HCI and design: uncomfortable bedfellows?

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Introduction

It would be rather natural to think that human-computer interaction and design (industrial design, graphic design) would have as professions and as disciplines easily form an alliance. After all, there is so much HCI design as a newcomer could have learnt from long-established design professions, and on the other hand the penetration of information technology in everyday life has greatly increased the public awareness and prestige of good design. In real life, the relationship between these two areas has been far from straightforward, but strained and complex. It took 15 years before an industrial designer was able to give a talk in the major HCI conference as a designer, and the relation to other direction has not been much more embracing. Although some development has taken place the contact points between the areas are still sparse after quarter a century of overlapping existence.

Why is this so? The paper will explore the issue by tracing the intellectual development of the HCI during the last 25 years, and comparing that with the design world. The point of interest will be the HCI “turn to design” in 1990s. There was a lively theoretical discussion within IT in the 1980s about the philosophical foundations of information technology design, resulting e. g. such classics as Winograd & Flores’ „Understanding Computers and Cognition“ 1986 and Ehn’s „Work-Oriented Design of Computer Artifacts“ 1988. This discussion did not, however, survive into the 1990s but it was ten years later replaced with a novel direction, the “turn to design”. Why did this turn take place, and did it succeed?

Main orientations in design thinking

Let us start with a short look in design thinking. Along the industrial needs to design consumer products for mass markets different ideologies of design evolved. As a rough caricature, we can identify two influential traditions in industrial design; the legacy of both is still very much alive. One of them is naturally functionalism or „modernistic“ thinking in design, and the emergence of it is usually connected with the Bauhaus school of design in Germany (1919-1933). The basic idea behind Bauhaus thinking was that there was a possibility to develop a new aesthetics for industrial products, that by skilfully taking into account the functionality of products, the nature of materials used and industrial production processes available, it was possible to developed aesthetically pleasant new forms for those products. The new products would not only function well for the purpose and be economical to produce, but they would also improve the aesthetical quality of life of their users. These ideas have been very influential and they are still part of most design education, and
"postmodernist" design approaches are still often defining itself in the opposition of the Bauhaus functionalism. The functionalistic tradition has been criticized, in particular by the postmodernists, having an elitist and patronizing view on the users of the products of design: the elite designer knows better what is needed, and is capable to raise the cultural level of the masses by means of design.

Another influential tradition in industrial design emerged during approximately the same period, in 1930s in USA. Its beginnings cannot be pinpointed with the same accuracy than the Bauhaus ideology, but it is often connected with „The Big Four“ designers of 1930s (Loewy, Teague, Bel Geddes, Dreyfus). This tradition of „styling“ or „consumer appeal“ was and is unashamedly commercial: the purpose of design is to help selling, and selling more. While Bauhaus built its aesthetics on functionality, the consumer appeal designers were much more liberal in this sense: they realised, that the decisions to purchase of a product were often heavily influenced by different meanings buyers connect with products, and that – with a help from marketing – it was possible to design positive immaterial meanings related with a product also when they were not directly connected with the functionality of the thing itself – meanings like social status, youth, or sexual attractiveness. The consumer appeal tradition has been in turn subjected to scathing criticism within the design community (e.g. Papanek 1971), as selling all moral principles for money and exploiting the lowest features of human nature. Despite that, if Bauhaus legacy has lasted long in design education, the consumer appeal has perhaps had stronger influence in actual design practices.

A framework for analysis

Next a simple model will be constructed to compare the worlds of HCI and design. It is based on the idea that the essence of different artefacts is to mediate between humans and world, and that this mediation takes place in a variety of ways. The original idea that artefacts mediate only as tools, as expenders of human capabilities, is since long found to be too narrow. In this discussion a hypothesis is made that there is a triple mediation between humans and world through artefacts – as if artefacts would at the same time belong three different spheres which are connected but which cannot be reduced to each other. The hypothesis is based on cultural-historical activity theory (Kuutti 1996), but it cannot be elaborated here further. The mediations are:

Functionality. The immediate usefulness of an artefact is based on how it functions. The materiality and making of an artefact are connected to this relation.

