

The challenges of HCI research

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ABSTRACT

Despite the increasing use of information technology, it appears that HCI research during the last ten years has become less important. This paper describes what can be done to improve the position of HCI research. It describes the general principles of the evolution and propagation of research ideas, applies these principles on earlier and current HCI research and describes ways that HCI research may improve its position.

Keywords

Design, Future, history, methods, practitioners

Introduction

The use of computers have spread more rapidly in the last thirty years than any other technology in the history of mankind, and HCI research has been a key area in that development. In spite of that, it appears that the influence of HCI researchers has decreased during the last ten years. I will therefore investigate the possible causes and discuss what can be done to avoid that HCI as a research area will stagnate and become increasingly unimportant.

A model of the evolution within a research area

The development within a scientific area can be seen as the result of a loosely connected evolution of ideas, where different attempts to act rationally interact with other forces that influence the development as for instance social values in the society, career opportunities and available resources. (In the following I will use the term ideas as a common term to designate observations, methods or opinions that are formulated so they can be communicated.)

According to Dennett, an evolutionary development of ideas requires three elements:

- Copying of ideas, so they may spread [2]. That happens for instance when a scientific paper refers to an earlier paper, or when someone reads the paper and applies the idea in a specific design
- Mutations or changes [2]. These happen for instance when someone quotes part of the account of an idea

and adds his or her own comments, when the person who applies the idea in a specific design does it in a slightly different manner than described or done earlier, or when a seemingly new idea is created based on earlier ideas.

- Selection, so some versions of an idea disappear, and only the versions that have a competitive advantage are spread [2]. The selection may for instance happen when an experiment shows that one version of an idea is better than another or because one version becomes adopted by a large company and a de-facto standard.

I have briefly described this evolutionary view in an earlier paper [11]. The paper describes how ideas may spread in different partly interconnected environments: among researchers, among practitioners in private companies and among consumers who may accept or reject products that embody a new idea.

Ideas spread more easily within an environment than from one environment to the other because the characteristics of ideas that spread most easily depend on the environment [11], and because persons within the same environment in general are more connected than persons in different environments.

The evolutionary view describes how ideas in a human environment gradually can become more useful and acceptable, without any overall guidance or sense of direction, simply because some ideas have a competitive advantage. Rogers [10] describes in more details some characteristics that may give an innovation or a new idea a competitive advantage:

- Relative advantage compared to what earlier has been used.
- Compatibility with existing values and habits.
- Trialability, which means that the innovation or idea can be tried before a full commitment is made.
- Observability, so other can see the innovation or idea and become aware of it.

It is important for the discussion of the development of HCI that an idea may have a competitive advantage in one environment, where it is compatible and offers a large relative advantage, whereas it may have no competitive advantage in another environment where it is incompatible or offer no relative advantage.

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Pioneer HCI

The field of HCI was established during the eighties and nineties, when computers, mobile phones and the internet were introduced as common work tools and consumer products. This created a need of interfaces that were easier to use, and it was obvious that it in most cases was not feasible to employ human factors experts to work on new interface designs.

Interface design within the human factors approach was regarded as an expert area in the construction of airplanes and complex systems, similar to electronics or structural engineering. It required practitioners with a university degree in cognitive psychology or ergonomics, and used precise, but complex methods as for instance GOMS that makes it possible to calculate the time a user needs to complete a range of physical and mental activities [9]. Such an approach was not feasible, if usability and interface design should become a normal part of large and small software projects.

The solution was to introduce a number of methods that seemed so easy to learn that software designers and other without any psychological background could apply them almost immediately. Nickerson and Landauer wrote [6]: "User testing is straightforward. Users try, the tester watches, notes errors, times tasks, later asks questions." In a similar manner, Jakob Nielsen [7] introduced "discount usability engineering", and stated [8] that a "large proportion of the problems one observe in user interface design" can be explained by just ten rules that can be described on less than one printed page.

Researchers adopted or were inspired by ideas from psychology, graphic design, anthropology and sociology. However, specific methods from other areas were often adopted without taking into account the assumptions the methods were based on, or the discussions of their limitations and use that occurred in the academic areas from which they were adopted. That made sense, when the goal was quickly to strengthen the area of HCI, and the approach was compatible with the values within computer science, where it is common to experiment with a new method based on a minimum of knowledge about it, and to adopt it, if the results seem to make it worthwhile.

