Personal Data Protection, known as the Malabo Convention [23].

While the Budapest and Malabo conventions focused on collaboration to mitigate cybercrime, gaps remained in how international law applies to cyber-operations, in particular those relating to conflict and human rights. Two in-depth academic studies, known as the Tallinn manuals, discuss a number of considerations in applying existing international law to cyber-warfare and cyber operations [24, 25].

At the United Nations, a series of Group of Government Experts (GGEs) were convened to consider "Developments in the Field of Information and Telecommunications in the Context of International Security" and then "Advancing responsible State behavior in cyberspace in the context of international security" [26]. There have been six completed GGEs from 2003 to 2021 [26]. The 2013 report confirmed the applicability of international law to cyber space, and the 2015 report proposed a series of norms of responsible state behavior in cyberspace [27, 28]. In addition to this, an Open Ended Working Group was convened, which was notable for its inclusivity through a multi-stakeholder approach, as well as achieving a consensus report in February 2021, with a second in progress from 2021–2025. There is also a proposed Program of Action that is considered an upcoming process at the time of writing [26].

Other processes and initiatives provide similar discussion, and often feed into the UN processes. For example, the Global Commission on the Stability of Cyberspace (GCSC) proposed a series of norms and definitions [29] as discussion and input to the

UN OEWG process. The Paris Call for trust and security in cyberspace is a multi-stakeholder initiative by the French government that has gained support from over 1000 entities, and advocates nine principles [30], which are similar in concept to the norms proposed by the GGE and GCSC. There are a number of other NGOs and initiatives that focus on related issues, such as The Geneva Dialogue on Responsible Behavior in Cyberspace [31], The Cybersecurity Tech Accord [32], Global Partners Digital [33], and the Global Forum on Cyber Expertise [34]. While this list is not exhaustive, it illustrates the recognition of the global importance of these issues. In addition to the norms and principles for good/responsible practice, these processes and initiatives also focused on confidence building measures and capacity building.

The norms and processes described in the preceding paragraphs are voluntary (i.e., non-binding), and a number of discussion around cybersecurity and international law are still open to interpretation. For instance, determining a use of force, act of war, or proportional responses in cyberspace is still uncertain. In practice, there has often been public attribution (usually denied by the alleged perpetrators) [15, 19] and sanctions against individuals implicated [35, 36]. An example of a retaliatory cyber-attack is a report that Israel targeted a major Iranian port in response to an alleged Iranian cyber-attack against an Israeli water system [37].

Key Works Related to Cybersecurity at National and International Levels. A number of selected works related to cybersecurity are presented below in alphabetical order of the title.

Books:

- *@War* by Shane Harris [38]
- *Countdown to Zero Day* by Kim Zetter [9]
- *The Cybersecurity Dilemma* by Ben Buchanan [39]
- *Cyberwar and Information Warfare*, edited by Daniel Ventre [40]
- *Cyber Conflict: Competing National Perspectives*, edited by Daniel Ventre [41]
- *Cyber Espionage and International Law* by Russel Buchan [42]
- *Cyber Mercenaries* by Tim Maurer [43]
- *Cyber Operations and International Law* by François Delerue [44]
- *Cyber Persistence Theory* by Michael Fischerkeller, Emily Goldman, Richard Harknett [106]
- *Cyber Strategy* by Valeriano, Jensen and Maness [45]
- *Cyber War versus Cyber Realities* by Brandon Valeriano and Ryan C. Maness [46]
- *Cyber War: The Next Threat to National Security and What to Do About It* by Richard A. Clarke and Robert K. Knake [47]
- *Dark Territory* by Fred Kaplan [48]
- *Global Information Warfare* by Andrew Jones and Gerald L. Kovacich [49]
- *The Hacked World Order* by Adam Segal [50]
- *The Hacker and the State* by Ben Buchanan [51]
- *Information Operations Matters* by Leigh Armistead [52]
- *Information Operations: Warfare and the Hard Realities of Soft Power,* edited by Leigh Armistead [53]
- *Information Warfare*, 2nd ed., by Daniel Ventre [54]