Meaningfulness. As discussed in the previous section, an artefact can be a bearer of culturally founded meanings, which some times are a crucial aspect of the artefact. A person buying a Mercedes or a BMW does not buy only moulded and painted sheets of steel, a motor and wheels, but also a lot of such meanings. A recent book by Krippendorff (Krippendorff 2006) is a good example in conceptualising and theorising on this mediation.

Economy. A rather small portion of all artefacts is crafted and used by persons themselves, but they are produced in a very organised way and distributed within the social division of labour. They are subjects of exchange – selling and buying – at the market, where they obtain an exchange value besides their use value.

Figure 1 shows a simple graphical description of the model.
There is quite a lot of variance within each relation: we have artefacts where the functionality is restricted to be a material bearer of meanings (objects of art), artefacts to which it is almost impossible to hang any additional meaning besides functionality (computer utility programs), and artefacts which are created and distributed outside the market mechanism (video clips in You tube). All these can however be considered within the model, so it is covering a broad area, and may serve as our sounding board when we look at the difference of HCI and design professions.

The task of a „traditional“ designer is (within the confines of this model) to solve the problem arising from a design brief: how the needed functionality can be produced smartly by using the available materials and production technologies? At the same time he or she has to shape this functionality into a form which references to the world of meanings in culture and society in such a way that the buyer and user will gain some added value from that, for example aesthetic pleasure. And all the time this must happen within the limits given by potential production volumes and costs of production, distribution, and marketing.

Thus all three mediations have been taken into account in design education. Although the artistic component of dealing with meanings – creating forms that make a unique reference to cultural sphere – has without doubt been the leading motive, also the functional/material and production/distribution economics relations have been kept in mind. Design education has also not been heavily interested in training students in detailed methods how to do design, but more in educating such personalities who can filter and crystallize cultural influences into effective and meaning-laden forms. So development of personal judgement what is good design and what not has always been one of the goals in education. This also means certain individualism; it is assumed that a design brief interpreted by two designers will lead to two different designs.
The sketch on design world presented above is crude indeed, but perhaps enough to help the discussion about tensions between it and HCI world later in the paper. Let's now turn to HCI.

**A short history of current HCI**

First it must be noticed, that during the last quarter of century technology and our ways of using it have developed enormously. From HCI point of view, the major steps could perhaps be identified as follows:

The emergence of desktop PC and stabilisation of the graphical user interface (GUI), which initially was a great step forward and enabled that computer use was able to spread beyond professional users, but the legacy of which has started to hinder the development further;

The emergence of World Wide Web, which from technical and interaction point of view was a definite step backward from desktop GUI, but which again enormously enlarged both the user population and the number of people capable to develop interfaces for new systems;

The emergence of mobile devices, of which mobile phones are certainly most numerous, and besides them personal digital assistants, MP3 music players, digital cameras and so on. This has brought forward many challenges to design, but also revitalized the interest in physical aspects of design;

Finally, the communication networks and penetration of information technology into everyday objects and environments, which is currently changing the technology design landscape again.

Given this change in the technology landscape it is clear that the following sketch attempt not to give an accurate history of the development of the field, but only outline some significant features related to the development of the “mainstream” ideas during the period in case.

**Background**

To keep the story of the development of HCI over last 25 years short and coherent it must be distorted into an one-dimensional caricature. The story tells about the baseline, „mainstream“ HCI, but there were important parallel side currents as well. Perhaps most important of them were Participatory Design movement discussed elsewhere in this book, and anthropologically and microsociologically inspired Computer-Supported Cooperative Work. The ideas and methods developed within these communities started eventually, towards the end of 1990s, filter into the mainstream HCI, and so the current landscape is more rich and varied than the rather bleak one presented in the story. For the purpose of this paper the caricature is useful, however.

