Distances and Diversity: Sources for Social Creativity

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ABSTRACT
The power of the unaided, individual mind is highly overrated: The Renaissance scholar no longer exists. Although creative individuals are often thought of as working in isolation, the role of interaction and collaboration with other individuals is critical to creativity. Creative activity grows out of the relationship between individuals and their work, and from the interactions between an individual and other human beings. Because complex problems require more knowledge than any single person possesses, it is necessary that all involved stakeholders participate, communicate, collaborate, and learn from each other. *Distances* (across spatial, temporal, and technological dimensions) and *diversity* (bringing stakeholders together from different cultures) are important sources for *social creativity*.

This paper describes conceptual frameworks and socio-technical environments (derived from the systems that we have developed over the last decade) in which social creativity can come alive.

Keywords
design, social creativity, spatial distance, temporal distance, technological distance, diversity, communities of practice, communities of interest, division of labor

INTRODUCTION
The solitary creative process is a myth [John-Steiner, 2000]. Despite the rhetoric of collaboration, however, we continue to advocate a culture — in our universities, schools, offices, and communities — in which people need to distinguish themselves as individuals [Bennis & Biederman, 1997]. In today's world, collaboration is not only a luxury but a necessity. We need not only reflective practitioners [Schön, 1983], but *reflective communities*. We need to understand how individual and social creativity [Fischer et al., 2005] interact with each other, and how we can exploit distribution and diversity in design teams, communities, and tools that support reflective communities.

This paper explores different *distances* [Fischer, 2004] and analyzes the impact of *diversity* [Bonifacio & Molani, 2003] to bring social creativity alive. In our research over the last decade, we have developed socio-technical environments empowering design communities to exploit distances and diversity as opportunities to enhance *social creativity*.

THE SOCIAL NATURE OF CREATIVITY
The power of the unaided individual mind is highly overrated [John-Steiner, 2000; Salomon, 1993]. Although creative individuals [Gardner, 1993; Sternberg, 1988] are often thought of as working in isolation, much of our intelligence and creativity results from interaction and collaboration with other individuals [Csikszentmihalyi, 1996]. Creative activity grows out of the relationship between individuals and their work, as well as from the interactions between individuals. Creativity does not happen inside people's heads, but in the interaction between a person's thoughts and a socio-cultural context [Engeström, 2001]. Situations that support social creativity need to be sufficiently open-ended and complex that users will encounter *breakdowns* [Schön, 1983]. As any professional designer knows, breakdowns—although at times costly and painful—offer unique opportunities for reflection and learning.

Social creativity explores computer media and technologies to help people work together. It is relevant to design because collaboration plays an increasingly significant role in design projects that require expertise in a wide range of domains. Software design projects, for example, typically involve designers, programmers, human-computer interaction specialists, marketing people, and end-user participants [Greenbaum & Kyng, 1991]. Information technologies have reached a level of sophistication, maturity, cost-effectiveness, and distribution so they are not restricted only to enhancing productivity — they also open up new *creative possibilities* [National-Research-Council, 2003].

Design projects may take place over many years, with initial design followed by extended periods of evolution and redesign. In this sense, design artifacts are not designed once and for all, but instead they evolve over long periods of time [Fischer et al., 1992]. In such long-term design processes, designers may extend or modify artifacts designed by people they actually have never met.

In extended and distributed design projects, specialists from many different domains must coordinate their efforts despite large separations of time and distance. In such projects, long-term collaboration is crucial for success, yet it is difficult to achieve. Complexity arises from the need to synthesize *different perspectives* [Fischer, 2001], exploit *conceptual collisions* between concepts and ideas coming from different disciplines, manage *large amounts of information* potentially relevant to a design task, and understand the design decisions that have determined the *long-term evolution* of a designed artifact.