- *Information Warfare: Separating Hype from Reality*, edited by Leigh Armistead [55]
- *Information Warfare in the Age of Cyber Operations* by Christopher Whyte, Trevor Thrall, and Brian Mazanec [109]
- *Inside Cyber Warfare* by Jeffrey Carr [56]
- *Modelling Nation-state Information Warfare and Cyber-operations*, edited by Brett van Niekerk, Trishana Ramluckan, and Neal Kushwaha [103]
- *No Shortcuts: Why States Struggle to Develop a Military Cyber-Force* by Max Smeets [104]
- *Offensive Cyber Operations* by Daniel Moore [105]
- *Russian Information Warfare* by Bilyana Lilly [107]
- *The Tallinn Manual and The Tallinn Manual 2.0*, edited by Michael Schmitt [24, 25]
- *The Virtual Battlefield* by Christian Czosseck and Kenneth Geers [57]

Conferences and journals:

- European Conference on Cyber Warfare and Security (https://www.academic-conferences.org/conferences/eccws/)
- International Conference on Cyber Conflict (https://www.cycon.org/)
- International Conference on Cyber Warfare and Security (https://www.academic-conferences.org/conferences/iccws/)
- International Journal of Cyber Warfare and Terrorism (https://www.igi-global.com/journal/international-journal-cyber-warfare-terrorism/1167)
- Journal of Information Warfare (https://www.jinfowar.com), with a special issue on Ukraine [117] edited by Bill Hutchinson
- Journal of Law & Cyber Warfare (https://www.jlcw.org/)

Other resources:

- CyberPeace Institute portal on cyber incidents during the Ukraine conflict [102]
- EU Cyber Direct Cyber Diplomacy Atlas [110]
- Geneva Internet Platform Digital Watch Portal [26]
- The Hague Centre for Strategic Studies Cyber Arms Watch [111]
- United Nations Institute for Disarmament Research Cyber Policy Portal [112]

3.2 Online Influence Operations and Activism

An Overview of the Theme. The growth of ICTs gave civil society, NGOs, and activists a greater voice. The first notable occurrence was the Zapatista movement, which changed from an insurgency to an online movement in 1994 [58]. Later occurrences saw mobile devices and social media begin playing a role in anti-government protests and similar movements. Initially, the use of such technology occurred in Iran, Moldova, Urumqi (in China) and Mozambique [59, 60]. Subsequently, social media activity was also apparent in documenting a military intervention in Zimbabwe, as well as supporting subsequent protests [61].

The two most notable examples are the Arab Spring events and in Ukraine. In 2010 mass government protests supported by the use of social media spread across North Africa and the Middle East, resulting in changes of government [62]. In the Ukraine, the scenario was more complex; initially, pro-EU protestors ousted a pro-Russia government; in these protests social media was used for communication, but also specifically arranging legal, medical, and other supplies for the protestors [62]. Following this, pro-Russian protests, supported by media and other influence operations began opposing the interim pro-EU government. Ultimately, the situation led to the annexation of the Crimea and a conflict in the Eastern Ukraine; this provides a good example of hybrid warfare, where media influence and cyber-attacks were effectively used as a pre-cursor to military actions [62].

Activism and influence operations can be related to information and cyber-security. An interpreter at the UK's General Communications Headquarters (GCHQ) leaked information on how the U.S. intended to spy on UN members prior to a vote on sending troops to Iraq [63], and a contractor for U.S. intelligence agencies leaked sensitive National Security Agency information [64]. WikiLeaks published numerous communications and documents from the military operations in Afghanistan and Iraq, as well as U.S. diplomatic communications, leaked by an intelligence analyst [65]. All of these major leaks were the result of internal actors breaching security; and these leaks have provided insights into the secret activities of governments' intelligence and cyber-operations.

WikiLeaks also released information obtained through cyber-attacks, such as from Sony Pictures, and emails from the Democrat's 2016 presidential campaign [65]. This latter incident is often associated with concerns of a broader influence operation to influence the elections, where messages across a broad range of social media was reportedly used to create divisions in the U.S. [66]. A PR firm, Cambridge Analytica, was embroiled in a scandal based on their messaging to influence voters based on data gathered about them on social media [67]; prior to this, Bell Pottinger was exposed using cynical and malicious messaging in South Africa, ultimately resulting in the collapse of the company [68].

