

Meta—Design: Beyond User-Centered and Participatory Design

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Abstract

Meta-design characterizes objectives, techniques, and processes for creating new media and environments that allow the owners of problems to act as *designers*. A fundamental objective of meta-design is to create socio-technical environments that empower users to engage in informed participation rather than being restricted to the use of existing systems. The seeding, evolutionary growth, reseeding model is a process model that supports meta-design. We have explored and assessed meta-design approaches in the development of innovative computational environments and in our teaching and learning activities.

1 Introduction

Our research interest is in designing the social and technical infrastructures in which new forms of collaborative design can take place. For most of the design domains that we have studied over many years (ranging from urban design to graphics and software design) [Arias et al., 2000], the knowledge to understand, frame, and solve problems is not given, but is constructed and evolved during the problem-solving process.

2 Design Time and Use Time

In all design processes, two basic stages can be differentiated: design time and use time. At *design time*, system developers (with or without user involvement) create environments and tools. In conventional design approaches they create complete systems. At *use time*, users or “stakeholders” use the system but their needs, objectives, and situational contexts can only be anticipated at design time, thus, creating a system that often requires modification to fit the user’s needs. In order to accommodate unexpected issues at use time, systems need to be underdesigned at design time. *Underdesign* in this context does not mean less work and demands for the design team, but is fundamentally different from creating complete systems. The primary challenge of underdesign is in developing environments and not the solutions allowing the “owners of problems” at use time to create the solutions themselves. This can be done by providing a context and an interpretive background against which situated cases coming up later can be interpreted. Underdesign is a defining activity for meta-design by creating design spaces for others.

3 User-Centered Design and Participatory Design

User-centered design approaches [Norman & Draper, 1986] (whether done *for* users, *by* users, or *with* users) have focused primarily on activities and processes taking place at design time in the systems' original development and have given little emphasis and provided few mechanisms to support systems as *living* entities which can be evolved by their users. In user-centered design, designers generate solutions placing users mainly in a reactive role.

Participatory design approaches [Schuler & Namioka, 1993] seek to involve users more deeply in the process as co-designers by empowering them to propose and generate design alternatives themselves. Participatory design supports diverse ways of thinking, planning, and acting making work, technologies, and social institutions more responsive to human needs. It requires the social inclusion and active participation of the users. Participatory design has focused on system development at design time by bringing developers and users together to envision the contexts of use. But despite the best efforts at design time, systems need to be evolvable to fit new needs, account for changing tasks, and incorporate new technologies.

4 Meta-Design

Meta-design [Fischer & Scharff, 2000] extends the traditional notion of system design beyond the original development of a system to include an ongoing process in which stakeholders become *co-designers*—not only at design time, but throughout the whole existence of the system. A necessary, although not sufficient condition for meta-design is that software systems include advanced features permitting users in creating complex customizations and extensions. Rather than presenting users with closed systems, meta-design provides them with opportunities, tools, and social reward structures to extend the system to fit their needs. Meta-design shares some important objectives with user-centered and participatory design, but it *transcends* these objectives in several important dimensions and it has changed the processes by which systems and content is designed. Meta-design has shifted the control from designers to users and empowered users to create and contribute their own visions and objectives. Meta-design is a useful perspective for projects where 'designing the design process' is a first-class activity, meaning that creating the technical and social conditions for broad participation in design activities is as important as creating the artifact itself [Wright et al., 2002].

The Seeding, Evolutionary Growth, and Reseeding (SER) Process Model. The major conceptual framework which we have developed to support meta-design is the *seeding, evolutionary growth, and reseeded (SER) process model* [Fischer & Ostwald, 2002]. The SER model is a descriptive and prescriptive model for large evolving systems and information repositories postulating that systems that evolve over a sustained time span must continually alternate between periods of activity and unplanned evolutions and periods of deliberate (re)structuring and enhancement. The SER model encourages designers to conceptualize their activity as meta-design, thereby supporting users as designers in their own right, rather than restricting them to being passive consumers. Figure 1 provides a graphical illustration of the SER model.

