

Titre courant: User-centered design through a particular form of collaboration

User-centered design through a particular form of collaboration
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This paper proposes a model for human-computer interface design, which seeks a high level of user-centeredness. The study looks at the complexity inherent in the design process and the challenges that designers have when they work with other disciplines at the conceptual level in creating shared understanding regarding user-centeredness. As designers we addressed the following question: how can designers create the conditions for diverse contributing collaborators to go beyond their individual knowledge and enrich their reflections in order to efficiently collaborate within a human-centered approach? Conducting a project-grounded approach led to introducing a new theoretical model of design.

Keywords: HCI design, user-centered approach, project-grounded approach, model of design

Résumé

Cette recherche porte sur des questions relatives à la conception des interfaces humain-ordinateur et s'intéresse aux approches centrées sur l'utilisateur. Elle étudie la complexité du processus de design d'interface au sein d'une équipe multidisciplinaire. Nous avons posé la question suivante : en tant que designer d'une équipe multidisciplinaire de conception, comment modifier la dynamique de collaboration et créer les conditions d'une conception véritablement centrée sur l'interaction humain-ordinateur ? Nous avons utilisé une approche de recherche *par* projet. L'analyse des données collectées des études de cas nous a conduit à créer un modèle théorique de conception d'interface qui informe et structure le processus de design impliquant une équipe multidisciplinaire.

Mots-clés : interface humain-ordinateur, approche centrée sur l'utilisateur, recherche-projet, modèle de conception

Introduction

The ongoing development and increasing complexity of information technology impacts not only our professional work, but also our social and economic interactions. Many of these technological possibilities such as using a software program, the Internet, an ATM or a mobile phone have become available to us through their user interfaces. However, while these possibilities are constantly transforming lives and the way we work individually or collaboratively, each one of us can recall occasional dissatisfaction with them. The focus of this paper is on the complexity of the human-computer interface (HCI) design process that generates constantly new opportunities and problems which design has to deal with. The paper discusses the problematic of the research, its methodological approach and the proposed model.

A significant amount of studies about user-centered approach and usability has been undertaken, and it is now understood that collaboration of a multidisciplinary team is crucial to develop user-centered interfaces. It is also well accepted that a disciplinary attitude can rarely succeed to solve these complex and wicked problems (Carroll, 2000; Dourish, 2004; Löwgren & Stolterman, 2004; Preece et al., 2002).

Although it is now common practice to bring together a multidisciplinary team, in a virtual or face-to-face setting, for solving various parts of the problems related to a design project, team members often have difficulties with sharing knowledge. They each have their own knowledge, operating procedures, ways in which they communicate about the design, and make representations of their ideas (Kleinsmann et al., 2007).

Design activity should take into account all contributing disciplines as well as all human factors related to cognition, social and cultural influences. As Boyarski mentioned, “without primary consideration for the people using the artifacts we design, and the context for their use, – in short, the entire experience of use– we relegate design to a marginal and self-serving activity” (1998). In HCI, this concern for the user is what distinguishes the design discipline from computer science and also from other stakeholders such as content experts, managers and clients.

Communication difficulties

But as design practitioners, when we work with and for others, we are often in conflicting positions. As previously stated, we frequently run into difficult situations regarding the sharing of knowledge between members of interdisciplinary teams who don't hold a holistic vision of the project. In addition, they don't have a common language of communication or a similar understanding of the needs and motivations of the user, they don't agree on usability issues, they don't bring their knowledge to the team at the right time and they are mainly concerned with their own expertise, making it very difficult to consider the end user. These issues are all crucial when implementing a HCI project.

Generally speaking, it is accepted that unsuccessful design is a direct result of an inadequate approach at the conceptual level, and in many cases, the inadequate approach is caused by miscommunication and a lack of understanding among team members (Carrara et al., 2009; Kleinsmann et al., 2007). The communication within a multidisciplinary team motivated us to address today's conventional approaches to collaboration and ask the central question of this paper: as designers, how can we create the conditions for diverse contributing experts to go beyond their individual knowledge and enrich their reflections in order to efficiently collaborate within a user-centered approach? This research suggests that their enriched knowledge will contribute to a more successful and sustainable design, and to the development of the project in a timely and efficient manner.

We believe that some of HCI design activities (such as exploring the context, framing of problems, sketching) have the capacity to modify the dynamic of collaboration and create conditions leading the multidisciplinary teams to user-centered interface solutions. In this regard there is a need to address the intertwined multidisciplinary situations where social, technological, political, economic, or organizational problems are closely linked to design.