The story of HCI is naturally not the whole story: there were also other studies on relationship between humans and computers from 1960s on than the information-processing cognitive psychology dominating the earlier phase oh HCI and discussed a bit later (one of such was psychology of programming, where very interesting work was done in 1970s). And there was and still is a strong rather separate tradition of research in ergonomics, in particular in areas such as production automation and cockpit design, from which HCI could have had learnt a lot, and perhaps still could –
but that is a story for another paper. In any case, to follow the development a starting point is needed: the research landscape on humans and computers in late 1970s and early 1980s.

For the purposes of this paper we can limit ourselves to two then dominating traditions of research: management information system (MIS) direction in Information systems (IS), and AI/Information processing psychology in HCI. There is certain symmetry with these traditions, and they fitted well enough together in the same textbooks. At that time IS was a very important area. The methods for and research on it were dominated by MIS ideology, which saw organisation as a rational machine, which can be better and better controlled by management with information technology. The standard mode of software development was a contract-based one, where a software vendor developed a unique system for a particular customer. The last phase of such project was called implementation, where the system was installed in use, and users trained and software tweaked until the combination finally became at least minimally fit for the purpose.

After the „cognitive turn“ in psychology in 1950s, the information processing variant of cognitive psychology had won the day and become a standard. The central idea of it was (and is) that human thinking is in principle similar than the functioning of a computer (and thinking is what matters). Artificial intelligence (AI) was the extremist branch of this tradition. The central research paradigm was a careful modelling and factorization of use situations based on theories of information processing psychology, and testing of these models in controlled laboratory experiments according to the best traditions of experimental psychology.

Thus in late 1970s and early 1980s the landscape of human-and organisation-oriented IT research looked rather different than now. The PC revolution was still to happen, and correspondingly HCI was far from the industry-academy mass movement we know now – it was a small, rather esoteric and purely academic area. Theoretically the artificial intelligence/information processing cognitive psychology had dominated the field some 20 years, and was still going strong, although its impact in practical design of systems had always remained minimal. Perhaps the most “progressive” area was information systems design, where the penetration of large systems further and further in the organisations had led to larger and larger and more and more diversified groups of people to become end-users of the systems, and continuously causing situations where the prevailing marriage of system-theoretical (cog in the organisational machinery) and information processing psychology (humans as rational information processors) was feeling less and less adequate.

**History of the current HCI**

This was going to change during the 1980s because of what happened at the market – PC emerged and brought with it a mass market for usable software. Two significant issues can be highlighted here, one interface invention, another commercial innovation. The interface invention was the development of spreadsheet software, the first of which was called VisiCalc, developed by Dan Bricklin and Bob Frankston 1979 for Apple II, and probably the most influential single program in the history of PC. Suddenly there was an interface that was easy enough to understand and manipulate, so that many kinds of tedious calculations could be automated
without learning computer programming. This made personal computer demonstrably useful for a variety of purposes, and many people bought Apple II just to use VisiCalc. The commercial innovation was of course IBM’s decision to go into the PC business, because only after that organisational decision-makers started to believe that PC is not a toy or passing fad but something serious that can be really useful, and that enabled PC to become a real mass phenomenon.

The commercial success of PC machines developed also a potential mass market for additional software for them. There was one serious problem, however: such mass-marketed software should be easy enough to learn and use “off-the-self” so that no extra training would be needed, because with training the business could hardly be made commercially viable. But nobody – neither industry nor academy – knew how to develop such quality in software, and this gap between needed and available knowledge was the start of the HCI research and community, as we know it now. Wisely enough, both academic and industrial resources were pooled together to solve the problem, the first CHI conference was organised in 1983, and since then the community and research area have been expanding and diversifying to become an important, visible and respected part of the IT research field – and one where cooperation between academy and industry has been and still is particularly close.

