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SPECIAL ISSUE ON DISTRIBUTED LEADERSHIP & ON-LINE COMMUNITIES

Niki Lambropoulos & Marianna Vivitsou, Guest Editors

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Original Articles

From the Editor in Chief

MICROINNOVATIONS IN HUMAN–TECHNOLOGY INTERACTION

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Human–technology interaction is a central consideration of our time: Many aspects of our social development depend on it. Therefore, it is essential to consider how best we can coordinate the innovation process, since innovation establishes the technological preconditions for future life. Issues such as inventing, creating, designing, manufacturing, marketing, and using new technologies are all steps in the complex innovation cycle.

Inventions or creations are the first step in a long line of processes that eventually result in something useful for improving the quality of people's everyday lives. However, only when hundreds, if not thousands, of small, at times independent, pieces are connected to each other into a sense-making whole, do we have an innovation. The idea is the beginning, but only ideas that improve on practice and are adopted by users become innovations (Schumpeter, 1939).

Sometimes the ideas may be relatively tiny and invisible, yet still their ultimate justification is always expressed in terms of human life. For example, it makes sense to apply nanotechnology in paper machines because it improves the process of making paper, something we can readily see when we read the newspaper at our breakfast tables. Thus, the value of small technological ideas and the improvements they bring have value when they raise the quality of life. This is why we should attend to the process that integrates the many ideas into a working whole.

The innovation process begins with a set of ideas. At this point, the ideas are simply that—an output of someone's thinking and imagining. Design solutions and marketing inventions are always products of human thinking. This means that thinking forms the very enigma of innovation processes. It makes them work, and for this reason we can investigate innovations as human thought processes.

The perspective on innovations opened by human thinking is intriguing. Much has been written about large innovations processes, such as governmental innovation processes, networks, and systems of innovations. We also know a considerable bit about organizational innovation processes and the diffusion or sustainability of innovations. But we know very little about innovative thinking in the scientific sense. Innovation processes can be very extensive, and so it is logical to call them macroinnovations. Alternatively, then, innovation as thinking can be considered a microinnovation process. Of course, innovation as thinking does not replace macroinnovation research. Indeed, microinnovation research opens up complementary

perspectives toward the innovations, thus enabling us to understand in a new way many macroinnovation phenomena.

Moreover, human–technology interaction design also has its microinnovation processes. Throughout history, these processes have had their success stories and failures. By analyzing the stories—particularly the failures—we can learn much about the typical microinnovation processes. As an example, we can analyze the WAP (wireless application protocol) fiasco from about a decade ago. Although many engineers saw technical problems as an explanation for the WAP's failure, it is clear that the users did not accept this technology. The fundamental misjudgment on the part of WAP's developers is that they did not recognize that users did not want to learn how to use its symbolic interface. In fact, the problem was that users could not learn to use it (Ramsay & Nielsen, 2000). So although members of the overly enthusiastic mobile industry recognized the usability factors in play on this important new technology, it took them time to realize there was little they could do to get audience to accept the product.

Thus, WAP serves as an instructional mistake. Had its usability assessments been undertaken before the development process of its final form of service was completed, much trouble would have been avoided. Yet, this innovation traveled a wrong path because a portion of its developers' thought processes arrived at wrong conclusions, or, perhaps more accurately, disregarded evidence in a key innovation task in reaching conclusions. The primary mistake was an underestimation of the users and the value of user testing in the early stages of technology development. Information and understanding about users' cognitive capacity were not included in the management decisions leading to product launch decisions. So, what can we learn from analyzing the WAP events?

WAP would not be important case unless it kept developers from repeating similar mistakes in contemporary industry. Today, large numbers of programs never reach their audiences, even though the ideas behind them are good. Freeware and the difficulties in marketing program products illustrate the challenges of getting products—even good products—accepted in the marketplace. Therefore, reflecting on the "logic" behind the failure in microinnovation processes of the WAP project offers lessons to be learned.

As noted above, innovation processes involve huge streams of ideas. Sometimes it happens that the failure of a single component can have disastrous consequences. For example, a number of supertankers exploded in the 1960s, the result of a small gas pocket in their tanks (Perrow, 1999). The space shuttle Challenger explosion was a similar case of a small component producing a catastrophic outcome (Presidential Commission, 1986). In fact, WAP shared the same characteristic: One uncontrolled phenomenon destroyed the big technological idea.

Microinnovation research is a huge field because thinking plays a role in all innovation processes. The WAP failure teaches us an essential lesson: the importance of task-necessary information. Users are an essential element in technology, and if information about and from users is not included within each step of the innovation processes, innovators are likely to err. Company managerial boards take unnecessary risks when they do not have on-staff personnel with user expertise or do not seek input from those so skilled. Negative outcomes can result from either ignorance of or false information regarding the human–technology innovation processes.

Another risk in human technology interaction development thinking was illustrated by Steve Jobs and Apple. The mobile industry had met with difficulties when introducing WAP. Human–technology interaction experts had demonstrated already in the year 2000 that text-based WEB services would not work (Ramsay & Nielsen, 2000). Experience with the Web in the pc world

had clearly shown that text-based interfaces were too complicated for ordinary users to apply in accessing the Internet, and yet the industry continued its work on WAP for a couple of years more, before accepting the facts. However, everyone knew that graphic interfaces worked fine in supporting Internet use. In other words, the solution to the WAP deficits actually existed under the noses of developers during this period. Nevertheless, it took nearly a decade before Apple was able to bring this realization to fruition in the mobile world. Of course, many of the factors explaining the slow emergence of the graphic mobile culture were technical, such as bandwidth and battery capacity. Nevertheless, it was necessary to restructure the human–technology interaction thinking associated with WAP in order to create a new application- and service-based culture. Changing the thinking allowed for this positive step.

Human thinking opens the potential for people to reach their goals in life when such solutions are not currently available (Newell & Simon, 1972). The failure of WAP illustrates the problems that can arise, and Apple's approach demonstrates how re-thinking can solve such challenges. The definition of goals, the identification of obstacles, and creative problem solving form the core of the innovation processes in human–technology interaction, as they do in other human endeavors. Problems and challenges can be solved only when innovative thinkers have sufficient expertise and the required information. Thus, the importance of defining human knowledge and understanding the users' behaviors, preferences, and attitudes is an essential component of expertise within the engineering community. This is not true only inside the walls of design offices, but also inside executive boardrooms.

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Guest Editors' Introduction

DISTRIBUTED LEADERSHIP FOR INTERCONNECTED WORLDS

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The technological advancements in the second half of the previous century generated the potential for participatory decision making in organizational and governmental institutions. Moreover, the digital networking environments on the Internet that enabled this type of decision making were accompanied by the emergence and establishment of on-line communities. Under this perspective, the range of communication mediated by ubiquitous computing allows problems, ideas, and suggestions of a specific nature to be considered when gathered into organizational and institutional virtual spaces. Within these spaces, the voices of individual customers, workers, organizational stakeholders, and/or citizens can be articulated and brought to bear on services, practices, and policies, as well as to join voices with salient others. Such naturally or intentionally formed communities and groups require roles within them to function.

One of these roles is leadership; Chemers (1997), in his book titled, *An Integrative Theory Of Leadership,* suggested that leadership is the process of social influence in which one person can enlist the aid and support of others in the accomplishment of a common task. Although this approach of *one* leader directing a group was representative of the 20th century, the new, globally interconnected context sets the stage for the expectation that leadership is to be less directive and more collaborative The application of leadership attributes such as values, knowledge, and skills can now be found in and employed by the diversity of the group members and community rather than residing solely in just one, or just a few, individuals. Consequently, the communication that integrates the individuals within the collective allows for new attributes to be attached to the leadership construct. Thus, a new approach is being observed within the realms of cyberspace: distributed leadership.

The term *leadership* usually refers to the traditional top-down model of centralizing control. Recently, however, a transformational aspect has become embedded within the term to indicate a bottom-up management mode. Simultaneously, the paradigmatic shift in media-interactive

communication, enabled by the development of Web2.0 tools and environments, has enhanced connectivity and resulted in the growth of the networked experience. The intersection of these two transitions has created an environment that has empowered the user by offering the opportunity for interventionist action beyond the individual level. This perspective, therefore, generates the need for the study of bottom-up approaches to leadership on the one hand, and the need for reconsideration of the leadership concept, on the other. Such research would embrace the extending features of distribution–of creating, of planning, of work, and of leadership. Distributed leadership, then, builds upon participants' contributions in participatory decision making. Despite the fact that the capacity for leadership is both individual and collective (Ancona & Bresman, 2007; Senge, 1996), at the moment, methodologies and techniques addressing the issue of management exist for top-down and bottom-up approaches distinctively and exclusively. Distributed leadership, moreover, being a relatively new field, is also, to a certain extent, a largely unexplored one.

Distributed leadership (Woods, 2004) has been related to participatory decision making as well as to participatory democracy, while the concept is further enhanced by the myriad information and communication technologies (ICTs) and on-line networking technologies available today. According to Ghosh (2002), distributed leadership is a matter of a more purposeful resolve to build "multi-dimensional trust" within an organization. Examples come from media and computer companies, as well as educational and governmental organizations. More particularly, some program producers encourage viewers to vote on the plot, thereby influencing and/or determining the outcome of a film, series, or protagonists. Customers for some companies can make suggestions and vote on their ideas for products. Students' on-line communities in universities make suggestions to enhance policy-making decisions. From a European viewpoint, distributed leadership has been associated with shared visions across and beyond the boundaries of European countries, creating shared direction for all. The need for shared visions in Europe, as stressed by Costas Simitis in his 1997 speech at the London School of Economics, is based on the reality that democracy is in crisis. In fact, the European Union (EU) has made several attempts to involve the citizens in decision making by providing on-line discussion forums and tools to facilitate this process.[1] An attempt to aid in the financial crisis in Greece was introduced by the editors of the Ideas Platform,[2] where the users could submit their suggestions for solutions to related problems. The suggestions were then forwarded to the relevant Greek ministry as well as to the EU group associated with the Digital Agenda for Europe[3] organization.

Despite the growing applications of participatory decision making, the organizational structures to support the nonhierarchical nature of power and authority practices have not been widely studied yet. Furthermore, few studies have considered the incorporation of information systems into a business perspective for building direct ties and relationships that benefit from improved communication with customers or to reform public services. Under this perspective, it appears that the previous conceptualization, approaches, and practices of leadership can no longer be applied unquestioningly in our interconnected world. The leadership target of social influence by any means needs to be replaced by a more participatory approach focusing on the end result. In this millennium, focusing on group accomplishments and the well-being of the members represents the innovation not just in leadership, but also in project output. Social influence as a means for accomplishing task is expressed by the diversity of stakeholders, rather than in just one individual.

One approach that has provided a framework to understand, analyze, and function under this new leadership perspective is that of the empathic leader (Goleman, 2004). The empathic leader works as an instrument: He/she listens with empathy and then leads with empathy, as well as observes, asks questions, provides the means toward success, and gathers information to uncover the "true reality" of the group or community. The importance of empathic leadership, as advocated by Goleman, rests on three reasons: the increasing use of teams as "cauldrons of bubbling emotions," the rapid pace of globalization with cross-cultural communication, and the growing need to retain talent. In considering the transition from the 20th century industrial revolution to the 21st century interconnected worlds, however, a discrepancy arises concerning the incorporation of the new leadership perspective within organizational and institutional practices when such an attempt is based upon existing theoretical frameworks.

Part of this knowledge gap then is bridged with this special issue of *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*. The four articles hosted in this issue focus on shared information, participation, and community-based dialogic forms of communication, and how these contribute to reshaping organizational, educational, and political practices.

Departing from the free movement principle that the open source culture supports, Kostakis, in the first article of this issue, explores the ways politics and democracies can benefit from the emerging participatory spirit that modern ICTs inspire. To meet this end, Kostakis sets out to provide a deeper insight into the nature, the effects, and the potential of the concept of wikipolitics for a revitalized democratic discourse. In his discussion of the ways networked environments allow for a reorganization of economic, cultural, and political life, the author also uncovers several problems underlying the open source approach. Kostakis concludes the present study by proposing that a law-abiding clear social community contract, a user-friendly architecture with natural narrative conversational modes of human interaction, and a change in the attitude of both politicians and citizens are some of the measures a scientifically designed wikipolitics project could take in order to rule out threats.

The conversational mode of interaction occurring in open source environments is, in fact, the departure point of the study conducted by Barberio, Mastrogiorgio and Lomi. To balance excessive research attention on the technical part, Barberio and colleagues follow an anthropocentric approach to investigate communication patterns that develop in order to meet discussion objectives. To this end, the researchers examine communication practices evolving among the members of a virtual community, gaining insight into dialogic forms of coordination. As the findings of their study indicate, communication practices provide a lens for looking at discussion coordination in a concrete way. Through communication genres already in use, cognitive complexity is reduced, a phenomenon that, as the authors underscore, also applies to collective decision making. The authors conclude that the potential of new Internet technologies to enhance dialogic–cooperative forms of coordination needs to be further explored.

Considering the potential for organizational innovation being the backbone of her studies, Jameson argues for distributed leadership as an effective model of operation within on-line communities. To support her case, the researcher draws upon the findings resulting from the operationalization of three case studies situated in an on-line global community. Through her analysis, Jameson pinpoints that an effective model of distributed leadership enhances active participation and enables community members to potentially become involved in on-line

community leadership. To meet this end, a balance between the visibility and invisibility of formal leadership presence in community discussions is essential. Reflecting upon her study findings, Jameson goes on to argue for the need of socioemotional trust to develop as one of the fundamental qualities towards the articulation of genuine dialogue between team members at all organizational levels. By alternating instances of presence and collaborative discretion, therefore, on-line community leaders pass the floor to other members, thus contributing to balanced group interactions and allowing for the distribution of democratic procedures.

Finally, the view of distributed leadership taken by Lambropoulos, Gourdin and Bakharia in their work situates the issue in the educational domain. In their paper, Lambropoulos and colleagues discuss and analyze the collaborative efforts of students participating in a distributed leadership course, implemented on-line and aimed at correlating interaction quality with idea generation. Scripting computer-supported collaborative e-learning activities based on distributed leadership principles, the authors claim, can scaffold students' interactions. In this way, collaboration is supported and idea generation promoted. The associated tools play their own part to collaboration enhancement, as scripting brings students' interactions and dialogical sequences to the fore, thus contributing to an improved learner awareness. Aiming towards data validation, the researchers apply a number of diverse methods and tools to provide a multifaceted approach so as to achieve a more holistic view of the data and their interpretation.

This special issue focuses on current trends and practices, as well as real-life case studies, where evaluations have been applied and validated. As a result, this issue not only reports first experiences and debates, it also manages to go beyond the current state of the art by looking into future prospects and emerging applications. As such, this special issue can be a useful guide and reference tool to practitioners and experts who study, design, construct, moderate, evaluate and maintain distributed leadership environments and techniques in e-learning, e-business, e-government, and other related domains. By stressing the individual's responsibility to be engaged actively in any group, the social or even national accomplishment, and the leader's duty to listen and respond, this special issue raises leadership to a new level, this of distributed leadership.

ENDNOTE

1. See, for example, the Interactive Policy-Making Tool (http://ec.europa.eu/idabc/ipm), which aims to improve governance by using the Internet to collect and analyze reactions of citizens and enterprises, evaluate existing EU policies, and facilitate open consultations on new initiatives.
2. This initiative can be seen at http://democracyreloaded.gr
3. The link to the Digital Agenda for Europe is http://ec.europa.eu/information_society/digital-agenda/index_en.htm

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THE ADVENT OF OPEN SOURCE DEMOCRACY AND WIKIPOLITICS: CHALLENGES, THREATS AND OPPORTUNITIES FOR DEMOCRATIC DISCOURSE

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Abstract: *It has been claimed that the Web 2.0, the open source movement, and the emerging mode of peer production have inaugurated a new era of debate about openness, participation, and cooperation as bedrocks for rebuilding the civilizations of the modern world. By way of introducing the concept of wikipolitics, this paper examines whether, and if so how, politics and democracies can benefit from this emerging participatory spirit and modern ICTs, and to document possible dangers of such a shift in the democratic process*

Keywords: *open source, wikipolitics, peer production, democratic discourse.*

A radical change in the organization of information production has been observed during last decades. Two parallel shifts have taken place: The most economically advanced societies are moving towards an information-based economy (i.e., emphasis on financial services, marketing, software, science, and culture), while the declining costs of information and communication technologies (ICTs) make them available to a much wider portion of the world's population (Benkler, 2006). This has led, in turn, to the creation of a new communicational, interconnected, virtual environment in which a new social, productive, and exchange model has emerged that is radically different from the industrial one (Benkler, 2006). This new paradigm has been described by Benkler (2006) as commons-based peer production, which reduces the value of proprietary strategies and makes shared information more important through large-scale, cooperative information production efforts. Bruns (2008) has called this era "produsage," where "produsers" (producers + users) simultaneously innovate, produce, distribute, and consume, all premised on an ethos of participation, sharing, communication, and collaboration. Therefore, peer production, in this context, is a new mode of production that has been enabled through Internet-based coordination, where decisions arise from the free engagement and cooperation of the people who coalesce to create common value. It is a mode arguably more productive in the creation, production, and distribution of

nonmaterial value (i.e., knowledge, information, or culture), in which the creative energy of multitudes is coordinated into meaningful projects without the traditional hierarchical organization (Bauwens, 2005a, 2005b; Benkler, 2006). The on-line free encyclopedia Wikipedia, which hosts millions of pages of information and knowledge; the thousands applications of FLOSS (i.e., free/libre/open source software, e.g., Linux); the Apache Web server that provides a foundation for open, collaborative software development projects; and the LibriVox project, a digital library of free public-domain audio books read and recorded by volunteers, are just a few examples of the legion of the ongoing peer production endeavors. Simultaneously, it has been frequently argued (Bauwens, 2005a; Benkler, 2006; Lessig, 2004) that culture is becoming more participatory and self-reflective, "where many more of us participate actively in making cultural moves and finding meaning in the world around us" (Benkler, 2006, p. 15). Millions of blogs, the open access movement, and the free dissemination of music, photography, and literature via Creative Commons licenses provide an account of the so-called "free culture movement" (Lessig, 2004).

The present paper, by and large, subscribes to this perspective and takes it as its framework and starting point. This, in turn, leads to several questions. If produsers in the economic arena can create common value via open, self-governed, networked, virtual communities—especially regarding nonmaterial production—what should and/or could be done in the procedure of democratic discourse? If, as argued by Surowiecki (2004), the crowds are actually wiser than the few experts and capable of making better decisions under certain conditions (that is, the crowd needs to be diverse and decentralized with independent members), then how can modern ICTs of the so-called networked area, in coordination with the open source culture, summarize citizens' opinions, arguments, and suggestions into a collective verdict that may provide societies with co-created political value? What effect can the open source movement in software and knowledge production have on enhancing and enriching modern democratic structures? What are the dangers of such a shift of the democratic process? This paper addresses the concept of wikipolitics, examining whether and how wikipolitics can facilitate an environment for peer production in the political field, and discussing the potential dangers, based on the study of a prominent peer project, Wikipedia.

INTRODUCTION TO WIKIPOLITICS

Staring at Open Source Democracy

Historically, democracy has been in an arduous search process of reinventing itself: "Like fire, painting or writing, democracy seems to have been invented more than once, and in more than one place" (Dahl, 1998, p. 8). And because democratic processes are tightly connected with information flows and communication nowadays, new opportunities, mainly induced by the technological progress especially in the ICT sector, are emerging and simultaneously transforming and being transformed by a refreshed subjectivity. Bauwens (2005a, 2005b) argued for the emergence of the peer-to-peer (P2P) concept. This specific form of relational dynamic, based on an assumed equipotency (i.e., no prior formal filtering for participation) of its contributors and organized through the free cooperation of equals in view of the performance of a common task, creates a common good, with forms of decision making and

autonomy widely distributed throughout the network. How can this networked environment facilitate a better democratic discourse or, in other words, a better democracy and indeed a better society? Before addressing that, what do we really mean by better democracy? How do we perceive the enhancement of democratic structures and the democratic discourse? Democracy could be said to be about the resolution of competing claims and visions of the good society in an arena open to all (Alexander, 2003). The democratic utopia is perceived as a number of processes based on equal and open participation in decision making, where every person has its say. So, in this paper, the enhancement of democracy is understood as a step closer to the aforementioned utopia. Some scholars (Bauwens, 2005a, 2005b; Benkler 2006; Bruns, 2008; Lessig, 2004; Rushkoff, 2003, 2007) claim that the participatory context, within which the myriad commons-based peer production endeavors are blooming, signals the return to autonomy, cooperation, and collectivity: New social norms are emerging. At the same time, numerous political scientists highlight the need for embracing cooperation, because otherwise the world would be ruled by "one power structure in terms of economic-technological development, military power and knowledge production" (Suoranta & Vaden, 2008, p. 182). Moreover, Sen (2002) underlined the importance of sharing common good in order to enrich human freedom.

Rushkoff (2003) demonstrated that the current political structures can be changed:

> Transparency in media makes information available to those who never had access to it before. Access to media technology empowers those same people to discuss how they might want to change the status quo. Finally, networking technologies allow for online collaboration in the implementation of new models, and the very real-world organisation of social activism and relief efforts …We are heading not towards a toppling of the democratic, parliamentary or legislative processes, but towards their reinvention in a new, participatory context. (p. 63)

In 2007, Rushkoff considered the modern information age as a second renaissance:

> Printing press, perspective, extended metaphor, circumnavigation of the globe, re-invention of the "individual", the beginnings of calculus all find their modern parallels in the internet, holography, hypertext, orbiting the globe, re-invention of the collective, the beginnings of systems theory…. old, repressed ideas, like the value of collaboration and cooperation, are being reborn in the next context of connectivity. (Answer 1, para. 1)

During the original Renaissance, people were transformed from passive recipients into active interpreters of the world. In the current renaissance, people are playing new roles: the role of author, the role of creator (Rushkoff, 2003). ICTs, or what Rushkoff (2003) calls "interactive media," can arguably provide the tools to develop collective narratives while remaining connected to each other. In a networked, information-based society (Bauwens, 2005a, 2005b; Bell, 1976, 1978; Benkler, 2006; Castells, 2000, 2003), in which a participatory, open, and free culture is emerging, societies aspire towards "a highly articulated and dynamic body politic: A genuinely networked democracy, capable of accepting and maintaining a multiplicity points of view" (Rushkoff, 2003, p. 51). The promise of this "networked democracy" lies in encouraging broader participation and taking advantage of the collective wisdom and the perspectives of the crowds. According to Jenkins (2006), ICTs induce a participatory culture that contains low barriers to civic participatory engagement and activism, as well as new forms of social connection, solidarity, and collectivism.

"Open source democracy" (a concept introduced by Rushkoff, 2003) is related to a "model for the open-ended and participatory process through which legislation might occur in a networked democracy" (p. 56). Members of open source communities experience the way that their actions affect the whole and, as a result, they are more conscious of "how their moment-to-moment decisions can be better aligned with the larger issues with which they are concerned" (Rushkoff, 2003, pp. 60–61). Open source democracy deals with interconnected local communities that are experienced as places to design and implement policies incrementally; this eventually will have an effect on the whole. It can be said that open source democracy is actually a strand of on-line participatory democracy, or "eDemocracy," since it concerns a particular context of democratic goals: enabling participation through input and consultation; inducing engagement and deliberation; and having no relation, for instance, with e-voting or simple digital feedback. In a nutshell, it tries to redefine modern democratic discourse in the digital information age. Open source activity is, in some ways, similar to "crowdsourcing," although I prefer using the term *open source* because it stresses concepts such as openness, the common good, and collaboration.

Wikipolitics constitutes those sociotechnological applications and processes that can exploit the untapped collective intelligence resources. It aims to strengthen democratic processes by facilitating electronic input within policy development and on-line policy consultation. After all, it is about content co-creation. So wikipolitics, where "networking technologies allow for online collaboration in the implementation of new models" (Rushkoff, 2003, p. 63), is a means with the potential to give rise to open source democracy. But, as Clift (2004, p. 3) noted, "There is no 'leap frog' path that easily leads to responsive governance that supports human and economic development." Getting over the hype in media coverage of the early 1990s, the Internet and ICTs are not inherently democratic or capable of leading absolutely on their own towards a democratic revolution. "ICTs might be functional to implement a certain kind of democracy, while it might lead to undemocratic results in another institutional setting," said Hilbert (2007, p. 7). However, nowadays, as will be explained in the next section, technology reflects a change of attitude towards participation and openness, expressed in the formation of new interactions—P2P relations—while new forms of political and productive organization are emerging. Open source democracy, along with wikipolitics, is being built upon this new relational dynamic at work.

The Evolution of Technology and the Emergence of a New Social Order

At this point, it will be helpful to shed light on the evolution of technology and the emergence of new modes of social organization, specifically following Bauwens' (2005b) analysis developed in his "P2P and Human Evolution" essay, since this provides a framework for the analysis to come. According to Bauwens, premodern technology was participative in a nondifferentiated world: The tools of the artisans were extensions of their bodies, and their societies were not differentiated, meaning people were part of a whole that was dominated by spirits (their ancestors, spirits of nature, objects, etc.). In the modern era (industrial capitalism), technology became less participative but more differentiated: Nature was considered an object (i.e., a resource to be used), while tools no longer served as an extension of the human; rather, the human became an extension of the machine. In the industrial system of production, humans and machines were of the same nature, both cogs in the system.

Nowadays, in the postmodern, information-based, networked era, machines are intelligent, but in a way different than humans (i.e., machines lack creative innovation, problem-solving, and decision-making capabilities). During the process of "informationization," a new paradigm has emerged (although coexisting with the old one): Computers are becoming extensions of the human brain while humans cooperate with them, thus enabling an effective communication among a much wider human community.

According to this argument, technology would reflect a change of attitude towards participation. This change is expressed in the formation of new P2P relations, while new forms of political and productive organization are emerging. These new forms do not offer solutions to the problems per se, but they constitute alternative, new processes for arriving at solutions. An increasing number of people are now able to manage their political, social, and productive lives through a variety of interdependent networks. These trends contribute to the formation of a social order increasingly based on meaningful cooperation. These new forms of civilization combine subjectivity (new values), intersubjectivity (new relations), objectivity (an enabling technology) and interobjectivity (new forms of organization; i.e., peer production as a new mode of production in the information and knowledge sector) that mutually strengthen each other in a positive feedback loop.

It can be said that there are two primary questions to be answered. The first one is an ontological question: How is technology transforming us? The second question, and the focus of this paper, is a political one: What can we make out of technology (Feenberg, 1998)?

The Essence of Wikipolitics

The advent of Web 2.0 has enabled large-scale interactions (O'Reilly, 2006) via emerging Web technologies such as wikis. Butler, Joyce, and Pike (2008, p. 1108) arrived at the conclusion that the "true power of wikis lies in the fact that they are a platform that provides affordances, which allow for a wide variety of rich, multifaceted organizational structures." According to Suoranta and Vaden (2008, p. 11), wikis ideally exemplify the Habermasian potential of digital technology and communication (see Habermas, 1984) because they "seem to promise almost limitless global open collaboration in terms of content production, discussion and argumentation." Wikipolitics is only a means to an end. According to Rawls (2003), the focus in the design of democratic information and communication processes should be premised upon procedures, rather than on truthful results. In addition, a great challenge for wikipolitics is to "efficiently steer and correctly administer the information overflow of a very large number of participants" (Hilbert, 2007, p. 21). Indeed, "new information technologies are not simply tools to be applied, but processes to be developed" (Castells, 2000, p. 31).

