

Anker Helms Jørgensen

From Calculation to Culture:

A Historical Perspective on the Development of the Computer and HCI

Short abstract

The book *Interface Culture* by Steven Johnson that describes the user interface as a cultural phenomenon witnesses the tremendous changes that the computer has undergone in the last 50 years: from a mere calculation engine to a cultural artefact, accompanied in equally substantial changes in society. The computer is now a universal and pervasive device that must be viewed as a cultural and social phenomenon in order to be fully understood and exploited. Along with these developments, the range of academic disciplines required to understand the role of computer has increased equally dramatically. Initially engineering and mathematics constituted the foundation while aesthetics, political science, and cultural studies have entered the field today. This paper presents a historical overview of the developments in academic disciplines required to understand the development of the computer as a social and cultural phenomenon - as seen from a HCI perspective. The overview takes shape as a table with 7 entries: *applications of computers*: areas where were computers were used, e.g., in communication; *techniques*: the technical developments, e.g., networks; *paradigms*: how were computers seen in a general perspective, e.g., technical; *interaction forms*: what forms of interaction were applied, e.g., menus; *forms of HCI evidence*: what kind of evidence crystallized in HCI, e.g., guidelines; *novel emerging disciplines*: the novel academic disciplines emerging, e.g., cognitive ergonomics; *basic disciplines*: the academic disciplines drawn upon, e.g., linguistics.

Extended abstract

Some years ago I had a wonderful experience: I came across the book *Interface Culture* by Steven Johnson (1997). Alas, the areas HCI (Human-Computer Interaction) and user interface design that I had been working with for two decades, primarily from a functional and psychological point of view, had finally become *culture*. Of course this had to come sooner or later, but this manifestation was indeed a revelation.

Johnson's book witnesses the tremendous changes that the computer has undergone in the last 50 years: from a mere calculation engine to a cultural artefact, accompanied in equally substantial changes in society. The computer is now a universal and pervasive device that must be viewed as a cultural and social phenomenon in order to be fully understood and exploited. Along with these developments, the range of academic disciplines required to understand the role of computer has increased equally dramatically. Initially engineering and mathematics constituted the foundation while aesthetics, political science, and cultural studies have entered the field today. This paper presents a historical overview of the developments in academic disciplines required to understand the development of the computer as a social and cultural phenomenon - as seen from a HCI perspective. The exposition is by no means an attempt to tell the complete history of computers or HCI – this has been attempted by others, see for example Wurster (2002) and Myers (1998).

The paper aims

- to create a landscape that may support the reader in positioning other papers in this book
- to provide a brief overview of the history of the computer and the history of HCI; this may be useful to young researchers from the humanities who are taking an interest in these hitherto technical areas.
- to provide grounds for a discussion of the field of usability that is being challenged by the social and cultural developments (Jorgensen, 2002).

Initially the computer was regarded as a purely technical artefact used for complex calculations, created by and largely used by engineers and scientists, drawing upon engineering and mathematics. The computer as such also developed, giving rise to the personal computer that complemented mainframes and minicomputers. Along with the developments and dissemination of networks, the computer became an everyday artefact in Western culture, accompanied for example by changes in the way citizens can express themselves in the public sphere (calling for media and communication theory) and by changes in the forms of the political debate (calling for political science).

The first computers were operated with switches so classical “knob & dial” ergonomics was a sufficient frame for understanding and handling the interaction. Later the computer Gradually novel interactions forms evolved: from the language-based commands over the visual menus and the graphical interfaces to speech input/output, calling for semiotics, graphic design and psycholinguistics. Along with this development, the computer moved out of the engineering context, first into the offices where it was regarded as a tool supporting work, later into educational contexts and finally in everyday life, often embedded in mobile devices supporting communication and social interaction, calling for organisational theory, anthropology, work psychology, pedagogics, cultural studies, and sociology.

Along with this development a number of novel academic disciplines emerged. First and foremost computer science, but this field was soon complemented by for example Human-Computer Interaction (HCI) and Participatory design (PD).

These developments have been captured in a “HCI landscape” that takes shape in table (here merely listed as bullets) with seven entries:

- *Applications of computers*: areas where were computers were used:
calculations – administration – utensils – communication – education - entertainment – design – art – culture
- *Techniques*: the technical developments:
mainframes – minicomputers – personal computers – networks – hypertext - Virtual Reality – robots – ubiquitous/pervasive computing.
- *Paradigms*: how were computers seen in a general perspective
technical – the individual – organisational context – social context – societal context – democracy – economy.
- *Interaction forms*: what forms of interaction were applied
knobs & dials – commands – menus & forms – graphical user interfaces – speech – multimedia – gestures – physiology – touch.

- *Forms of HCI evidence*: what kind of evidence crystallized over the years
experience – guidelines – cognitive experiments – concepts – theories – development
methods – standards – evaluation methods.
- *Novel emerging disciplines*: the novel academic disciplines emerging
computer science – cognitive ergonomics – Human Computer Interaction – Computer
Supported Cooperative Work – Participatory Design – Computer Supported Cooperative
Learning – Computer Mediated Communication.
- *Basic disciplines*: the academic disciplines drawn upon
electronics – ergonomics – cognitive psychology – linguistics – semiotics – philosophy –
pedagogics – communication – media studies – organisational theory – design – sociology
– ethnography – cultural studies – political science – aesthetics – literary theory – art
history – drama – occupational health.

References

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