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Foreword

The editors of this volume bring together a collection of papers that, taken together, provide an interesting snapshot of current research on Human Computer Confluence (HCC). HCC stands for a particular vision of how computing devices and human beings (users) can be fruitfully combined. The term was coined some 10 years ago in an attempt to make sense of the increasingly complex technological landscape that was emerging from different interrelated research strands in Information and Communication Technology (ICT). It was clear that computers could no longer be seen just as machines that execute algorithms for turning input into output data. This simply seemed to miss a lot of the ways in which computers were starting to be used, in which 'users' could interact with them and the multitudes of shapes they could take. After the era of 'desktop computing', the power of an application was no longer just residing in the sophistication of its algorithmic core, but also, or maybe even mainly, in the way it blends into the user's sensation of being engaged into some value-adding experience (for work, for health, for entertainment,...). Moreover, everything that had been learned about how to design good screen-based interfaces seemed useless for dealing with settings of, for instance, wearable or embedded computing. In order to capture all this there was a pressing need for new concepts, a new language, new ways of measuring and comparing things.

Human Computer Confluence became the name of a 'proactive initiative' (EC, 2014), funded by the European Commission's Future and Emerging Technologies (FET) programme under the Seventh Framework Programme for Research (FP7). In a nutshell, the mission of FET is to explore radically new technological paradigms that can become the future assets for a globally competitive Europe that is worth to live in. A FET proactive initiative aims to assemble a critical mass of research around such a technological paradigm in order to shape its distinct research agenda and to help building up the multi-disciplinary knowledge base from which the paradigm can be explored and further developed into a genuinely new line of technology.

Not all the work that is documented in this volume has been funded through FET. Many of its authors would not even say that they are doing their work under the umbrella of HCC. HCC is not a strictly defined school of thought. It is rather an undercurrent that permeates across many lines of contemporary research activities in information and communication technologies. In that sense, the concept of Human Computer Confluence is more like a road sign marking a direction in the socio/technological landscape, rather than a precise destination.

1 The views expressed are those of the author and not necessarily those of the European Commission

What's in a name? Why was there a need for a new term or concept such as Human Computer Confluence? After all, there was already 'ubiquitous computing' to capture the visionary idea of anywhere, anytime and contextualised computing. After all, there were already emerging areas like Presence research and Interaction Design, both with their essential focus on techniques to develop characterise and even measure the 'user experience', be it in virtual reality, augmented reality or embedded and ambient computing/settings. These areas of research are all very relevant for the emerging HCC research agenda, and it is at their intersection that the idea of HCC takes shape.

As should be obvious from the name, perhaps the most essential feature of HCC is that it is not just a technological research agenda. Somewhat retrospectively, one can argue that its whole *raison d'être* was to counterbalance the technology-dominated vision of ubiquitous computing that (with a detour through ambient intelligence) is now developing into Internet of Things. The whole human side of it that was initially very strong (especially in Disappearing Computing and Ambient Intelligence) got overpowered by the more pressing and concrete technological research agenda of components, systems, protocols and infrastructures. With the more fundamental questions of the human side of the equation temporarily side lined, there was an obvious need for longer term research such as funded by FET to do some groundwork on this. It is in this context that HCC both as a term and as an initiative was born. Ultimately, it will be in its contribution to turning Ubiquity and Internet of Things into something worth to have for Europe's citizens that its long-term impact should be measured.

It is worth mentioning the other big school of thought for a human/technology combination, namely the convergence research agenda of NBIC – Nano-Bio-Info-Cogno. This is a strongly reductionist vision of human engineerability, based on its reduction to elementary material and ultimately engineerable building blocks over which perfect control can be exercised. In its most radical versions it leads to Transhumanism where human nature itself gets inevitably replaced by a superior bio-techno hybrid nature. Human Computer Confluence points to an alternative approach of trying to understand and enhance the human sense and experience of technological augmentation by building technology that takes into account the full human nature of the 'user'. In that sense it is also a good illustration of what the European version of the NBIC convergence agenda could look like (HLEG, 2004).

HCC addresses what seems to be a paradox: how can we become more human through technology, instead of less?[2]

– Humans as equal part of the system to be studied: HCC cannot be reduced to a purely technological challenge. Whereas before the human was a factor to be

2 This list is based on the outcome of a panel discussion at the second HC2 Summer School, IRCAM, 2013 (HC2, 2013)

taken into account (for example for usability) it is now an equally important part of the study. This redefines the boundaries of the 'system', and hybridises the nature of it in a fundamental way. The old idea of interface as the fine line that cuts between system and user is no longer tenable. One rather has to think about how complex process on both side interact and intertwine, at different levels (for instance, physical, behavioural, cognitive) and based on a deep understanding of both.

- Empowerment rather than augmentation: HCC is not about augmentation of specific human capabilities (for example force, memory, concentration, perception, reasoning), but about empowering humans to use their abilities in new ways, themselves deciding when and what for.
- Social enhancement rather than individual superiority: it appears useful to anchor HCC in a networked view of computing, such as ubiquity or internet of things, in order to keep it focused on group, community and social dimensions, in addition to the individual user's view (Internet of Everything).
- Privacy and trust are essential for user's to engage into the experiences that HCC enables for them. HCC requires much more transparency on who or what is in control or has certain rights. It remains to be seen whether current trends in big data are going to provide a sufficient framework for this.
- Another emerging feature of the HCC idea is that users are creative actors. In HCC there is a sense that we put things together, more than that they are pre-packaged technology bundles. The active involvement of the human as the composer or bricoleur of its own technology-mediated experience is stronger, maybe even more essential then the automated adaptation of the technology to the user. In this sense HCC resonates well with current trends of 'makers', fablabs and social innovation. Will HCC bring everyday creativity and popular cultural expression to the heart of the research agenda, not just as a creative methodology to design new technologies but as an integral feature of any human/socio-technological system?

Looking at this list, it is clear that HCC has not been achieved yet in a significant way. The combination through technology of such features as personal empowerment, social enhancement, trust and user creativity has not yet been demonstrated in a strong way. It is not even clear what form such a demonstration would take. Beyond research, one can only speculate about the killer application that would demonstrate its power. Maybe it could be in sports, in gaming or in fashion, where playfulness and serious results can be combined and where wiling early adopters can be easily found. What would be its first big market: commerce, entertainment, the grey economy, education, the public sector or ecology? Or will it be and remain generic from the outset, leaving it entirely to the users as creative actors to invent what it can do?

As the chapters of this book illustrate, Human Computer Confluence is a fascinating vision in which a lot remains to be understood. Some of the choices mentioned above will need to be made more consciously in order to grow beyond the incidental

flashes of insight to a genuinely new paradigm of information technology. It has the potential to create the opportunities for a distinct European approach to how humans and technology can be combined.

References

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