Is there any specific example of wikipolitics being put into practice? This paper will deal later with three projects that can be considered wikipolitics cases because they have many of the characteristics of wikipolitics, as described above, and bring some empirical results. They will be briefly introduced here already. The first one is the Deliberatorium platform initiated by Iandoli, Klein, and Zollo (2008), scholars from MIT and Naples University. The researchers were trying to create a platform that would allow for collective deliberation, suggestions formulation, and decision making concerning important, complex issues, such as climate change. The second wikipolitics project studied here was called wikipolitics.gr;[1] it is now inactive. Developed by PASOK,[2] the dominant socialist party in Greece, and supported by the

on-line journal *Re-public* and the newspaper *Ta Nea*,[3] this platform facilitated collaborative politics. Future Melbourne,[4] the third wikipolitics project, dealt with "the transformation of a traditional city planning exercise governed by a few, to a global, wiki-based collaboration on the future of Melbourne, Australia," according to Mark Elliot (2008, para. 1), a key contributor. The goal was to leverage the potential of collaboration and to take advantage of Web 2.0 opportunities. Therefore, the city's 10-year plan was migrated "to a wiki-based collaborative environment for both internal and public consultation" (Elliot, 2008). All these cases were studied in winter 2008-2009, and, exactly after 2 years, they were re-examined and their progress is documented within the relevant sections that follow in this essay.

As was mentioned above, if the crowds are really wiser than a few experts, and democracies are not as transparent and participatory as they could be (and assuming transparency and participation are good, and indeed essential, for democracy) a question comes to the fore. Under these circumstances, can the modern ICTs, in coordination with the open source culture, summarize citizens' opinions, arguments, and suggestions into a collective verdict that may provide societies with co-created political content?

Varoufakis' (2007) main objection to the wikipolitics notion was that "these splendid hopes rest entirely on an erroneous diagnosis: Namely, that our democratic deficits [sic] is a technical problem in search of a technological solution." He explained,

> As long as our societies are typified by a stark separation of the political from the economic sphere, reserving equal rights for the former while allowing the latter to be characterised by increasing inequality in the allocation of property rights, wiki…can play no significant role in civilising them. Wiki may help democracy but only if it is employed in the context of a wider political project of redesigning property rights in such a way as to make possible a world in which people form units of production which create and distribute value in a participatory manner; in a manner such that no one employs anyone, everyone contributes labour and ideas, while each is rewarded according to contribution but also need. Until then, all wiki can achieve is, at best, interesting experiments in non-price spontaneous order (like Wikipedia) and, at worst, an e´Mob that is as distant from an e´Demos as Genghis Khan was from a contemporary critic of nationalist divisions. (Varourfakis, 2007)

In a similar vein, Pawley (2007) noted,

> It is perhaps the case that to be optimally effective, such re-imaginings of political action must be accompanied by a re-imagination of the institutions that provide them. Such a solution, while optimistic, offers the best chance of transcending tensions between participation and passivity, centralisation and subsidiarity, and past and future.

But perhaps such an institutional redesign is under way as well, closely related to technological facilitations of participation. In nonmaterial production, humans co-create and distribute value in a participatory manner: The production of knowledge and politics becomes diffuse; it is distributed throughout the system and, thus, disrupts former spatial and temporal continuities (Hartzog, 2007). It is not accidental that the emergence and the conceptualization of wikipolitics and open source democracy coincide with the observed emergence of what has been called new modes of property and governance: peer property and peer governance. Peer property includes the universal common property regimes and legal means for social reproduction of peer projects, which are inherently more distributive than both public and private property (Bauwens,

2005a, 2005b). For instance, the General Public License or some forms of the Creative Commons licenses are examples of peer property legal regimes. In other words, peer property is a modern form of communal shareholding whereby resources are held in common and each individual contributes according to his/her willingness and ability (Fiske, 1991). Peer governance is a new mode of governance and a bottom-up mode of participative decision making that is being tested in peer production projects such as FLOSS production and Wikipedia (Bauwens, 2005a, 2005b). Thus, peer governance is the way that peer production, the process where common value is produced, is organized and managed. It could be argued that the emergence of peer processes supported by the Commons and the open access movements facilitates a wider political context in which reimagining politics at the institutional level is possible.

An important question that could be posed, however, is whether citizens will actually embrace the possibility for participation. Hilbert (2007, p. 129) noticed, "The argument is that the average citizen has many other private interests and does not want to get bogged down in political details. The common counterargument is that citizens see no point in participation because of the limited civil influence allowed by political institutions." Hence, Hilbert (2007, p. 129) concluded, "Political apathy is the consequence." In Barber's (2003, pp. 265, 272) words, "The taste for participation is whetted by participation: Democracy breeds democracy … [Citizens] are apathetic because they are powerless, not powerless because they are apathetic." Despite the fact that I do not completely agree with such a linear, one-directional causal explanation, I share Hilbert's view (2007, p. 129) that "digital transparency in the public sector would … stimulate people's willingness to participate."

Another important issue concerning wikipolitics is transparency and its democratic nature. The programming of an ICT tool determines "the democratic institution that channels and guides public deliberation" (Hilbert, 2007, p. 117). Hence, it must always be ensured that ICTs cannot be manipulated. Open source software and open protocols have to be used in order to ensure transparency in the process. Elliot et al. (2007) highlighted two key threats facing the use of Internet nowadays as a medium for open source democracy:

> [the] exploitative manipulation of the medium through the harvesting and subsequent misuse of personal information, as well as the biasing of the Net's infrastructure through legislation associated with net 'non-neutrality'. Such moves undercut public trust and faith in the system to protect their rights while providing an accurate representation of the digital world. (para. 13)

Regarding the protection of privacy, wikipolitics must balance the "democratic independence of the individual, the increase of information efficiency for the benefit of the individual and the protection of the public from criminal individuals" (Hilbert, 2007, p. 120).

One of the most significant challenges is that of on-line accessibility, that is, the standards and methods in order to ensure equal access to content across the barriers of distance, cost, and usability (Elliot et al., 2007). Having no access to digital infrastructure and being digitally illiterate constitute important barriers to equal access in open source democracy. As with other technologies, the distribution of ICTs follows a center–periphery scheme: The center is distinguished by certain characteristics (higher income and level of education), whereas the periphery tends to be at a lower level of development (Hilbert, 2007). This follows long-established patterns of inequality (Hilbert, 2007), which, following Elliot et al. (2007, para. 14), "might also be seen as a signal for the need to provide digital network access as a basic, free

service." It can be claimed that more access to emergent forms of on-line democracy might also help spur many more forms of social, civic, and economic participation (Elliot et al., 2007).

Therefore, if the goal is to consider wikipolitics as a medium for democratizing democracy, it is necessary to widely distribute essential ICTs to ensure the availability of information regardless of time and location. Already movements such as the One Laptop per Child[5] and the two world summits on the information society[6] have focused on safeguarding the right to ICT access. In that context, it is encouraging that the costs for ICT equipment are falling and the mechanisms for collaboration are blooming. However, Suoranta and Vaden (2008) maintain that even in the Western world, let alone the rest of it, giant strides to reach satisfactory levels of digital literacy are necessary. Nonetheless, as Clift commented in 2004, "Waiting for the digital divide to close will eliminate the opportunity to build social expectations for civic uses of the Internet while the medium is still relatively new."

WIKIPOLITICS CASES

Web 2.0 and Virtual Communities

It has been argued (O'Reilly, 2006) that with the advent of the Web 2.0 large-scale interactions take place via the emerging Web technologies such as blogs, forums, wikis, e-mail, podcasts, and so on. Therefore, using such "collective intelligence technologies" nowadays makes it possible to "draw together knowledgeable individuals, analytic tools and information sources on a scale that was impossible a few short years ago" (Iandoli et al., 2008, p. 1). The emergence of new ICTs, along with growing on-line virtual communities, gives rise to new practices in the production of politics. However, several differences exist between on-line virtual communities and traditional organizations. Interaction within the virtual community takes place mainly or solely via the Web; individual contribution is basically voluntary and limited to three forms: knowledge provision, knowledge rating, and knowledge organization (e.g., classification; Iandoli et al., 2008). According to these authors, a virtual community is a self-organized system where top-down management and centralization can be found only to a very limited extent.

However, as Iandoli et al. noted, in order for virtual communities to work properly, three important governance problems have to be addressed:

Attention governance: We must attract a considerable number of users, reduce the risk of premature convergence and enable sufficient exploration of the search space by countervailing the influences of informational pressure, social pressure and common knowledge;

Participation governance: We must retain a critical mass of motivated diverse users, and provide them with support and incentives for evidence-based reasoning as well as the sharing of unique personal knowledge;

Community governance: We must identify the rules and the organizational structures of the community in terms of the process and roles that enable attention governance and effective participation. (2008, p. 6)

The *Re-public* team developed the wikipolitics.gr platform. The interview with their developers involved, among others things, the three challenges raised by Iandoli et al. (2008)

and how the team was dealing with them during the operation of wikipolitics. Moreover, the strengths and weaknesses of such a platform were identified and speculations about the future of democratic discourse were made. The e-mail exchange with Mark Klein regarding Deliberatorium followed a similar vein. The examination of Future Melbourne was built on an on-line discussion that took place at P2P foundation's blog[7] in the middle of 2008, as well as on material extracted from the project's official Web platform.[8]

Discussion with Priftis and Hatzopoulos of PASOK's Wikipolitics Platform

The wikipolitics.gr project began in 2007 with a wide-ranging on-line interview with PASOK's leader, and current (from 2009) prime minister of Greece, George Papandreou. More than 1,000 citizens submitted their questions, which were evaluated by about 50,000 citizens. Then Papandreou replied to those with the highest rating. In late 2008 the wikipolitics-parliament project was launched. In early 2009 I interviewed Thanasis Priftis and Pavlos Hatzopoulos, the initiators of the wikipolitics.gr platform and editors of *Re-public*, and our discussion focused more on the parliamentary usage of wikipolitics.gr that had just completed its first phase. Later, in mid-2009, two open discussions (with various evaluation processes) about education affairs as well as green development took place via wikipolitics.gr. In late 2009, before the national elections in Greece, wikipolitics.gr gathered citizens' suggestions for the agenda of the first 100 days of cabinet, if PASOK would rise in power, which it did. After that the platform became inactive, and was superseded by the more sophisticated opengov.gr that is the web page of Greek prime minister's office for open government, run by almost the same people.

It is still interesting to address the 2009 interview with Priftis and Hatzopoulos,[9] the people behind wikipolitics.gr and, now, the main figures of Greek prime minister's office for open government, since many of their views have been the cornerstones of their efforts "*to empower democratic structures through ICT*" (Priftis). The beginning of the conversation dealt with the correlation between modern ICTs and participation in politics. They viewed ICTs promoting participation as only partly true since, on one hand, the "*Web is really us*":

> *In theory, the more you adopt participatory ICT, the more possibilities you have towards the realization of an open party: Openness opens the way for investment in people. On the other hand, when trying to adapt this idea to real life, things are not so easy as they might seem. The existing bureaucratic, hierarchical model of governance and organization within a political party—even if its leadership wants to—is very difficult to relinquish. Only a few PASOK members of the Parliament, say nine or ten, have understood the dynamics of this open culture. But they cannot act very differently in an old-fashioned political scene; where hierarchical filters gobble up a large part of the bottom-up voices.... Furthermore, the use of ICT does not guarantee that it will effectively strengthen democracy. Culture and social norms, law, and faults in implementation threat such an initiative.* (Priftis)

The methodology of wikipolitics.gr is quite simple:

> *We are trying to convert a bureaucratic process* [at that time, the process involved the submission of questions to the Greek Parliament] *into a more transparent one by connecting it to the digital world. Such a process predicates open access to information and wants to deliver accountability that will win citizens' approval.* (Priftis)

As Priftis noted, at that period of time, the implementation of the wikipolitics.gr project was in an early phase: "*We are experimenting and creating fissures in the existing mechanism… After all, we are trying to build up a momentum in order to ensure and strengthen democracy in the information age.*" Their work aspired to show that all of the questions to be submitted to the Parliament would be at least open to a more transparent process where citizens could have their say. For instance, Anna Diamantopoulou, a prominent PASOK member who became Greece's minister of education and innovation policy when PASOK came to power in 2009, submitted a question to the wikipolitics.gr platform while still a member of Parliament for open discussion about converting the ugly roofs of the housing blocks in Athens into green gardens. The comments made by the citizens offered many interesting insights and inputs, so that the question actually submitted to the Greek Parliament was really coauthored by Ms. Diamantopoulou and dozens of active citizens, as Priftis and Hatzopoulos told me. At the time of our interview, citizens were to start discussing and evaluating the suggestions of PASOK about technical education in Greece. "*The next step,*" Priftis said in 2009, "*is that all the questions of the PASOK members of the Greek Parliament would be available for discussion at the wikipolitics.gr platform.*" This is now taking place at the opengov.gr platform for several, but not all, of the bills that are to be presented in the Parliament for passage.

When asked about the function of their platform, Priftis and Hatzopoulos replied that a stable team of people maintains wikipolitics.gr, while a critical mass of citizens quite often offer their commentaries. "*In the beginning, we were worried about the prevalence of quantity over quality… We are constantly trying to create clearly defined ways to gather and assess the inputs,*" Priftis said. In a similar vein, Clift (2004, p. 28) advised that "without structured ways to gather, evaluate, and respond to public input online, there will be diminishing value received or perceived with each additional public comment." In addition, Priftis and Hatzopoulos realized the need for a more automated mechanism regarding the coordination between their team and the members of Parliament:

> *We push the comments and the formulated ideas to the PASOK members of the Parliament. With our platform, we want to show that every citizen should have the right to participate in the debate over particular issues, even via lottery.* (Hatzopoulos)

Our conversation ended with Hatzopoulos' speculations about the future of politics:

> *We live in a contradictory, globalized society. Peer production and Commons coexist with the capitalistic, speculative production and the exclusive ownership. Every effort, so far, to subvert capitalism was "symmetrical," and thus doomed to failure: symmetry in a world that is asymmetrical and contradictory. Hence, we believe that we are moving towards a mixed political system that includes discrepant and asymmetric elements that coexist. Societies have to devote time and resources to have a better understanding of the real threats and potential of wikipolitics, as the dystopia is always a possible scenario.*

Discussing the Deliberatorium Platform

In 2009, I discussed this platform via e-mail with Mark Klein, a principal research scientist at the MIT Center for Collective Intelligence and one of Deliberatorium's main developers. According to Klein, the initial results (from three evaluations—200 people in Naples, Italy,

300 people in Zurich, Switzerland, and 100 people at Intel in Massachusetts, USA) showed that large numbers of people, without special training, could effectively use this tool to create large deliberation maps on complex topics. Klein told me that next steps included the development of new functionalities aimed at (a) making it easier to find/enter content in large maps; (b) collecting metrics on the progress and problems in a deliberation; and (c) integrating deliberation maps with social media tools that are based on narratives and conversations (e.g., chat, e-mail, wikis). The current version of the Deliberatorium tool has incorporated many of these changes and can be found on-line.[10] The access is open and some of the collected data is analyzed as part of an ongoing study on improving the support of large-scale web-mediated collaborative work, as their website states.

Klein was also asked to articulate his ideas regarding the effects that Deliberatorium could have on the production of politics, that is, decision-making and problem-solving processes. Klein hoped that,

> *The Deliberatorium will make it possible for large numbers of people to much more effectively and systematically collect and evaluate a wide range of ideas concerning how to solve complex problems. I believe it can help in two ways:*
>
> - *Take better advantage of the cognitive diversity our societies offer to increase the range of solutions being considered. In current social computing systems, all too often only a tiny fraction of the possible solution ideas see the light of day, because of problems such as redundancy and dysfunctional collaboration dynamics.*
>
> - *Foster decision-making based on evidence and logic rather than bias and emotional manipulation. The Deliberatorium is designed to encourage people to explain why they support given ideas, and uses a community-rating scheme that rewards coherent, well-supported arguments.*

Talking about open source democracy and wikipolitics, as realized in the current research project, I asked Klein whether he agreed with the view that the Deliberatorium platform could be one of the means towards open source democracy. He replied,

> *Open source democracy has different meanings to different people. I think many see it as being about giving everyone an equal voice in making decisions that affect them. While I appreciate that value, my focus is more on finding ways to use our collective intelligence to identify the best possible responses to pressing problems. Since I am exploring the use of reputation and proxy voting systems, you might even say that the Deliberatorium embodies meritocratic, rather than democratic, principles. But I think it is compatible with open source democracy, since my work aims to help people identify possible solutions and is agnostic about the process by which people eventually decide which of these solutions is adopted.*

Finally, Klein referred to the main strengths and weaknesses of that platform. He mentioned that its main strength is that "*it allows us to tap, in ways not previously possible, the skills and knowledge of large numbers of people in the service of solving complex multi-disciplinary problems.*" On the other hand, Deliberatorium's main weakness is the fact that "*it is based on a style of interaction that is somewhat formal and artificial.*" However, as Klein clarified, their goal is "*to integrate the strengths of a deliberation map with the narrative conversational modes of interaction that people find natural.*"

The Future Melbourne Project

According to Elliot (2008)[11], Future Melbourne was the first project in Australia that used a wiki for public consultation and the first one in the world that did it so extensively in a city planning process. It contained more than 150 targets to measure the city's progress towards achieving them through six key goals: a city for people, a prosperous city, an eco-city, a knowledge city, a creative city, and a connected city. In 2007, the vision that gave rise to the Future Melbourne project was the reengineering of Melbourne's city process for generating its next 10-year strategic plan (2010-2020). Elliot (2008) noted,

> Previously, such plans were produced using cooperative participation (contribution of discrete elements that are synthesized by someone other than the contributors). However a requirement of this project was that the new plan be produced by collaborative participation (contribution with the capacity to add/edit/delete by all in order to inclusively represent the perspectives of all involved through collective contribution and synthesis). (para. 2)

In a nutshell, according to Future Melbourne's Web platform, this project constituted a community plan that aimed to

- Engage citizens in creating a vision for the future, setting priorities, and contributing to decision making;
- Value and utilize local networks;
- Focus on people and places, requiring a more flexible and joined-up [collaborative] approach to policy and service delivery;
- Connect the top-down and bottom-up policy processes that influence resource allocation.

The strategic planner and wiki administrator of the project (Dale Bowerman, "6 Responses," item 6, in Elliot, 2008), deemed that this new form of on-line consultation/participation would need some time before the majority of people feel comfortable in taking part. Discussing the maturity of this new mode of governance, Elliot wrote,

> It won't be long until special interest groups and lobbyists develop a better understanding of the potentials. This will likely spawn more conflict (along with healthy debate) surrounding the struggle for the representation of a decision. However, I see this in no way as a drawback; rather it would simply be an indication of maturity of the medium through the mirroring of life's normal activities within it. At which point, our dispute resolution policies would no doubt develop accordingly and given enough time, perhaps the need to be able to represent more perspectives/interests in policy would exert pressure upon government to rethink how "valid" policy is formed, created and updated. (2008, "6 Responses," item 2)

Coordination problems on interpersonal and interorganizational levels, as well as gaps concerning the interests and the identities, were often to be found in virtual communities and may result in subsequent conflicts. Therefore, Future Melbourne had a specific plan (informed by the Wikipedia experience, Elliot, 2008, "6 Responses," item 2) for conflict resolution.

Further, Bauwens (commenting in Elliot, 2008) assumed that the separation of the idea formation from the representational and interest-based decision making is a key step for the success of such a wikipolitics project. He believed,

What is happening until today is that "interests" distort not only representation, but also crucially the input phases of solution-seeking, so that solutions are filtered a priori with interests already in mind, thereby prohibiting good ideas to filter through. But if we have a mechanism to allow good ideas to filter through, then it becomes a lot more difficult, with that transparency build in, for illegitimate interests to come through to the back door, and they can only acquire legitimacy by engaging with the good ideas, not filtering them out a priori. (Bauwens in Elliot, 2008, "6 Responses," item 3)

With regard to Bauwens' comment, Elliot (2008, "6 Responses," item 4) stated, "This sums up the ideal role … providing a publicly accessible means of developing the ideas, which opens them up to scrutiny and discussion, while enabling the further development of the ideas in a transparent and open-access way." Elliot thought that the Future Melbourne project had already achieved this.

At the moment Future Melbourne has accomplished its mission and the "Post Implementation Review" conducted by Collabforge (n.d.), an organization specialized in social media and government using modern ICTs, investigated the degree of its success. According to this report, wikis are a viable platform for public consultation that should be further examined. Following the review, important recommendations in this regard are that the opportunities for further implementation of collaborative on-line consultation must be explored; that a link between the delivery of on-line consultation and the development of digital literacy is necessary; and that policies for the development and the implementation of an innovative change management program, which adopts and integrates the new ICTs and processes in a sustainable way, are of a crucial importance.

WIKIPEDIA PROJECT

Wikipedia, the popular free, on-line encyclopedia, is often hailed as a prominent peer production project where individuals voluntarily participate and produce a vast knowledge base. However, various criticisms (Bauwens, 2008; Butler et al., 2008) have been recently leveled against Wikipedia regarding the mode of governance that is followed. Although Wikipedia is not a wikipolitics project, it is a virtual community and shares several similarities with wikipolitics. So, using the Wikipedia project as a point of departure, I will try to identify and draw some conclusions regarding the dysfunctional and problematic situations of the governance mechanism. This study will allow for further considerations concerning the dangers of misplaced openness and participation for open-source democracy and wikipolitics projects.

Introduction to Wikipedia

The Web 2.0 has triggered large-scale interactions in unprecedented ways and gave rise to many collaborative projects, such as the well-known free encyclopedia:

Wikipedia is a free, web-based, collaborative, multilingual encyclopedia project supported by the non-profit Wikimedia Foundation. Its 18 million articles (over 3.6 million in English) have been written collaboratively by volunteers around the world, and almost all of its articles can be edited by anyone with access to the site. Wikipedia was launched in 2001 by Jimmy Wales and Larry Sanger and has become the largest and

most popular general reference work on the Internet, ranking around seventh among all websites on Alexa and having 365 million readers.

The name *Wikipedia* was coined by Larry Sanger[10] and is a portmanteau of *wiki* (a technology for creating collaborative websites, from the Hawaiian word *wiki*, meaning "quick") and *encyclopedia*. (Wikipedia, 2011, para. 1 & 2)

This is how Wikipedia defines itself. It uses the wiki technology that allows anyone to create and edit content on-line, in an open access and participatory context. Wikipedia is actually what Bruns (2008, pp. 104, 137) calls "representations of knowledge" rather than a "synthesis of a unified position of, and on, knowledge or 'truth' itself":

> [It] provides a central, accessible, and easily editable space for the compilation and maintenance of such communal knowledge and an effective means for the aggregation of multiple and diverse such community knowledge bases into a unified, single project devoted to the compilation, synthesis and extension of representations of human knowledge about the world. (p. 104)

In other words, Wikipedia offers a draft of history that is subjected to continuous revision (Rozenzweig, 2006), so it is about unfinished artifacts in a constant process of creation and evaluation (Bruns, 2008). The content creation remains always incomplete, since it relies on the constant constructive participation of the community (Bruns, 2008). Bruns further commented that the government processes in Wikipedia are not related to any form of direct democracy. The heterarchy[12] structure, however, is constantly at risk of transforming itself into a more inflexible hierarchy of administrators. In the next subsection, the main governance problems are discussed, based on the study of internal forums, external Websites concerning Wikipedia, and e-mail interviews with (ex-)Wikipedians and experts.

Governance Problems

The Wikipedia project is premised on values such as transparency, mass collaboration, equipotentiality,[13] holoptism,[14] heterarchy, communal evaluation, and sharing. However, the creation of an allegedly open playing field occasionally entails the prevalence of active and organized minorities or individuals over less active members of the community. Group polarization is another danger that open, virtual communities, such as Wikipedia, face: "Discourse among like-minded people can very quickly lead to group polarization … which causes opinions to diverge rather than converge… [so], it is very probable that the strongest groups will dominate the common life" (Hilbert, 2007, p. 120). Further, according to Bauwens (2008), a power structure in Wikipedia has been created that is largely invisible and hence vulnerable to the tyranny of structurelessness, as described by Freeman (1970):

> Contrary to what we would like to believe, there is no such thing as a "structureless" group. Any group of people of whatever nature coming together for any length of time, for any purpose, will inevitably structure itself in some fashion. The structure may be flexible, it may vary over time, it may evenly or unevenly distribute tasks, power and resources over the members of the group. But it will be formed regardless of the abilities, personalities and intentions of the people involved. The very fact that we are individuals with different talents, predispositions and backgrounds makes this inevitable. Only if we

refused to relate or interact on any basis whatsoever could we approximate "structurelessness" and that is not the nature of a human group. (para. 5)

Freeman's argument is that even seemingly structureless groups possess some structure, even if it is hidden, that may impose various practices and processes on the rest. An unregistered user of Wikipedia who I contacted at random in a forum[15] cynically commented that Jimmy Wales, one of Wikipedia's co-founders, created "*the structurelessness of a tyranny*" (personal correspondence, Informant 1, January 2009). Another user observed that Wikipedia lacks "*functional system architecture*" and "*functional social contract*" (personal correspondence, Informant 2, January 2009). A user named Yehuldi noted, "*There is a social contract, and most users and most admins adhere to it. The fundamental flaw is that there is no way to deal with the minority of admins who don't*" (personal correspondence, Informant 3, January 2009).

Wikipedia is constantly at risk of transforming itself into an inflexible, despotic hierarchy, while new disputes are emerging about the governance mode of content creation. As the size of Wikipedia increases, it becomes continually more difficult for a relatively small group of administrators to keep track of everything that happens "in the far-flung [reaches] of the site" (Bruns, cited in Kostakis, 2010). Based on my observations (Kostakis, 2010) and discussions, coordination problems on interpersonal and interorganizational levels, as well as gaps concerning the interests and the identities of the inter-Wikipedia communities, result in governance crises (conflicts about participants' editing practices, unjustified bans, power abuse by administrators, the so-called battle among inclusionists and deletionists, as documented by The Economist, 2008, etc.) and threaten the sustainability of the project. Further, the vagueness of the distinction between the social and technical powers of the administrators (who sometimes take more authoritative roles and increasingly make "moral" decisions about user behavior) leads to power accumulation in one section of the community (Forte & Bruckman, 2008). According to interviews I conducted with active (ex-)Wikipedians (Kostakis, 2010), a functional resolution process for resolving content disputes and an unambiguous community social contract model are lacking. Wikipedia may follow certain rules regarding content creation that in many cases are mutually inconsistent and conflicting. Thus, administrators who are adept at gaming the system can pick and choose among the hodgepodge of rules, "clobber" their adversary, and justify a deletion, a block, or a ban. Moreover, another problem to be solved is the balance between participation and selection for excellence; in other words, "how to make sure that truth does not become the rule of the majority and that expertise can find its place" (Bauwens, cited in Kostakis, 2010).