This development has had its own turns and twists. In the beginning, the “old” HCI research tradition rose eagerly to face the challenge of helping commercial software development. During the 1980s, however, it started to become more and more apparent that there was no success in sight: that academic research was not able to deliver results that would be useful in industry. Broadly taken, two reasons can be identified. Firstly, to make laboratory experiments controllable enough, the information processing psychology-based modelling had to abstract a way from use situations so many practically relevant issues, that the results had very little meaning with respect to real-life development. Secondly, the time needed for proper series of laboratory experiments did not fit at all the hectic pace of development. Towards the end of 1980s this was evoking two different responses. In academia, there was an increasing call for new theoretical foundations for HCI research, foundations that would be better in grasping what is happening in real-life situations, and researchers such as Liam Bannon, Philip Barnard and John M. Carroll tried to open such foundational discussion. In the industry side there was a growing disappointment in academic research and distrust in the usefulness of any theoretical accounts.

In the end of 1980s an innovation emerged from industry research laboratories (IBM and Digital were both very active at that time), innovation which shaped the HCI research landscape far in the future. This innovation was called usability testing. Interestingly enough it was based on the psychological laboratory experiments and maintained the appearance of such quite long (IBM’s usability laboratory people are dressed in long white laboratory coats in a widely distributed PR photo – e.g. in Preece et al. 1994), although the scientific content of the experiments (like theory, modelling, factors, control, statistics) was totally discarded. What was left was just observation of actual users in simulated tasks to identify potential problematic moments encountered in the process. Very simple, but also very efficient in practice: the emergence of such working methods directed the whole course of HCI for at least the next decade: usability became the central concept in HCI and better methods to
evaluate and design for it the major research topic. Unfortunately this also meant a certain intellectual impoverishment: calls to discuss about HCI theoretical foundations lost the audience, when the somewhat a-theoretical (and originally sometimes even anti-theoretical) usability movement took over.

It is good to remember, that although at first personal computers were built by hobbyists, and that was also the core customer base of the first commercially successful generation of PCs in the end of 1970s, it was in the workplace desktop computing within which the need for HCI emerged. Thus HCI was during the whole 1980s and long into 1990s work-oriented, and issues like emerging computer gaming did not receive much attention. Only during the latter part of 1990s PC started to evolve towards such consumer appliance as it is now, in parallel with the emergence of other computer-based consumer-oriented technology, like digital mobile phones, game consoles, etc.

During the 1990s and until the early years of 2000s usability remained by far the dominating topic in HCI. Better and better methods were developed, evaluation of usability was pushed earlier and earlier in the design process, and even attempts to gain more strategic weight in decision-making within product development organisations were launched. The longevity of usability as a research topic is somewhat surprising, giving that it is a rather narrow area, for which even no theories have been developed. But the need for more and more usability research has been fuelled by the rapid development of technology during the same period: first stabilisation of GUI interface, then emergence of WWW and explosion of WWW sites, then emergence of mobile devices as mass consumer phenomenon, and finally emergence of wireless networks, ubicomp environments and convergence of computers, networks, services, and consumer devices. Every technical development has meant a need to rethink how usability can be evaluated and designed, and that has kept the issue alive. Only in 2000s some challenge to usability domination in the field has been felt, in particular from the new emerging area of „user experience“, of which more will come later in the paper.

The relation between “usability” HCI and design

How has the relationship between HCI and design evolved? Or perhaps we could also ask why, despite a clear overlap of interest areas, it has evolved so slowly. Only in the last years of the quarter of century history outlined above ideas developed in design have started to have broader influence in the design field.

It is rather natural that in the beginning HCI did not have much contact with the design community. It can be speculated that usability movement could have learnt something from very practically oriented ergonomics tradition, which was and still is in contact with the design community, but ergonomics and HCI were not academically close, the former often within mechanical engineering, the latter in computer science or in other information technology department. The previous academic HCI had practically nothing to do with the design tradition, and when the usability movement broke off, it was left in a vacuum in this respect.

