Social Creativity: Making All Voices Heard

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Abstract

The power of the unaided individual mind is highly overrated. Much human creativity is *social*, arising from activities that take place in a social context in which interaction with other people and the artifacts that embody collective knowledge are essential contributors.

Social creativity is not a luxury but a necessity to address the problems faced by societies in the 21st century. Our research has focused specifically on complex design problems requiring the contributions of many stakeholders. These stakeholders come from many different backgrounds, requiring cultural and epistemological pluralism to *make all voices heard*. We have developed *socio-technical environments* supporting these objectives in the specific contexts of urban planning, collaborative learning, and collaborative software design.

1 Introduction

The analysis of creative people and creative objects has demonstrated that most scientific and artistic innovations emerge from joint thinking, passionate conversations, and shared struggles among different people, emphasizing the importance of the social dimension of creativity (Bennis & Biederman, 1997; John-Steiner, 2000). On the one hand, interactions of humans with other humans and with artifacts and tools is not only needed but central to social creativity. On the other hand, people participate in such collaborative inquiry and creation as individuals, and individuals need time to think and reflect about their contributions to social inquiry or creativity (Fischer et al., 2005).

Complex design problems seldom fall within the boundaries of one specific domain; therefore, they require the participation and contributions of different stakeholders with various backgrounds. These different stakeholders speak with their own voices grounded in their individual backgrounds as, for example, an industry person or an academician, a natural scientist or a humanist (Snow, 1993), a teacher or a learner (Rogoff et al., 1998), a professional or a client (Illich, 1973), a software developer or a software user (Greenbaum & Kyng, 1991).

This paper briefly discusses the relationship between individual and social creativity and then analyzes the need for multiple voices and the difference between voices. It describes a number of different socio-technical environments that allow multiple voices to be heard, and it concludes with some reflections on what we have learned from these research activities over the years.

2 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. Individuality makes a difference, and organizations get their strength to a large extent from the creativity and engagement of their individual members. Appropriate socio-technical settings, at the same time, can amplify the outcome of a group of creative people by both augmenting individual creativities and multiplying rather than simply summing up individual creativities (Fischer et al., 2005).

Individual Creativity. Creative individuals can make a huge difference in exemplary cases, such as movie directors, leaders of sports teams, and leading scientists and politicians. Individual creativity comes from the unique perspective that the individual brings to bear in the current problem or situation. It is the result of the life experience, culture, education, and background knowledge of the individual, as well as the individual's personal interest associated with a particular situation. Individual creativity, however, has limits. In today's society the Leonardesque aspiration to have people who are competent in all of science has to fail because the individual human mind is limited (Campbell, 1969; Shneiderman, 2002).

Social Creativity. Creative activity grows out of the relationship between an individual and the world of his or her work, as well as from the ties between an individual and other human beings. Much human creativity arises from activities that take place in a social context in which interaction with other people and the artifacts that embody group knowledge are important contributors to the process. Creativity does not happen inside a person's head, but in the interaction between a person's thoughts and a socio-cultural context (Csikszentmihalyi, 1996).

Integrating Individual and Social Creativity. Our work is grounded in the basic belief that there is an "and" and not a "versus" relationship between individual and social creativity. Creativity occurs in the relationship between an individual and society, and between an individual and his or her technical environment. The mind—rather than driving on solitude—is clearly dependent upon the reflection, renewal, and trust inherent in sustained human relationships (John-Steiner, 2000). We need to support this distributed fabric of interactions by integrating diversity, making all voices heard, increasing the back-talk of the situation, and providing systems that are open and transparent, so that people can be aware of and access each other's work, relate it to their own work, transcend the information given, and contribute the results back to the community. This process is illustrated (in part at least) by the "location, comprehension, and modification" cycle in software reuse (Fischer et al., 1991), the "collect/relate/create/donate" model (Shneiderman, 2002), and by the decentralized development process of open source communities (Scharff, 2002).

Individual and social creativity can be integrated by means of proper collaboration models, appropriate community structures, boundary objects, process models in support of natural evolution of artifacts, and meta-design. By integrating individual and social creativity, support will be provided not only for reflective practitioners but also for reflective communities. Even within disciplines, disciplinary competence is not achieved in individual minds, but as a collective achievement made possible by the overlap of narrow specialties (Levy & Murnane, 2004).

3 Making All Voices Heard

3.1 The Need for Multiple Voices in Design

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 such that they are not restricted only to enhancing productivity but 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, collaboration is crucial for success, yet it is difficult to achieve. Complexity arises from the need to synthesize different perspectives, 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.