HCI ideas spread rapidly, even through do-it-yourself descriptions in popular magazines, and researchers and practitioners found it easy to change ideas and methods in order to create their own variations. In contrast, the selection was quite weak. That can be seen in proceedings from scientific conferences at that time. A number of articles resemble personal accounts, and some articles with creative ideas were accepted even though the reliability of their results was not documented.

The notion seemed to be that any knowledge about usability was better than nothing, which is a rational view for researchers within a rapidly developing new discipline, as well as for practitioners for whom any reduction of the uncertainty in interface designs was advantageous. The

environments of researchers and practitioners were partly overlapping and not clearly separated. Practitioners presented their products at scientific conferences and researchers took part in interaction design for industrial software development.

When computers, mobile phones and later the Internet was seen as something new and unknown, it was possible for members of the HCI community to gain an entrance into established fields as communication, marketing and social science studies. When few other people investigated the use and consequences of the new technology, the ideas of HCI researchers had a comparative advantage, even within other areas where HCI researchers had limited experience and theoretical knowledge.

The informal approach to learning HCI made it easy for software developers and other to enter the field of HCI. They experienced a good triability. That was also the case for managers of software projects. They could for instance do a usability test in a single project before they decided to introduce usability testing in their normal development process. The relative advantage appeared to be obvious, when there earlier had not been any methods for ensuring a minimal level of usability, when any knowledge about possible usability problems clearly was better than nothing, and when usability problems frequently were discussed in public.

HCI work was compatible with the existing values and habits in software development, as long as it focused on evaluations and testing that could be done with only a minimal influence on the normal process of software development, and the informal approach to learning it was compatible with the notion among software developers that formal education was less important than the ability to learn a new skill quickly.

In contrast to the human factors approach, HCI had all the characteristics that were necessary to ensure a rapid growth of the area.

HCI today

Scientific work is normally regarded as a progressive process where the available amount of ideas are improved and expanded. However, if we regard the development of scientific ideas as an evolutionary process, it is possible for a scientific area to stagnate. There may still be generated new variations of ideas, but they will be less diverse and it is less likely that a new variation shows a relative advantage compared to the existing ideas.

According to Kuhn [4] a new paradigm may then be accepted and revitalize the area. However, that is by no means certain. As described by Horgan [3], it may become increasingly difficult to generate new knowledge within an area, and Rogers [10] describes how a practically oriented area may run out of ideas to inspire further research. In evolutionary terms, it becomes increasingly difficult to generate new ideas or variations of ideas with any competitive advantage.

This may happen within HCI. When the number of variations of ideas within the area increases, it becomes more difficult to generate new ideas or variations of ideas with a competitive advantage. For instance ideas or variations that offer a solution to an existing problem that is substantially better than any of the earlier solutions. Even ideas or variations that offer documented benefits may not be accepted. As in other mature research areas, individual researchers have generated a body of ideas, that their career and reputations to a large extent are based on, these ideas are spread through textbooks and they are parts of curricula. Existing ideas will therefore always have some competitive advantage compared to any new variations of ideas. (It may in particular be difficult to get small beneficial variations of existing ideas accepted, because it does not seem worthwhile to change the existing basis of ideas to accommodate them. This is in spite of the fact, that small changes to ideas are more likely to be beneficial than larger ones.)

The focus of scientific articles in a mature area is no longer to communicate experiences that may be useful for practitioners, but to document results so other researchers can quote them. This is how the reviewers, who evaluate the articles, expect to use them. Reliability is considered more important than the validity of studies, because the validity in most cases is easier to evaluate. This favors in particular quantitative comparative studies, even when such studies are done under circumstances that are invalid for practical applications. The research environment values precision which often requires complexity, and it is easier to change ideas by making them more complex than by simplifying them, so new ideas tend to become more complicated and more difficult to use for practitioners. The consequence is that researchers and practitioners are split into two different communities with only limited contact.

There are a large number of skilled practitioners. It is easier for them than for researchers to determine, if a new design is feasible in the specific application domain where they are working, and whether it offers some advantages and because they are part of the environment that produce new applications, it is in general easier for them than for researchers to get their designs implemented.

The number of practitioners is larger than the number of researchers, so they are potentially capable of producing a larger number of variations of designs. In addition, they are more inspired by the designs other have made. This way of working is similar to what Claude-Lewi Strauss describes as bricolage [5] or the use of available pieces to solve a particular problem. It is more compatible with normal practical work than the use of results from scientific articles. It is also in general faster and safer to use a design that already has shown some potential on the market, than to use a design based on a scientific article.

The adoption of ideas from a number of different fields and the change of them into easily applied methods makes it difficult to discuss the professional identity of HCI

practitioners and researchers. They are involved in software development, but in most cases without really being software developers, they are using methods and discussing problems similar to those in social science, while demonstrating a predominantly technical background.