Emergence of user-centered design

Until recently, HCI had been mostly developed with a technology-centered approach (Dourish, 2004; Linard, 2001). Although reflections about ergonomic and user-centered design are not new (Dreyfuss, 1955; Norman, 1988), user-centered design related to HCI is particularly developed with the appearance of the Internet. Since then the design of interfaces are based on users' needs, context of use, and activity of the user. The fast development of information technology, along with the variety of users asking for a more efficient interface, contributed to the creation of the "interaction design" domain focused on shaping the use-oriented qualities of a digital artifact (Löwgren & Stolterman, 2004). Interaction design brought together the interests of many disciplines including business, technology and engineering, ergonomics and cognitive psychology, design, media and culture. These interests contributed to the move away from technology-centered design and to the shift to a focus on the human being (Boyarski & Buchanan, 2000) for which new methods and tools are needed to facilitate the unavoidable disciplinary collaboration.

Shortcomings

Two situations are common regarding user-centered design. In a collaborative approach, it is mainly the responsibility of the designer to better understand users. The designer uses diverse research strategies and methods such as ethnography, observation, and contextual study to grasp the user experience (Dourish, 2004; Suchman, 1987), and subsequently uses this understanding for decision-making. In a participatory approach, users are invited to take part in the project, share their ideas and experiences with the design team. In this approach, "designers are partners with the problem owners" (Cross, 2007). Users' knowledge helps the design team look at the project in a different way, generate ideas and create new concepts. In both these user-centered approaches, project teams who are composed of a variety of people with different expertise need to communicate. However, as Preece et al. (2002) state, communication and collaboration in the team are not easy. "The more people there are with different backgrounds in a design team, the more difficult it can be to communicate and progress forward the designs being generated." The reason seems to be that people from different backgrounds have different perspectives and different ways of talking about things. What is valued by one person may be of no interest to another. This lack of a common language creates confusion and becomes the source of disinterest and dissatisfaction regarding the exchange of ideas. As a result of these communication challenges, interaction design needs to deal with interactions between people and interfaces as well as with interactions and negotiations among people.

HCI design concerns

The main concern of this research is user-centeredness. Various approaches and techniques are offered. Carroll (2000) recommends the scenario-based design method, which he defines as stories about use. With reference to Schön, he writes, "Scenarios evoke reflection-in-action". From a cognitive point of view, Visser (2006) mentions that in the context of HCI, design has specific characteristics that distinguish it from other cognitive activities. It is characterized as a problem solving activity with the following aspects: design problems are complex and cannot be decomposed into independent sub-problems; analysis of the problem and

elaboration of the solution are not two consecutive stages, rather they progress in parallel. They are ill defined.

To increase the efficiency of the user's experience, design should consider the user in all phases of the process, from the earliest stages of a project (Carroll, 2000). In this regard the interactions between stakeholders are essential. The study presumes that by using design activities as a method for collaboration, the multidisciplinary team will align its interests with users. This means that the team will see the project holistically (Senge, 1990), reflect on design criteria collectively, and share its knowledge about both the design content and the design process. The shared understanding leads to the construction of new knowledge, which is needed for tackling complex situations.

Searching for effective ways of communication between disciplines has been a question for researchers trying to find a new language that goes beyond the boundaries of individual disciplines. As a team, efficient communication and the sharing of knowledge between disciplines mark a move toward interdisciplinarity. According to Morin (1994), the interdisciplinary approach supports dialogue and the exchange of knowledge, analysis, and methods between two or more disciplines. It also implies interaction and a mutual enrichment between specialists. This idea has been gaining acceptance by many researchers. Boyarski (1998) talks about an "interdisciplinary attitude" by which he means "integrating approaches from other disciplines, allowing 'multiple sighting' on a problem".

Studying the HCI design process

As designer-researchers, we simultaneously designed and examined three successive cases in the context of real professional design projects in order to find answers to the research question. The studies focused on the early stages of the design process of complex websites.

Data were gathered with the objective of understanding what really happens during collaboration within the assigned team. These data led us to develop a theoretical model which supports and structures collaborative design activities of a multidisciplinary team with regards to designing user-centered interfaces. The model is discussed later in this paper.

This research used a method called, "Project-grounded research" (Findeli, 1998, 2004, 2008). This kind of research is about developing knowledge and theory related to design activity by going through a real design project. This means that the theory is situated in the project and its implication on practice is directly observable. This method conciliates theory and practice (Findeli, 2008; Jonas, 2007). In other words, conducting research and constructing knowledge become part of the design project. This research approach offers advantages for HCI design (Zimmerman et al, 2007; Zimmerman et al, 2010) and can deal with wicked problems (Rittel & Webber, 1973). It can also help tackle the complexity of problems where designer needs to use opportunities related to different design situations in order to integrate information, knowledge and competencies from several domains (Visser 2006).