3.2 Individual and Social Perspectives

Individual Perspectives. Individuals may have the following concerns related to their voices being heard:

- *"Am I interested enough and am I willing to make the additional effort and time so my voice is heard?"* — this relates to what motivates people to participate (e.g., to vote in an election, to engage in a neighborhood association); participation is more likely in cases in which people are engaged in personally meaningful problems (Fischer, 2002);
- *"Do I have something relevant to say?"* — the local voices and unique expertise are often especially valuable in a global world; the incredible diversity of building styles, restaurants, food, and hotels that exist in different parts of the world are jeopardized and in some cases destroyed by the rise of tourism and the global marketplace;
- *"Am I able to express what I want to say?"* — owners of problems need to be independent of high-tech scribes; this requires literacy, and in the world today, where ideas and work products are documented with computers, it requires digital fluency (National-Research-Council, 1999);
- *"Am I able and willing to express myself in a way that others can understand me?"* — this is relevant in (1) participatory design processes in which people should express themselves with boundary objects rather than with their respective own technical jargon, and (2) efforts that the public can understand the work of the scientists.

Social Perspective. A group, community, or society is interested in hearing as many voices as possible for the following concerns:

- *"How can we encourage individuals to contribute to the good and progress of all of us?"* — this is relevant in open source efforts, which rely on social capital and gift cultures (Fischer et al., 2004);
- *"In order to stimulate and increase social creativity, how can we support and exploit cultural pluralism and epistemological pluralism as an advantage rather than as a disadvantage?*" — related questions include: Is the European multi-culturalism and its local and regional identities a strength or a weakness? Are we willing to accept the validity and the multiple ways of knowing and thinking, especially by including the voices of underrepresented and underprivileged groups (e.g., people with disabilities (Carmien et al., 2005))?;
- *"How do we avoid the situation that voices get lost because there is too much information or their input does not get recorded?"* — in other words, how do we create knowledge management environments that support the right division between pull and push technologies and that have some context-awareness?
- *"How do we avoid illegitimate voices?"* — this includes information that is pushed at people without their consent (such as spam mail) or is made available against their will (such as violation of privacy);
- *"How do we avoid getting stuck in group think?"* — make sure to see controversy as an asset rather than as a limitation; group think is especially harmful if some groups believe that their way of thinking is on top, rather than on tap (Turkle & Papert, 1991);
- *"How do we eliminate sources of exclusion?"* — this includes not only rules that specifically exclude people (such as minorities, lay persons facing experts, people with disabilities), but ways of thinking and organizing that make them reluctant to join in.

3.3 Different Voices: Exploiting Diversity and Distances

Social creativity thrives on the *diversity* of perspectives included by making all voices heard. It requires constructive dialogs between individuals negotiating their differences while creating their shared voice and vision. This section describes different sources of creativity by exploiting four different *distances*: spatial, temporal, conceptual, and technological (Fischer, 2004).

Voices from Different Places: Spatial Distance. Bringing spatially distributed people together with the support of computer-mediated communication allows the prominent defining feature of a group of people interacting with each

other to become shared concerns rather than shared location. It further allows more people to be included, thus exploiting local knowledge. These opportunities have been successfully employed by the open source communities as well as by social networks of people who have a shared concern (such as a family member with a disability).

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, 2005). Web2gether (dePaula, 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. Experience sharing 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).

Voices from the Past: Temporal Distance. 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; 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 in the past whose voices have been lost. 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).

The idea of exploiting and building on the voices of the past to enhance social creativity is important not only for software reuse but for our overall cultural heritage. In cultural evolution there are no mechanisms equivalent to genes and chromosomes (Csikszentmihalyi, 1996); therefore, new ideas or inventions are not automatically passed on to the next generation, and education becomes a critical challenge to learn from the past (Bruner, 1996). Many creativity researchers have pointed out that the discoveries of many famous people (e.g., Einstein who could build on the work of Newton) would have been inconceivable without the prior knowledge, without the intellectual and social network that simulated their thinking, and without the social mechanisms that recognized and spread their innovations.

Voices from Different Communities: Conceptual Distances. To analyze the contribution of voices from different communities, we differentiate between two types of communities: communities of practice (CoPs) and communities of interest (CoIs).

Communities of Practice (CoPs) (Wenger, 1998) consist of practitioners who work as a community in a certain domain undertaking similar work. Examples of CoPs are architects, urban planners, research groups, software developers, and end-users. CoPs gain their strength from shared knowledge and experience. However they face the danger of group-think: the boundaries of domain-specific ontologies and tools that are empowering to insiders are often barriers for outsiders and newcomers. CoPs must be allowed and must desire some latitude to shake themselves free of established wisdom.

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). 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. Fundamental challenges facing CoIs are found in building a shared understanding (Resnick et al., 1991) 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 and to establish a common ground (Clark & Brennan, 1991). CoIs provide an example for the importance of the multiple voicedness for social creativity because it is generally believed and observed that the centers of creativity tend to be at the intersection of different cultures, where beliefs, lifestyles, and knowledge mingle and allow individuals to see new combinations of ideas with greater ease.

Voices from Virtual Stakeholders: Technological Distances. The preceding subsections emphasized computer-mediated collaboration among humans to reduce the gaps created by spatial, temporal, and conceptual distances. Voices from virtual stakeholders are embedded in artifacts such as books and in more interesting and powerful ways in computational artifacts.

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.