Reflections in Relation to Wikipolitics

The study of the Wikipedia case (Kostakis, 2010) brought to the fore several potential threats and problems that on-line, virtual, open communities—including wikipolitics sites—face. In a nutshell, the documented dysfunctions and threats are the following:

- Active and organized minorities may prevail over the uncoordinated majority and other individuals, and individuals adept at the function of the platform can adroitly handle it and dominate their opponents
- Group polarization
- The tyranny of structurelessness with hidden hierarchies

- An overload of information that makes it difficult for administrators to keep track of everything
- Coordination problems on interpersonal and interorganizational levels, as well as gaps concerning the interests and the identities of the intercommunities, may result in governance crises.

Of course, wikipolitics projects differ from Wikipedia in that, for the moment at least, they are not self-governed: Administrators in wikipolitics projects are paid employees that manage and maintain each project. The examination of Wikipedia's governance problems showed how important the presence of a clear and consistent set of rules and principles is, in other words, a community social contract[16] that will reduce the chance of power abuse, protect from the danger of corruption provoked by unsavory individuals (or group of individuals), and facilitate selection for excellence when needed.

CONCLUSION

The aim of the current paper was to contribute to the theory of open source democracy and provide an understanding of the nature, the effects, and the potential of the concept of wikipolitics for a revitalized democratic discourse. The research issues were approached from both a theoretical and a pragmatic perspective. In theory, I demonstrated that, on the one hand, modern ICTs offer new ways for humans to produce and organize their economic, cultural, and political lives, as the economically advanced world seems to shift towards new paradigms that appear less hierarchical and more transparent, based on a participatory ethos. On the other hand, the threats and the problems of an open source approach, and consequently of wikipolitics, were documented: There is no leapfrog path that can instantly transform democracy. Minority prevalence, group polarization, the tyranny of structurelessness, information overload, platform manipulation, protection of privacy, an unambiguous and clear social community contract enforced by law, a user-friendly architecture with natural narrative conversational modes of human interaction, and a change in the attitude of some politicians and citizens are only some of the issues and the problems that a scrupulous and scientifically designed wikipolitics project must confront.

Although open source democracy introduces new forms of democratic practice, it remains unclear whether and how they can effectively redefine democracy. Still, fiducial solutions are needed for several governance problems that on-line communities face. Moreover, as democracy deficits are not merely a technical problem in search of technological solution (Varoufakis 2007), change in the attitude of both people and politicians is needed. To make this point clearer, and to end on a more personal note, it might be suitable to quote Carlota Perez, the prominent theorist on great surges and techno-economic paradigm shifts, about technological utopianism and the efforts Greece has made under George Papandreou to take advantage of modern ICTs. In the name of openness and transparency some politicians, who seemed at that point to share that vision, thought that if we masquerade the bureaucratic elephant (e.g., Greece) as a white horse using a technological veil, then it will run as fast as a horse: Looking like a horse, the elephant can easily enter the village, and while villagers are admiring its beauty, the short-tempered elephant can launch deadly attacks. What most of the

villagers would think is "How evil these white horses are!" and never trust horses again (Personal communication, Carlota Perez, 2009).

The investigation of the three cases of wikipolitics (Deliberatorium, wikipolitics.gr, and Future Melbourne) showed that their empirical results so far seem positive and capable of splitting the traditional hierarchical paradigm. In general, all the examined cases showed that there are possibilities for large numbers of people to effectively collaborate in the formulation and the evaluation of a wide range of ideas regarding the solution of complex problems. We saw that some of the theoretical conclusions articulated by the Deliberatorium team had been verified by the function of the wikipolitics.gr platform: The three main governance issues to be dealt with in an on-line community (attention governance, participation governance, and community governance) are vital towards sustaining it. However, the ICTs used in wikipolitics projects have to become less artificial and formal and adopt more natural narrative or conversational modes of human interaction. Also, they have to be user-friendly so that users can easily and quickly grasp and handle them. Some of the discussions echoed Clift's (2004) advice that significant barriers to successful wikipolitics application are the bureaucratic fears of quantity over quality and the scarcity of time faced by citizens. Therefore, well-structured ways for content submission and evaluation are needed, something that seemed to happen in the case of Future Melbourne. In addition, during our discussion with the wikipolitics.gr team, it was understood that the traditional hierarchical modes of organization within political parties and societies, in general, arise as an obstacle towards a new, more participatory era for democracy.

It becomes obvious that the open source approach, which entertains openness and cooperation in various fields of human activity, has a long way to go towards rebuilding a tolerant, integrated civilization of the modern world. Because ICTs are rapidly evolving, and their application and practices are quite recent, reliable empirical data are still rare. Moreover, it is considerably difficult to assess the future of democracy. "Our economic life determines the political life" a Marxist would say. Peer production, a mode of production based on collaboration and communication, rings the bell for the creation of nonmaterial value: Together we have everything; together we know everything. Hence, it is up to us—the citizens—to achieve the next step towards to the genuinely democratic utopia: Together we decide everything.

ENDNOTES

1. The main page of wikipolitics.gr can be found at http://www.wikipolitics.gr/

2. See http://en.wikipedia.org/wiki/Panhellenic_Socialist_Movement for more info about PASOK.

3. The main page of Ta Nea is accessible from http://ta-nea.dolnet.gr/

4. The main page of the Future Melbourne project can be found at http://www.futuremelbourne.com.au/wiki/view/FMPlan

5. The URL to main page of the OLPC initiative is http://laptop.org/en/laptop/software/index.shtml

6. Background and information on the World Summit on the Information Society Geneva 2003 – Tunnis 2005 can be found at the following Websites:
http://www.itu.int/wsis/index.html
http://www.itu.int/wsis/docs/geneva/official/poa.html
http://www.itu.int/wsis/docs2/tunis/off/6rev1.html

7. The discussion can be found at http://blog.p2pfoundation.net/future-melbourne-the-dawning-of-the-age-of-p2pgovernance/2008/06/06 (retrieved April 30, 2009). Elliot's post includes interesting comments by

Michel Bauwens (founder of the P2P foundation), Zbigniew Lukasiak (user interface consultant), and Dale Bowerman (strategic planner and wiki administrator of the Future Melbourne project).

8. See the dispute resolution plan at http://www.futuremelbourne.com.au/wiki/view/FMPlan/PoliciesAndGuidelines#Dispute_Resolution

9. Pavlos Hatzopoulos and Thanasis Priftis were interviewed in person in Greek and, thus, their quotes have been translated in English by the author.

10. The Deliberatorium platform can be accessed at http://franc2.mit.edu/ci/login

11. All of the quotes concerning the Future Melbourne project are derived from an on-line discussion that took place at P2P foundation's blog in the middle of 2008, as well as on material extracted from the project's official Web platform.

12. Peer production projects such as FLOSS or Wikipedia do not operate in strict hierarchies of command and control. Rather they operate "in a much looser [environment] which…allows for the existence of multiple teams of participants working simultaneously in a variety of possibly opposing directions" (Bruns, 2008, p. 26). The "leadership is determined through the continuous communal evaluation of participants," and "through the degree of community merit they are able to build in a process" (Bruns, 2008, p. 26). In this sense, peer projects' heterarchies are not simply adhocracies, but ad hoc meritocracies.

13. In peer production projects, such as FLOSS or Wikipedia, all participants have an equal ability to contribute, although not all the participants have the same skills and abilities, a situation termed *equipotentiality* (Bauwens, 2005a, 2005b).

14. *Holoptism* is the ability for any part to know the whole (Deleuze, 2005). In peer production projects, holoptism allows participants free access to all information, in contrast with *panoptism* where participants have access on a need-to-know basis only (Bauwens, 2005b).

15. The conversations with three former Wikipedians contributors (two anonymous and one with the username Yehuldi) took place randomly in Wikipedia's Review forum in February 2009 at http://wikipediareview.com/index.php?showforum=19; see also the interview information provided in the Appendix.

16. Regarding Wikipedia, Barry Kort, a MIT Media Lab scientist and active Wikipedian, said to me in an interview, "The whole Rules and Sanctions paradigm is ill-conceived and should be scrapped in favor of a 21st Century Community Social Contract Model consistent with collegial norms of academic and scholarly enterprises."

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APPENDIX

Consent for publication has been given by all participants for interviews and conversations conducted for this research project:

Bauwens, Michel, interview in February 2009 via e-mail exchange; subsequent Google talk, April 2009.

Bruns, Axel, interview in February 2009 via e-mail, with semi-structured questions.

C., G., and F. are active (ex)Wikipedian users wishing to keep their anonymity and were contacted regarding questions about the problems of Wikipedia's governance in February 2009. The structured interviews took place either via email or via the message tool of the website Wikipedia Review at http://wikipediareview.com/ (membership is required).

Hatzopoulos, Pavlos, interview in April 2009 via e-mail exchange.

Klein, Mark, interview in February 2009 via e-mail exchange. I had contacted all of the initiators of collaboratorium (the former name of Deliberatorium, i.e., Iandoli, Zollo, and Klein). They decided that Klein would answer my (semi-structured) questions.

Kort, Barry, interview in 2009. He received structured questions via email in the beginning of February and returned the responses to me in March.

Priftis, Thanasis and Hatzopoulos, Pavlos, face-to-face interview in Athens, Greece, in February 2009. The 90-minute conversation in Greek was recorded and the most significant points were translated into English. The interview was semi-structured.

Yehuldi and two other anonymous Wikipedia users took part in a discussion that took place in Wikipedia Review forum, in January 2009. These informants noted within the article.

INDIVIDUALS' USE OF E-MAIL COMMUNICATION GENRES IN OPEN SOURCE SOFTWARE COMMUNITY BUILDING

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Abstract: *The advent of the participative Internet (Web 2.0) sheds a new light on traditional knowledge about communication practices. The role of information and communication technologies seems to be very central in managerial literature, while the human side of the issue is less considered. This paper argues that individuals establish communication genres as semantic templates for accomplishing their communicative projects. Communication genres are codes of default behavioral expectations resulting from recurrent communication actions over the time. By using semantic network analytical techniques, our argument is explored in a particular empirical setting, that is, a virtual community of open source software development.*

Keywords: *communication genres, semantic networks, open source, cognitive models, vote practices.*

INTRODUCTION

The recent evolution of the Internet (i.e., Web 2.0) has brought about an unprecedented unfolding of distributed collaborative communities that specify new business models, ICT tools, and products. Open source software (OSS) projects are emblematic examples of these new human–technology interaction forms, where individuals cooperate at a distance in order to jointly complete tasks and achieve common objectives. In 1999 Eric Raymond introduced the metaphors of the "bazaar" and the "cathedral" that highlight the dramatic difference between OSS development and commercial software development.[1] In order to contribute to the general knowledge about individuals' use of communication in OSS projects, this paper builds on three related ideas common in managerial and sociological literatures. First, organizational production

has general coordination principles, and OSS communities do not differ. Second, repeated communicative actions let individuals institutionalize communicative forms, or *genres,* providing a framework for the contents they share. Third, once established, communication genres can be reinforced by sanctioning nonconforming behaviors.

The main objective of this paper is to explore in depth the practical implications for individuals using Internet-related communication genres. A case study is presented about software developers voting by e-mail. The case has been extracted from mail repositories of an OSS project, with communication practices consolidated over 12 years of community development history. More precisely, we selected the Apache project, whose development community counts hundreds of contributors worldwide. Because of the geographical dispersion, Apache's developers coordinate with each other via several Internet-based tools—e-mail, chat, code repositories, wikis, issue trackers—rather than face-to-face. The case articulates a semantic network analysis of e-mail contents belonging to a community-building (not technical) mailing list. Two particular e-mail threads, whose messages' sequential arrangement shows a content-genre conformity issue, were analyzed. Semantic network analysis allowed us to structurally evaluate the issue of a genre's conformity in terms of its impact on shared mental models.

The next section offers a short review on coordination in OSS projects, highlighting a lack of attention to the human side of the human–technology dyad. We follow, then, with the theoretical argument for the ICT-mediated process, going from individual cognition to communication genre and back to individuals. Next, we describe methods and data used in our case study, and follow that with the results of the case. The paper ends with our conclusions and proposals for possible extensions of this research.

LITERATURE ON COMMUNICATION IN OSS COMMUNITIES

Literature on OSS projects has flourished over the last 10 years. Focusing on the particular topic of individuals' use of communication, we have been able to distinguish two main lines of reasoning. The first one is referred to here as *contingent*. It portrays organizational communication primarily as a means of information exchange to enable coordination between interdependent product development tasks (Baldwin & Clark, 2006; von Hippel & von Krogh, 2003). The second perspective on organizational communication in OSS is considered *institutional*, and portrays communication as the manifestation of underlying status and trust social dynamics (Chen & O'Mahoney, 2007; O'Mahoney & Ferraro, 2007).

The contingent perspective is prevalent in management and software engineering literatures. From a theoretical point of view, it entails a model of organizations as information processing systems (March & Simon, 1958), where individuals use communication and ICTs in order to coordinate interdependent tasks in conditions of uncertainty (Daft & Lengel, 1986; Thompson, 1967). In OSS communities where neither formal authorities nor central planners are responsible for task assignment, many communicative behaviors are expected to mirror product architecture (Sanchez & Mahoney, 1996). Following this reasoning, and since software has a more modular architecture than other products, virtual communities producing software will tend to represent more distributed communication structures than other productive organizations (Baldwin & Clark, 2006; von Hippel & von Krogh, 2003). Considering the nature of economic incentives to participate, von Hippel (2007) proposed that open source

communities can be thought of as flat networks of user nodes linked by information exchange. According to this view, the content of communication is the mutual assistance that programmers provide each other. Kuk (2006) proposed that programmers use communication as means of epistemic search for the knowledge that they need in order to solve their technical problems. In doing so, they try to interact with other programmers who control more valuable knowledge, but also accept a general rule of reciprocity.

The institutional perspective, which is more visible in sociological studies on organizations, entails communication reflecting status and trust dynamics arising from cultural processes (Powell & DiMaggio, 1991). Community members, by means of repeated interaction, are expected to institutionalize shared codes and values to create what sociologists call an organizational field (DiMaggio & Powell, 1983). Thus communities are ensembles of actors who share a collectively constructed reality (Berger & Luckmann, 1966). Empirical research in this strand displayed encouraging results from our point of view. For example, Chen and O'Mahoney's (2007) ethnographic study of four virtual communities showed that communication among members operates a synthesis between two logics over the time: (a) an expression logic, which advocates informal organizations as a way to respect differences in members' motivations, abilities, timeliness, and accountability and to encourage broad participation; and (b) a production logic, which endorses rationalized, bureaucratic practices, such as a division of labor and rules. In a study on the Linux Debian project, O'Mahoney and Ferraro (2007) used content analysis techniques on electoral candidacy e-mails in order to explore the concept of meritocracy as shared within the development community. They showed that such a shared understanding shifted over the time from a more technical (code-writing) concept of leadership to a more organizational one (community-building). Then, inverting the logic, they compared individual performance and the likelihood of being appointed to a community-management position and found the likelihood of a leadership position was affected by the individual's behavioral conformity to the socially rewarded kind of merit (technical or organizational). Communication as repeated interaction among community members seems to provide a means of social evaluation and trust building, resulting over time in status-consolidated social structures. For example Grewal, Lilien, and Mallapragada (2006) have shown that individuals' embeddedness (Uzzi, 1996), measured as centrality in communication networks, increases legitimacy, and thus positively affects access to resources and performance.

The main strength of contingent approaches (Baldwin & Clark, 2006) is their recognition of interdependence-related aspects of individuals' participation in organizational work. However, this line of research has not paid much attention to the human side of the human–technology dyad on the one hand, and to communication contents, on the other hand. The institutional research has insightfully pointed out that socially institutionalized codes enhance coordination (or reduce uncertainty) by constraining the scope of possible actions (O'Mahoney & Ferraro, 2007) and the access to resources (Grewal et al., 2006). However it seems to us that a microanalytical exploration of the human–technology interaction process is lacking in both the theoretical and empirical literature. Moreover from a methodological point of view, semantic analysis techniques could usefully integrate the content analysis methods we have seen employed so far for revealing shared meaning structures. Our research shares the basic assumption of institutional logic trying to deal with the three highlighted gaps. Therefore, in order to understand how individuals deal with communication practices in OSS communities, the next three sections will (a) model existent (theoretical) contributions into a conceptual

microlevel interaction framework; (b) propose a semantic network analysis method for mining shared meaning structures (methodological); and (c) provide empirical substance to both the theoretical and methodological claims (empirical).

THEORETICAL FRAMEWORK

In Figure 1 the general framework of our research is illustrated. It is modeled as a human–technology interaction cycle with several aspects. In (Step 1), individuals make sense of reality by arranging symbolic elements into internal representations. Next (1→2), individuals' participation in groups entails the use of communication for establishing shared understandings and achieve coordination. Over time (Step 2), individuals' participation in groups makes communication genres emerge as templates for enhancing contents' contextualization. Finally, (2→1), genres are reinforced and modified by means of use over time. An organization provides technological and symbolic context (Area 3) for the interaction. The concepts in this paragraph concern the ideal link between an individual's perception of work and ICT-mediated communication genres. For the sake of simplicity, we refer to the OSS development process as an organizational setting. However, many ideas behind the model actually possess validity in general human–technology interaction.

From consolidated research in cognitive psychology (Rosch, 1975), we know that human beings act differently according to their own internal representations of the world. Each individual holds several such representations, known as cognitive models (CMs), which are selectively activated according to the situation. Even if some deep cognitive structures are very stable within any given individual, CMs are expected to evolve over the time. Because CMs are semantically reflected within the social use of language (Lakoff, 1987), this idea of internal representations also applies insightfully to the representation of coordination within
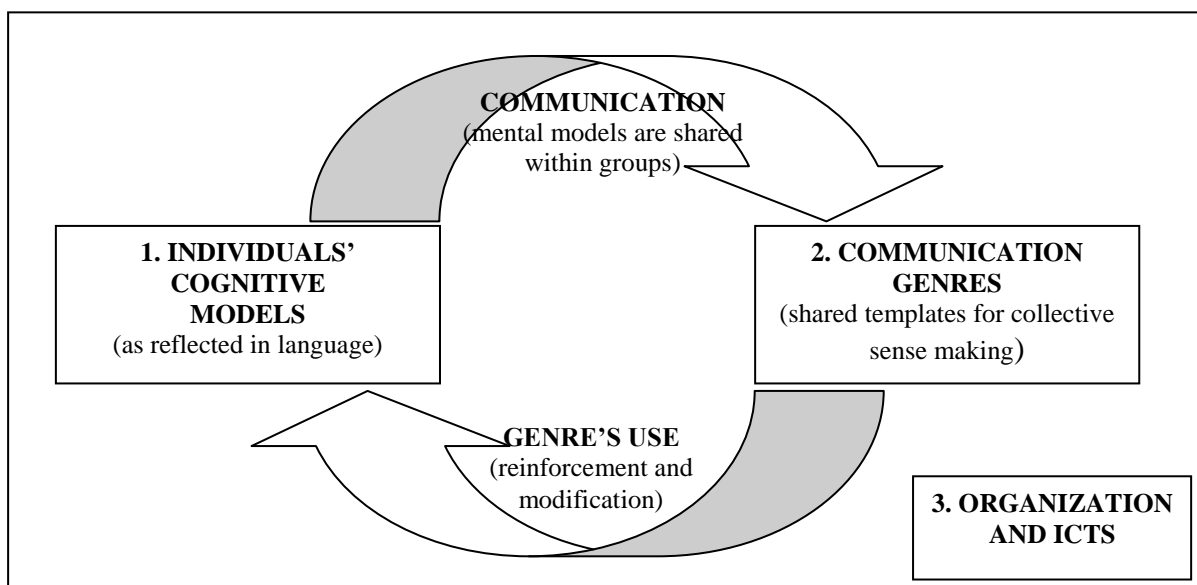
Figure 1. General framework: The relationship between individuals, groups, and communication genres in organizational human–technology processes.

on-line communities. In fact, due to the scarcity of or even the frequent absence of face-to-face interaction, virtual community members rely primarily on e-mail (and other communication tools) for expressing their opinions and connecting with their peers.

OSS development is characterized by communities where members take part in a socio-organizational productive activity. Technical tasks concerning software development are managed mainly by means of code repositories and issue/bug trackers (Mockus, Fielding, & Herbsleb, 2002). Hence, we can expect that, when engaging in e-mail communication, the developers deal with the distinct need for achieving a shared view on their actions. In other words, it is still a matter of coordination; however, rather than only technical tasks, now there are different and sometimes contrasting individuals' representations of the situation (either technical or social) that need to be composed. Through communicative actions, individuals share their CMs, enabling collective sense making and problem solving. Because collective decision-making forms of organizing encourage diversity, they permit a wider range of organizing practices than a conventional form would allow (Weick, 1995). Since community members may develop competing ideas about the best way to organize (Chen & O'Mahoney, 2007), the communication content is expected to reflect the selective process of such practices.

Organizational forms of production provide a both material–technological and symbolic context to communication leading to the emergence of institutionalized practices of communication referred to in this paper as *communication genres* (Yates & Orlikowski, 2002). Drawing on Giddens' (1984) structuralist perspective, Orlikowski and colleagues (Im, Orlikowski, & Yates, 2005; Yates & Orlikowski, 1992) proposed an approach for studying organizational communication that is based on genres (e-mails, meetings, expense forms, reports, etc.) as social structures constituted through individuals' ongoing communicative practices. Communication represents an ideal domain in which the sociocultural dynamics comes into being, arising from the practices of different communication genres (Im et al., 2005; Yates & Orlikowski, 2002). As these authors suggested in a recent work regarding exploring communication genres in commercial software development,

> These genres are socially recognized types of communicative actions that are habitually enacted by organizational members over time to realize particular social purposes in recurrent situations (Yates and Orlikowski, 1992). Through such enactment, genres become institutionalized templates that shape members' communicative actions. Such ongoing genre use, in turn, reinforces those genres as distinctive and useful organizing structures for the community. (Im et al., 2005, p. 5)

What, then, is the content of the feedback relation connecting communication genres and individuals' CMs? Here we propose that communication genres can be thought of as metacognitive models, which are shared schemas for reassembling individual cognitive models into collective understandings. Generally speaking, structuration theory concerns the production, reproduction, and transformation of social institutions that are enacted by the use of social rules (Giddens, 1984). These rules shape the action taken by individuals in organizations. At the same time, by regularly drawing on the rules, individuals reaffirm or modify the social institutions in an ongoing, recursive interaction. Whether used explicitly or implicitly as organizing structures, genres shape beliefs and actions, both enabling and constraining how an organization's members engage in communication (Im et al., 2005).

METHOD

Setting

Because we wanted to go in depth with the exploration of genre structures' enactment in e-mail communication, OSS development seemed an ideal empirical setting. In many OSS projects, people taking part in product development never or very rarely meet face-to-face. We can then consider discussion threads unfolding in mailing lists a symbolic construction of the reality available to participants to link the (software) artifacts with the community.

We have chosen to focus on the Apache OSS project for our empirical investigation. The Apache project started in February 1995 when Rob McCool stopped developing his httpd-server software at the National Center for Supercomputing Applications in the USA, and a small group of users, the so-called Apache Group, began a combined effort to coordinate fixes to the existing code. After several months of adding features and small fixes, the Apache Group replaced the old server code base in July 1995 with a new architecture designed by Robert Thau. The core developers were distributed around the world and all of them were working on the project as volunteers. Therefore, both the leadership and coordination mechanisms were distributed as well, to take into account the limited time that each programmer could devote to the project. As one of the founding members pointed out,

> Unlike most open source projects, Apache has not been organized around a single person or primary contributor.... There was no Apache CEO, president, or manager to turn to for making decisions. Instead, we needed to determine group consensus, without using synchronous communication, and in a way that would interfere as little as possible with the project progress. What we devised was a system of voting via email that was based on minimal quorum consensus. Each independent developer could vote on any issue facing the project by sending mail to the mailing list with a "+1" (yes) or "-1" (no) vote." (Fielding, 1999, p. 42)

The Netcraft Survey (April 2011)[2] currently lists Apache as the most important server software in the world by market share (179,720,332 websites served across all Internet domains, 61% of total), followed by Microsoft (57,644,692 websites served, 25% of total). Actors in Apache's development constitute a little universe clustered around more than 100 subcommunities. Like other consolidated OSS projects that spent their early years with a straight focus on technical issues, the Apache community only slowly began addressing social organizational issues. Apache now has very consolidated practices and even several community building guidelines[3] that indicate,

> Mailing lists are the life blood of Apache communities. They are the primary mode of discourse and constitute a public and historic record of the project. Other forms of communication (P2P, F2F, personal emails and so on) are secondary… The reason is that communications on other than the public mail aliases exclude parts of the community. Even publicly advertised IRC chats can be exclusionary due to time zone constraints or conflicting time commitments by community members who might want to participate. (The Apache Software Foundation, 2009, Communication, para. 1)

The so-called Apache Way is an interesting cultural code for studying individuals' involvement in new Internet-based collective efforts. Given a very simplified picture,

decisions are taken in two ways: (a) consensus generation around a given proposal by means of simple discussion, and (b) voting on the emergent proposal when no consensus is reached by means of simple conversation. To keep the distributed decisional process moving, each Apache voting system lasts no more than 72 hours.

Data Collection and Subjects

Data were gathered from an infrastructural mailing list belonging to the Apache Software Foundation (instituted in 1999). The community mailing list[4] was created in 2002, after a period of institutional reorganization (1999–2002), with the aim of discussing topics regarding community-building. At the time of our study the target mailing list had more than 300 subscribers around the world. We selected a particular discussion concerning the "if" and eventually the "how" the community mailing list itself should be made accessible to the participants.

The discussion comprised 155 individual e-mails clustered within two threads. The temporal lag of the discussion on both threads extended from 22 October, 2002 to 6 November, 2002. All of the retrieved e-mails had the tag [vote] in its subject field. Following previous research on e-mail genres (Im et al., 2005), this would entail all of the mail belonging to the same communication genre. Because we wanted to investigate some potential concern with the use of genres, these two threads were selected as involving a voting session on the same issue (same subject plus same tag = [vote]), but extending over time for considerably longer than the usual 72 hours (the Apache Way).

While most scientific papers address specifically the demographic characteristics of its study participants, this would be a nearly impossible task in our study. OSS Projects such as those used for this study often do not collect basic demographic characteristics on the participants. Moreover, if they are collected, they may not be complete. Finally, not all members of the list participate in all of the discussions, so the sample is not representative in any event. Specifically, we did not have access to personal data on the list members, and thus cannot provide that information here. We recognize that this situation presents a limitation to the generalizability of our findings.

Network Text Analysis

Semantic network analysis, also known as network text analysis (NTA), is used in this paper to explore the template structure provided to the emerging shared understanding within the communication genres. NTA is a set of analytical methods for applying network techniques to the semantic analysis of shared meanings extracted from texts. Like content analysis techniques, NTA can be used to extract mental models from text (Carley & Palmquist, 1992). However the main difference between content analysis and NTA is that while the former considers only the frequencies of isolated concepts, the latter also takes into account the semantic connections between concepts. A semantic network is a graph where the nodes are concepts and the links are inferred as relationships between the concepts. For all automatic processing steps on e-mail texts and later on for semantic network analysis, the CASOS[5] software suite has been used.