During the COVID-19 pandemic in 2020, there were various attempts at disinformation and influence. Some disinformation campaigns were attributed to nations, particularly surrounding the origins of the virus [69]. Other nations used social media as a propaganda mechanism, targeting countries in an attempt to improve their image in conjunction to providing aid to those countries [70]. A disturbing trend was a handful of world leaders to also providing disinformation [71, 72].

The response to disinformation and influence operations has not yet achieved the growth that has been see for cyber-security. The Carnegie Endowment for International Peace hosts a Partnership for Countering Influence Operations [73]; this group is a partner to the Disinfodex, an online database of information about known disinformation operations [74]. Large tech firms also release dataset, such as Twitter's data on information operations [75]. National responses to disinformation, especially during the pandemic, was to pressure social media companies to enhance their efforts [76], or to outlaw disinformation and misinformation, which raised some debate due to concerns over restrictions on freedom of speech [77].

Key Works and Resources Related to Influence Operations, Disinformation and Online Activism. A number of selected works related to cybersecurity are presented below in alphabetical order based on the title.

- *Active Measures* by Thomas Rid [78]
- *Atlantic Council's Digital Sherlocks programme and 360/OS conference* [113, 114]
- Carnegie Endowment for International Peace Partnership for Countering Influence Operations [73]
- *Influence and Escalation* by Rebecca Hersman, Eric Brewer, Lindsey Sheppard, and Maxwell Simon [108]
- *Information Wars* by Richard Stengel [79]
- Special Issue on Countering Influence Operations, *Journal of Information Warfare*, edited by Alicia Wanless and James Pamment [80]
- *This Is not Propaganda* by Peter Pomerantsev [81]
- *The World Information War*, edited by Timothy Clack and Robert Johnson [82]
- *Towards Responsible AI in Defence: A Mapping and Comparative Analysis of AI Principles Adopted by States* by Alisha Anand and Harry Deng [116]

3.3 Artificial Intelligence, Autonomous Systems, and Surveillance

An Overview of the Current Issues within the Theme. With the increase of 'smart' or 'intelligent' systems that are connected, there are a number of concerns raised. In terms of commercially available devices, concerns usually revolve around privacy and the extent of information these devices and the manufacturers collect; this applies both to home automation and mobile devices [83]. When similar technological concepts are extended to physical security applications, such as facial recognition in CCTV surveillance, both privacy and accuracy become problematic. As surveillance systems are not in an 'ideal' environment there is the likelihood for incorrect matches; this becomes particularly problematic when incorrect matches are used as evidence for criminal or other legal proceedings [84, 85].

When such technology is employed in military and intelligence contexts, there are concerns that autonomous and semi-autonomous systems can potentially attack incorrect targets [86]. A fully autonomous system is defined as one that can perform target identification and selection, as well as attacking the target, with no human control [86]. As can be seen from the list of key works below, the majority of research and focus on this topic revolves around the ethics and law of using artificial intelligence and autonomous systems.

Key works and resources related to AI, autonomous systems, and surveillance. A number of selected works related to cybersecurity are presented below in alphabetical order based on the title.

- *Army of None* by Paul Scharre [87]
- *Autonomous Weapons Systems: Law, Ethics, Policy*, edited by Bhuta, Beck, Geiβ, Liu, Kreβ [88]
- *Autonomous Weapon Systems and the Law of Armed Conflict* by Tim McFarland [89]

- *Genius Weapons* by Louis A. Del Monte [90]
- *Killer Robots* by Armin Krishnan [91]
- *Killer Robots* by U.C. Jha [92]
- *Lethal Autonomous Weapons*, edited by Galliott, MacIntosh, and Ohlin [93]
- Organization for Economic Co-operation and Development (OECD) AI Policy Observatory [115]
- *Wired for War* by P.W. Singer [94]

4 Future Directions

The themes relevant to the working group have numerous possible future directions. This section will provide an overview of current and future events that are likely to drive the issues and research considered by the working group.