Three successive case studies

A- In the first case study we examined the traditional HCI design process while conducting a professional project. We collaborated with a team of five specialists for almost three months. We looked at how the designer collaborates with each involved discipline separately, collects all information, and brings solutions through an iterative and cyclical design process. Generally the traditional HCI design process contains four main phases: project definition & analysis, conceptualization, construction, and maintenance. The study's focus was on the two first phases. The highlights of the findings are:

- Information is not fully given to the designer when it is needed;

- Stakeholders focus on their disciplinary domains; they don't seek a holistic view of the project;
- There is a lack of common language;
- The project solution is crystallized through many back and forth conversations between the designer and other stakeholders.

B- For the second case, a framework was created to study a collaborative process among all stakeholders and address the issues of the previous study. A voluntary group of three designers, a manager, two web programmers, a journalist and a photographer teamed up for this project. We focused on conditions which could support the project team to collaborate, to have more constructive dialogues and exchange of information, and to consider the user in all steps of their work. The two first phases of design process were integrated in order to define the project's goal, establish the information architecture, and to create the guidelines of visual design. During multiple collaborative sessions, HCI design activities were used as a method to:

- Facilitate communications and constructive exchanges between disciplines;
- Generate a holistic vision of the project and demonstrate its complexity when the focus is on users need and wants.

This case study provided the basic elements for the construction of our theoretical design model.

C- The third case was related the redesign of a complex website through an intensive work session with all stakeholders. The disciplinary collaboration was converted into a new knowledge generation, useful for the purpose of the project. The availability of the stakeholders for a set period of time and their willingness to engage in the process were the needed conditions for applying the new design model.

As the team (the designer-researcher, two office assistants, a web programmer, three content experts and the project owner) became more familiar with the user-centered approach to design, new questions emerged and modified the viewpoints of all stakeholders. The team's interest in theory and its implications in practice grew. Discussions regarding the concerns of each discipline helped the team share information, develop a common understanding, and modify its attitude toward collaboration (Zahedi et al., 2010). Figure 1 shows the phases of the project and the place of the intensive and iterative work session in the phase 1. During this phase, stakeholders redefined the project through consensus building and identified the guiding principles of the production. Their joint reflection on diverse aspects of project crystallized the design solution. Phase 2 relates to production and Phase 3 to implementation.

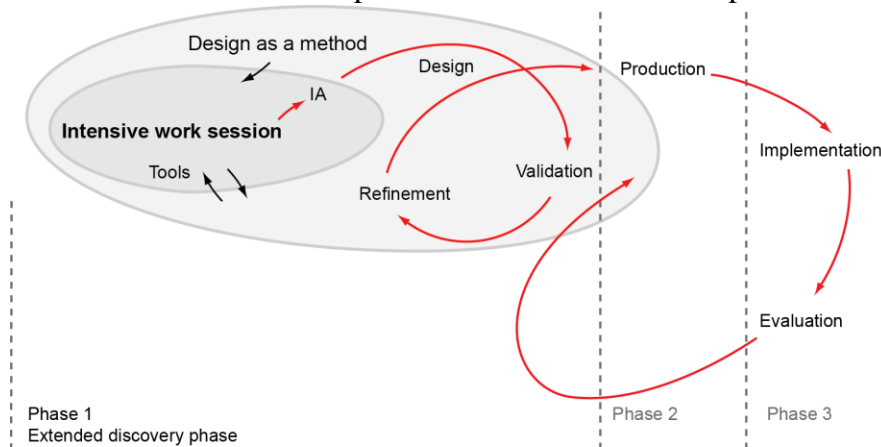


Figure 1: An overview of the extended discovery phase of HCI design process

The conclusions drawn from the case studies confirmed that efficient collaboration between stakeholders is a key condition for leading a team to set the underlying principles of a user oriented and sustainable HCI design. Openness, sharing, trust, engagement and reflective practice characterize this collaboration.

The theoretical design model

The model is inevitably organized around a line that we call “User axis”. The function of this axis is to align communications, conversations, and individual or collective efforts of the team with the user. We use the term “user axis” rather than “user-centered” to bring the idea of evolution and continuity regarding usability principles. Also, as the axis is a continuum, there is no target point; rather there is a direction to follow. Design process revolves around the user axis.

The model is based on constructivism epistemology (Le Moigne 1995). It is considered a tool that supports a project team during a HCI design process, when the goal is to achieve user-oriented results. The constituents of the model are the following:

- Embracement of a “interdisciplinary attitude” by all project team members;
- Introduction of a “joint reflective practice”;
- Establishment of new phase called “extended discovery phase” at the beginning of the design process in which all team members participate actively in order to build consensus on the project goals and users’ needs/wants.