The e-mail texts have been processed in order to extract semantic network reconstructions of individuals' CMs. Natural language texts extracted from the e-mails went

through a set of procedures entailing coding choices about what concepts to delete or generalize (Carley, 1993). This preprocessing work entailed three main steps. The first step deleted redundant information within the original set of 155 e-mails. In fact, when answering messages (Reply), people often included the quoted text from the original message. Text blocks, or *corpora,* quoted across messages could have some relevance on emerging semantics, but that was not essential for revealing elementary meaning structures. Hence, for the sake of simplicity in this study, we deleted them. The second step refers to noise deletion. Every single word is characterized by a frequency of occurrence within each single text (individual frequency) and across all texts (aggregated frequency). The distribution of words' frequencies seems to follow a power law distribution, that is, a few words present high frequencies of occurrence while the most of words occur just a few times. However the concepts that occur most often are usually irrelevant to the extent of reconstructing meaning structures. These (often trivial) concepts are normally related to grammar and syntax, such as articles, pronouns, and prepositions, and so these "irrelevant" words were deleted. Very low-frequency words—those occurring once or twice across all texts—represent idiosyncratic concepts also not expected to be relevant in the domain of discourse, and so they were deleted as well. This preprocessing step applied a thesaurus file on the selected (postnoise deletion) set of concepts. In doing so, we made the grain of the text coarser by bringing back similar concepts to a single, more general concept: The loss of information represents a gain in terms of synthesis. The third and final preprocessing step was the inference of relationships between concepts. The software tool we used for this purpose includes an automatic words–proximity procedure that addresses the issue of link generation based on the co-occurrence of words within a "window" that slides over the text (Carley, 1997; Danowski, 1982).[6] According to this procedure, the more two concepts occur in a proximal position within texts the more intense the semantic relation is between them.[7]

The outcome of the preprocessing steps is a set of 155 semantic networks, one for each e-mail corpus. These semantic networks are CMs' representations made by nodes and links, where the nodes are concepts and links are the relationships between such concepts inferred from their proximity within text corpora. The weight of a link between two nodes has been set as their co-occurrence frequency. All semantic network analysis will, of course, be developed by comparing results from two separate clusters of e-mails, that is, one cluster for each mailing list thread. Two semantic analysis techniques have been used for further analyzing the extracted cognitive models: semantic connectivity and visual map analysis. Semantic connectivity (Carley & Kaufer, 1993) allows the detection of important concepts recurring across multiple texts. It entails a linguistic classification of concepts, just like nodes in semantic networks, based on their centrality (Wasserman & Faust, 1994) and consensus across distinct texts. In this research we focused only on *symbols*, which are concepts with a combined high score[8] comprising both degree and betweenness centrality, on the one hand, and on consensus (the number of texts in which it occurred) on the other. Finally a visual map analysis was conducted in order to make as clear as possible the role of genres on shared meanings. In practice we created an aggregate semantic network containing the union set of concepts for all 155 individual semantic networks and union set of links (sum of weights criterion). The resulting graph was simplified by removing links with weight less than a threshold of 5 (co-occurrence frequency) to improve visual interpretation.

RESULTS

Semantic Networks Descriptive Statistics

Semantic network descriptive statistics computed across all 155 semantic networks are reported in Table 1. We notice that e-mail texts in Thread 1 presented a higher average number of concepts with a higher standard deviation than e-mails in Thread 2. Semantic networks in Thread 2 are slightly more densely connected (0.06) than networks in Thread 1 (0.05). Moreover semantic networks in Thread 1 displayed a higher average clustering coefficient than those from Thread 2. This means that e-mails within the first set tended to form clusters or, in other words, to have reciprocally connected neighborhoods than those in second set do. These facts tell us that the e-mails in Thread 1 are, on average, characterized by larger and less cohesive sets of concepts than the e-mails in Thread 2.

Symbols

The semantic connectivity analysis procedure gave as output a classification of concepts from which we selected the 10 highest scoring symbols (see Table 2) for further interpretation in this paper. By confronting the 10 highest ranking symbols for each thread, we were able to draw some additional comparative results. First, in Thread 1, the concept View scores fourth in rank, immediately after Apache, Committers (the core developers), and Vote. We interpret this as a manifestation of the discussion focus around a sort of call to committers to express their personal views and, at the same time, a call for voting. Second, in Thread 2, the concept View is not present among the top 10 symbols. Instead, the concepts Vote 1 and Vote 2 are important because they express a polarization of voting around two precise proposals. Third, it is noticeable that the negative vote designation (expressed in Table 2 as -1) also ranked very highly. As we discovered by looking closer at the communication contents, this happened because most of the committers voted against (-1) the proposal to fully open (reading and writing) the community mailing list. Both threads have a committer's name in the top 10 symbols, "Sam" in Thread 1 and "Roy" in Thread 2. This could be interpreted as the detection of two distinct "voices" (or points of view) whose presence in discourse was respectively more evident in each of the threads. In reviewing the original messages, we were able to confirm that

Table1. Statistics Across all Semantic Networks from Both Thread 1 and Thread 2 ($N = 155$).

Measure	Thread 1 ($n = 88$)				Thread 2 ($n = 67$)			
	Min.	*M*	Max.	*SD*	Min.	*M*	Max.	*SD*
Number of concepts	5	37.31	113	21.89	5	20.45	54	7.87
N. of isolated concepts	0	0	0	0	0	0.97	4	0.87
Number of links	4	46.33	162	32.14	2	21.87	76	10.42
Density	0.01	0.05	0.20	0.03	0.03	0.06	0.17	0.02
Clustering Coefficient	0	0.03	0.08	0.02	0	0.02	0.17	0.03

Table 2. Concepts Classified as Symbols (Scoring High or Over the Mean in Degree, Betweenness, and Consensus).

Thread 1 (74 concepts in this class)				Thread 2 (50 concepts in this class)				
Rank	Concept	Consensus	Degree Centrality	Betweenness Centrality	Rank	Concept	Consensus	Degree Centrality	Betweenness Centrality
1	Apache	0.01	0.09	0.11	1	Vote	0.01	0.06	0.24
2	committers	0.02	0.09	0.10	2	vote1	0.04	0.09	0.13
3	Vote	0.01	0.08	0.11	3	Need	0.00	0.02	0.21
4	View	0.01	0.07	0.09	4	Committers	0.03	0.06	0.12
5	Archive	0.01	0.08	0.08	5	vote2	0.04	0.08	0.07
6	Org	0.01	0.06	0.09	6	-1	0.03	0.02	0.13
7	community	0.01	0.06	0.06	7	let's	0.04	0.02	0.12
8	Sam	0.01	0.05	0.06	8	Community	0.00	0.04	0.13
9	More	0.01	0.05	0.05	9	Roy	0.00	0.03	0.13
10	Do	0.01	0.06	0.04	10	No	0.03	0.02	0.10

Notes. *Consensus* refers to a measure of the extent to which concepts recur across distinct pieces of text. The *degree centrality* of a given node (concept) is the number of its direct connections with other adjacent ones, expressed as a fraction of all possible connections between dyads of nodes in a network. The *betweenness centrality* of a node measures the extent to which it rests in all (shortest) paths connecting all possible dyads between other nodes in a network (Freeman, 1979). All measures are rounded to two decimal places.

"Sam" was speaking more in favor of an open policy of access, while "Roy" was the spokesperson of the party proposing a more restrictive policy.

Consolidated Semantic Networks

In order to refine preliminary findings of the semantic connectivity analysis illustrated above, we have constructed a consolidated semantic network (CSN) for each mail thread. A CSN relative to a thread is intended as the union of all the semantic networks corresponding to the e-mails forming that thread. The sum criterion was used to unite the networks. This means that a link between two nodes in the CSN has weight equal to the sum of link weights across all individual networks presenting that dyad. In order to enhance the visual interpretability of results, all links having a weight less than 5 (co-occurring less than 5 times in a thread as a whole) were removed from the data set. Isolated (totally disconnected, degree = 0) concepts where removed iteratively as well.

In looking at the CSN generated for Thread 1 (Figure 2), it is clear that the concept View is the most central in terms of weighted degree centrality (the most of high-weight links are related to it). Starting from the node View, we can find at least two paths that could be interpreted as roughly corresponding to the alternative proposals involved in the voting process:

(a) *view → close → except → committers → members → invitees*

(b) *view → open → completely → anyone → can → subscribe → post → read*.
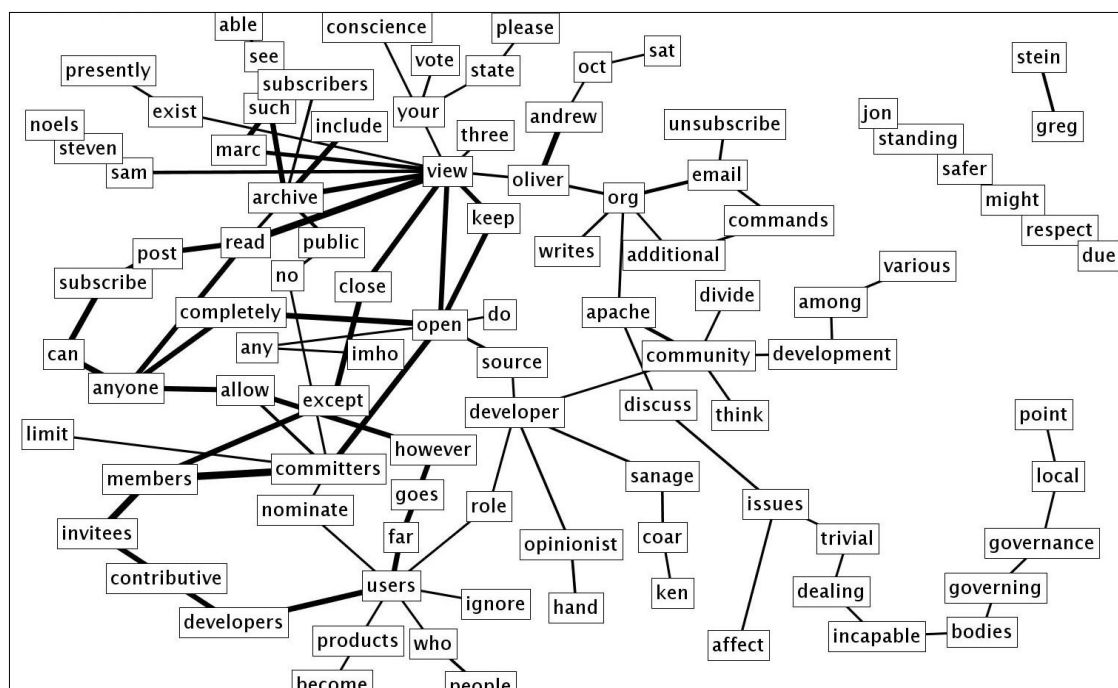
Figure 2. A consolidated semantic network (CSN) from e-mail Thread 1. Links with a weight less than 5 and isolated nodes have been removed from the original network to offer a clearer representation. Links' width reflects weights, that is, the frequency of co-occurrence for a dyad of concepts in the thread.

The first proposal entailed opening the mailing list only to active participants and those invited by current committers, while the second proposal entailed fully opening the list to anyone interested. Another interesting path is located in the bottom right side of Figure 2:

(c) *local → governance/governing → bodies → incapable → dealing → trivial → issues → affect.*

This semantic path or sequence of concepts seems to express that some developer perceived the potential scenario where everybody is allowed to read and write on the mailing list as a threat. The marginal position of this "tail" to the main component does not necessarily mean that the underlined meanings are of secondary importance. In fact it could be interpreted as the fact that, even if few participants used the concepts in this cluster, the underlined meaning attaches directly to core arguments in discussion. From a discourse point of view, we could also think that the position expressed by this path is very clearly understandable for an audience, while very central nodes could be characterized by more ambiguity and noise.

As we have shown so far (see Tables 1 and 2), the CSN based on Thread 2 data is characterized by a less complex[9] semantic structure. This simpler structure makes more recognizable the basic elements of the voting dynamic (the +1 and -1 concepts) entailed by e-mails. In major detail we can see (in Figure 3) the symmetric structure of options in Thread 2, making it clearer. For example, let us consider the most central the e-mail-mediated voting process. Concepts like Vote1 and Vote2 refer to kinds of formalized proposals to be voted: nodes 1, 0 and -1 are the actual manifestations of voting preferences. Departing from those

concepts/nodes, we can find again, even if in a more stylized representation, the elements corresponding to two different proposals:

(a) *vote1 → 1 → yes → let's → open → everyone*

(b) *vote2 → committers → keep → private*.

The content of communication concerned "who" should be allowed to do "what." The options for the who issue were expressed by the concepts Committers and Non-committers, while the options available for the issue were Write and Read. Different configurations of these elements were formalized initially within a proposal with alternative scenarios to be voted on by community members in Thread 1. Because a second voting session (Thread 2) took place around the same subject, we expected that some kind of realignment of the communicative action would have been proposed. So we double-checked for concrete proof of this *genre tuning* within the content of e-mails. Not surprisingly, we found in the very first e-mail within Thread 2 (see Figure 4) a claim for switching to a more structured and linear voting session because the previous consensus formation process was too complex for univocal interpretation.

The e-mail in Figure 4 also provides a concrete idea about the flexibility of the vote genre in adapting to the situation. In response to the individual points of view that emerged in the preceding session, the second voting clarified two points: there is no need to provide reasons for the vote, and to simplify the voting, since only full numbers were sought.
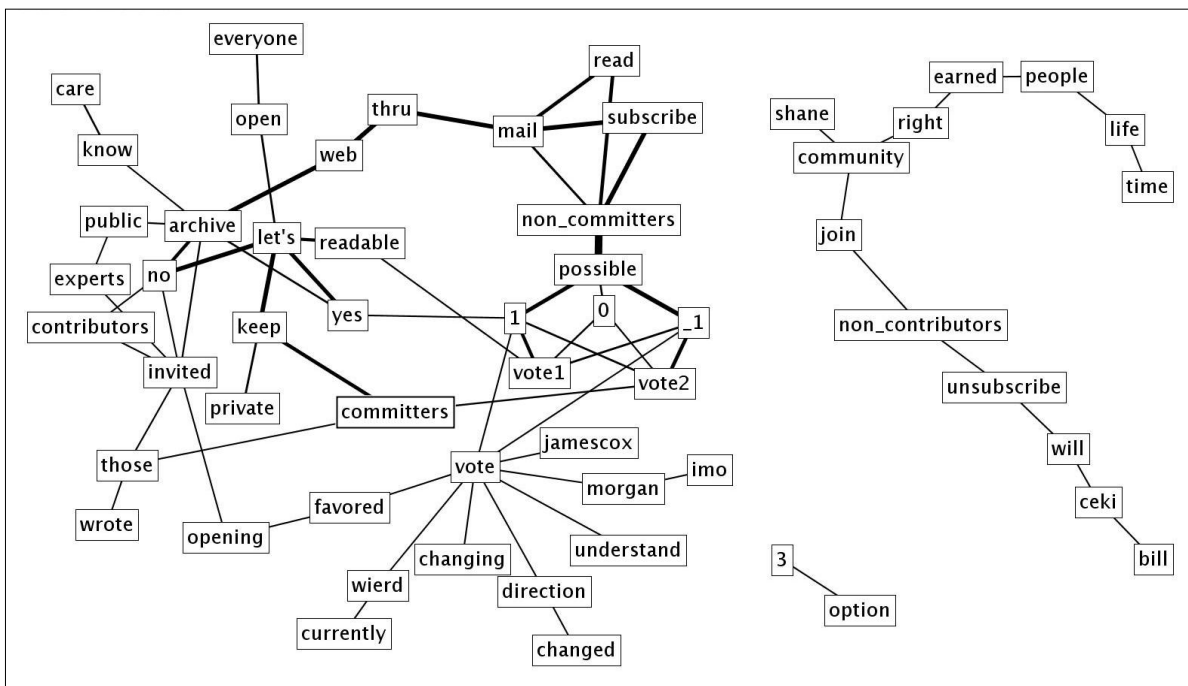
Figure 3. Consolidated semantic network from e-mail Thread 2. Both links with weigh less than 5 and isolate nodes have been recursively removed from the original network to offer a clearer representation. Links' width reflects weights, that is, the frequency of co-occurrence for a dyad of concepts in the thread.

```
Please, allow me to restart the voting in order to make it easier to reach some
consensus since it's hard to interpret the results of the previous one.
                                  - o -
There are two different concerns for openness:
  - open to read
  - open to write
Let's try to keep them separate.
NOTE: there is no need to indicate the reasons for your votes, either
for negative ones.
Also, please, don't vote 0.5 or other numbers, let's keep it simple for
the final count.
                                  - o -
VOTE 1:  would you like to make it possible for non-committers to read
this mail list through a web archive?
  [ ] +1 yes, let's make it readable
  [ ]  0 don't know/don't care
  [ ] -1 no, let's keep it private
                                  - o -
VOTE 2:  would you like to make it possible for non-committers to fully
subscribe to this mail list?
  [ ] +1 yes, let's open it to everyone
  [ ]  0 don't know/don't care
  [ ] -1 no, let's keep it for committers only
                                  - o -
Please, place your vote even if you already voted in the previous poll. We'll reset
the clock and give 78 hours for the vote. I volunteer to count the results and post
them here.Thanks in advance and sorry for the double poll noise.
```

Figure 4. The body of text from the first (in chronological order) e-mail in Thread 2. It should be noted that the author of the above message mentions a 78-hours time period instead of the 72-hours that a careful reader of this article could have expected. This was a mistake in the original text that we reproduced as is. A statement resetting the timing to a 72-hours time window followed later in the e-mail discussion.

DISCUSSION AND CONCLUSIONS

The Apache Way as a system of coordination and governance practices based on shared values (an institution) inspired the worldwide OSS community in the past and still continues to provide an example for many new OSS projects. It structures distributed decision making and coordination through enacting several communication genres (e.g., vote, bug, cvs, proposal, etc.). In the Results section, we detailed some aspects relative to the use of the vote genre. In particular, we showed the interaction between the vote communication genre and collective mental models (represented as CSNs) as activating alternative scenarios within the developers' collective mind. One contribution of this paper is the understanding of dialogic forms of coordination as enabled by the use of communication practices. We have seen that collective decision making with e-mail voting systems entails two main steps: consensus creation and voting. Voting is not mandatory but it saves time when consensus cannot be reached by simple discussion. These two communicative actions could be contextual or sequential. Moreover, as we have seen in the case of the double poll, even the most consolidated practices can be varied according to the situation.

These facts make us consider the important differences existing between compliance to formal rules and the use of communication genres as alternative coordination tools. Even if

the setting of our study was specific (OSS development), the results identified could be of interest in the more general research on coordination practices. The core principles of practices are not a set of conscious, constant rules, but rather practical schemes, often opaque to their possessors, and vary according to the logic of situation (Bourdieu, 1990). Faraj and Xiao (2006) suggested that, in complex knowledge and fast changing environments, the "lens of practice" is more suitable to understanding coordination than traditional contingent approaches. When work situations are characterized by novelty, unpredictability, and ever-changing combinations of actors, tasks, and resources, it could be very complicated to specify ex ante systems of routines and formalized plans of action (Faraj & Xiao, 2006).

In such contexts, then, the concept of trajectories (Strauss, 1993), the sequences of actions toward a goal, could better emphasize the interplay between the contingencies and interactions among actors. Trajectories better allow a consideration of eventual deviations within the course of action from the desired objective. In those scenarios, decisional processes deal more with the situation rather than with formal organizational arrangements. Mische and White (1998) proposed the concept of conversation as a discursive form in which the story does not lend itself to a precise final, and the concept of situation as regarding the possibility of an unexpected or problematic final (which, in our case, was the absence of a clear policy for community management). In summary, it seems to us that communication practices provide a perfect lens for looking at coordination in a concrete way. Moreover, the usefulness of such a lens is increased by the progressive affirmation of dialogic–cooperative forms of coordination enabled by new Internet technologies.

A second contribution of this paper is the network representation (i.e., the CSN) of shared understandings. This analytic tool allowed us to show the reduction of cognitive complexity underlined in collective decision making and coming from the re-orientation of communication genres in use. We have seen how this worked in practice in our case study. If the first thread resulted in a more complex and fuzzy outcome because it was more focused on consensus formation, the second thread effectively reset the situation toward a final decision. This result contributes to recent literature on communication genres and communication management. For example, Luckmann (2009) stated that communicative genres may be defined by their function as models for the solution of specifically communicative problems of social life.

ENDNOTES

1. The bazaar metaphor entails a distributed-production system, involving a large number of developers and characterized by (a) the absence of a centralized decision-making unit defining the ex-ante direction of development of the software code; (b) parallel design and debugging; (c) the integration of users into the production of software code; (d) self-selection of programmers (volunteering) for the tasks that best match their abilities. The cathedral metaphor entails an opposite approach. Here software development is compared to a cathedral-building process carefully crafted by individual wizards or small bands of mages working in splendid isolation, with no beta to be released before its time.

2. The most recent Netcraft survey and its archives are publically available at http://news.netcraft.com/archives/2011/04/06/april-2011-web-server-survey.html

3. Find Apache community-building guidelines at http://incubator.apache.org/guides/community.html

4. The Apache community list is available at http://mail-archives.apache.org/mod_mbox/www-community/

5. For parsing texts and creating semantic networks, we used AUTOMAP. For semantic network analysis procedures, we used the software ORA. Both tools are available at http://www.casos.cs.cmu.edu/ for free use, with conditions.

6. For example, a window of size 2 sliding over the text "John writes code" produces the two distinct associations "John → writes" and "writes → code."

7. Of course, the larger the window, the more noise is captured in terms of nonmeaningful inferred relations. On the other hand, if the window is set too small, important semantic relations are not captured. See Carley (1997) for more details on windowing/proximity procedures.

8. A concept is considered as scoring high in a given measure when its value for that measure is one standard deviation over the mean of the corresponding distribution across all the 155 networks in the sample.

9. A more detailed explanation on semantic complexity is given in the Appendix.

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APPENDIX

This appendix shows in major detail how the implementation of a strict communication genre (i.e., voting) could reduce the complexity of meaning structures underlined in discourse. As discussed on p. 34, conversation (as a low-structured dialogic practice) is a good way to express diverse opinions. At the same time, it could be very difficult to make effective and efficient decisions relying just on conversational practices. We expected that shifting from a conversation to a voting session could be a solution for collective decision making because it reduces discussion complexity. In terms of semantic networks, we could formulate that as the simplification of a high number of almost randomly interrelated concepts into a smaller number of more structured ones.

In Table A1 we report some structural indicators of overall complexity for consolidated semantic networks representing both Thread 1 (left column) and Thread 2 (right column). Indicators are computed first on the "original" consolidated networks (a) that consider all of the existing concepts, and then on the "reduced" networks (b) that consider the same networks after removing links with weight less than 2 (concepts that co-occurred less than twice across all e-mails within the same thread). Figures A1 and A2, below, graphically illustrate the effects of such reduction over semantic networks.

Table A1. Structural Indicators of Overall Complexity for Consolidated Networks.

Measure	Thread 1		Thread 2	
	Original (a)	Reduced (b)	Original (a)	Reduced (b)
Node count	360	345	306	61
Link count	1639	887	631	72
Density	0.013	0.008	0.007	0.020
Characteristic path length	3.813	5.086	6.296	5.296
Clustering coefficient	0.076	0.047	0.048	0.034
Network levels (diameter)	14	17	17	12
Degree centralization	0.076	0.050	0.089	0.057
Betweenness centralization	0.102	0.161	0.237	0.117
Closeness centralization	0.237	0.019	0.038	0.025

In comparing the original networks (Figure A1, where t represents the respective thread), we see that Thread 1 (a) is more complex than Thread 2 (b) in terms of concepts/nodes, 360 (t1) versus 306 (t2), and number of ties, 1,639 (t1) versus 631 (t2). Moreover, when observing the reduced networks (Figure A2), this difference is accentuated dramatically. In fact, when the data undergoes a reduction process, Thread 1 (a) has 345 nodes and 887 ties, while Thread 2 (b) has 61 nodes and 72 ties. So when we did not consider concepts with a very low co-occurrence frequency across all of the e-mails (which are more likely to be "noise"), we see that the number of nodes just slightly decreases in Thread 1 (-4.2%), but dramatically fall in Thread 2 (-80.1%). In a similar direction, the links in Thread 1 decrease almost by half of the total (-45%), whereas the links in Thread 2 decrease by almost as twice that (-88.6%).

(a) t1, original
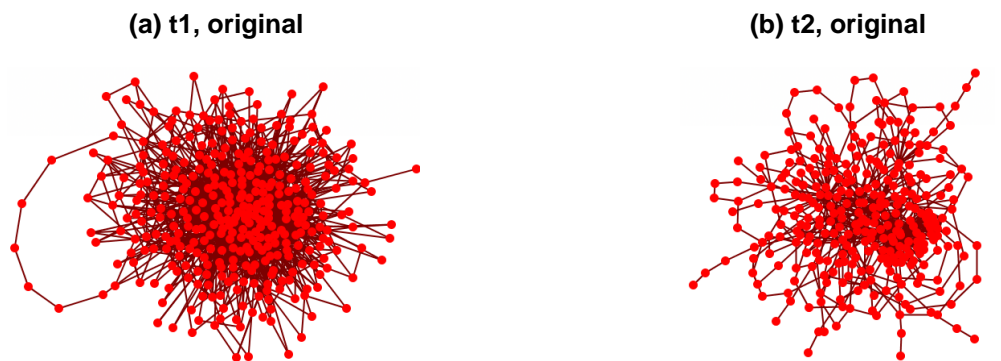
(b) t2, original

Figure A1. Original consolidated semantic networks (before link/node reduction). The network on the left (a) refers to the content of Thread 1. The network on the right (b) refers to the content of Thread 2. Isolated nodes are not displayed for the sake of clarity.

(a) t1, reduction
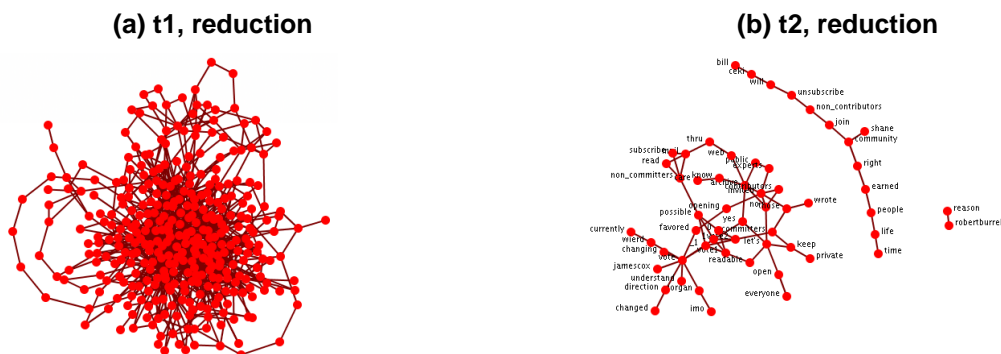
(b) t2, reduction

Figure A2. Reduced consolidated semantic networks (after link/node reduction). The network on the left (a) refers to the content of Thread 1. The network on the right (b) refers to the content of Thread 2. Isolated nodes are recursively hidden for the sake of clarity.