The focus of this article on social creativity does not imply that *individual creativity* should be considered as irrelevant. We believe that there is an *"and"* rather than a *"versus"* relationship between individual and social creativity. Social creativity does not necessitate the development of environments in which the interests of the many inevitably supersede those of the individual. Creative individuals, such as movie directors, champions of sports teams, and leading scientists and politicians. can make a huge difference, as analyzed and shown by Gardner [Gardner, 1995] in exemplary cases. Organizations get their strength to a large extent from the creativity and engagement of their individual members [Fischer et al., 2005]. Appropriate socio-technical settings can amplify the outcome of a group of creative people by both augmenting individual creativity and multiplying it, rather than by simply summing up individuals' creativities.

DISTANCES

Collaborative design can be distributed (1) *spatially* (across physical distance), (2) *temporally* (across time), (3) *technologically* (between persons and artifacts), and (4) *conceptually* (across different communities). The first three dimensions are discussed in this section, and the last one, which emphasizes diversity, is addressed in the next section.

The Spatial Dimension

Even though communication technology enables profoundly new forms of collaborative work, Olson and Olson [Olson & Olson, 2001] have found that collaborative design can still be difficult to support at a distance. Critical stages of collaborative work, such as dealing with ill-defined problems or establishing mutual trust, appear to require some level of face-to-face interaction. In contrast, distributed teams of collaborators are able to carry out effective work, and indeed evolve totally new ways of working that have a great impact on their activities [Olson & Olson, 2001]. Open source software communities provide an example of successful collaboration on a large scale mediated by computational media [Raymond & Young, 2001; Scharff, 2002].

Bringing spatially distributed people together by supporting computer-mediated communication allows the shift that *shared concerns* rather than shared location becomes the prominent defining feature of a group of people interacting with each other. It further allows more people to be included, thus exploiting local knowledge. These opportunities have been successfully employed by the *open source communities* [Scharff, 2002].

Transcending the barrier of spatial distribution is of particular importance in locally sparse populations. Addressing this challenge is one of the core objectives of our research work in the CLever ("Cognitive Levers: Helping People Help Themselves") project [CLever, 2004]. Web2gether [dePaula & Fischer, 2004] is a multi-year-long effort embedded in CLever to provide professional and social support for caregivers of people with cognitive disabilities. Web2gether is designed to help caregivers not only find resources, but also form social networks and share experiences. Sharing experiences is an effective approach in the context of distributed and complex work practices [Bobrow & Whalen, 2002]. It goes beyond the mere *access* model of technology [Arias et al., 2000] by supporting *informed participation* [Brown et al., 1994] based on the seeding, evolutionary growth, reseeding (SER) model [Fischer et al., 2001].

The SER model characterizes the lifecycle of large evolving systems and information repositories. It postulates 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 requires the support of users as designers in their own right, rather than restricting them to only passive consumer roles. The SER model provides a framework that supports social creativity through supporting individual creativity. Users of a seed are empowered to act not just as passive consumers, but as informed participants who can express and share their creative ideas. System design methodologies of the past were focused on building complex information systems as "complete" artifacts through *the large efforts of a small number of people*. Conversely, instead of attempting to build complete and closed systems, the SER model advocates building seeds that can be evolved over time through *the small contributions of a large number of people*. Open source system developments [Fischer et al., 2005; Raymond & Young, 2001] follow the processes postulated by the SER model.

The Temporal Dimension

A design strategy that can be recommended to anyone aspiring to make a creative contribution or to evolve an artifact in any domain is to master as thoroughly as possible what is already known in a domain; the ultimate goal is to transcend conventions, not to succumb to them. Design processes often take place over many years, with initial design followed by extended periods of evolution and redesign. In this sense, design artifacts (including systems that support design tasks, such as *reuse environments* [Ye & Fischer, 2002]) are not designed once and for all, but instead evolve over long periods of time [Dawkins, 1987]. For example, when a new device or technology emerges, most computer networks are enhanced and updated rather than redesigned completely from scratch.