Computers and other information technology has become part of most aspects of human life, and researchers in different areas of humanities and social science have become familiar and comfortable with them. This means that development psychologists, organizational researchers, anthropologists and media researchers work with HCI related problems within their own area, where they have a better theoretical and empirical basis than HCI researchers. In total they have substantially more resources available for working on HCI related problems, and the media coverage indicate that they are better than HCI researchers at spreading ideas in ways that are interesting for a broader group of users and practitioners.

The basic principles of usability or ease of use have become well known and generally accepted. This means that the most interesting research problems today are related to the ways that people interact with computers and different electronic media, and how we may design them – computers and media, not the people – so they are used in a desired and positive manner. Not only will researchers in other areas have a better basis for exploring new aspects of HCI. The new aspects may be the most essential for the design and adoption of information technology today and in the foreseeable future. Outside the research environments, ideas about HCI related topics from other disciplines seem to have a competitive advantage compared to ideas from HCI researchers.

Finally, it has been extremely difficult to get HCI integrated in current software development processes. It is likely that current HCI methods in general are incompatible with the values and habits of software development, so a successful integration or just more widespread use of HCI ideas in software development, so an improved integration either requires new HCI methods that are adapted to the values and ideas of software development, or a change in the values of habits of software development, similar to what is required to introduce agile methods or CMM (the Capability Maturity Model).

Discussion and conclusion

This paper describes that we today have one environment with HCI researchers and another with HCI practitioners, only a limited contact between the environments, and where ideas that have a competitive advantage in the research environment in many cases cannot compete and propagate in the practitioner environment. It is then likely, that the area of HCI is becoming increasingly irrelevant.

I will like to discuss some of the arguments *against* such a development:

- Adopting a specific new idea, for instance a new method or a specific theory to guide HCI work, can

solve the problems within HCI. Different researchers have suggested a number of specific new ideas. However, none of them have been able to show that their ideas had such a large competitive advantage that they have been generally accepted.

- There are more papers published than ever before, and the competition to get papers published is harder than ever before. A hard competition may even accelerate the stagnation of a field, if the consequences are that a more narrow range of ideas are published, or if the variation in the papers mainly is caused by attempts to find something publishable and not necessarily to progress the field.
- There are more researchers than ever before. The recruitment and abandonment of an area lags behind its development. It is therefore not unexpected that the number of researchers within a field may reach its maximum when it is stagnating.

If we accept the contents of this paper, it is possible to find ways to improve the general position of HCI research.

HCI can be made more relevant by listening to the needs of practitioners and by finding ways to solve the problems they experience. That is in particular advantageous, if an effort is made to find ways to encourage and value the publication of results that are useful for practitioners, instead of focusing on the publication of articles that mainly are written to be quoted by other researchers. It may also be possible to improve the whole publication process, which to some extent is designed to fit the needs of the pre-internet era.

The large and creative environment of practitioners can be used to strengthen HCI research. It is possible to focus part of the HCI research on the registration, classification and evaluation of design ideas created among practitioners. One advantage is that the invention and design of new ways of interaction is the part of research it is most difficult to standardize and make more effective, whereas it is much easier to set up standard procedures for classifying and evaluating new design ideas.

It is possible to collaborate more closely with other research disciplines that work on HCI-related topics, and in particular to utilize the experience of researchers in these disciplines. An HCI researcher may for instance work with anthropologists on a study using anthropological methods, instead of trying to apply these methods based on a more superficial knowledge about them.

Such collaborations are only possible, if HCI researchers have something to offer other research disciplines. This requires a discussion and a re-thinking of the professional identity of HCI researchers and practitioners, so it is possible to identify the strengths that HCI researchers have compared to researchers from other areas. Some of these

strengths may not be related directly to what we normally regard as HCI research.

I have criticized the superficial manner in which HCI research has adopted methods and ideas from other areas. However, compared to other areas HCI research has a large experience in ways to combine ideas from different research areas. This is a professional area, a sort of meta-methods where it is possible for HCI to build a strong position. Compared to other academic areas, HCI has a large experience working with industry in the borderland between research, design and product development. It is something that also can be found in some design and technical areas, but rarely in social sciences and humanities. I have also experienced that HCI, compared to social sciences and humanities, has a strong tradition for focusing on a specific goal in order to produce ideas that can be used as a basis for new or useful designs. That may actually be a more essential element of HCI than the ability to do usability testing and inspections.

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