DISTRIBUTED LEADERSHIP AND THE VISIBILITY/INVISIBILITY PARADOX IN ON-LINE COMMUNITIES

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Abstract: *This paper analyzes the role of distributed leadership in three on-line communities, reflecting on an observed visibility/invisibility paradox in leadership within these communities. Leaders who downplay their seniority and assume a degree of invisibility, allocating discretionary powers to subordinate levels in an organizational hierarchy, may facilitate the emergence of distributed leadership. Yet, simultaneously, leader-led relations are enabled by high leadership visibility. This paradox—that leaders need to be both highly visible and also invisible, or hands-off, when the occasion requires it—was derived from prior research into e-learning communities and tested in the analysis of discussions from on-line communities using a case study pattern-matching process. The operation of both visibility and invisibility in leadership is a key issue for enabling effective collaborations in distributed leadership situations based on trust. Such collaboration fosters positive group interaction and participative decision making in a consensus facilitated through leadership distribution amongst on-line community members.*

Keywords: *distributed leadership, on-line communities, visibility/invisibility paradox, e-learning leadership, case study methodology, pattern-matching, leadership, ambiguity.*

INTRODUCTION

An on-line community has been defined as "a collective group of entities, individuals or organizations that come together either temporarily or permanently through an electronic medium to interact in a common problem or interest space" (Plant, 2004, p. 54). Plant noted in 2004 that there were an estimated 400,000 communities on the World Wide Web, with over 300,000 on-line topic-based discussion boards used by such communities. Recently, however, global interest in social networking has accelerated markedly: in 2010, it was estimated that the active unique audience for social networking sites globally grew by around 30% in one year, from 244.2 million to 314.5 million (Nielsen Wire, 2010). Although Datamonitor predicted in 2007 that the growth in social networking would flatten out by 2012

(Pierce-Grove, 2007), more recent data indicate that social networking is still on the rise (Nielsen Wire, 2010). The QQ social network in China, now arguably the largest in the world, has around 637 million active users, while Facebook has more than 517 million such users (Tencent, 2011; Miniwatts Marketing Group, 2010). Within the general category of on-line communities, Boyd and Ellison (2007) defined social networking sites as

> web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. (p. 1)

While social networking sites have grown massively in number and developed their membership globally, so have the communication processes involved in these and other on-line communities. Web users have gradually become more sophisticated, demanding, and expert participants in on-line systems. Simultaneously, on-line community sites have adjusted to early problems and scandals identified in, for example, anonymous or pseudonymous use. As Grohol (2006) noted, the occasional havoc created by the excesses of early user disinhibition in on-line communities resulted in increased monitoring and control.

Thus, refinements in on-line reputation monitoring systems, membership registration, moderation and evaluation of discussion boards, and other forms of scrutinizing on-line user contributions have gradually emerged, as has consciousness about issues such as identity theft. Given the potential problems with regulation and safety in on-line communities and the importance of effective site organization, the requirements for on-line community leadership in the form of facilitation or moderation have begun to be specified, for example, in on-line learning sites (Salmon, 2000). These include also the establishment of systems for monitoring access and security permissions; shared ground rules and clear registration systems; high quality relevant content; support for community and member identities; active member-driven participation; reliable, responsive and consistent member services; and a culture of trust, openness, and mutual respect. Forum One Communications carried out research in 2008 to identify the most important factors in establishing an on-line community culture. Respondents thought the second most important factor (after "quality, up to date content") was "strong moderation/facilitation" (Forum One Communications, 2008). This echoes the earlier findings of Crawford that some form of facilitation by a leader of an on-line community is now an essential requirement:

> The facilitator is absolutely indispensable. There needs to be somebody "who knows" and who has a role as leader to take participants gently into the community and make them feel welcome — part of the community. They need to be obviously keen on the system and dedicated to making it work. An enthusiast. (Crawford, 2002, p. 441)

Assuring the effective leadership of on-line communities is, in fact, an essential prerequisite for safe and harmonious participation by members in these groups. Such leadership is also arguably best achieved through a distributed form of power-sharing, as this paper will argue. The paper analyzes the role of distributed leadership in facilitating and participating in a number of on-line social networking communities, reflecting on the nature of an observed *visibility/ invisibility paradox* in the leadership demonstrated within several of

these communities, and the potential of distributed leadership to offer theoretical and practical solutions to effective on-line community organization.

The Emergence of Distributed Leadership

Executive managers within traditional hierarchical structures in public-sector and government organizations are finding it increasingly difficult to deliver innovations effectively using top-down command and control systems, as Senge (1996, p. 2) noted some years ago in his reflections on successful learning organizations. By contrast, the power of flexible community and team leadership has substantially grown in an era increasingly influenced by on-line communications, including those involving on-line social networking. Analyzing the rapid emergence of the movement towards distributed leadership in education, Hartley (2007, p. 209) reflected on Page's (2006) view that in "contemporary culture there is a trend 'from organised social structure to network culture'…what Bauman (2000) calls 'liquid modernity'" since "[d]istributed leadership, dispersed across and within agencies, strikes a chord with the flexible 'liquid modern' view of time and space." Whether or not we agree that the recent popularity of distributed leadership is evidence of Zygmunt Bauman's liquid modernity or we give credence to the latter at all, distributed leadership indisputably has been on the rise for some years, as other researchers have also observed (Harris, Leithwood, Day, Sammons, & Hopkins, 2007). The kinds of shared adaptive group leadership approaches broadly envisaged in the concept of distributed leadership tend to be characterized as "non-management," agility, and de-centralization, with a relative downplaying of the role of authority in structural hierarchies (Heller, 2006a, 2006b). As Hartley noted in 2007,

> Distributed leadership has currency: its time has come; it is the "new kid on the block" (Gronn, 2006, p. 1), "in vogue" (Harris, 2004, p. 13), attracting "growing attention" (Hoyle and Wallace, 2005, p. 192). Since Gronn's preliminary taxonomy of distributed leadership (Gronn, 2002a, p. 435), it has turned into something of a social movement. The National College for School Leadership (NCSL) in England now has its own dedicated *Distributed Leadership* website (NCSL, 2006). In the USA, there is a similar trend. (p. 202)

Distributed leadership is enabled by leaders who subtly downplay the seniority of their roles and render some aspects of authority slightly invisible, allocating discretionary powers to those in subordinate layers of their organizational or project team hierarchy. Such an approach is likely to garner more buy-in for innovations from all levels of the organization than would top management attempts to enforce change through coercion. There is latterly a drift towards the validation of "softer" leadership approaches that respect social-emotional trust facilitated by communities within organizations rather than of the rational authority of management imposed through positional structures. As Hartley observed,

> Biggart (1989) concludes that firms can no longer control workers through rational-legal (that is, bureaucratic) structures: "Independent work that relies on solidarity, respect, or mutual trust, is poorly served by bureaucratic structures that create authority differences" (p. 169–170). The slippage from management to leadership since 1989 has resonated with an increasingly premodern atavistic tendency within the broader culture towards communities whose basis is an appeal to the non-rational. For example, in a recent MORI poll, it was noted that there was a "drifting from [the] rational to polysensuality"

(Page, 2006, unpaginated). This emotional turn is also to be seen in educational management. (Hartley, 2007, p. 208)

The emotional turn Hartley identified is supported by Page's presentation in UK Ipsus MORI social demographic and organizational trends data for 2004-05 in comparison with 1979, in which he reported that "Polysensuality is [the] fastest growing British trend. [There is g]reater trust in a nonrational approach to make sense of the world" (Page, 2006, p. 19). This trend also has been accompanied in the UK by a rise in skepticism, anxiety, consumer expectations and autonomy, an increase in university participation, a widening rich–poor gap, erosion in government credibility, and increased feelings of remoteness from central institutions (Page, 2006, p. 19).

Possibly (but not necessarily) linked with these trends, leader-led relations in education are, as the UK Office for Standards in Education (Ofsted) inspection services would have it, demonstrably facilitated by the high visibility of senior leaders, particularly in so-called failing situations. Ofsted (2008, p. 8) noted, "In the early weeks following special measures the highly visible presence of senior leaders in corridors and in classrooms was seen as important." Yet in the wider world of communities outside schools, there is evidence of an increase in skepticism towards authority, allied with increasing consumer demand for authenticity (Page, 2006, p. 37). This, combined with greater scrutiny of institutions and anxiety about governments in the wider population, gives rise to a paradox: Leaders need to be highly visible and yet invisible, or hands-off, when the occasion requires it.

This is, arguably, a key issue in the formation of effective collaboration in distributed leadership situations based on trust—that leaders are more trusted when they are both authentic as positional authority figures and also capable of stepping back from the limelight to become team players (Jameson & Andrews, 2008; Jameson, Ferrell, Kelly, Walker, & Ryan, 2006). The ability to be an effective collaborator fosters participative decision making and is further facilitated through the active distribution of leadership among members in on-line communities. Thus, effective leaders of on-line communities continually face a paradox in their decisions on how best to lead their members.

A paradox is a statement or situation providing a resolution of opposites that appears to be in conflict with logical expectations but in reality expresses some truth. Such a statement is either true or seems to be true, but it also encompasses a contradiction or situation that apparently defies intuition. Take, for example, the paradox in the biblical scriptures: "Whoever shall seek to save his life shall lose it, and whoever shall lose his life shall preserve it" (Luke 17:33).[1] The resolution of the apparent contradiction in this statement is achieved through awareness of the deeper understanding that, paradoxically, a self-centered grasping attitude to keep one's own life at all costs ultimately puts people in general, and perhaps oneself, at greater risk of loss of life than selfless generosity towards others, which in turn leads to greater shared freedoms for the community and better survival for everyone. This deeply paradoxical statement operates on a number of different levels, from the spiritual to the pragmatic.

In similar manner, stating that the best leaders are both visible and invisible appears to contain a contradiction. It seems logically impossible for leaders to be simultaneously visible and invisible. Yet the seeming contradiction expresses a deeper truth: "Followers" arguably benefit from leaders whose presence is to some extent veiled, so that they envisage group achievements as their own. Such a perspective was known already in ancient Chinese philosophy: "A leader is best when people barely know he/she exists" and "When the best leader's work is done the

people say, "We did it ourselves!" (Lao Tse, 2009, Chap. 17, sentence 3). However, followers also benefit from having leaders who are very visible when necessary, close at hand. Leaders should guide the people both invisibly from behind, as in the oxymoron, "In order to lead people One must follow them" (Lao Tse, 2009, Chap. 66, sentence 2), and visibly from the front, "The people will not feel like they are being manipulated, if a wise person is in front as their leader. The whole world will ask for her guidance, and will never get tired of her" (Lao Tse, 2009, Chap. 66, sentence 3). Leader visibility is best achieved effortlessly, without the leader trying too hard: "Display yourself and you will not be clearly seen; Justify yourself and you will not be respected" (Lao Tse, 2009, Chap. 24, sentence 2). For, paradoxically, and apparently beyond reason, leaders are more effective in being visible when they carry their authority lightly: "True wisdom seems foolish. True art seems artless" (Lao Tse, 2009, Chap. 45, sentence 1).

Therefore, in some situations it may be better for leaders to downplay their role and act in a low-key way, demonstrating humility (Collins, 2001) by stepping back from the limelight. Yet, in other situations, followers need leaders who clearly outline the mission of the organization, define its meaningfulness, articulate the interests of the people, and delegate leadership tasks and responsibilities to others, thus providing the kind of trusted certainties that, in an age of anxiety, many people may need. The operation of relatively flatter structures of distributed leadership can therefore arguably facilitate bottom-up commitment to innovation in public sector educational organizations (Jameson, 2007b). By contrast, as Senge noted regarding top-down hierarchical management, the coercive pressure of managerial power in such institutions does not tend to result in commitment from people at all levels:

> The more strongly hierarchical power is wielded, the more compliance results. Yet there is no substitute for commitment in bringing about deep change. No one can force another person to learn if the learning involves deep changes in beliefs and attitudes and fundamental new ways of thinking and acting. (Senge, 1996, p. 2)

It is argued here that on-line communities benefit from low-key informal leadership that operates within a team ethos of equality, in which competition is minimalized, and communities of practice (Wenger, 1998) models of social engagement are facilitated (JISC infoNet, 2006). This avoids well-known problems reported as policy-led top-down micromanagerial control by senior leaders, characterized by critics as interventionary "new managerialism," in which reductive performativity can reduce levels of trust (Ball, 2003). Prior literature demonstrates that humility, humor, and bottom-up processes of team empowerment can be facilitated through "relational intelligence" (Collins, 2001; Regine & Lewin, 2003) intentionally fostered by the leaders of such communities. It has also been found that creative willingness to share leadership tasks and responsibilities in a distributed–coordinated team model are among those features that tend to result in highly successful teamwork (Ancona & Bresman, 2007; Bennis & Biederman, 1997; Jameson et al., 2006), while cultural and communicative intelligence seem to be important attributes of emerging leaders in leaderless internet environments (Kelly, Davis, Nelson & Mendoza, 2008).

Hypothesis About Leadership Derived from the JISC Project

The first contribution to this paper was provided in a hypothesis about leadership derived from the analysis of 21 in-depth case studies, including individual and collaborative studies,

produced by the team engaged in working on the eLIDA (e-Learning Independent Design Activities) CAMEL (Collaborative Approaches to the Management of e-Learning) design for learning project (Jameson, 2007a, 2008; JISC, 2007). The theory that a combination of visibility and invisibility in leadership is needed in on-line communities emerged from face-to-face and on-line community interactions in a Joint Information Systems Committee (JISC)[2] e-learning project. During the evaluation of the JISC-funded eLIDA CAMEL project's on-line community interactions in 2006-2007, a hypothesis emerged that a visibility/invisibility leadership paradox existed in on-line interactions: That is, leaders needed to be both highly absent and highly present for the effective framing of such communities.

The eLIDA CAMEL project implemented and evaluated learning design tools in higher and further education within the JISC Design for Learning pedagogic e-learning program in 2006-07. The project partners collected design-for-learning case studies and learning design sequences from universities, colleges, and schools using LAMS and Moodle platforms to contribute their own user evaluations of the learning design functionality of innovative tools used in the classroom. Project partners also participated in on-line community discussions in a distributed team model of leadership in which both tasks and responsibilities were shared (Jameson, 2007a). The project brought together learning activity sequences from 10 post-16/higher education partner organizations into a collaborative e-learning community of practice based on the CAMEL model for communities of practice (JISC infoNet, 2006) that has led to a range of national and international partnership developments in e-learning.

Among the technologies and resources used by practitioners within the project were tools within LAMS and Moodle. These included, for example, a project wiki, chat, forums, quizzes, Web pages, journals, presentations, labels, glossaries, and external resources. Overall, results from the project indicated that project leadership was well regarded by team members. Everyone knew who the leaders were, and in that sense leadership was both visible and accessible. However, they also perceived the leaders as low-key or almost invisible, so that the greater focus was on the team itself and its working processes and achievements, rather than on the leaders. The on-line Moodle environment was heavily participative, with a greater number of inputs and responses being posted by practitioners than project leaders. At the end of the project, an external team member wrote in her summative evaluation of the project that she had observed an increasing tendency towards vocal appreciation of the efforts of other team members during the project and therefore a high degree of relational intelligence and trust between members:

> It has been interesting to observe how the group has "grown" over the time of the project—at first there was a slight wariness between the two groups that had come together. But trust developed very quickly; perhaps due to the fact that all the partners are committed to the project, the practitioners are reflective practitioners …. and the CAMEL model encouraged an openness and honesty…. During initial meetings partners were keen to work together as they were all bringing something to the table to share. Increasingly partners would discuss issues they encountered in their own institutions, whether positive or negative, during their feedback/update sessions. Discussions would often take the turn where partners had encountered a problem and other partners would offer advice/guidance. Partners also became increasingly complimentary of others' work and achievements. (eLIDA CAMEL external agency representative: summative report)[3]

Participation within social events was a formal part of the project. Such events consciously sought to develop a community of practice approach, as the following demonstrated:

> Repeated informal relaxed process[es] helped build good, solid working relationships as seen at the end of the project, as well as more lasting friendships, where partners grew in confidence and expressed honest opinion. (eLIDA CAMEL external agency representative: summative report).

One aspect of the project's closure focused on the sustainability of design-for-learning work within the partners' institutions. In eLIDA CAMEL on-line survey team responses, partners claimed they would miss the following aspects, which related both to the partners and the leadership within the project team. Comments written by the team members included,

- Constant support and positive attitudes of partners
- Enthusiasm for using technology to transform teaching and learning, which is not shared by some senior management within the institution
- Encouragement to succeed and drive innovation
- Acknowledgement and praise of my team's work
- The use of the partners' servers
- An independent voice that raises important questions.

An understanding of the paradoxical nature of leadership, and its necessarily liquid flexibility in such groups, is useful to support effective functioning. This paper examines the nature and practice of a visibility/invisibility paradox observed among the distributed leadership operating within a number of on-line communities. These communities included (a) an externally funded project team using Moodle for on-line interaction, and (b) three subgroups within an on-line community social networking site.

METHODS

The visibility/invisibility paradox hypothesis about leadership developed in the eLIDA CAMEL project needed to be tested independently in a different on-line community context. For the current paper, three randomly selected on-line community discussions that had taken place in a social networking site during spring 2009 were recorded and analyzed, as outlined in Table 1. The selected social networking site is set up as a worldwide charity, with members providing educational, charitable, and environmental donations and participating in a wide range of activities and discussions.

The large social networking site has more than 5 million members worldwide, although the particular group of activities from which the three discussions were recorded and analyzed has more than 3,000 members participating. At any one time within the social media conversations in this group, there are around 10 different discussion threads in operation, in which a small number of participants (10-20) are regularly active, that is, participating in a variety of conversations. Membership is voluntary and free, and members come from many different types of backgrounds.[4] Overall three people operate as formal site hosts, and are the leaders with a formal management role within this group of activities. However, a range of other kinds of leaders also act, including volunteer discussion leaders, subgroup leaders with

Table 1. On-line Community Case Study Participation.

	Case Study 1 New Initiative	Case Study 2 Technical Issue	Case Study 3 Spammers Issue
Nature of group	Subgroup within free on-line charitable social network: discussion group led by a formal site host acting as a discussion leader	Subgroup within free on-line charitable social network: discussion group led by an informal volunteer discussion leader	Subgroup within free on-line charitable social network: discussion group led by an informal volunteer discussion leader
Number of participants in group overall	3,000+	3,000+	3,000+
Number of actual participants in discussion	15	17	15
Leadership in the discussion	1 discussion leader, also a site host; 2 other site leaders, 1 subgroup leader	1 discussion leader, no other leadership evident	1 discussion leader, input by site host during the latter part of discussions
Number of postings overall	69	111	86
Duration of discussion	5 days of postings over a period of 8 days	3 days of postings over a period of 3 days	6 days of postings over a period of 8 days

a volunteer role in leading particular issues in different groups, and managers from the wider overall social networking site who visit and monitor various forums from time to time. The findings of three case studies selected are provided below.

I used a mixed methods analysis to investigate the extent to which a distributed leadership hypothesis about the visibility/invisibility of leadership derived from earlier work was replicated. The hypothesis that leaders need to be both highly absent and highly present in on-line communities was tested by recording and analyzing three randomly selected conversation threads from hundreds that were taking place in an open area of the site over several days during one particular week. These conversation threads were then, and still are, typical of the kind of conversations that occur in this global social network charitable site every day. A quantitative and qualitative conversational analysis of asynchronous conversational interaction in the on-line polylogues (Marcoccia 2004) created among members and leaders in the social networking site was carried out, using a case study pattern-matching methodology to analyze conversation threads. This process was devised from replicating Lambe (2006)'s work on the analysis of conflict in on-line communities as well as Marcoccia's (2004) work in analyzing written conversation in on-line newsgroup polylogues.

The next section provides the analysis of conversation patterns in threads of on-line messages for the presence and absence of distributed leadership. In the Discussion section that follows, I make recommendations for fostering improved distributed leadership in on-line community conversations, and then draw conclusions.

FINDINGS

Case Study 1, New Initiative: Effective Leadership

A group leader, Kipper,[5] opened this discussion by making an announcement regarding a new initiative to be introduced in the site. The discussion eventually involved 69 posts. The announcement was received favorably, with a range of comments from users welcoming this news as "*wonderful*"[6] and only one critical comment from a member who noted a problem with terminology with respect to one aspect of the initiative. This mainly positive discussion received no further information updates or other posts for a couple of days. On Day 4, Kipper repeated the announcement and added further information, stating that the site was featuring items relating to a number of aspects of the initiative. A wide range of comments followed, mainly positive or neutral, with a few critical comments being made regarding some aspects of the launch of the initiative. Mary, a subgroup leader, answered some of these queries in a helpful response on Day 5. Both positive and neutral replies followed this.

After a day's break, the conversation was reopened on Day 7 by Laura, another site leader with a formal management role, who confirmed the importance of the announcement, fed back positively on the initiative, and thanked one of the members for her "*sweet note.*" A couple of neutral comments were then followed by a new member post (from Eve) that contained a wide range of critical comments, querying the nature of some aspects of the service, and outlining a rigorous challenge to the site's self-constructed international identity. These queries were expressed in a critical questioning style, slightly softened at the end with the words, "*Thanks for hearing me.*"

One of the discussion group's voluntary subgroup leaders (Jean) did not react well to the extended criticism by Eve and posted two inscrutable messages consisting primarily of emoticons. In the first case, the word "*Hmmm*" was followed by a frowning face; the second case involved "*Whatever ….*" with a grimacing face. In both cases, the implication appeared to be critical of the member who had posted negative comments. Eve's reaction to this subgroup leader's inscrutability was swift: She replied early on Day 8, a few hours after the second emoticon had been posted to say, "*Again a deafening silence on valid issues. The emoticons is out of place and frankly rude.*" Several hours after Eve's post, another member (Lynne) said she agreed with Eve's original criticism and sympathized with Eve, saying, "*I'm beginning to wonder what the point of being here is.*" Subgroup leader Jean then replied to Eve that the use of emoticons had been meant as a criticism of the site leaders who had a formal management role, not of Eve. Jean said that she "*…used them as I'm fed up with writing here as it has no sense,*" criticizing a range of functions she was concerned about within the site.

Within less than an hour, group leader Kipper replied in detail to Jean's criticism, thanking her for her feedback and asking for more detail to be provided about the area where Jean was having difficulty. Kipper also restated the mission and purposes of the site regarding the overall area Jean was concerned about, explaining again the intention of the site creators and about some new initiatives that had been introduced in the area that was the subject of critique. Kipper then said that she "*didn't mean to hijack this thread, so I'm starting a new one to solicit this type of feedback. Please join the conversation: new thread address ….*" Following this, there were several neutral and positive posts, with just one critical comment from another member (Scuba) about general aspects of the area under

discussion. Kipper then came back quickly again to acknowledge that one of the points of critical feedback was correct, providing more information, making a joke about some aspects of the deficit, and saying "*Thank you again for this valuable feedback. We will look into ways we can improve this feature.*" Subgroup leader Jean then came back politely with further information relating to the issue she had been worried about. Lynne then gave thanks and a pictured bouquet of flowers illustrated as "From Me to You" to Kipper as group leader. The final message rounding off the discussion was by Mary, another site leader with a formal management role, who welcomed the new thread to discuss feedback and introduced some new aspects of work in the site to respond to various criticisms by members in the two conversation threads.

Figures 1 and 2 illustrate the pattern of leader and member posts over the 8-day period of the discussion, during which members were active in posting throughout 5 days. The chart and graph display show that although there was a relatively high level of critical feedback (23% of posts) and even a small amount of aggression (1%), there was also a high level of leader information (19%), demonstrating good visibility levels from the main discussion leader and also a number of additional leaders who came in to support her in subtle ways. There was an effective range of neutral discussion in user information/query postings (26%) and also a slightly odd posting by Jean, the subgroup leader ("leader inscrutability"; 3%), containing two critical emoticons that were relatively hard to understand as well unclear in their target, that is, as critical of the main group leaders. As discussed above, these emoticons were received with critical comment by Eve, though the group's focus and direction was pulled back into line through the intervention of Kipper as group leader. Overall, this first case study provided an example of a relatively effective balance of visibility and invisibility on the part of the main leader, with distributed leadership operating well, with the intervention of a number of other contributing leaders.
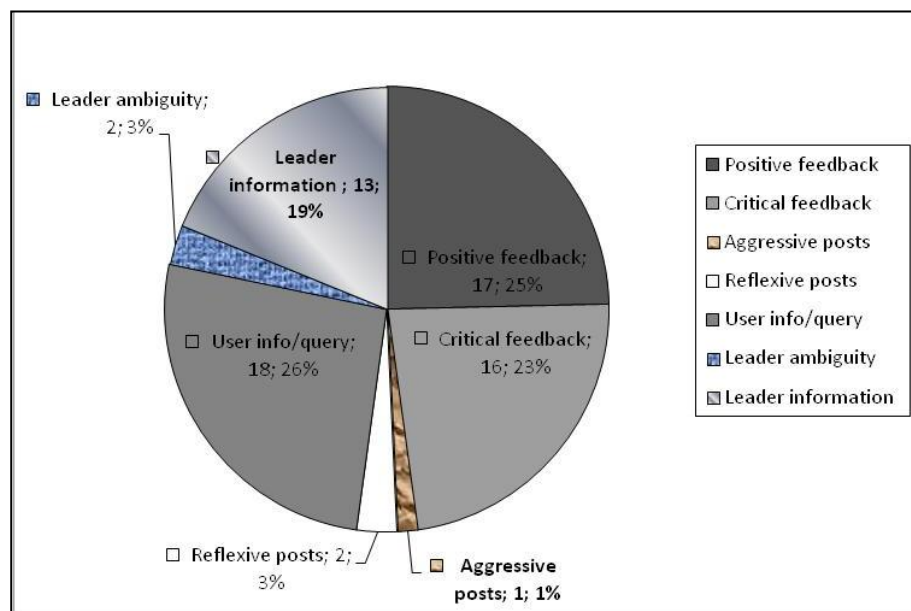
Figure 1. Chart demonstrating the nature of the posts in Case Study 1 Discussion: New Initiative.
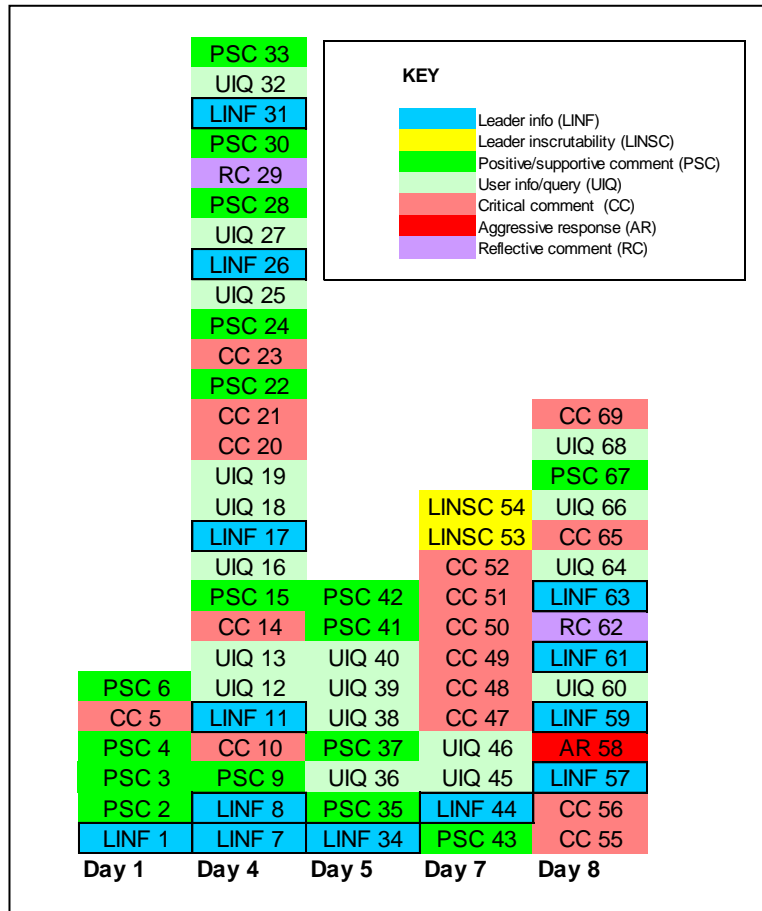
Figure 2. Graph of Case Study 1 demonstrating the pattern of posts: New Initiative.
Note: The letters represent the key and the numbers provide the post number. The leader posts are outlined.