Much of the work in ongoing design projects is done as redesign and evolution, and often the people doing this work were not members of the original design team. To be able to do this work well, or sometimes at all, requires that these people "collaborate" with the original designers of the artifact. A special case of this collaboration is *reflexive computer-supported cooperative work (CSCW)*, which supports the same individual user, who can be considered as different persona at points of time that are far apart [Thimbleby et al., 1990]. In ongoing projects, long-term collaboration is crucial for success yet difficult to achieve. This difficulty is due in large part to individual designers' ignorance of how the decisions they make interact with decisions made by other designers. A large part of this, in turn, consists of simply not knowing what has already been decided and why.

Long-term collaboration requires that present-day designers be aware of not only the rationale [Moran & Carroll, 1996] behind decisions that shaped the artifact, but also any information about possible alternatives that were considered but not implemented. This requires that the rationale behind decisions be recorded in the first place. A barrier to overcome is that designers are biased toward doing design but not toward putting extra effort into documentation. This creates an additional rationale-capture barrier for long-term design [Grudin, 1987].

A further barrier raised by long-term design projects is the ability to modify a system's functionality [Fischer et al., 2004]. During the lifecycle of an ongoing design project, the environment in which the artifact functions may have changed in ways that were not anticipated by the original designers. If the system cannot be adapted to its changing environment at use time, it will cease to be useful. One way to view this need for adaptation is to think of the lifecycle of a system as an ongoing design process, sometimes called design-in-use to emphasize that design of a system happens alongside use [Henderson & Kyng, 1991].

We have focused our work specifically on *long-term, indirect collaboration* [Fischer et al., 1992] by exploring CSCW technologies that support and represent the intentions and actions of others who cannot be seen and contacted personally. A design support system that fosters long-term indirect collaboration among a community of designers must support communication about not only evolving artifacts but also background context and rationale about the artifacts. We have explored innovative approaches toward reducing the barrier of temporal distance. *Incremental formalization* [Shipman, 1993] is an attempt to achieve two conflicting goals: (1) assuring that design rationale recording does not take too many cognitive resources away from the primary task to be done; and (2) assuring that the rationale is (at least partially) formalized so that computational support makes it easier to retrieve later when needed.

The Technological Dimension

The preceding sections emphasize computer-mediated collaboration among humans to reduce the gaps created by spatial and temporal distances. This section focuses on issues in which the computer plays a more prominent role, partially understanding and doing a complex task. Our interest has been in a relationship in which computers do not emulate human capabilities but *complement* them [Shneiderman, 2002; Terveen, 1995]. The technological dimension is an important additional dimension grounded in an observation by Illich: *"a thing is available at the bidding of the user — or could be — whereas persons formally become a skill resource only when they consent to do so, and they can also restrict time, place, and methods as they choose"* [Illich, 1971].

Design can be described as a reflective conversation between designers and the designs they create. Designers use materials to construct design situations, and then listen to the "back-talk of the situation" they have created [Schön, 1983]. Unlike passive design materials, such as pen and paper, computational design materials are able to interpret the work of designers and actively talk back to them. Barriers occur when the back-talk is represented in a form that users are unable to comprehend (i.e., the back-talk is not a boundary object), or when the back-talk created by the design situation itself is insufficient, and additional mechanisms (e.g., critiquing, simulation, and visualization components) are needed. To increase the "back-talk of the situation," we have developed *critiquing systems* [Fischer et al., 1998] that monitor the actions of users as they work and inform the users of potential problems. If users elect to see the information, the critiquing mechanisms find information in the repositories that is relevant to the particular problem, and present this information to the user.

Media changes the nature of learning and communication in design. Ideally, new media will improve both individual and collaborative design by augmenting the cognitive abilities of designers and allowing them to transcend some of the barriers that in the past have limited knowledge creation and sharing in design. We have built *domain-oriented design environments* (DODEs) [Fischer, 1994] in many domains. Some of the major design objectives associated with DODEs are: (1) supporting "human problem–domain interaction" and not just human-computer interaction, (2) increasing the back-talk of the situation, and (3) integrating action and reflection [Schön, 1983]. During this process, we have developed a *domain-independent software architecture* that describes the tools and knowledge-based mechanisms that support creativity. Unlike many other computational environments, DODEs play an active role in the knowledge creation, integration, and dissemination process among design communities.