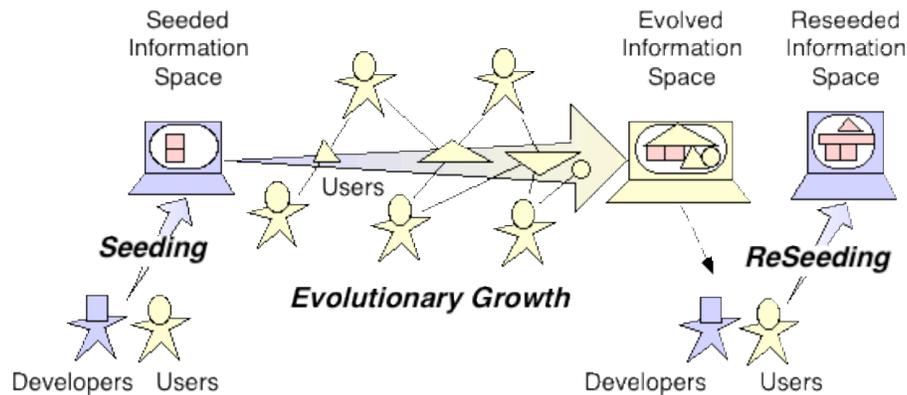


Figure 1: The Seeding, Evolutionary Growth, and ReSeeding Process Model

Informed Participation and Unselfconscious Cultures of Design. *Informed participation* [Brown & Duguid, 2000] is a form of collaborative design in which participants from all walks of life—not just skilled computer professionals—transcend beyond the information given to incrementally acquire ownership in problems and to contribute actively to their solutions. It addresses the challenges associated with open-ended and multidisciplinary design problems. These problems involving a combination of social and technological issues, *do not have right answers*, and the knowledge to understand and resolve them changes rapidly. To successfully cope with informed participation requires social changes as well as new interactive systems that provide the opportunity and resources for social debate and discussion rather than merely delivering predigested information to users.

Being ill-defined, design problems cannot be delegated (e.g., from users to professionals), because they are not understood well enough that they can be described in sufficient detail. Partial solutions need to “talk back” [Schön, 1983] to the owners of the problems who have the necessary knowledge to incrementally refine them. Alexander [Alexander, 1964] has introduced the distinction between an unselfconscious culture of design and a selfconscious culture of design. In an *unselfconscious* culture of design, the failure or inadequacy of the form leads directly to an action to change or improve it. This closeness of contact between designer and product allows constant rearrangement of unsatisfactory details. By putting owners of problems in charge, the positive elements of an unselfconscious culture of design can be exploited in meta-design approaches by creating media that support people in working on their tasks, rather than requiring them to focus their intellectual resources on the medium itself.

5 Environments Supporting Meta-Design

The goal of making systems modifiable by users does not imply transferring the responsibility of good system design to the user. In general, “normal” users do not build tools of the quality a professional designer would since users are not concerned with the tool per se, but in doing their work. *Domain-oriented design environments* support meta-design by advancing human-computer interaction to *human problem-domain interaction*. Because systems are modelled at a conceptual level with which users are familiar, the interaction mechanisms take advantage of existing user knowledge and make the functionality of the system transparent and accessible so that the computational drudgery required of users can be substantially reduced. The *Envisionment and*

Discovery Collaboratory [Arias et al., 2000] is a second generation design environment focused on the support of *collaborative design* by integrating physical and computational components to encourage and facilitate informed participation by all stakeholders in the design process.

6 Application of Meta-Design Approaches

Social Creativity. Complex design problems require more knowledge than any single person can possess, and the knowledge relevant to a problem is often distributed among all stakeholders who have different perspectives and background knowledge, thus providing the foundation for *social creativity* [Arias et al., 2000]. Bringing together different points of view and trying to create a shared understanding among all stakeholders can lead to new insights, new ideas, and new artifacts. Social creativity can be supported by innovative computer systems that allow all stakeholders to contribute to framing and solving these problems collaboratively.

Open Source. *Open source development* [Raymond & Young, 2001] is an activity in which a community of software developers collaboratively constructs systems to help solve problems of shared interest and for mutual benefit. The ability to change source code is an enabling condition for collaborative construction of software by changing software from a fixed entity that is produced and controlled by a closed group of designers to an open effort that allows a community to design collaboratively based on personal desires following the framework provided by the seeding, evolutionary growth, and reseeding process model. Open source invites passive consumers to become active contributors [Fischer, 2002].

Learning Communities. *Courses-as-seeds* [dePaula et al., 2001] is an educational model that explores meta-design in the context of university courses by creating a culture of informed participation. Courses are conceptualized as seeds, rather than as finished products, and students are viewed as informed participants who play an active role in defining the problems they investigate. The output of each course contributes to an evolving information space that is collaboratively designed by all course participants, past and present.

Interactive Art. *Interactive art*, conceptualized as meta-design, focuses on collaboration and co-creation. The original design (representing a seed in our framework) establishes a context in which users can create content. Interactive art puts the tools rather than the object of design in the hands of users. It creates interactive systems that do not define content and processes, but the conditions for the process of interaction. Interactive art puts the emphasis on different objectives compared to traditional design approaches, including shifts from (1) guidelines and rules to exceptions and negotiations; (2) from content to context; (3) from objects to process, and (4) from certainty to contingency (these “cultural shifts” have been developed jointly with Elisa Giaccardi who has explored the concept of meta-design in interactive arts [Giaccardi, 2003]).

7 Conclusions

We have evaluated our approaches in different settings, with different task domains, and with different stakeholders. While meta-design is a promising approach to overcome the limitations of closed systems and to support social creativity, it creates many fundamental challenges: in the technical domain as well as in the social domain including the need for social capital, the willingness of users to engage in additional learning to become designers, and the additional efforts to integrate the work into the shared environment. Meta-design addresses one of the fundamental challenges of a knowledge society [Florida, 2002]: to invent and design a culture in

which all participants in a collaborative design process can express themselves and engage in personally meaningful activities.

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