Case Study 2, Technical Issue: Aggression and Leadership Neglect

An ordinary site member, Gerald, opened this 111-post thread as a volunteer discussion leader. He alerted site members to an important technical problem that could affect users if they were not aware of it. This announcement on Day 1 was greeted with alarm and thanks, with a range of comments from users discussing the technical issue involved. Day 1 discussions remained relatively neutral and positive, with members posting a range of information items and queries.

During Day 2, however, the discussion took a more critical and negative turn. A relative lack of official leader information (4/111 of the posts overall, or 4%), combined with low visibility on the part of Gerald and a lack of presence by other site or group leaders meant that an increasing number of critical responses on Day 2 received no attention from the leaders. The three information posts made by Gerald during Day 2 addressed the key concern about the technical issue involved and had a slightly hectoring tone, reminding members that they should be listening to and applying the technical advice given. However, Gerald's frustration and impatience with providing anything more than basic information to the group

meant that he failed to demonstrate meaningful and helpful guidance to members on a number of issues, including on the tone required to foster interactive group relational intelligence. His approach to the group's dynamics was blunt, as if he expected members to respond in a logical way to issues involving social relations in much the same way as if these were straightforward technical issues. This can be seen, for example, in his reminder to members that "*when I post Virus Alerts then it is not personal….*" and in his note to say that he was absenting himself from providing help to anyone who did not read the information he posted: *'Its all the same to me if you don't but I'm not available for those who suffer from not reading tips.'* Hence, though Gerald contributed 3 information posts plus one reminder (providing no new information) amongst a total from the whole group of 36 posts on Day 2, he demonstrated weak leadership skills by failing to address or answer critical comments by other members. Following his final information post on Day 2 (which was simply a brief note to alert people to his previous posts, classified as "user information" because the note specifically commented on his own nonleadership of the group), Gerald did not enter into the conversation thread again at all, simply leaving other members to get on with the discussion themselves without any further guidance from him.

Perhaps a result of this neglect by Gerald as the discussion leader and also by other leaders of the site, the conversation on Day 3 began to take a further negative turn. A number of aggressive and insulting responses (4%) were introduced into the discussion, some of which were wholly unnecessary and off-topic. A new member entering the conversation on Day 3 noted with concern that "*the thread has already stepped into off-topic name-calling.*" Many positive and neutral member responses were also posted, and it seemed that, as in the on-line conflict analyzed by Lambe (2006), members were trying to compensate for insulting remarks that had passed among several of the group. These negative posts included personal insults from Christine to T-Rex on Day 3, such as the following: "*…I really don't have the energy to stay here bickering with you, you sad little man...*" and T-Rex's reply, "*… Do you even read what other people write or are you too busy working on your next insult and belittlement of those who may not agree with you?*" Reflective comments by Wolf on the nature of the group were posted in response to the squabble between members:

> *It never fails, it always seems that no matter what topic there always seems to be an argument over something or someone coming in making nasty remarks about something that has nothing to do with the topic at hand. Why does this have to happen? Why if you do not have anything to say about the topic say anything at all and if you cannot say anything nice then please do not say anything at all?* (Comment by Wolf, Day 3 Case Study 2).

These reflective comments were followed by defensive explanations from both Christine and T-Rex, and by further criticism. T-Rex apparently took the critical personal comments by Christine to heart but rebutted these with further critical comment and the expectation that he would be insulted again: "*Looks like this sad little man answered the question to everyone's satisfaction except the one who asked it ... Go figure and yet another insult.*" The relative decline in the social atmosphere of the group discussion on Day 3 is interesting, in view of the lack of leadership visibility. Overall, this second case study provided an example of a relatively ineffective balance of visibility and invisibility on the part of the site leader, with low levels of information and social support being provided by the discussion leader, a high level of critical feedback and a small number of highly aggressive comments, which were

relatively uncontained. The emergence of aggressive comments stimulated moderating input from other members such as Wolf, whose contributions kept the discussion in check in the absence of other leadership. Distributed leadership, therefore, arose naturally from within the equal membership of the group.

The interactive thread between the on-line community members taking part in Case Study 2 on a technical issue is illustrated in Figures 3 and 4, providing analyses of the pattern of leader and member posts over the 3-day period of the discussion. These figures indicate that there was a high level of critical feedback (31% of posts) and a fair amount of aggression (4%), arguably as a result of the lack of leader information (4%). There was also a strong level of positive feedback (25%), in which it seemed that group members were rallying round to make up for the lack of leadership. The very weak visibility levels from the main discussion leader (only four leader information posts, with one non-leader reminder classified as "user information") and lack of involvement by any other site leaders regarding important technical issues meant that other members of the group tried to fill the gap. There was, therefore, an active level of neutral discussion among user information/query postings (35%), with a small number of reflexive posts (4%). Overall, this second case study provided an example of an ineffective balance of visibility and invisibility on the part of the site leaders, with distributed leadership from the group occurring incidentally to redress deficits from leadership neglect.
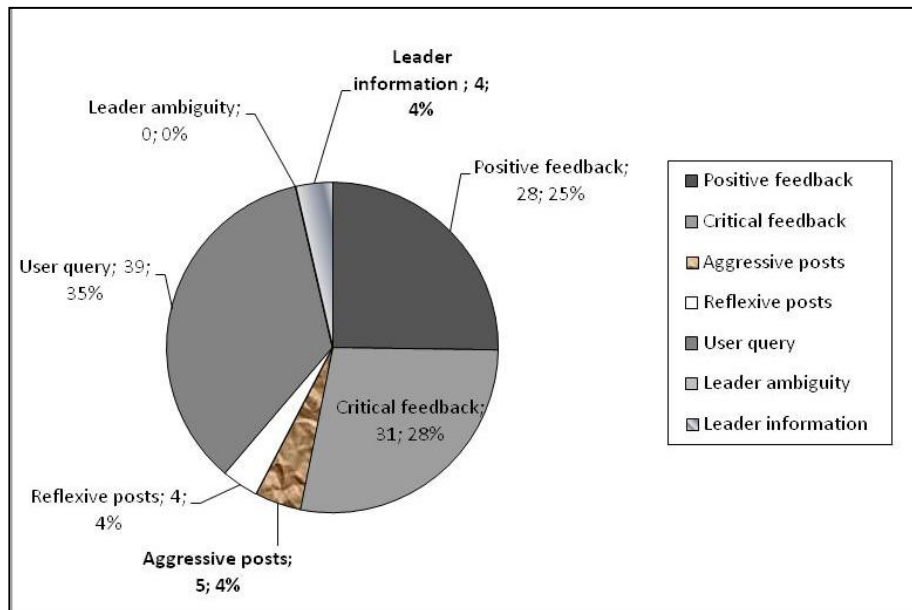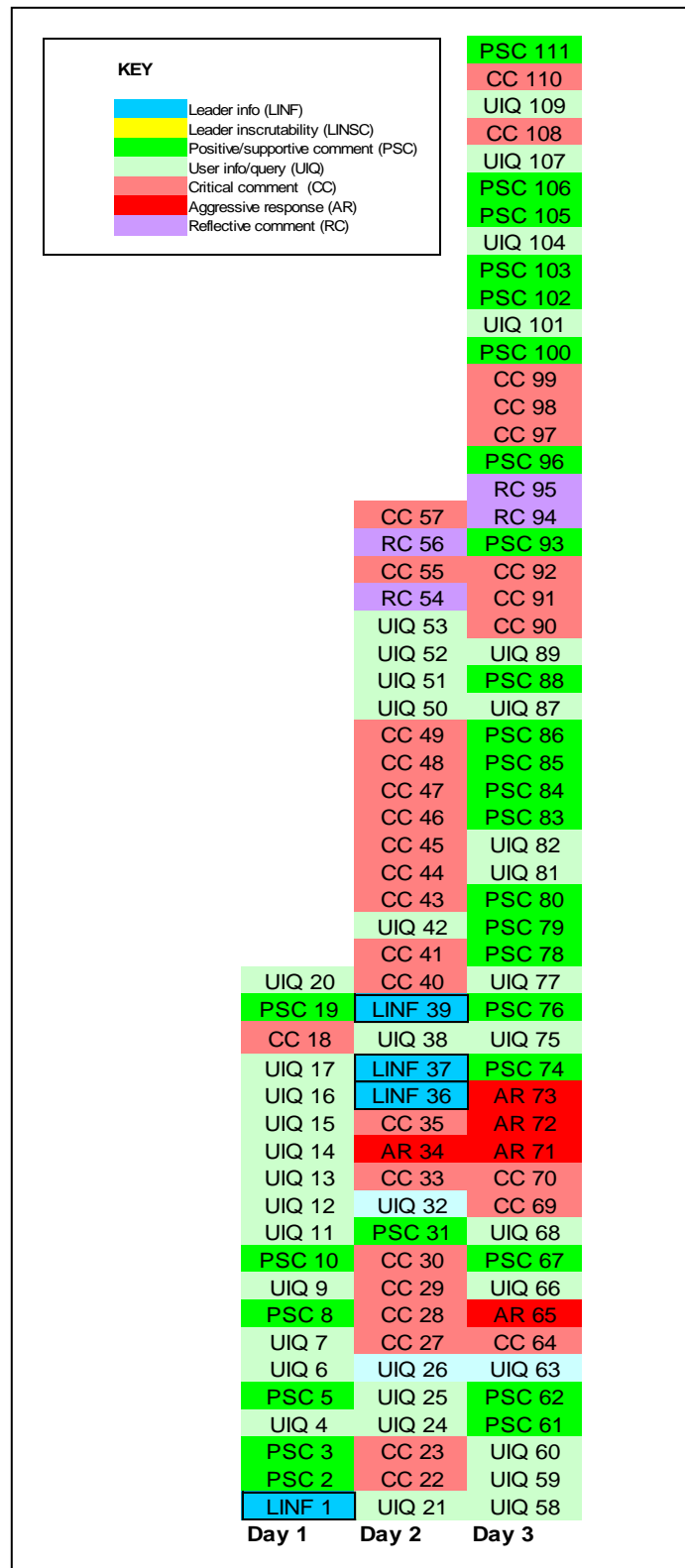

Figure 3. Chart demonstrating the nature of the posts in Case Study 2, Technical Issue.

Figure 4. Graph of Case Study 2: Technical Issue, demonstrating the pattern of posts.
Note: The letters represent the key and the numbers provide the post number. The leader posts are outlined.

Case Study 3, Spammers Discussion: Aggression and Leadership Rescue

An ordinary site member, Barbara, became volunteer discussion group leader as she opened this 86-post discussion involving 15 participants. Barbara alerted members to the problems of spam, asking for group action on this. This announcement on Day 1 initially was met with agreement and neutral comments in response, with a range of information items and queries from users discussing the technical issues involved.

However, quite quickly during Day 1, comments began to turn towards being a more critical exchange about the nature of spam, when one member (Bacon) challenged the initial posting by Barbara, saying, *"You will never stop spam, your goal is to keep up with it, posting in caps and screaming about it is getting old…."* A spate of critical comments and reflective postings followed, with advice, user information, and reflections on the tone and tenor of the discussion being expressed during a debate on the issue. The discussion leader Barbara then replied. Taking exception to Bacon's comments, she wrote a number of aggressive comments to Bacon, all composed in capital letters, the use of which is considered at least rude in discussion groups, and possibly inflammatory. This highly aggressive series of comments from Barbara ended with, *"PEOPLE LIKE YOU IS WHY I 'NEVER' GO TO A GROUP."* But then she followed this with a positive comment to member Beetroot, welcoming a practical suggestion that Beetroot had made.

A few hours later on Day 1, Bacon replied to Barbara, exacerbating the tensions in the exchange with highly aggressive comments. An exchange followed between Barbara and Bacon that degenerated into name-calling, with insult following upon insult. This aggressive exchange continued into Day 2, with a large number of aggressive responses exchanged between Barbara and Bacon. Member Justine posted an emoticon to suggest that the two members should restrain themselves, with a positive expression of thanks. This was followed by an inscrutable but clearly critical visual post from Bacon, and a positive comment from Dragon in support of Barbara. Dragon criticized Bacon, saying, *"Bacon … some of your posts are the most hateful things I have ever read…. Everyone is entitled to their opinion … it does not have to be yours. Rock on Barbara."* A neutral comment was posted by Katie, after which Bacon came back to make a further aggressive comment, now criticizing Dragon as well. Day 2 ended with a further short spate of aggression between these two members. On Day 3, T-Rex came in as a member to make moderating suggestions, saying that,

> *If someone's post is not to your liking, ignore it! Why do we have to constantly degenerate into personal attacks that serve no purpose at all – sometimes it's like watching kids in a playground…. For me everyone's two cents is worth at least that – and then just occasionally if you actually try listening to each other, you might hear a real gem that's worth a darn site more.* (Comment by T-Rex on Day 3 in Case Study 3).

With the moderating input of T-Rex and a range of other neutral, critical and positive comments, Day 3 ended on a relatively positive note, with a comment from Frank, a member who had made few points so far.

On Day 4, the site group leader Kipper came into the discussion to comment on a suggestion about flagging accounts, subtly reminding people that *"…when you encounter inappropriate behaviour… members should flag this"* and the site staff would then follow up. This reminder of the regulations of the site in the leader's comment addressed not only the issue of spam, but also, indirectly, the issue of the inappropriate verbal comments that had been made between members. Barbara, the discussion leader, thanked the site leader for the

information, but also apparently could not resist making a further aggressive comment to Bacon. Her action, however, resulted in a call for censure by member, Justine, who said, "*Barbara, that last comment was rude, immature and uncalled for.*" Barbara replied defensively, saying that she had also suffered from rudeness against her. A range of positive and neutral comments followed and, apart from a somewhat churlishly aggressive emoticon from Bacon, the remainder of Day 4, followed by Days 5-8, witnessed no further aggressive comment by members. On Day 5, site leader Kipper came in again to provide further useful information on the issue of spam. Bacon welcomed this with a positive comment. No further exchanges followed, with the final positive post being made on Day 8, by Sheila, a new member to the discussion, who welcomed T-Rex's insights, saying, "…*wise words, my friend.*"

Overall, this third case study provided an example of a "leadership rescue," in which a relatively ineffective balance of visibility and invisibility of leadership was achieved after some initial serious aggression, including from the discussion leader. Low levels of information and social support were provided by the discussion leader, who resorted to name calling even when supported in her discussion by one of the main site leaders. A high level of critical feedback and a large number of highly aggressive comments were relatively uncontained during the early part of the discussion. Following the emergence of highly aggressive comments, interventions by Kipper, one of the main site leaders, restored the balance of visibility of leadership on Days 4-5, following which the group settled down and the aggressive interactions stopped. The sudden change to more positive group behavior towards the end of the discussion also may suggest that some behind-the-scenes work was being done by the site leaders to warn members not to engage in aggressive and impolite exchanges. The latter is speculation, however, since there was no direct evidence of this within the on-line conversation except the silences from and changed attitudes by some members.

The pattern of the interactive thread between on-line community members taking part in Case Study 3 is illustrated in Figures 5 and 6. These figures indicate leader and member posts
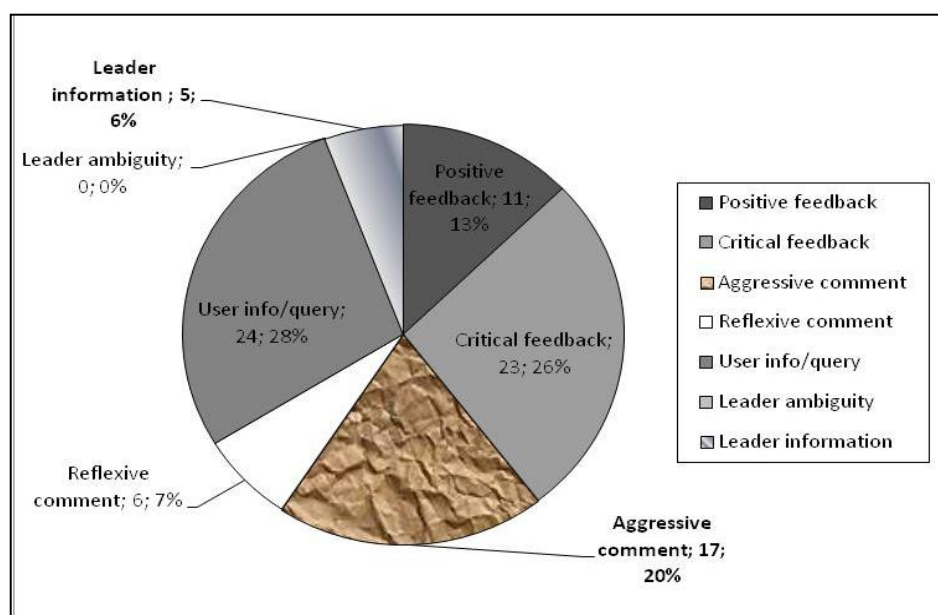
Figure 5. Chart demonstrating the nature of posts in Case Study 3: Spammers Discussion.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 8
UIQ 32					
PSC 31					
CC 30					
AR 29					
AR 28					
CC 27					
UIQ 26					
PSC 25					
CC 24					
AR 23					
AR 22					
CC 21					
RC 20					
CC 19	UIQ 51				
UIQ 18	AR 50				
RC 17	PSC 49				
CC 16	CC 48		CC 78		
RC 15	AR 47		UIQ 77		
CC 14	AR 46		UIQ 76		
CC 13	CC 45		AR 75		
CC 12	UIQ 44		CC 74		
UIQ 11	PSC 43	PSC 62	UIQ 73		
UIQ 10	CC 42	PSC 61	UIQ 72		
CC 9	CC 41	UIQ 60	PSC 71		
CC 8	PSC 40	UIQ 59	CC 70		
UIQ 7	AR 39	CC 58	UIQ 69	PSC 85	
UIQ 6	AR 38	AR 57	CC 68	LINF 84	
UIQ 5	AR 37	CC 56	AR 67	LINF 83	
UIQ 4	AR 36	UIQ 55	PSC 66	UIQ 82	
CC 3	AR 35	RC 54	LINF 65	RC 81	
UIQ 2	AR 34	RC 53	LINF 64	CC 80	
LINF 1	AR 33	UIQ 52	UIQ 63	UIQ 79	PSC 86

KEY

Leader info (LINF)
Leader inscrutability (LINSC)
Positive/supportive comment (PSC)
User info/query (UIQ)
Critical comment (CC)
Aggressive response (AR)
Reflective comment (RC)

Figure 6. Graph of Case Study 3 Spammers Discussion, demonstrating the pattern of posts.
Note: The letters represent the key and the numbers provide the post number. The leader posts are outlined.

over the period of the discussion, with the first 5 days being the most active in members posting, though the discussion remained open for 8 days. From the chart and graph displaying the pattern of posts, it can be seen there was an acutely high level of aggression (20% of posts) as well as critical feedback (26% of posts), most likely as a result of the very poor way in which the discussion leader handled her responses to criticism, and strongly aggressive postings by some members of the group. A high level of user information/query (28%) and only a moderate level of positive feedback (13%) combined with smallish amount of neutral leadership information (6%), made this the most difficult on-line interactive discussion overall of the three case studies.

The strident presence of the main discussion leader in critical and hostile postings and her descent into aggressive language meant that leadership was too intrusively visible, in unhelpful ways. The rescue by the main site leader appeared to be welcomed with relief, and the group discussion faded entirely on Days 6-8. Overall, this third case study provided an example of unbalanced levels of visibility and invisibility and ineffective, belligerent

leadership on the part of the discussion leader. The intervention by the site leader rescued the situation, but could not restore the hurt feelings of some members of the group, as evidenced by the nature of the comments made by participants.

DISCUSSION

The term *distributed leadership* implies that leadership tasks and responsibilities are dispersed between and among different levels of a hierarchy. A commonsense view of distributed leadership might suggest that such dispersal would be widely enacted across the organization. However, there is no single, agreed definition of how the model of distributed leadership should be enacted, since the idea of distribution is currently more discussed than practiced. The ostensible distribution of decision making could also be envisaged, cynically, as a fairly empty rhetorical promise to involve a relatively disempowered network of service user participants in public service delivery. Such a device enables a site government to tick various rhetorical boxes about collaboration and partnership, since a distributed network of client users who, on the face of it, shares in leadership decisions can provide a useful "cultural complement to the formalised structural 'joining up' of hitherto separate organisations" of governance (Hartley, 2007, p. 207).

The mere reference to distribution in itself does not mean that people will necessarily work together equally to share in the knowledge, power, and authority of the executive leaders or site government. Distributed leadership can be facilitated by managers who are, de facto, completely in control of positional hierarchies: Some forms of seeming distribution may be relatively artificial, having been set up and controlled behind the scenes by positional managers operating in more or less autocratic ways. Furthermore, situations can exist in which people to whom tasks are distributed do not fully work together, but report individually on particular responsibilities. If discretionary tasks are distributed without authority and power, "followers" may resent tokenistic dispersals of leadership duties. In addition, as Hartley has observed (2007, p. 210) "the research evidence which informs distributed leadership is not yet well founded." When well-effected using consensual operational methods, however, distributed leadership does seem to exist in on-line communities in such a way as to facilitate genuine delegation of leadership tasks with concomitant levels of authority, power and responsibility. This is best achieved when senior leaders honestly communicate the real extent of distribution and engage themselves collaboratively as community-focused members as well as team leaders in on-line networks.

Effective collaboration in leadership has been conceptualized as distributed–coordinated team leadership that operates ideally for superior team performance, though this is less effective in distributed–fragmented situations (Jameson et al., 2006; Mehra, Smith, Dixon, & Robertson, 2006). The benefits of collaborative advantage can, however, accrue from an effectively managed culture of genuinely empowered leadership distribution, for example, by inviting specific individuals to lead specialist work on key tasks. Furthermore, the very process of on-line task distribution, if undertaken in an authentic way and enabled for members, tends to transform communities and project teams into more inclusive groups through synergistic, dynamic processes of active engagement in leadership's vision and values. Informal practitioner leaders can also be empowered with the knowledge, authority, and goal-directed

problem-solving skills that continue to be required for managing provision in education. Distributed leadership, if achieved effectively, can change an entire organization by enabling everyone to be seen as a leader of a particular domain of work, achieving collaborative advantage when the synergy of group working on leadership is affected.

This analysis of these three case studies found that both high visibility and high invisibility on the part of leaders in an on-line community site were needed to ensure that effective and proactive social exchanges took place. Three randomly selected discussion group conversations lasting several days each and involving a range of members were analyzed for the presence and absence of leaders within a distributed leadership model. The analysis found that leadership was in some instances distributed relatively effectively across the site, between several host group members and subleaders of discussion groups. Findings also indicated that leadership was stronger in achieving positive results if site leaders with positional authority demonstrated a high degree of relational intelligence and operated visibly to announce information messages and responses that subtly but firmly addressed problems with members' interaction. On-line environments particularly need straightforward, unambiguous, and flexible communications regarding information and appropriate forms of interaction.

When leaders are more absent (as in Case 2) or themselves engaged in criticism of other members (as in Case 3), a likelihood increases that not only would more aggressive responses be posted by members, but that such aggression would degenerate quickly into increasingly hostile situations. One group member compared this belligerent interaction between members with the behavior of "kids in a playground." Several members indicated that aggressive interactions, including name-calling and insults, routinely occurred. However, when effective positional site leaders were around, such leaders either directly or indirectly stopped the name-calling that otherwise emerged within the discussion threads.

High leader visibility was therefore found to be beneficial in this social networking site, not only for content information purposes, but also to promote relational intelligence for social purposes. It seemed that when effective leaders had been involved in group discussions, aggression between members diminished and that the tone of comments and supportive wording suggested members felt safer and happier in group interactions. Many members expressed appreciation for leaders' information and efforts. There was little evidence of any critical attitude towards site leaders, with the exception of the inscrutable emoticons posted by one subgroup leader. The moderating effect of leader visibility, when accompanied by relational intelligence, therefore seemed to be welcomed and their presence in discussions appeared to have strongly beneficial results in these case studies. Leader responses were polite, informative, clearly expressed, and full enough to provide information, but not too long. Leaders signed off all posts with a polite salutation such as *sincerely*, their name and the title of their official role in the site.

However, it was clear from the nature of the discussions in the on-line community that the groups involved also benefited, from time to time, from site leaders being absent—or highly invisible—so that members could pursue discussions without a sense of constantly being "watched." The fact that two of the case studies had discussion leaders who were ordinary group members able to open up a new discussion could be seen as a positive aspect of this on-line community. Enabling ordinary members to lead discussions encourages them to assume real ownership of key debates. The distribution of leadership was therefore effected through site leader invisibility at the times that such discussions emerged. In order to achieve the high degree of participation and involvement that this site routinely attracts, such occasional low visibility

from site leaders seems to be a necessity. An effective balance between leadership visibility and leadership invisibility occurred in Case Study 1, as the leader was present in appropriate ways, but then stepped back to enable the group to discuss the announcement of the new initiative.