DIVERSITY

"The clashing point of two subjects, two disciplines, two cultures ought to produce creative chaos."
C.P. Snow [Snow, 1993]

Design communities are increasingly characterized by a *division of labor* [Levy & Murnane, 2004], comprising individuals who have unique experiences, varying interests, and different perspectives about problems, and who use different knowledge systems in their work [Bonifacio & Molani, 2003]. Shared understanding [Resnick et al., 1991b] that supports collaborative learning and working requires the active construction of a knowledge system in which the meanings of concepts and objects can be debated and resolved. In heterogeneous design communities, such as those that form around large and complex design problems, the construction of shared understanding requires the interaction and synthesis of several separate knowledge systems.

Diversity is not only a constraint to deal with but an opportunity to generate new ideas, new insights, and new environments [Basalla, 1988; National-Research-Council, 2003]. The challenge is often not to reduce heterogeneity and specialization, but to support it, manage it, and integrate it by finding ways to build bridges between local knowledge sources and by exploiting conceptual collisions and breakdowns as sources for innovation.

Our own research efforts have focused on supporting diversity in the following contexts: (1) the expertise gap between experts and novices within a particular practice (conceptual barrier *within* a domain); and (2) the conceptual gap between stakeholders from different practices (conceptual dimension *between* different domains).

Homogeneous Design Communities: Communities of Practice

Communities of Practice (CoPs) [Wenger, 1998] consist of practitioners who work as a community in a certain domain undertaking similar work. Within each community, however, are individuals with special expertise, such as power-users and local developers [Nardi, 1993]. Examples of CoPs are architects, urban planners, research groups, software developers, and end-users. Domain-oriented design environments (briefly mentioned above) support CoPs by allowing them to interact at the level of the problem domain and not only at a computational level. Domain-oriented systems allow for efficient communication within the community at the expense of making communication and understanding difficult for outsiders. For example, over the last ten years, we have created concepts, systems, and stories representing an efficient and effective means for communication within our research group. We have also learned, however, that boundaries that are empowering to insiders are often barriers for outsiders and newcomers to a group. CoPs must be allowed and must desire some latitude to shake themselves free of established wisdom.

Traditional learning and working environments, such as university departments and their respective curricula, are disciplinary. Throughout history, the use of disciplines and their associated development of a division of labor have proven to be powerful approaches to deepen our knowledge and increase productivity [Basalla, 1988]. However, we also know from all the attempts to support multidisciplinary work that hardly any "real" problems can be successfully approached by a lone discipline [Campbell, 1969].

Heterogeneous Design Communities: Communities of Interest

Communities of Interest (CoIs) [Fischer, 2001] bring together stakeholders from different CoPs to solve a particular (design) problem of common concern. They can be thought of as "communities-of-communities" [Brown & Duguid, 2000] or communities of representatives of communities. Two examples of CoIs are (1) a team of software designers, marketing specialists, psychologists, and programmers, interested in software development; or (2) a group of citizens and experts interested in urban planning, in particular implementing new transportation systems. CoIs are supported by the *Envisionment and Discovery Collaboratory* [Arias et al., 2000], an integrated physical and computational environment that supports informed participation through new forms of knowledge creation, integration, and dissemination.

Fundamental challenges facing CoIs are found in building a *shared understanding* [Resnick et al., 1991a] of the task-at-hand, which often does not exist at the beginning, but is evolved incrementally and collaboratively and emerges in people's minds and in external artifacts. Members of CoIs must learn to communicate with and learn from others, [Engeström, 2001] who have different perspectives and perhaps different vocabularies to describe their ideas, to establish a common ground [Clark & Brennan, 1991].