From a technical cyber security perspective, research in current and future attack trends [95], vulnerabilities, as well as improving detective and preventative controls will continue as future research avenues. As the Fourth Industrial Revolution continues and more technological innovations are introduced (such as 5G and quantum computing), the interactions between cyber security and the other pillars of 4IR will continue to evolve and require research [96]. There are already indications that the 4IR is evolving to the Fifth Industrial Revolution, which will increase the security challenges [97, 98]. In addition to the cyber-security perspective, the application of emerging technologies in conflict, peace, and security settings will require investigation, including the ongoing legal and ethical debate on autonomous weapons systems.

From the cyber diplomacy perspective, there are a number of initiatives at the time of writing: The UN Human Rights Office of the High Commissioner is developing a report on cyber mercenaries [99]; the mandate for the OEWG was extended for 2021–2025, with the GGE scheduled to completed in 2021 [26]; the next phase of the Paris Call is continuing in 2021 with a series of working groups [100]; and a second additional protocol for the Budapest Convention is in the consultation phase [101]. The number of initiatives in this area indicate that there will continue to be significant research and investigations continuing for the foreseeable future.

As disinformation and influence operations continue, there is likely to be ongoing discussion and an increasing number of forums considering disinformation and influence. There is also likely to be research aligning the detection and mitigation of influence operations with existing cyber security techniques. As with cyber security, emerging technologies are likely to increase the sophistication and reach of influence operations.

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Appendix: Collaboration with Regional Groups

One of the novel aspects of the International Federation of Information Processing (IFIP) organization is that individual people are not members. Clicking on the "members" tab of the IFIP website reveals a list of national or regional computing societies. As discussed in the Introduction, this is a basic structural principle of the organization. The following groups have often supported IFIP Technical Committee 9 (TC 9). They have appointed representatives to TC 9, and they have been important participants in TC 9 meetings. We are grateful for their support. Other regional or national groups are welcome to appoint representatives to TC 9.

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Austria	
Organization	Austrian Computer Society
Website	http://www.ocg.at
TC 9 Rep.	Gerald Steinhardt (gerald.steinhardt@tuwien.ac.at)
Goals	ACS seeks to make the benefits of ICT accessible to all people in order to promote social development
Description	Founded in 1975, ACS serves as an interdisciplinary networking forum for ICT, promoting synergies between science and business. The organization sponsors many interdisciplinary and international events related to computing
Notes	The organization's first president was Heinz Zemanek. As noted in the introduction to this volume, Zemanek was a president of IFIP. He was instrumental in the effort to create TC 9's first Human Choice and Computers conference in 1974. ACS offers an annual award in his name
Bulgaria	
Organization	Bulgarian Academy of Sciences, Bulgarian National Committee of IFIP
Website	http://ifip.acad.bg
TC 9 Rep.	Nelly Ognyanova (nelly.ognyanova@gmail.com)
Goals	In order to support national culture, economic development, and universal human values, the Bulgarian Academy of Science conducts research and training in 42 scientific units
Description	The Bulgarian Academy of Sciences was established in 1869 at a time when the country was under Ottoman rule; the organization moved from Romania to Brăila, Romania, to Sofia, Romania. Bulgaria was one of the founding members of IFIP in 1959. The executive of the national committee is elected by the Bulgarian Academy of Science, meaning that they are among the best of Bulgaria's experts. Since 1975, the national committee has been a part of most conferences in Bulgaria related to computing
Finland	
Organization	Finnish Information Processing Association
Website	https://tivia.fi/in-english/
TC 9 Rep.	Kai Kimppa (kai.kimppa@utu.fi)
Goals	To uphold the professionalism and professional interests of its individual and organizational members and make the IT profession and its work visible to the general public
Description	According to the 20th anniversary article "How Was the Hole Card Association born?" by Erkki Pale: The origins of the Punch Card Association (the original name) were in 1953. IBM had a monopoly over punch card machines in Finland, but some felt there was a lack of training in system management and utilization. The association promoted collaboration between users and provided a forum for discussing guiding principles. Learning from other groups, the association was open to users of all systems, not just IBM, and it allowed companies to become members to help finance the association's activities. The activities of the association cover the whole of Finland and include education of people interested in the field through seminars, conferences, congresses, and publications; publishing articles in magazines and journals; and funding travel to international conferences
	Dr. Kimppa has been vice-chair of TC 9