In Case Studies 2 and 3, this balance was much less effective, as insufficient levels of capable leadership visibility were achieved. In Case Study 2, the group discussion leader neglected to cultivate relational intelligence between members. Thus the discussion degenerated to a significant level of unhelpful critical comments (28%) and aggressive behavior (4%); the leader information levels also were relatively low (4%), as well as being focused only on the content of the discussion itself and not on the nature of the interaction. In Case Study 3, an example of a highly aggressive series of interactions, the lack of leadership information and presence in Days 1-3 was particularly problematic, when nearly half of the exchanges involved a critical comment or antagonistic behavior. In response to what had begun to develop into a dilemma for the group, the leadership presence of Kipper on Days 4-5 mitigated the growing spirals of aggression. An effective series of information and interactions by Kipper, a helpful positional leader, resulted in a greatly improved situation, with the overall leadership involvement (6%) reaching a relatively healthy balance by the end of the debate on Day 8. However, some damage from the earlier, extremely negative series of aggressive interactions did have a lingering effect, as some members were still clearly upset by this by the end of the debate, as demonstrated by their comments, for example in the note by Justine that *"Barbara, that last comment was rude, immature and uncalled for."*

This analysis underscores that an effective model of distributed leadership enables all members to be involved in on-line community leadership through achieving a balance between the visibility and invisibility of leadership presence in community discussions. Conscious adoption of distributed–coordinated team leadership models for on-line community interaction arguably develops trust and enables genuine dialogue between team members at all levels. This can assist leaders in knowing when and how to engage high visibility and when to subtly step into the background while team activities and decision-making processes are underway.

It is recommended that leaders of on-line community discussions demonstrate both high visibility and discretion in terms of the mission, purposes, and control of the group operations. However, they also must demonstrate an ability to step back from time to time and enable others, especially group members, to assume some degree of involvement and responsibility for group discussions. Clear demonstration of relational intelligence, sensitivity, and informal, friendly responsiveness to group posts are important requirements in leadership that foster trust among members. Leaders also need to be clear, unambiguous, and supportive in their salutations and expressions of information to members: The group benefits if the leadership quickly picks up on emerging issues that can cause aggressive responses. Such negativity can be most effectively handled by using a consistently sensitive, friendly, and informal approach at appropriate times that subtly and indirectly tackles the question of appropriate behavior, which decreases intergroup upset and fosters beneficial group interactions.

CONCLUSIONS

This paper proposed that distributed leadership is an effective model of operation for the leadership of on-line communities. A tailored local combination of distributed leadership

responses should be applied to potential dilemmas, such as the emergence of aggression within on-line community groups. A visibility–invisibility paradox of distributed leadership that had been hypothesized in a prior research project involving an on-line community was tested through the analysis of conversational interaction within three randomly selected discussion groups. The analysis found that both high visibility and high invisibility, as the occasions demand, are required of leaders. Conscious adoption of distributed–coordinated team leadership arguably develops trust and enables genuine dialogue between and among team members at all levels of an on-line community. Effective leaders need to demonstrate relational intelligence, sensitivity, and awareness of when and how to engage with high visibility and when to subtly step back while member activities and decision-making processes are underway. Further research needs to investigate appropriate methods for the operation of distributed leadership in on-line communities.

ENDNOTES

1. Quotation from Luke from the on-line King James Bible, retrieved 11 April 2011: http://www.kingjamesbibleonline.org/Luke-17-33/
2. The Joint Information Systems Committee (JISC) is an organization funded by the Higher Education Funding Council for England, which is set up to promote and fund e-learning development work in UK higher and further education
3. This summative report was privately commissioned in 2007 from the Association for Learning Technology, and thus is unlikely to be found through a public search. However, other reports from the JISC e-learning projects are available at http://www.jisc.ac.uk/whatwedo/programmes/elearning_pedagogy/elp_elidacamel
4. These types of e-mail lists frequently do not collect significant demographic data on their participants. Therefore, it is difficult to quantify the sample in regard to aspects such as gender, age, or profession. I recognize this as a limitation to the study.
5. All names used for participants in the case studies have been changed to pseudonyms.
6. All quotations from the social networking site are reproduced verbatim, including spelling mistakes and incorrect punctuation.

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Abstract: *This paper aims to identify, discuss and analyze students' collaboration factors related to distributed leadership (DL), which correlates with interaction quality evident in idea generation. Scripting computer-supported collaborative e-learning (CSCeL) activities based on DL can scaffold students' interactions that support collaboration and promote idea generation. Furthermore, the associated tools can facilitate collaboration via scripting and shed light on students' interactions and dialogical sequences. Such detailed planning can result in effective short e-courses. In this case study, 21 MSc students' teams worked on a DL project within a 2-day e-course at the IT Institute (ITIN), France. The research methods involved a self-reported questionnaire; the Non-Negative Matrix Factorization (NNMF) algorithm with qualitative analysis; and outcomes from the Social Network Analysis (SNA) tools implemented within the forums. The results indicated that scripting DL based on the identified distributed leadership attributes can support values such as collaboration and can be useful in supporting idea generation in short e-courses.*

Keywords: *distributed leadership, e-Collaboration, CSCeL, idea generation, scripts, CSCeL tools.*

INTRODUCTION

Education as a discipline was initially anchored in cognitive psychology and pedagogy, and only recently have educators and researchers considered the sociocultural aspects of learning through the use of tools. Nowadays, the Internet and e-learning platforms support the collaborative

dimensions of working and learning in groups and can be implemented in short e-courses. The quality of such collaboration is essential in order to achieve group common goals based on the naturally developed or intentionally designed group roles. One of these roles is leadership. Chemers (1997) suggests that leadership is the process of social influence in which one person can enlist the aid and support of others in the accomplishment of a common task. However, in today's globalized world, the concept of just one person leading a group does not seem to apply. For this reason, new approaches such as top-down and bottom-up leadership within interactive groups (distributed leadership, DL) seem to provide the frameworks to understand, analyze, and enhance groups' enterprises.

This paper aims to identify, discuss, and analyze the DL factors that support group effectiveness in a global environment. It presents a single case study as part of a series of workshops and e-courses specifically developed for the IT Institute (ITIN) at Cergy University, Paris, France. ITIN's mission is excellence in preparing technical engineers to be project managers capable of working efficiently within intercultural teams. Therefore, ITIN's main role is to help employees (i.e., students learning within apprenticeships) in companies that belong to the Chamber of Commerce and Industry of Versailles, France. The students need to develop their knowledge in various practical areas, as well as develop their knowledge about their knowledge (metacognition; Morin, 2000). The curriculum is aimed at helping the student professionals achieve specific credentials for their working environment. Thus for the IT students in ITIN, the knowledge acquisition and building of students' individual expertise and skills can lead them to becoming CEOs or members of an organization's board of directors.

In observing economic globalization (Friedman, 2007; Stiglitz, 2007) and information systems globalization (Raivola, Kekkonen, Tulkki, & Lyytinen, 2001), it is vital to prepare the students to become actors in international value chains and intercultural team projects. For this reason, the e-courses at ITIN are oriented towards developing the "soft skills" that students need in the global labor marketplace. Such skills also are essential in distributed leadership (DL). Human factors such as global collaboration and team leadership are the 21st century skills required to effectively work in both environments.

The acquisition of knowledge and its relation to students' competencies has been suggested as the major change in education in the 21st century (Wenger, 2010). For this reason, we explore briefly the progression in educational practices, and in collaborative learning in particular, so that this need is made explicit.

The paper is developed as follows: The first section addresses the pedagogical approach, such as the importance of the sociocultural perspective in computer-supported collaborative eLearning (CSCeL) and DL. The next section is dedicated to the tools used to promote CSCeL and DL within the course being studied. This is followed by a presentation on scripting within the e-learning design. We then discuss the methods, data collection, and analysis used in this case study, which is then followed by the results and discussion. We end with conclusions and suggestions for future research.

The Sociocultural Perspective

From the last century up to the present day, a series of pedagogical epistemological paradigms have emerged (Kuhn, 1962). During the modern transition, a behaviorist approach

based on both the positivist philosophy (Comte, 1830–1843) and the Darwinian theory came to the fore. The learning process was seen as a cognitive reflex in response to specific stimuli. The more recent cognitive approach (Piaget, 1988) reflects, in essence, rationalism (Boudon, 1995), by addressing an individual's choices as rational and able to be reduced to reason. Here, the predominant paradigm was ontological: It was believed that knowledge is something that exists in oneself and can be taught and transmitted to others.

The constructivist approach (Lemoigne, 2003) followed, with the perception that knowledge is man-made, that is, constructed. Therefore, this knowledge can be developed and nourished by personal experience and the learner himself or herself. For constructivists, the actual "acting out" allows for experimentation and, as a result, acquisition of knowledge (Berger & Luckmann, 1966; Jonassen, Davison, Collins, Campbell, & Bannan Haag, 1995). The complementary idea that man learns as a result of social interaction led to the socioconstructivist approach (Jonnaert, 2002; Vygotsky, 1978).

Collaborative activities and learning in groups appears to be the new trend in 21st-century education, due in part to the capabilities that social media tools provide. However, collaborative activities and group learning are not new ideas. Johnson and Johnson (1987) provide an overview of the historical perspectives on cooperative learning within the past 400 years. For example, in the early- to mid-1600s, Comenius believed that students benefit from both formal teaching and being taught by other students. In the late 1700s, Lancaster and Bell made extensive use of cooperative learning groups in England, while Colonel Francis Parker used cooperative learning procedures in public schools in Quincy, Massachusetts, in the US. Cooperative learning appeared in the work of Rousseau and Pestalozzi in the 18th and 19th centuries, respectively, while in the 1930s, John Dewey promoted the use of cooperative learning groups as part of his project method. Peer interaction also was central to Vygotsky's sociocultural learning. In 1940s, Deutch proposed a theory of cooperative and competitive situations. Other researchers note that scholarly discussion during the 1990s often suggested that Piagetian constructivism did not take interpersonal relations into account (Crook, 1994; Mercer, 1995). However, Piaget himself suggested that "cooperation … eliminates the process … of egocentric thought" (1995, p. 208), since cooperation is defined as "all relations between among more equal, or believed to be equal, individuals, that is to say, all social relations in which no element of authority or prestige is involved" (p. 200). Bruner (1986, p. 127) admitted, "I have come increasingly to recognize that most learning in most settings is a communal activity, a sharing of culture."

The recent sociocultural interest in education has arisen from the ideas of Soviet scholars—Vygotsky, Luria, and Leontief—who established learning as primarily socially and culturally achieved rather than an individual process. The internalization and externalization processes (Vygotsky, 1978) were proposed as continual dual dialectic processes whereby humans construct both themselves and their culture primarily through language. Therefore, both people and culture are constantly changing over time (Jarvis, 1992).

Despite the interplay of internalization and externalization, ultimately the individual's cognitive processing depends on his/her own cognitive processing and whether the collaboration context favors it. This also means that both ontological and constructivist approaches are of equal importance and need to be supported in the learning design via activity descriptions.

Nowadays computers and the Internet are integrated into education as never before. Educational organizations are forced to support a new wave of networking and collaboration

directed by Web 2.0 applications, which fused the borders between the classroom environment, the workplace and home. According to Clark and Mayer (2007), the use of technologies in the classrooms is increasing and converging, as blended learning replaces traditional classroom teaching. In both modes, student engagement is central to learning; the lack of it, also known as disengagement or alienation, has been a particular research interest (Carini, Kuh, & Klein, 2006). Students' engagement is evident in the appearance of excitement, enthusiasm, and commitment to their studies as hard work and investment in learning. As a result, student engagement is encouraged in national educational policies.

Newmann (1992) defined engagement as the student's psychological investment in an effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote. Fredricks, Blumenfeld, and Paris (2004) suggested three types of engagement that can be used here as evidence of collaboration: (a) behavioral engagement, (b) emotional engagement, and (c) cognitive engagement. One of the most promising approaches to deal with the engagement and collaboration requirements in this educational context and the increasing demands for 'Net- and Web-based education is computer-supported collaborative e-learning (CSCeL). This approach, used in DL, will be discussed next.

Distributed Leadership

DL is the process of top-down and bottom-up social influence among the members of a group, community, or even nation in order to create and achieve something that none of the members could do alone. It has become popular due to the action and influence of people at all levels of hierarchy (Bolden, 2008). Due to the creative nature of group achievement, DL has been reported to enhance co-creativity and innovation (Agbor, 2007; Ancona & Bresman, 2007). In their interpretive review of the DL literature, Bennett, Wise, Woods, and Harvey (2003) referred to DL as "an emergent property of a group or network of interacting individuals. This contrasts with leadership as a phenomenon which arises from the individual" (p. 7). Other than introducing the open network in leadership and the major roles of groups and communities, those authors also suggested that varieties of expertise are distributed across the many, not the few. The variable features identified in this literature review are: control and autonomy; the organizational structure; the sociocultural context; and the source of change. Such a bottom-up approach is informal leadership, based on the dynamics of teamwork and conflict resolution; these are spontaneous forms of leadership and team collaboration. In this way, more opportunities are developed for the group and community, and the members' skills are enhanced. Therefore, co-creativity and innovation as applied creativity can be enhanced via learning DL by doing DL (Silva, Gimbert, & Nolan, 2000), in other words, as learning in practice.

In the e-course used within our study, DL was considered twofold: within international teams of students and in DL as participatory decision making. The first was related to the associated and appropriate e-learning course design and the second in the provision of appropriate instructions and tools to enhance interpersonal trust, empathy, and collaboration towards co-creativity for new ideas generation. In DL in particular, collaboration skills are extremely important for developing initial trust and empathy between and among team members; encouraging collaboration; sharing information and experiences; observing others' activities as ways of learning and working; and, lastly, enhancing idea generation based on information provision, emulation and argumentation, and idea generation.

The sense of presence has also been considered important for communication, team coordination, and collaboration. There is a need to "see thyself and others" in order for the group to react, act, and anticipate appropriately. Short, Williams, and Christies (1976), working on studies about discussions on the phone, defined social presence as the "degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions" (p. 65). They also referred to the concepts of immediacy as the psychological distance (see also Weiner & Mehrabian, 1968) and intimacy as the interpretation degree of interpersonal interactions (see also Argyle & Dean, 1965). Later, social presence was defined as the degree by which a person was perceived as real in an on-line conversation (Meyer, 2002, p. 59). For this reason and to facilitate empathy, the construction of students' profiles was obligatory (Lambropoulos, 2009). Also new tools aimed at enhancing social presence and copresence in CSCeL were used with the intention of raising the students' involvement in the course, thereby increasing their engagement and participation and, ultimately, their collaboration in CSCeL.

COMPUTER SUPPORTED COLLABORATIVE E-LEARNING (CSCeL)

Based on the literature presented earlier, it appears that collaboration is a very important and required cognitive and motivational force in fostering learning. Two terms have been used interchangeably in the collaborative learning history: cooperation and collaboration. *Cooperation* is the basis for sociability: "acting together, in a coordinated way at work, or in social relationships, in the pursuit of shared goals, the enjoinment of the joint activity, or simply furthering the relationship" (Argyle, 1991, p. 15). *Collaboration*, on the other hand, "is a principle-based process of working together that produces trust, integrity and break-through results by building true consensus, ownership and alignment" (Marshall, 1995, p. 15). Schrage (1990, p. 40) defines collaboration as "the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding." In order to facilitate research and analysis, Teasley and Roschelle (1993) proposed a distinction between cooperation and collaboration:

> Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem…. Cooperative work is accomplished by the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving. (p. 235)

Lambropoulos and Culwin (2010a) provided their definitions based on learners' skills. Cooperation is related to the process of joint activity. Two or more individuals bring complementary skills and knowledge to a task. Each contributes his/her particular skill to the common purpose. Accordingly, an individual can depart once his/her contribution has been made. Collaboration, however, is related to the process of joint creation. Two or more individuals bring overlapping skills and knowledge to a task. Ideally each contributes equitably, if not equally, to the common purpose. Accordingly, an individual remains engaged until the task has been completed. The confused understanding of the distinction between these two terms extends beyond the literature to the participants themselves. An individual may both cooperate and collaborate in a task, and yet be unaware of his/her contributions.

UNESCO also provided a definition. Collaborative learning occurs

> when learners work in groups on the same task simultaneously, thinking together over demands and tackling complexities. Collaboration is here seen as the act of shared creation and/or discovery. Within the context of electronic communication, collaborative learning can take place without members being physically in the same location. (n.d., third defined term)

UNESCO's definition also supports the context of electronic communication breaking the borders of physical locations, thus providing definitions for both on-site and on-line collaborative learning. The electronic shared space, such as groupware, becomes a frame of reference for the collaboration and provides an environment in which collaboration can occur (Lehtinen, Hakkarainen, Lipponen, Rahikainen, & Muukonen, 1999). The description of such environment is described next.

Computer Supported Collaborative eLearning (CSCeL) Research

According to Dillenbourg, Baker, Blaye, and O'Malley (1996), as well as Fischer and Mandl (2005), the computer-supported collaborative learning (CSCL) has been studied to exhaustion in research in which the individual is the focus. However, limited studies focus on the ways teams function and the interrelated factors that affect knowledge convergence. The transition of the research focus from the individual to group and community learning was evident in the influential review conducted by Dillenbourg and colleagues (1996). They suggested that the development of an understanding of collaborative learning began with the learner as an individual and moved to group learning in a more sociocultural mode. During the 1970s and early '80s, research concentrated on the individual's learning processes. The context of their interaction with others was seen as a backdrop rather than a research topic in its own right. When the group became the unit of analysis, the focus shifted to the social construction of knowledge; however, this was still based on the study of individuals. In terms of empirical research, the focus was on comparative processes to establish whether and under what circumstances collaborative learning was more effective than individual learning.

Because CSCL and e-learning environments (CSCeL), in particular, are inherently complex, it was almost impossible to establish causal links between the conditions and the effects of collaboration. Therefore, Dillenbourg and colleagues (1996) indicated the need for new tools and methods for observing and analyzing interactions to increase understanding of the collaborative learning social mode. Dillenbourg (2000) also stressed the social aspect of learning as a designed information space where learners are actors, that is, they co-construct the information space and their learning context. In other words, collaboration among peers needs to be designed and shaped based on the CSCeL environment (Dillenbourg, Järvelä, & Fischer, 2009). CSCeL tools provide collaborative settings aiming at fostering conceptual advancement and facilitating learning. Such tools would shed light onto these processes and support CSCeL activities.

CSCeL Technologies

Designing e-learning tools to support CSCeL has methodological advantages. The variety of CSCeL tools (Hoadley, 1998) allows explicit control of the learning process and supports a

variety of interactions that scaffold the learning process. For example, there are tools to aid coordination, such as project management, and tracking and scheduling software. There are also tools to aid communication, such as e-mail, bulletin boards, teleconferencing, and real-time messaging systems. Other tools support educational content, such as tools for learning objects. And lastly tools can enhance cognitive processes, such as tools based on argumentation models.

We present briefly now three CSCeL tools examples that are widely used by the CSCeL community and also are connected to dialogical sequences that are the focus of this study: SpeakEasy, Belvedere, and MessageForum. SpeakEasy (Hoadley, Hsi, & Berman, 1995) has two intended effects on the user: (a) to allow the user to internalize and learn from the knowledge held by other members of the discussion community, and (b) to augment the community's knowledge (i.e., construct new knowledge) by synthesizing new ideas. Hoadley et al. found that students participated more often and more equitably in SpeakEasy than in off-line discussions. Moreover, their conceptions advanced as a result of these discussions.

Belvedere (Suthers, 1998) facilitates and supports constructing and reflecting on diagrams of one's ideas. It prompts students' cognitive activity by giving them a graphical language to express the steps of hypothesizing, data gathering, and weighing of information supporting collaborative learning through the ability to share diagrams. Suthers (1998) found that Belvedere proved to be helpful for higher order social interaction and, subsequently, for better learning in terms of deep understanding.

MessageForum (Jeong, 2005) supports on-line dialogical argumentation. One tool within MessageForum is ForumManager, an Excel application for downloading and analyzing text messages (which Jeong conducted in Blackboard-threaded discussion forums using the Internet Explorer browser). Jeong (2005) found that the visibility of the structure helped learners' reflection: More replies elaborated previous ideas, users showed greater gains in knowledge acquisition fewer unsupported claims, and greater knowledge of argumentation processes.

When building tools to support educational activities, the educational task needs to be connected with the tool's functionality. In other words, the direct fit between educational task and the method chosen to pursue it is essential (Lambropoulos & Culwin, 2010b). Anchored in Järvenoja and Järvelä (2009), this means that tools need to support learners' socially constructed self-regulation and enhance their socially shared regulation strategies. For our study, three such tools, drawing on the research provided by Hoadley et al. (1995), Suthers (1998), and Jeong (2005), were built and are now hosted on Moodle.[1] Thus, in order to support DL factors for collaboration and idea generation towards group accomplishments, the forums were enhanced with tools based on co-creativity. One approach we developed was called Hybrid Synergy, which is a five-level non-linear collaborative creativity analytical framework for analysis and a high order cognitive model that facilitates and enhances e-learners' metacognitive awareness. The designed tool based on this approach, modeled specifically for the Moodle environment, was the HySynTag, (Lambropoulos & Kampylis, 2009). The other two tools were the Participation Avatars (Lambropoulos, 2009; Lambropoulos & Culwin, 2009, 2010b), and the Visualisation Interaction Tool (Lambropoulos, Kampylis, & Bakharia, 2009).

The HySynTag tool (Figure 1, left) allows discussion participants to attach to their posts qualitative metadata based on a specific cognitive model, and thus get an overview of their cognitive levels on an individual and group basis. This visualization can occur on three levels: the actual unfolded discussion, the posts, and the overall view of the discussion (threaded view in Moodle). More specifically, participants have the opportunity to tag their

posts in accord with various Hybrid Synergy high order thinking levels: social, inform, explore, idea, evaluate, and summarize. When none of six levels of Hybrid Synergy seems to cover their argumentation, users can tag their post "other."

Users have the option to tag their posts or not, although they were encouraged to do so throughout the course. The tool, placed below the Reply button, can also aid metacognition because the tags can be inserted when replying, or after finishing the posting message. The overall view of the thinking levels via the tags in one discussion on both individual and group basis can enhance the spiral and nonlinear creativity mobility, allowing the "Aha!" experience to occur. The HySynTag tool also provides a twofold real-time thematic analysis that encourages the students to build upon their arguments. An added benefit is that researchers can analyze the messages in real time.

In assessing the participants' presence and/or activity within the on-line community, the researchers employed two perspectives. *Null passive participation* is defined as the absence of activity: The on-line participant registers, but takes no further actions whatsoever. *Passive participation* is defined as users visiting and reading posts, but without posting themselves. It is categorized into three levels—low, medium, and high—as defined by the number of days when at least one visit is made, with respect to the length of the course. Low passive participation is where the average number of days is one fourth or less of the duration of the course. High passive participation is more than three fourths of the duration, and medium passive participation is between these two categories.

Measuring passive participation is a challenge because the users do not click on items and so the interface does not recognize or log any action. Therefore, we assessed passive participation based on registration days rather than the actual activity recorded in the logs, as would occur in active participation. We then created a second tool to provide an assessment of activity, that of *on-line active participation*, which is defined as the presence of activity: The participant registers, reads, and posts. The tool employed in our study course involves graphical representations of levels of active participation, known as avatars (Figure 1, center). The avatars are initially grey and change color depending on the level of participation (bottom, top and head). The avatars appear on the left side of the interface and provide the most recent activity by members of the community. Active participation is categorized into three levels—low, medium, and high—defined through a comparison with the most actively posting e-learner. Low active participation
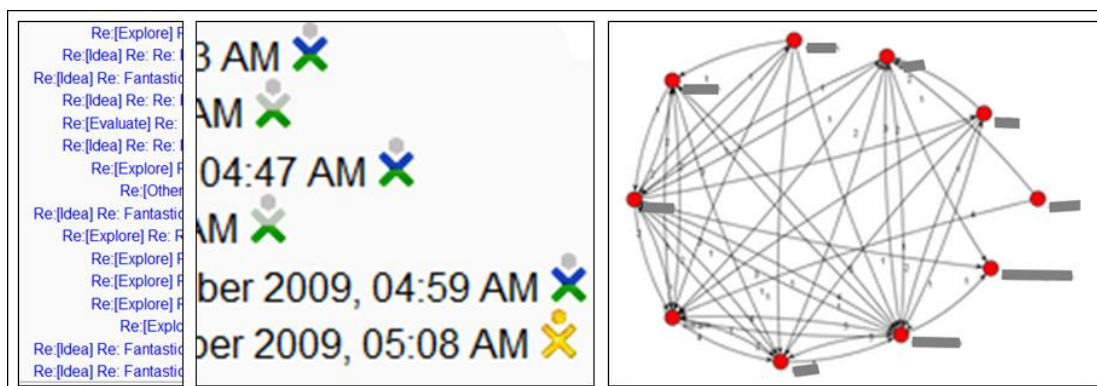
Figure 1. Outputs of the collaboration tools, left to right: HySynTag, avatars & visualization interaction tools.

is where the average number of posts is one fourth or less of the total posts from the most active e-learner. High active participation is more than three fourths of the posts, and medium active participation is between these two categories.

The third embedded tool uses social network analysis (SNA) (Figure 1, right) to visualize communication and relationships between and among people and/or groups. It uses diagrams to depict social relationships between a set of actors (Baroudi, Olson, & Ives, 1986). The diagrams consist of nodes (the actors of study) and their relations (the strands between actors). The patterns produce subgraphs that describe the degree of centrality or isolation of each actor within one particular forum. When researchers examine descriptive SNA during data analysis, it refers to structural and positional analysis of the actors.

The lagging nature of the process, however, makes it suitable only for post-hoc analysis. In order for the information contained to be useful to an e-learner, it would have to be immediately available to them. This implies that the data would have to be captured and processed automatically if it were to be used for moderating or self-organization purposes. An SNA real-time tool can support a learner's social awareness and depict an actor's locality within the group, making visible the participant to him/herself and others almost immediately.

Bakharia (2008) discovered a process for acquiring data from discussions forums in nearly real-time. She used GreaseMonkey, a Mozilla Firefox add-on that allows users to install scripts, that is, to inject client-side JavaScript code. This process extracts forum post–reply data and exports the social relationships data in a format that allows the SNA desktop application NetDraw to produce visualization graphs. The visualization of the Social Network tool was further developed by Bakharia and Dawson (2011).

These three tools were used in the course to enhance the e-learners' co-creativity based on the DL values of quality interaction and collaboration by increasing awareness of others' intentions and actions. It needs to be noted that the group work represented 30% of the students' assessed grade in this particular course. In addition to the tools, the course was specifically built to support DL based on the following learning design.

BENDING TIME IN E-LEARNING: SCRIPTING IDEA GENERATION IN DL

Other than meeting the ITIN curriculum objectives by a careful learning design, the e-course that served as the case for this study needed to be flexible enough to enhance students' individual DL skills. This goal becomes feasible by embracing students' shared meanings and team-determined plans by creating their own space and background of interaction. Therefore, a detailed e-learning plan was developed, anchored in both initial organizational activities and learning activities, and based on pedagogical design and the use of associated tools. In order to ensure idea generation, the learning approach was anchored in (a) both individualistic and collaborative learning, and (b) the multidimensional role of the e-tutor as moderator and orchestrator of activities, as well as being a model him/herself to the e-learners (Bandura, 1977). This process suits the relatively new use of scripts in the CSCL literature. In their literature review, Dillenbourg and Tchounikine (2007) found that the term *script* has been used previously in cognitive psychology and refers to the mental representation of procedures we use in everyday situations, such as entering a restaurant, and has also been used for describing methods that structure face-to-face collaborative

learning. Thus, in regard to pedagogy, a script is the predescription of the learning activities for the learning context organization and knowledge convergence (Dillenbourg et al., 2009).