Comparing CoPs and CoIs

Learning within CoIs is more complex and multifaceted than legitimate peripheral participation [Lave & Wenger, 1991] in CoPs, which assumes a single knowledge system in which newcomers move toward the center over time. CoIs must support a healthy autonomy of the contributing CoPs and at the same time provide possibilities to build on interconnectedness and a shared understanding

Learning in CoPs can be characterized as "learning when the knowledge base is shared," whereas learning in CoIs is often a consequence of the fact that relevant knowledge comes from very different sources [Fischer, 2001]. CoIs have multiple centers of knowledge, with each member considered to be knowledgeable in a particular aspect of the problem and perhaps not so knowledgeable in others [Engeström, 2001]. In informed participation, the roles of "expert" or "novice" shift from person to person, depending on the current focus of attention.

Boundary Objects

Boundary objects [Bowker & Star, 2000; Wenger, 1998] are externalizations of ideas that are used to communicate and facilitate shared understandings across spatial, temporal, conceptual, or technological gaps. In design communities, boundary objects help to establish a shared context for communication by providing referential anchoring [Clark & Brennan, 1991]. Boundary objects can be pointed to and named, helping stakeholders to incrementally increase their shared understanding.

In CoIs, boundary objects support communication across the boundaries of different knowledge systems, helping people from different backgrounds and perspectives to communicate and to build common ground. Boundary objects allow different knowledge systems to communicate by providing a shared reference that is meaningful within both systems. Computational support for CoIs must therefore enable mutual learning through the creation, discussion, and refinement of boundary objects that allow the knowledge systems of different CoPs to interact. In this sense, the interaction among multiple knowledge systems is a means to turn the *symmetry of ignorance* [Rittel, 1984] into a resource for learning and social creativity [Fischer, 2001].

Boundaries form the locus of the production of new knowledge. They are where the unexpected can be expected, where innovative and unorthodox solutions are found, where *serendipity* [Roberts, 1989] is likely, and where old ideas find new life. The diversity of CoIs causes difficulties in creating shared understandings, but it also provides unique opportunities for the creation and sharing of new knowledge.

Humans serving as *knowledge brokers* can play important roles in bridging boundaries across or within communities. For example, within design communities that develop around complex software systems, members who are interested in and inclined to learn about the technologies may develop into *power-users* [Nardi, 1993] who are able to make modifications and customizations. By making needed changes to a system on behalf of the community, or by teaching others how to do so, power-users help others to transcend the boundary that exists between using a system as it is and modifying it for new purposes.

EXAMPLES

In another paper we have discussed in detail examples that we have developed over the last decade to understand the nature of social creativity and the socio-technical environments that support it. These examples are:

- The *Envisionment and Discovery Collaboratory* [Arias et al., 2000] is an environment in which participants collaboratively solve problems of mutual interest. The problem contexts explored in the collaboratory, such as urban transportation planning, flood mitigation, and building design, are all examples of open-ended social problems. The socio-technical environment empowers users to act as designers in collaborative problem solving activities.
- *The Caretta* system [Sugimoto et al., 2004] (closely related to the Envisionment and Discovery Collaboratory) supports face-to-face collaboration by integrating personal and shared spaces It allows users to engage in urban planning tasks by supporting them to incrementally articulate their "best" ideas and negotiate with each other to create mutually agreeable design plans. Individual reflections and group discussions often happen in parallel: Some participants try to come up with their own individual ideas, and other participants collectively evaluate existing plans. Most existing computational media, however, do not fully support users' individual and group activities at the same time. Caretta is designed to overcome this shortcoming by providing users with personal spaces for individual reflections, a shared space for group discussions, and intuitive transition methods between these spaces.
- *Interactive art* [Giaccardi, 2004] is based on the premise that computational media enable people to operate at the source of the creative process by creating a "pool of *pixema,*" meaning individual pieces produced by different artists, that can be exchanged to synthesize new paintings. This allows creativity to be shared and no longer limits it to individual artists. The expansion of the creative process claimed by interactive art involves different forms of transcendence: from access to informed participation, from autonomous minds to distributed cognition, and from individual creativity to social creativity. These facets, which allow the production of artworks that could not be created in isolation or even "exist" [Giaccardi, 1999], make interactive art an invaluable source of possible combinations between individual and social creativity.
- *CodeBroker* [Ye, 2001], a reuse support system, creates awareness of each other's work so that efforts are not wasted and people can focus on what has not been done before. CodeBroker monitors software developers' programming activities, infers their immediate programming task by analyzing semantic and syntactic information contained in their working products, and actively delivers task-relevant and personalized reusable parts [Fischer et al., 1998] from a reuse repository created by decomposing existing software systems. Codebroker will be further developed as an open source software system [Raymond & Young, 2001] to support the collaboration of a large number of developers in order to achieve social creativity. Although most modern software systems are the results of collaboration (i.e., few systems are now developed by a single software developer), open source software systems are built on the tight integration of individual and social creativity in socio-technical environments supported by the seeding, evolutionary growth, reseeding model.