The interdisciplinary attitude

Each participating discipline in a HCI design project brings its visions, priorities, and motivations. However it needs to make a significant move and align its interests rapidly with the user axis to achieve a common goal for the project. By embracing an interdisciplinary attitude the move becomes possible. Figure 2 shows the diverse interests of each discipline and their alignment toward similar objectives.

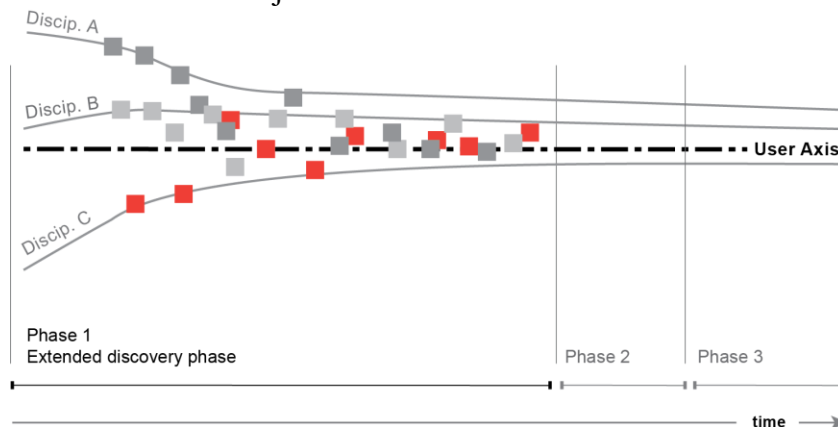


Figure 2: Alignment of disciplines toward user axis and joint reflective practice

The interdisciplinary attitude brings shared commitment, acceptance of approaches from other disciplines, and a way of looking at the problem from various perspectives. It will allow openness to other perspectives and a willingness to share information. We consider the interdisciplinary attitude as a mind-set that encourages an informal teaching and learning dynamic. When all disciplinary knowledge is contextualized (for the project at hand), it will be easier for team members to understand diverse perspectives and see the relevance of diverging viewpoints. To achieve good understanding as a team, each member needs to interact with others and become aware of all aspects and priorities presented by diverse disciplines.

Joint reflective practice

As explained earlier, HCI design situations are complex and problems are interconnected; the design tasks require the confluence of a variety of expertise. When more people become involved in the design process, we also see more value conflicts. Schön (1983) emphasizes the “complexity, uncertainty, instability, uniqueness, and the value conflicts” of situations of professional practice and explains that these situations are not problems to be solved. They are problematic situations, which are uncertain and unclear, but they need to be understood. Reflective practice, which considers design as an “action-oriented” activity (Schön, 1983), makes this understanding easier at an individual level. The theory behind this concept (Dorst, 1997) is that “designers are active in structuring the problem” and they evaluate their actions in structuring and solving the problem. Designers have “reflective conversation with the situation” (Schön, 1983). Introducing a joint reflective practice, where stakeholders are collaborating actively in structuring the problem, will allow the team to change its perspective, bring together diverse knowledge and skills, notice interconnected problems, have a dialogue with the problem, and challenge the concepts and theories by which it makes sense of knowledge. As a consequence of joint reflective practice, a project-specific team will bridge different understandings, formulate the project differently, and deal with uncertainty.

Extended discovery phase

During this phase the team is brought together to collectively set the problem (Schön 1983) and establish the guiding principles of the project, which allow the development of the solution. Interdisciplinary attitude and joint reflective practice play the role of foundations for this phase while design activities are used as method for creating meaningful communications among the team members and help them converge toward the user axis.

It is essential for the multidisciplinary team to consider the following four factors when they participate in the extended discovery phase: the uniqueness of each project, the continuous change of user needs, the rapid development of information technology, and that HCI projects are dealing with complex and messy situations. We believe that to design with usability and sustainability in mind, the multidisciplinary team needs to, not only consider these four critical factors, but also understand the relationship between them.

In a HCI design, three woven activities play out the phase: setting the problem (P layer), outlining the information architecture (A layer), and creating visual design and technological guidelines (V layer).

The project starts with the P layer and evolves around the user axis. Interdisciplinary attitude helps the team to create a common language and achieve consensus on project goals and priorities. The next step is tackling the A layer in order to define the structure of the project. Joint reflective practice supports the development this layer. The final step is the V layer, which needs to take into account many elements that the project wants to communicate through the interface (such as history, culture, message) and the fundament of the technological decisions. Figure 3 shows the interaction of these layers with each other and with the user axis.