4 Socio-Technical Environments

Socio-Technical Environments. Over the last decade, we have developed socio-technical environments that help people to make their voices heard across the distances described in the previous section. We briefly mention here some of these developments:

- ***Domain-oriented design environments*** (Fischer, 1994) support CoPs by allowing them to interact at the level of the problem domain and not only at a computational level. They allow for efficient communication within the community at the expense of making communication and understanding difficult for outsiders. They support the voices of virtual stakeholders in the form of critics (Fischer et al., 1998) by increasing the back-talk of situations.
- ***The Envisionment and Discovery Collaboratory*** (Arias et al., 2000) supports CoIs with 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 design problems. The socio-technical environment empowers users to act as designers in problem-solving activities by supporting face-to-face collaboration. It allows users to engage in complex design tasks by supporting them to incrementally articulate their "best" ideas and negotiate with each other to create mutually agreeable design plans.
- ***CodeBroker*** (Ye, 2001), a reuse support system specifically addressing temporal distance, 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.

- ***Courses as Seeds*** (dePaula et al., 2001) is an educational model with the goal to create a culture of informed participation that is situated in the context of university courses and yet extends beyond the temporal boundaries of semester-based classes. Courses are conceptualized as seeds, rather than as finished products, and students are knowledge workers who play an active role in defining what they will learn. From the courses-as-seeds standpoint, the role of technology is to form and sustain active communities of learners who can make their voices heard by contributing ideas from their own unique viewpoints, and to connect them in new ways. From this perspective, mere access to existing information and knowledge (e.g., seeing courses as finished products, either in the classroom or on the web) is a very limiting concept.

Meta-Design: Creating Opportunities for Creativity. To bring social creativity alive, media and environments must support meta-design. The perspective of *meta-design* (Fischer & Giaccardi, 2005) characterizes objectives, techniques, and processes to allow users to act as designers and be creative. The need for meta-design is founded on the observation that design, in the real world, requires open systems that users can modify and evolve. Because problems cannot be completely anticipated at design time when the system is developed, users at use time will discover mismatches between their problems and the support that a system provides. These mismatches will lead to breakdowns that serve as potential sources for new insights, new knowledge, and new understanding. Meta-design advocates a shift in focus from finished products or complete solutions to conditions for users to fix mismatches when they are encountered during use. It is a methodology that posits that voices can be heard at all times during the life of a socio-technical environment, not just at design time.

Meta-design has the potential to establish a new level of social creativity by providing resources for users to become active contributors in personally meaningful activities that arise in unpredictable environments. Meta-design, which supports *creativity of use* (Hill, 2003), encourages users to be naturally active and creative by providing them with infrastructures and process models that sustain such an attitude.

Meta-design supports *informed participation* (Brown & Duguid, 2000) 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.

5 Implications

Achieving social creativity by making all voices heard is supported by methodologies such as meta-design and informed participation, by open socio-technical environments evolvable by their users, and by people who act as active contributors and designers rather than passive consumers. This approach creates a culture that is fundamentally different from *professionally dominated cultures* that can be characterized by a small number of producers and a large number of consumers. Professionally dominated cultures are based on strong input filters to information and tool repositories (e.g., low acceptance rates for conferences and journals and proprietary software), grounded in the assumption that this will increase the trustworthiness of the accumulated information and quality of tools. The disadvantage of this model is that only a small number of voices will be heard, most people will be limited to accessing existing information, and potentially relevant information (which may not be of great value at a global level, but very important for the work of specific individuals) will not be incorporated into information repositories and therefore will not be shared and further evolved. Making all voices heard requires an epistemological pluralism in which professional opinions are "on tap but not on top" (Turkle & Papert, 1991).

Section 3.2 asked the following questions: (1) from an individual perspective: *"am I interested enough and am I willing to make the additional effort and time so my voice is heard*?" and (2) from a social perspective: *"how can we encourage individuals to contribute to the good and progress of all of us?"* These questions indicate the importance of motivation and rewards in persuading people to make their voices heard. The following criteria and features of socio-technical systems are important dimensions for motivation (Fischer et al., 2004):

- making changes must seem possible for the skill and experience level of specific users (Scharff, 2002);

- changes must be technically possible (a central objective of our meta-design approach) (Fischer & Giaccardi, 2005);
- benefits must be perceived; e.g., individuals must perceive a direct benefit in contributing that is large enough to outweigh the effort (Grudin, 1987);
- the effort required to contribute must be minimal so that it will not interfere with getting the real work done (Carroll & Rosson, 1987).

Social creativity needs the "synergy of many," and this kind of synergy is facilitated by meta-design. However, a tension exists between creativity and organization. A defining characteristic of social creativity is that it transcends individual creativity and thus requires some form of organization. On the one hand, elements of organization can and frequently do stifle creativity (Florida, 2002). On the other hand, there are historical precedents that *too many voices* can be worse than having a few choices. As a prime example, the multi-party system that existed in the Weimar Republic in Germany after World War I has created a less stable political system compared to countries with a limited number of political parties.

6 Conclusions

To achieve and support social creativity is not only a technical problem; it requires new cultures and new mindsets. Making all voices heard requires socio-technical environments that provide people with powerful media to express themselves and engage in personally meaningful activities. The complexity of design problems transcends the individual human mind by requiring the integration between individual and social creativity. 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.

7 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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