	EDC	Caretta	Interactive Art	CodeBroker
Domain	transportation planning; flood mitigation	urban planning	art	open source software
Participants	diverse stakeholders	diverse stakeholders	artists	software developers
Distances	temporal and technological	temporal and technological	spatial, temporal, and technological	spatial, temporal, and technological
Diversity	stakeholders from different disciplines (CoIs)	stakeholders from different disciplines (CoIs)	minimal (CoPs)	minimal (CoPs)
Collaboration model	explore symmetry of ignorance to construct new understanding	diversified exploration of solutions from multiple perspectives	creation, sharing, and evolution of digital images	division of tasks according to interest and knowledge
Boundary objects	shared representation in a construction space	shared problem	shared painting	source code
Process model	conjecture, refutation, and discussion	short cycle of alternating individual reflection and group discussion	crossing of *pixema* assigned by artists according to each one's sensibility	parallel individual development with punctuated integration
Integration of individual and social creativity	face-to-face discussion in a shared construction space	intuitive integration of shared space and individual space	individual creativity expressed by different *pixema*, which are synthesized in new paintings	individual code expanding others' codes, and integrated back into the whole system

Table 1. Aspects of Support for Creativity Explored in System Developments

Table 1 provides an overview of how these four system development illustrating the framework articulated in this paper.

DISCUSSION AND IMPLICATIONS

As illustrated and described in the previous sections, our research over the last decade has developed conceptual frameworks and socio-technical environments to support design and design communities. This research was driven forward from a perspective focused on distances and diversity. The framework developed in this paper has been used and will be used for transforming our classrooms [dePaula et al., 2001; Rogoff et al., 1998], our offices, our communities, and our scientific collaborations. Traditionally, collaboration in the classroom has not been promoted and actively supported; in fact, collaboration has often been prohibited and considered as *cheating* [Norman, 2001] and interdisciplinary work has been seen not as a source of power by exploiting diversity but as a lack of focus in a particular field, thus preventing people from getting tenure in universities.

This section explores a number of themes that contribute to our understanding of the multiple facets of how distances and diversity are important dimensions of social creativity.

Consumers and Designers

One of the major objectives of social creativity is to create, accumulate, and share knowledge, and enable innovation. The amount of available information and knowledge is exploding, and because information and knowledge consume attention we are all suffering from this overload. To gain a deeper and more detailed understanding of social creativity, we have analyzed two different models characterizing different cultures in creating, accumulating, and sharing knowledge requiring not only consumers but designers as informed participants [Fischer, 2002].

Professionally Dominated Cultures. A professionally dominated culture [Illich, 1973] is characterized by a small number of producers and a large number of consumers. Based on strong input filters (e.g., low acceptance rates for conferences and journals), relatively small information repositories are created. The advantage is the likelihood that the quality and trustworthiness of the accumulated information is high, and that relative weak output filters are required. The disadvantage of this model is that it greatly limits that *"all voices can be heard"*; that most people are limited to *accessing* existing information; and that potentially relevant information (which may be of great value not at a global level, but for the work of specific individuals) may not be incorporated into the information repository.

Design Cultures. Design cultures can be characterized by weak input filters that allow users to become active contributors engaging in *informed participation* [Brown et al., 1994; Candy & Edmonds, 2002] and not only "accessers," which results from increased distribution and diversity. The resulting information repositories are much larger (as evidenced by the World Wide Web, the prime example of this approach). Major limitations of this model are the potentially reduced trust and reliability of the content of the information repositories. Addressing this limitation requires powerful search mechanisms to find relevant information and strong new output filters to allow users to judge the reliability of the information.