France	
Organization	CREIS-Terminal
Website	https://www.lecreis.org
TC 9 Rep.	Dominique Desbois (desbois@agroparistech.fr)
Goals	CREIS-Terminal, composed mainly of researchers and teachers from various disciplines (law, economics, management, computer science, psychology, sociology, etc.), conducts a reflection on the challenges of the new information and communication technologies in society, in conjunction with its journal *Terminal*. CREIS-Terminal is an association under the French law of 1901
Description	CREIS-Terminal is the result of the merger of two associations, sharing common objectives, history and members: CREIS and CIII (association publishing the journal Terminal). CREIS-Terminal publishes the journal *Terminal* (https://journals.openedition.org/terminal/) and organizes annual study days on themes concerning the social, economic and cultural uses of information technologies (list of Study Days: https://www.lecreis.org/?page_id=939)
Notes	The member society from France is Société Informatique de France (https://www.societe-informatique-de-france.fr), which appointed Dr. Desbois as TC 9 representative. Desbois is a board member of CREIS-Terminal
Italy	
Organization	Italian Association for Computer Science
Website	https://www.aicanet.it
TC 9 Rep.	Norberto Patrignani (norberto.patrignani@polito.it)
Goals	In support of an inclusive and competitive society, AICA offers paths for all to take an active role in managing digital technology
Description	AICA was established in 1961, allowing Italy to join IFIP. The association sponsors an annual congress; publishes *Mondo Digitale,* a magazine that reviews ICT, and *Bricks* magazine, about use of digital technology in teaching; offers awards to outstanding students; bridges students, teachers, schools, and companies to disseminate best practices for education; supports diversity in computing with its Women in ICT Task Force; and conducts many other activities
South Africa	
Organization	Institute of Information Technology Professionals South Africa
Website	http://www.iitpsa.org.za
TC 9 Rep.	Jackie Phahlamohlaka (jphahlamohlaka@csir.co.za)
Goals	IITPSA is a professional association for ICT practitioners that fosters an inclusive community of ICT professionals that promotes best practices for an innovative digital society
Description	Established in 1957 as Computer Society South Africa, IITPSA has a long history of promoting computing. They are the sponsors of activities like the SA Computer Olympiad, that involves more than 30,000 people per year. They also organize a myriad of professional development seminars, encouraging members to engage in lifelong learning
Notes	Dr. Phahlamohlaka was deputy chair and chair of TC 9 as well as the South African representative to IFIP

Japan	
Organization	Information Processing Society of Japan
Website	https://www.ipsj.or.jp/english/index.html
TC 9 Rep.	Taro Komukai
Goals	Solving social issues and creating values with technical innovation
Description	The Information Processing Society of Japan (IPSJ) was founded in 1960 order for Japan to become a member of IFIP. IPSJ leads the sound evolution of computer science and technology and contributes to creation of new ideas to cope with the accountability for evolving technology, playing a critical role in the world for the global prosperity
Notes	Dr. Komukai was one of the proceedings editors and the local host for two TC 9's Human Choice and Computers conferences
United Kingdom	
Organization	British Computer Society
Website	https://www.bcs.org
TC 9 Rep..	Penny Duquenoy (pennyduquenoy@gmail.com)
Goals	The British Computer Society (BCS) seeks to benefit the public by promoting the study and practice of computing. It consists of three main groups: computing professionals, computing companies, and society at large
Description	Established in 1957 when the London Computer Group merged with a group of scientists. Recently, BCS helped to establish a new computing curriculum for schools in England. BCS's Computing at Schools program supports nearly 30,000 computing teachers throughout the UK. The BCS provides professional development opportunities, shares knowledge among members, supports educational innovation, and influences industry standards and professionalism
Notes	Dr. Duquenoy has served as secretary of TC 9

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