It is also rather easy to see, why HCI people did initially not feel a need to contact designers. During the desktop computer era, and in particular after the stabilisation of
GUI interface, there was not much else than computer screens or program windows to be „designed“, and because designers seldom had enough understanding of the „material“ to be used, they were reduced in changing the appearances. An even this was frustrating, because at that time programs were almost solely for utilitarian purposes. A piece of software made for a particular utility purpose is a quite peculiar object, and it must be one of the most utilitarian things in existence. It is indeed very difficult to load any extra meanings upon a piece of software, although not totally impossible: for example an aspiring sound engineer may attempt to create a feeling of professionalism – for oneself or for others – by using a professional sequencing software, and the diehard users of legacy software, say, the old Macintosh OS9 operating system, are certainly making also a symbolic gesture that is meaningful for them. But in a general, it is only the functionality and how it is put in the hands of a user that matters. Thus the strongest area of designer’s competence could hardly be used with respect to HCI at that time.

On the other hand, using the triangle model presented in the beginning it is also easy to understand why people belonging to design professions did not joyfully embrace this new group of people also calling themselves designers. From the three mediations HCI has been covering only the functionality side, and usability is an even narrower slice of that. During the usability development, interest in costs and benefits of usability work emerged, but the interest in the side of meanings, for example in the aesthetic aspects of HCI, have remained always thin. Thus from the viewpoint of a designer HCI people were not designers but „barbarians“, uneducated technicians lacking any understanding of the aesthetics and complexity of the cultural filtration involved in a design. This suspicion was strengthened by the HCI people’s obsession on methods instead of a personal judgement. (It is, by the way, a bit alarming to note that while the eye of a designer is indeed trained with good examples of design and there is almost a whole book industry devoted to the topic, nothing similar exist in HCI: the closest thing available are websites full of bad examples...)

**Turn to design in mid-1990s**

In the mid-1990s a very interesting „turn-to-design“ happened. It is hardly an accident that this was also the time when mobile devices, in particular mobile phones, started to become popular. The emergence of mobile devices and the continuing convergence between computers and other specialised devices meant a break in the desktop-dominated HCI. The small size of handheld devices created totally new HCI problems, but it also revived the interest in physical design, that had almost disappeared from HCI during the desktop era. And interest in physical design brought naturally interest in people who are capable to shape physical forms, designers. So the first designer finally got floor in CHI’98 – in the role of a designer of small computer-based devices: Jose Ferrante from Fluke Corp. in a panel on small interfaces (Marcus et al. 1998).

Prominent authors like Terry Winograd and Pelle Ehn, who ten years earlier had written polemical philosophical books against too narrow rationalist-cartesian view on humans dominant in IS design (Winograd 1987, Ehn 1988) had changed their orientation and instead of searching help from philosophy were turning towards the design profession, Winograd in the book "Bringing Design to Software" (Winograd
1996), and Ehn with his "Manifesto for a Digital Bauhaus" (Ehn 1998). The motivation of both of these is very similar: both regret that the connections between software design and other, older design professions have been lacking, and think that the design tradition can make valuable contributions to the design of software. The question is to find the areas and ways how these contributions can best be assimilated.

The book edited by Winograd, „Bringing design to software“, is a collection of fourteen rather diverse texts from a number of authors. Its general tenet is that there are lots to improve in software quality, and that a design perspective might be a good one to address these quality aspects. The opening chapter of the book is Mitchell Kapor’s famous „A Software Design Manifesto“, where he blamed the lack of quality, in particular use quality, of most of the existing computer software, and suggested that the reason for this is the paucity of design thinking in software development. The definition what actually is software design, remains quite elusive, despite several attempts to clarify it. 17 from the 20 authors have information technology background and only three come from design professions proper, so in opening of a dialog between IT and design professions the book takes only a modest step forward. Ehn’s paper, „Manifesto for a Digital Bauhaus“, has two goals: it is a discussion on the importance of Bauhaus tradition to all design and an exploration of digital as a novel material for design, and at the same time it outlines a program for a new curriculum he had been planning for Malmö University, where the idea of „digital bauhaus“ was to be put in the practice.