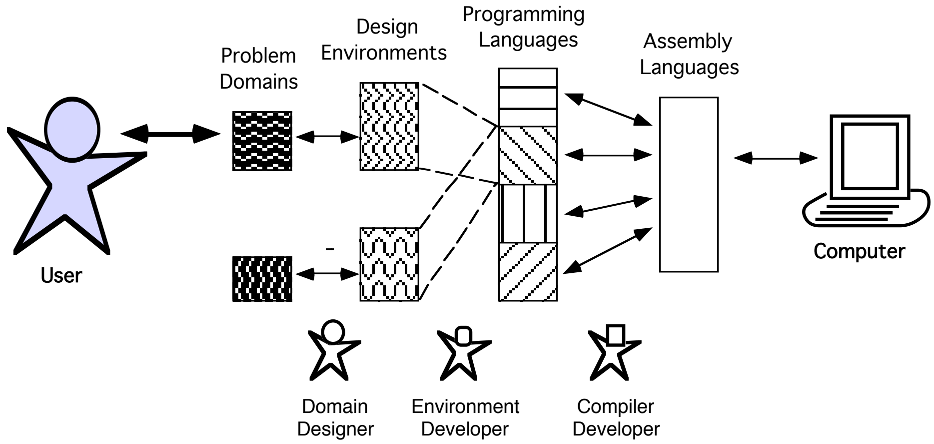

Figure 1. A Layered Architecture Supporting Human Problem Domain Interaction

As indicated in the brief characterization of the two models, they each have strengths and weaknesses, and both of them serve as the guiding principles in different settings.

Division of Labor

As briefly discussed before, *domain-oriented design environments* empower owners of problems to interact with digital artifacts at a problem domain level (representing *their* level of discourse) rather than on the computer level (representing the level of discourse for computer scientists). DODEs increase the distribution and diversity among the stakeholders, contributing to the use of computational environments by creating a *division of labor* [Levy & Murnane, 2004] of computer users into compiler developers, environment developers, domain designers, and users (see Figure 1).

This layered architecture allows individuals to carry out work tasks that were once successfully shared across a group. In a *reversal to the division of labor*, these tasks are now concentrated on an individual (e.g., in desktop publishing, all the tools that previously were distributed among authors, editors, copy editors, designers, typesetters, printers, and distributors, each with his or her own embodied, inarticulate skill and judgment built out of experience, are in the hands of one or a few) [Brown & Duguid, 2000]. Environments like this empower individuals by providing them with new levels of personal control (including that the back-talk of the situation is directed to the owners of a problem), but they also create a *"do-it-yourself society,"* which puts a big burden on individuals who may lack the experience, support, and daily exposure that was distributed among many different roles. This burden is especially felt when individuals are forced to accomplish tasks that are personally not meaningful [Fischer, 2002].

CONCLUSIONS

The complexity of design problems transcends the individual human mind. This paper has discussed conceptual frameworks grounded in distances and diversity to gather people and media together to bring social creativity alive. Our work has only scratched the surface of exploiting the power of collective minds equipped with new media. The challenges of the complex problems that we all face make this approach not a luxury, but a necessity.

ACKNOWLEDGMENTS

The author thanks the members of the Center for LifeLong Learning & Design (L3D) at the University of Colorado, who have made major contributions to the ideas, frameworks, and systems discussed in this paper. The reviewers of this paper have provided valuable feedback leading to this final version.

The research was supported by (1) the *National Science Foundation*, grants (a) REC-0106976 "Social Creativity and Meta-Design in Lifelong Learning Communities," and (b) CCR-0204277 "A Social-Technical Approach to the Evolutionary Construction of Reusable Software Component Repositories"; (2) *SRA Key Technology Laboratory*, Inc., Tokyo, Japan; and (3) the *Coleman Institute,* University of Colorado, Boulder.

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