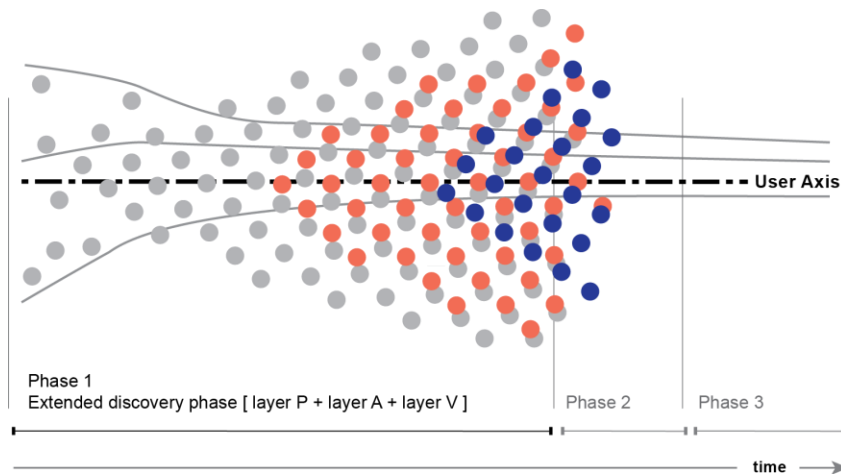


Figure 3: Superposition and alignment of layers in phase 1

Development of these layers and their interactions lead to a better understanding of the project and to the discovery of solutions.

Intensive work session

To make the model operational, we designed an “Intensive workshop” in which all stakeholders participate actively during an uninterrupted period of time. The workshop allows for collaborative learning opportunities (i.e. principles of usability, iterative design process, etc.) that combine theoretical and practical aspects. It encourages joint reflective practice. The workshop includes:

- Tools to support knowledge sharing and team performance (i.e. visual representation of processes, instructions for creating personas and use scenarios, systems like wikis for contribution and access to information, etc.);
- HCI design activities as method to facilitate communication and collaboration, (i.e. framing of problems, sketching, prototyping, etc.).

During the work sessions, the three layers, P, V and A become functional. Through the model and the workshop, we sought to build the particular sense and the know-how for the project, to enrich and harmonize the understanding of the users’ needs and motivations, and to create conditions for interdisciplinary exchanges. The dynamic and the productivity of the intensive workshop depend not only on how the workshop plays out, but also on the effectiveness of the designer, who acts as a mediator during the workshop to facilitate the events, prepare and adjust the tools.

To stimulate the emergence of team expertise the workshop seeks to:

- Encourage contact between stakeholders;
- Incite knowledge sharing leading to a holistic point of view;
- Encourage critical thinking and direct feedback;
- Make resources readily accessible to all at the opportune moment;
- Advance the project in an efficient manner, on time, and while respecting the process.

When used collaboratively, HCI design activities have the following capacities: to bring changes to the dynamic of communications and align stakeholders’ vision with users’ needs; to facilitate critics; to play an integrating role and connect people; to support the workshop process and results.

The activities geared to support each work session need to be carefully designed and facilitated by the designer. We believe that the designer is the most appropriate team member to

accomplish these tasks because of her/his expertise in the following areas: s/he is trained to develop a holistic view of the situation despite its wickedness and fuzziness; can diagnose problem areas; communicates visually; can rapidly develop mockups and prototypes that would be used as tools for helping teams exchange ideas. Referring to Cross (1993, 2001), s/he has a “designerly” way of thinking, knowing and acting.

Conclusion

The intensive work session supported by interdisciplinary attitude and joint reflective practice mirrored the theoretical model. We found that it is possible to encourage the design team in the early stage of the project, to approach the problem with a research stance, while keeping its focus on the end-users. In the third case study we made the model operational. The workshop showed how communicating meaningfully through design helps collaboration. As discussed earlier, openness, sharing, trust, engagement and reflective practice, encourage this particular collaboration. The workshop also significantly reduced the development time, and added value to the project by becoming a sustainable design. This situation brings up the idea raised by Manzini (2008) that the transition toward sustainability is by “a radical change in ways of being and doing.”

As a result of our research, we believe that the designer needs to be trained for this new role that we call designer/mediator. Therefore it becomes important to consider the outcomes of research in design education. Additional knowledge and a set of new skills will be required to enable the designer to organize and run intensive workshops, facilitate the interactions among members of a team, facilitate the achievement of the needed attitude, keep the team focused on goals, create a synergy, mediate the informal situation of learning and teaching, and so on.

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