**Development in 2000s**

The book edited by Winograd was an indicator of a broader interest, and in mid-1990s two new forums were opened both of which continue still. One of them was the launching of a new ACM journal called *interactions*, a professional magazine on HCI and design. The authorship consist on academic and industrial HCI people, but also people coming from design professions. Another opening was a series of biannual conferences called Designing Interactive Systems (DIS), the first of which was organised in 1994. The organisers were members of the HCI community, interested in bringing in more influence from design tradition and having a forum for a dialogue between HCI and traditional design professions, and it was mostly the Bauhaus inspired tradition the organisers wanted to communicate with. The DIS series has continued until today, and the 8th DIS will be held in 2008, so the interest in design issues has been quite persistent. The conference has not, however, been really able to serve as a forum for a dialogue between HCI and design professions: although there are in each conference some contributions coming from the design side, the majority has always been HCI oriented.

After ten years of usability research and development, in the beginning of 2000s, it had become clear that usability alone will hardly be a major selling factor for any IT products, but something else is needed. This led to a development of an interesting new concept called “user experience”. As far as I know, it was brought in the design field from HCI side: I encountered it first time as a member of the workshop program committee for CHI’98. Among the proposals sent to the committee was one entitled „Emotions and user experience“, and I remember being the only member in the committee suggesting that it should be accepted. My e-mail archive does not reach
that far back, but I believe that there was an agreement within the rest of the committee that the topic was „not serious enough for CHI“ ... so times have changed a bit since then. After the initial confusion the new concept started to gain foothold and it has rapidly become a major new feature in the evolution of the HCI design field, almost challenging already the usability as the most popular term used. The interest in the concept has also led to a new series of conferences called Designing User Experience (DUX), of which three have been organised this far (2003, 2005, 2007). If DIS is hanging on the Bauhaus ideals, DUX is clearly leaning towards the Customer Appeal orientation, and design for commercial success. This had led to a certain tension between DIS and DUX communities.

**Conclusion**

This paper has made a short review on the relation between design and HCI. Although they may superficially seem having strong similarities, a closer look has found a gap between them, gap initially wide enough to hinder communication. The origins of the current HCI were in a specific historical situation, which has directed the development of the field and thinking perhaps more than the members of the community are aware of. The usability movement has been a great success that has made the HCI research community grow and flourish. But the success has masked an intellectual void: usability and utility alone are too narrow a perspective to understand the relation between humans and technology from a design point of view. And this void may be the reason why HCI researchers and developers are so eagerly embraced „user experience“ during the last years.

Meanwhile, design has always had a broader and richer view encompassing all sides of our framework – although the articulation of that view has been far from straightforward, but that is another story. Thus the “turn to design” in HCI ten years ago advocated by sensitive researchers such as Ehn and Winograd has not remained as an empty gesture, but it indicated a fermenting need within the HCI community. In ten years design in several forms has become a part of HCI landscape, and there is a possibility that it will lead to a certain reorientation of the whole field. The concept of user experience is still very diffuse, and many people are not happy with the doubtful Customer Appeal overtones in it. It can, however, be also seen in a more positive light: despite the lack of any explicit programme to do so, this far it is the most serious attempt to develop a new foundation for the next stage of HCI research and development. It is also one of the few concepts whose origin is in HCI but which has become popular also within other design professions, and which thus might serve as a bridge between different communities. According to the user experience community the concept is holistic and encompasses the issues of functionality and usability, complementing these with the meanings user gives to interaction. It remains to be seen, if it in the future can be developed further to really serve for such integrative purpose.

Finally, in this context it is interesting to notice, that although Pelle Ehn 20 years ago founded his manifesto firmly on the Bauhaus ideals, he also raised the need for “production of useful, beautiful and amusing everyday things and experiences for ordinary people” – a visionary touch, we can say now for sure.
References


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