In CSCeL's aim to support learning design by structuring it, collaboration scripts provide one of the most important design elements. A script describes the manner in which students have to collaborate, through task distribution or roles, turn-taking rules, work phases, deliverables, and so forth (Dillenbourg & Jermann, 2007). According to Kollar, Fischer, and Hesse (2006), collaboration scripts consist of at least five components: learning objectives, types of learning activities, sequencing, role distribution, and types of representations. Moreover, collaboration scripts are sequences of phases, each characterized by the following five attributes: type of task to be accomplished, group formation (and composition), distribution of the task within and among groups, type and mode of interaction (e.g., co-located vs. remote, synchronous vs. asynchronous, text-based vs. voice-based, etc.), and the timing of the phase.

There are two types of scripts, micro and macro:

- *Microscripts* are dialogue models, mostly argumentation models, which are embedded in the environment and which students are expected to adopt and progressively internalize (Dillenbourg & Hong, 2008). We used the Hybrid Synergy model as implemented in the HySynTag (see the Appendix). Finer grained scripts follow a more psychological approach on an individual level (Dillenbourg & Tchounikine, 2007).
- *Macroscripts* are pedagogical models, that is, they model a sequence of activities to be performed by groups. For instance, argumentation can be triggered by collecting students' opinions and pairing students with conflicting opinions (Dillenbourg & Hong, 2008). These scripts aim to increase the quality of interactions that take place among group members, linking the social part of learning with the actual learning (Dillenbourg & Tchounikine, 2007).

In addition, the internal and external script definitions served as the initial proposition for internationalization and externalization of knowledge related to both ontological and constructivist approaches. According to Kollar et al. (2006), the term *external script* refers to the pedagogical scenario that students are asked to play, while the term *internal script* describes the mental representation that students construct of the external script (Dillenbourg & Jermann, 2007). In other words, the external script functions as the course's storyboard and the internal script refers to the students' mental structures that may have existed before the e-course.

The dialogical part of the microscript also is presented in the Appendix. The following sections describe the macroscripts components for the DL e-course: resources, participants, groups and group formation, roles, activities, component distribution, and sequencing.

METHODS

A 2-day course on DL was selected for study. ITIN uses merged learning (on-line and on-site): Typically, the students and the teacher are physically present in the classroom but the in-class experience is based on simultaneously work both on-line and on-site. On some occasions, the teacher works from a remote location although the students are always located in ITIN's fully equipped classrooms. If students are absent from a class, they can visit the on-line environment

and complete at home their assignments, which include in addition to in-class information, the out-of-the class teaching and learning experience.

In this case course, students were present in the ITIN classroom and the tutor was in London, teaching in real time. The communication media were the Moodle tools that provide synchronous and asynchronous interaction (chats, forums, wikis), as well as simultaneous Skype and e-mails.

Participants

The 21 students who form the data for this study are employed full time in various fields and come to ITIN regularly to study towards a master's degree (6 times in one year to complete their MSc). For this reason, the teacher expected these particular students to bring rich working experiences to their exchange, as compared to traditional university students. The students belong to the SIBA (a master's-level degree program on bank and insurance information systems; in French, Systèmes d'Information pour la Banque et l'Assurance) group. SIBA students had studied information technology (IT) for 4 years. By following this option, they earn a double competency on banking and insurance systems, primarily regarding concepts and processes; only 5% of their studies focus on IT. In this e-course, the students were physically within the classroom, although they worked exclusively on-line within the Moodle mediated environment. The course also involved 1 e-tutor (the first author of this paper), 1 technical support person, and 2 ITIN representatives (the ITIN pedagogical coordinator and the third author as the ITIN director). All of the students are native French speakers, although the MSc studies are presented in English.

Dynamic Group Formation and Roles

Based on the number of students ($N = 21$), three groups were formed based on their special interest at the start of the course: the self-named FT1, IMAGES, and Dream-ITIN-Team. Each team elected a leader for the duration of the course. The process of dynamic group formation was employed because it increases flexibility by promoting group evolution that fosters positive interdependence. For this course, we employed role play, which initiated the group forming, but also continued as the framework of the groups' activities throughout the balance of the 2-day course. The students pretended they came from different cities and countries and enacted various roles, as for example, team leader, developer, usability expert, and so on. Throughout the course, the tutor orchestrated activities and intervened in the groups' work only when it was absolutely necessary. The role-play scenario was the same in all groups and it was taken from their real working environment. Each team had to create a vision statement, determine the location of their pretend organization's headquarters, and designate members' roles within that organization. This information was sent to the tutor, who uploaded the information to the learning management system, namely Moodle.

Resources

Several diverse educational resources were used in the course, such as PowerPoint presentations, videos, archives, community discussions, as well as tools related to DL, for example, mind tools and social network analysis. These were provided by the tutor, but the resources also included

materials from previous students in the course, which were used as examples of related work. Additionally, current students were encouraged to submit their own resources. More importantly, the students were required to exchange information and experience within the discussion forums that were provided separately for each group so the team leaders could develop their own discussion topics. This served to aid in the construction of their own group narrative, which provided the background for the elaboration of their ideas based on the DL study materials and taking into consideration the tools actual measurements. The resources were coordinated by their integration within the e-learning activities sequences. In this way, the whole course was designed for the tutor to intervene only if the group narrative was interrupted or changed direction completely. The tutor's redefined and multifaceted role is presented in the next section.

The Role of the E-Tutor

During the post-modern era (Lyotar, 1984), the main preoccupation of pedagogical research was complexity (Morin, 2005), uncertainty, and controllability, with serious limitations for nonphysical problems and the inability to control the learning process (Taleb, 2007). To control such limitations within a CSCL environment, the teacher orchestrates collaborative activities for the students. Orchestration is the process of productively coordinating supportive interventions across multiple learning activities. It covers various forms of student and learning coordination related to (a) activities at different social, contextual, and media levels; (b) scaffolds at different social levels; (c) self-regulation and external regulation, and (d) individual motivation and social processes (Fischer & Dillenbourg, 2006). Thus, while working with the newest learning tools, the e-tutor follows four overlapping stages of pedagogy as an expert in the field of study (Brown, Collins, & Newman, 1989):

1. Modeling (demonstrating expert performances). At the modeling stage, the expert proceeds slowly, commonly separating the task into separate subcomponents and using a simplified version of the task as illustration for the learners.
2. Coaching (expert guidance and help). The coaching stage involves the tutor/aid paradigm: The expert can either act as a tutor and provide direct instruction or can act as an aid and provide hints.
3. Fading (expert assistance is gradually withdrawn). With the gradual withdrawing of expert involvement, learners are encouraged and supported in completing the tasks.
4. Reflecting (students' self-monitoring and reflecting upon past performances). Self-monitoring and reflecting is related to self- and group- regulation of activities, also facilitated by the newest tools and thus, supporting metacognition.

The activities were structured in a detailed way to facilitate the work and learning flow. First, the learning goals were clarified and articulated, meaning after the completion of this particular course, the ITIN e-students would be able to

1. Work within DL principles
2. Create international teams with a competitive edge
3. Successfully lead global virtual teams
4. Become team players: actively participate in on-line collaboration and presentations.

The learning objectives/outcomes were visible on the interface. Assessment was associated with the learning objectives: 35% of each student's final grade represented individual

coursework and active contribution to the group, 35% was drawn from the group project product and presentation, and 30% came from the individual's self-evaluation.

The activities sequence for the 2 days was displayed on the interface. The first day was dedicated to learning about DL, becoming familiar with the Moodle interface, and developing students' social intelligence skills, presence, and copresence. The students used the enhanced on-line forums to follow the scripting procedure; for example, the team leader posted appropriate messages and moderated the discussion to generate ideas. During that time, the e-tutor's role was changing from an instructor, providing information and advice, to the orchestrator of the collaborative learning activities. During the second day, the students worked individually and collectively within their teams to construct a new project, based on what they learned the previous day. The tutor remained present on-line, although she intervened only when coordination problems occurred. Late on the second day, the groups presented their projects to the class.

Component Distribution

The components described above were distributed according to the evolving teaching and modes of learning related to roles and associated activities. For example, during the teamwork process, the students worked on both the jigsaw puzzle (independently on various parts of the project) as well as collaboratively (on the same of the project), depending on their roles and associated tasks within the team.

Organizational Convergence: Coordination and Sequencing

Coordinating and sequencing CSCeL activities and resources are important in reaching a flow towards organizational convergence, especially in short e-courses. For this reason, limiting the degree of coercion and tackling unpredictability is a delicate design process (Dillenbourg & Tchounikine, 2007). Scripting such sequences can scaffold students' social and learning interactions in such a way so as to achieve peak collaborative and idea generation performance within each group. This course design used a specific linear sequence of activities and resources, as well as repetition of activities with minor variations. Traverse and rotation were used in the three groups. The former is the repetition of the same educational material in the same order looped through, with only one element being in use at a time; the latter rotates the elements in a given set towards the same direction.

The relation between the responsibility for activities by the tutor and by the students was inversely reciprocal. Thus, the students gained experience in various steps in the DL activities, the tutor gradually faded into the background regarding her direct support.

To conclude, the e-learning design was scripted in detail, which allowed the structuring to promote individual and group flexibility, which in turn enabled students to act and collaborate on both an individual and group level. In this way, the students knew in advance about the educational material and the basic structure of their activities and roles as well as tutor's role used in each phase, but experienced an open scenario in which to grasp the intended learning goals. Consequently, transaction cost and time was significantly saved and the e-course finished successfully on the second day. The next section presents the scripting implementation in a case study and the results between the script description and what actually happened.

Data Gathering and Analysis Process

We used quantitative and qualitative data gathering methods, as well as the data extracted from the implemented tools. Causal research methods alone (effect intervention) do not provide the holistic view (Andrews & Haythornthwaite, 2007) needed for this study. Consequently, diverse evaluation methods and tools aided in the identification, development, improvement, and validation of the e-learning design defined by the scripts. The students completed a self-reported assessment questionnaire (i.e., what they learned about DL since DL was a relatively recent course introduced into the MSc curriculum).

The extracted data comprised texts from each group's forum. All these texts were run through an algorithm called Non-Negative Matrix Factorization (NNMF; Lee & Seung, 1999), because this algorithm is able to discover patterns within text. NNMF has proved successful in text clustering evaluation studies (Xu, Liu, & Gong, 2003). In the context of this study, NNMF was able to uncover the main themes, the main words used in the theme, and the messages linked to the theme. As a comparison to the automated output of the NNMF, we also conducted a qualitative analysis of the forum discussion texts only in ATLAS.ti, using the Collaborative eLearning Episodes Matrix (see the Appendix). ATLAS.ti is a commercial software product that supports qualitative data analysis by allowing researchers to manually attach codes (concepts) to text segments. Lastly, we compared the above results with the data extracted from the HySynTag (counting the provided tags), the participation Avatars (counting the different participation levels), and the SNA tools (describing and analyzing the visual data). Lastly, we compared the student-coded data (from the HySynTag analysis) with the researcher-coded data (from the Atlas.ti analysis) to determine if it was possible to assess differences in perspective between the researchers and the students. A side benefit of this was the ability to involve the students within the research project.

RESULTS and DISCUSSION

Due to the diversity of the investigated issues, this section presents both results and discussion in order to avoid confusion if discussion was a separate section. The results briefly presented in this section are grouped into quantitative, qualitative and tools-based data (quantitative, qualitative and visual data). Quantitative data were collected with the NNMF algorithm directly from the forums, while the qualitative data were extracted from the forums, saved, and analyzed separately. The tools-based data arise from the HySynTag, the avatars, and the visualization network (the latter provided the visual data).

Self-Reported Questionnaire

Since the students had no previous knowledge of DL, the assessment questionnaire checked whether the students actually acquired the DL principles and were able to articulate them in their own words. Despite the fact that the French students had some small problems with the use of English language, the results showed that all students grasped the DL principles. For example, Participant BD said,

@ First, even if we work far away from each other, it is possible, using distributed leadership, to communicate as fast as if we were in the same room. Then, distributed leadership is making you build a database knowledge. To finish, DL means share your ideas with people from different cultures, and that's very good for innovation. [2]

The open question on the self-reported survey regarded what the students will change in their professional practice, based on what they learned from the e-course. Some directly quoted extractions include,

- *That a one-man leadership is not always the solution to bring a project to the end; distributed leadership can be an interesting choice to manage a project.*
- *DL can be used effectively because the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.*
- *Knowing people is a very important step for team works, for this, communication is the key.*
- *Communication is very important for good management.*
- *The importance to have a team communicating and dynamic.*
- *The tools which permit to succeed a project.*
- *The efficiency of collaborative tools for international project. All the online tools we discover in this lesson are very powerful and are a precious advantage for work as a team.*

In addition to learning the DL principles, these extracts show that the students attached importance to the human factors, such collaboration and coordination, the distribution of tasks, working on the same task, clear communication, diversity among the team members, and the use of tools as the technical factors to facilitate DL. Other than the qualitative data, quantitative data offer a different viewpoint about the quantity of the posts. Table 1 presents the overall number of messages and words used within the discussion forum, as a quantitative measure.

The average number of posts was 31 per discussion and 8.9 posts per learner, whereas the average number of words was 1,080 per discussion and 308.4 words per learner. The length (depth) of discussion posts varied in the number of replies. Also, it appears from the table results and analysis that the team leaders actively engaged their team members, resulting in the absence of lurking; in other words, passive participation was zero. However, more detailed analyses are needed to correlate the factors that contributed to the successful implementation of the short e-course. For this reason, both automated (the NNMF algorithm) and manual approaches (behavioral coding of messages extracted from the forum via the Atlas.ti) were employed.

Table 1. Discussion Forum Summary, with Two Forums for Each Group.

Discussions	FT1		Dream-ITIN-Team		IMAGES		Total	
#	On DL	New DL Tools	On DL	New DL Tools	On DL	New DL Tools	#	Average per discussion
Replies	34	18	27	18	35	55	187	31
No. of Words	1,011	651	1,359	667	1,368	1,422	6,478	1,080

Theme Discovery within Discussion Forums: Non-Negative Matrix Factorization

NNMF (Lee & Seung, 1999) has two features crucial to the application of the algorithm within a collaborative discussion context. Firstly, participant posts are allowed to correspond to multiple themes; this is essential because participants quite naturally may address or refer to multiple themes and concepts in a single post. Secondly, NNMF produces readily interpretable results. The main keywords, as well as the top participant responses within a theme, are produced as the output from the algorithm. The input to the NNMF algorithm is a matrix with forums posts and the counts of words for each word found in the forum post. The NNMF algorithm outputs themes and the main keyword within the theme by relative weight, which indicates the keyword's strength within a theme. The output can be interpreted as a tripartite graph, which maps words and documents (in this case forum posts) to themes where the weights represent the link strength.

Themes discovered by NNMF are not automatically labeled (that is, given a title). However, labels can be manually determined by analyzing the prominent keywords and posts within a theme. The algorithm also is not able to automatically detect the number of themes present within a forum. It is up to the researcher to interactively specify the number of themes and review the results in order to find the best fit. A tool known as the Thematic Explorer was developed by Bakharia for this study to facilitate the required interaction with the NNMF algorithm within Moodle forums. While NNMF is able to group participant posts into coherent themes based on word usage, interpretation and further refinement of the results by the researchers is essential.

Table 2 provides an illustration of the themes from one specific forum. As with all of the themes and main keywords outputs from NNMF, the themes were determined by the word usage within the forums (i.e., the most-used descriptive words served as the titles). This exemplar shows the "Find new tools for DL" forum that was setup for each of the three groups as part of the activities on Day 1.

Analyzing the students' posts from each of the forums processed by NNMF provided a high-level overview of the distributed leadership tools being discussed within a group. Such outputs

Table 2. Themes Derived from Non-Negative Matrix Factorization.

Distributed Leadership Course		
Group Work Day 1		
Discussions	**Identified Themes**	**Keyword Weights > 1**
FT1: Find new tools for DL		
#Messages	18	
	Facebook	facebook [1.73] people [1.06]
	Group Forum Discussions	discuss [1.01]
	Instant Messaging	
	Wikis and Information Sharing	
Dream-ITIN-Team: Find new tools for DL		
#Messages	18	
	Social Networks	friend [1.25]
	Management and Distributed Workflows	
	Friend Whell (tool)	
	Discussion and Facebook	discuss [1.18]
	Distributed Leadership Resources	
IMAGES: Find new tools for DL		
#Messages	55	
	Project Management Software and Bug Reporting Software	PMS-BR [1.71] compani [1.38]
	Open Source Collaborative Products	product [1.40]
	Tools for Monitoring Tasks/Progress	task [1.68]
	Accessible Software	softwar [1.16]
	Time Management	time [1.31]

allow us to compare the content being discussed by each group. The FT1 and Dream-ITIN-Team groups primarily discussed social networking tools and social software. The IMAGES group, on the other hand, was more focused on project and time management software.

The data from this focused analysis of this initial discussion of the e-course, as depicted in Table 2, show that the most productive group, in terms of number of posts, was IMAGES. This discussion was directed towards the implementation of the DL tools, since 2 of the 5 themes refer to IT and time project management, whereas the rest were focused on social tools for international collaboration, which is an aim of DL. The main keywords found in the "Find new tools for DL" theme were 17% for the word project; 13% for idea, team, and company; 9% for inform; 6% for discuss and system; 5% for user; 4% for share and wiki and 2% for people. The most frequently used words and percentage of appearance from the previous table were management (29%), tools (28%), idea (20%), collaboration (20%), and physical space (3%). Taken together, the keywords and most frequent words reflect the DL values of collaboration and decision making based on dialogue, as well as the software tools used towards idea generation.

Qualitative Analysis Using ATLAS.ti

The data from the forums that were used for the NNMF algorithm were inserted into ATLAS.ti in order to observe any differences in the ways the NNMF algorithm treated the data as compared to the manual coding by the researchers via the ATLAS.ti. The information is presented in several tables to follow. Due to lack of space, results only from Day 1 (169 messages and 20 idea generation cycles) are presented in Table 3.

Table 3. Researchers' Code Network in Day 1 (ATLAS.ti).

CeLE Level	Number of Codes	Total	%
Social	36	36	9
Information	53		
Question	39	98	24
Answer	6		
Explanation	25	25	6
Agreement	40		
Justification	16	60	15
Disagreement	4		
Exploration	69	69	17
Evaluation	64		
Justification	28	92	22
Ideas	20	20	5
Summary	9	9	2
Total		409	100

When comparing the results from the algorithm and the argumentation analysis (i.e., the qualitative analysis via Atlas.ti), it appears that the former provides evaluation of the macroscript while the latter does the same for the microscript. In other words, the algorithm was able to acquire the most used words from a great amount of data, thereby verifying the success of the macroscript and, by extension, the success of the CSCeL pedagogical design. For example, throughout the course, the students used social software, IT, and timeline-based project management tools. Their work therefore reflected collaborative behaviors, and their discussions of this work involved words such as *team*, *idea* or *discuss*. This naturally resulted in the themes surfacing in the forums, which in turn indicated collaboration.

However, the algorithm alone cannot provide enough information in support of the microscript; this means, we needed more evidence of cognitive and psychological development within the scenarios that reflected the outcomes of the discussion design. It appears that the students concentrated on the DL educational material of the course rather than on social exchange, since they knew their peers already. Thus, they focused on initial information provision based on the educational material, their own experiences, and information derived from the Web in order to explore the materials and decide upon their usefulness. Moreover, based on the researchers' previous experience with similar research, the percentage of correspondence on idea generation (5%) was relatively high (Lambropoulos, 2009; Lambropoulos & Kampylis, 2009). However, because each group and each case study are unique events, this may simply suggest an evolution in our approach in using collaborative learning scripts, or that the DL approaches and tools may have resulted in better collaboration and thus evidence of increased group co-creativity and idea generation. Table 4 provides selected excerpts from message exchanges within the IMAGES team and their unique forums that evidence DL principles.

Table 4. Excerpts from IMAGES Team Evidencing Understanding of DL Principles.

Stanza Number	Participant	IMAGES Forum	Tag	Comment
Stanza17	BDR	Forum#5	INFORM	"*in DL, the language is very important to avoid misunderstood.*"
Stanza46	JD	Forum#5	EXPLORE	"*And with IM* [Instant Messaging], *you lost the human contact between people and the work become monotonous.*"
Stanza75	PE	Forum#5	EXPLORE	"*Well, it's pretty expensive but I think I'm gonna propose this tool in my team*"
Stanza80	JB	Forum#5	EXPLORE	"*You're welcome my friend!*"
Stanza19	MB	Forum#2	[none]	"*Open plan is the best and the simple way of exchanging informations of any type. But it's not the best solution, the confidentiality of datas and informations are in danger in that kind of organisation. I think the best solution is a mixed organisation*"
Stanza202	MB	Forum#2	[none]	"*Yes of course, Many of companies used this system (collaborative). It permits to keep contact and share the documents, which we want to expose for partners and then applicate many rights (read only, write only...)*"

Note. Stanza numbers are created automatically by Atlas.ti.

Table 5 provides feedback messages, drawn from the FT1 team. In this conversation, it appears that participants generally did not consider tagging the social messages, possibly because such tagging was not helpful to them in their discussion evolution towards idea generation.

Table 5. Comments from FT1 Team That Reflect Feedback Messages.

Stanza Number	Participant	FT1 Forum	Tag	Comment
Stanza184	CBDV	Forum#1	[none]	*"Have we great answered the question?"*
Stanza185	XD	Forum#1	[none]	*"I think it's great!"*
Stanza186	SK	Forum#1	[none]	*"I think it's a very good answer!"*

The following short social messages exchange (Table 6) enabled team members of the Dream-ITIN-Team to elaborate on their contributions. Because the students knew each other, they often used their names in their interactions, although the names have been redacted here. It is also interesting to note that Participant JW copied the structure of JD's explorative message.

Table 6. Social Exchanges from the Dream-ITIN-Team Regarding Discussion Contributions.

Stanza Number	Participant	Dream Forum	Tag	Comment
Stanza122	JD	Forum#3	[none]	*"In our company, in one hand, we can use collaborative website as Intranet, or forums which relate our discussion about projects to improve productivity and answer about problems. In other hand, we can separate task in several leader. For example, one leader create planning, distribute tasks and role in the project, and the other leader execute the leader on his team.* *"I share the same opinion with my team leader."*
Stanza124	DB	Forum#3	[none]	*"Thank you for your help J![...]"*
Stanza125	JW	Forum#3	[none]	*"I can say that in my campagny I have many roles: In the one hand, my main goal is to write codes lines (for news projects, news moduls or plug-in).But in a second hand, my manager can give me some responsibilities: lead my own project from the begining to the end: planning, ressources, an available software (for instance)...To conclude with my opinion: we can give many role or responsibilities to an employee to lead a project!"*

In the discussion extract in Table 7, the students in the IMAGES team exchanged experiences using examples in order to help their peers to understand their viewpoint and also increase their knowledge on the subject. Peer feedback and a reciprocity effect also are evident, as a team member reciprocated the initiated communication and argumentation style, indicating peer vicarious learning. Moreover, this exchange demonstrates that students repaired meanings (Sacks, 1992) to achieve a common understanding.

Sharing and repairing meaning is extremely important in CSCeL, as an indicator of common ground and creating the basis for common knowledge in a group. Stahl (2010) suggests

Table 7. Clarifications, Feedback, and Communicative Repair Examples from the IMAGES Team.

Stanza Number	Participant	IMAGES Forum	Tag	Comment
Stanza91	PE	Forum#5	EXPLORE	*"Excuse me Ja, but your question isn't clear, can you precise??Thx"*
Stanza92	JB	Forum#5	EXPLORE	*"I'm sorry. The question is: Is this software easy to use?"*
Stanza93	ES	Forum#5	EXPLORE	*"It's a good question Jb, but i'can't answer you directly, beacause i don't know very well this produt. Ask to P."*

that meaning making is essential in learning since learning is a social activity that is conducted collaboratively. He advocates that meaning making depicts individualistic and social learning.

One primary benefit of DL, particularly in the business arena, is idea generation. Table 8 provides examples of how members of the Dream-ITIN-Team went about the process, with Stanzas 127 and 128 of focus here. These discussion extracts provide evidence of students' active engagement, knowledge acquisition of the DL topic, learner-generated text as the background for going beyond information given, and co-creativity as idea generation. Referring

Table 8. Idea Generation Exchange in the Dream-ITIN-Team.

Stanza Number	Participant	Dream Forum	Tag	Comment
Stanza126	DB	Forum#3	EXPLORE	*"In the DL, I think that everybody must be equal. Actually, if you have a manager who works on the same office as you, I don't think it has something to do with DL. Do you agree?"*
Stanza 127	GE	Forum#3	EXPLORE	*"DL put the focus on the team working. The main fact is to give to every member of the team the possibility to express their opinions. It's permit to reduce the Hofstede's Power Distance! DL purpose is to give responsabilities to every members of the team. It's permit to forget the idea of leaders/followers."*
Stanza128	DB	Forum#3	EXPLORE	*"I think you are right. You talk about the power distance. DL gives the same hierarchic level to anyone in the team. What do you think about that? Personaly, I think that every project team should have a manager, otherwise everyone in the team tries to show that his idea is the better one. Don't you think? Talking about Hofstede's system, do you think that masculinity is an important factor in DL ?"*
Stanza129	JD	Forum#3	EXPLORE	*"The problem if there is only one leader is when he is missing, the team can't work at 100%. In the case where a decision must be do, nobody would to take the responsability to put the company in danger. So, if you use the DL, you can manage the project for all situation…"*

to Hofstede's (1967-2009) power distance concept, the discussion was enriched by many contributions about hierarchical and security levels, as well as team members' skills and experiences in their professional careers. Participants' active involvement in the discussion is evident in, for example, the use of exclamation marks in the eureka experience (“*It's permit to reduce the Hofstede's Power Distance!*”), critical thinking in arguments, and asking for their peers' feedback their own thoughts about the topic. Furthermore, engaging multiple perspectives, particularly through exploring the pros and cons of a particular concept, were products of critical thinking in favor of DL.

Overall, the results from the researchers' qualitative analysis showed that the depth of the discussion allowed multiple ideas in various subtopics to occur. Moreover, the learner-generated text provided larger quantities of and diversity in information, allowing increased knowledge acquisition from the educational resources as well as from the argumentation cues. The data also evidenced peer support and vicarious learning, as well as fewer unsupported claims. Finally, the students' evaluations and summaries indicate team convergence towards consensus.

HySynTag Tool Codes and Analysis

The student-coded HySynTag results are summarized in Table 9. Note that not all messages were tagged and some messages were tagged twice, depending on the e-learners' choices. Because HySynTag provided information in real time, it made the argumentation structure visible to the learners by facilitating their cognitive presence and co-presence. However, when we compared

Table 9. HySynTag Results from Two Forums from Each Group.

	FT1		Dream-ITIN-Team		Images		TOTAL	
Discussions	**On DL**	**New DL tools**	**On DL**	**New DL tools**	**On DL**	**New DL tools**	**#**	**%**
Social	0	0	0	0	0	0	0	0
Inform	0	12	5	7	0	20	44	29
Explore	1	10	6	6	13	50	86	57
Idea	0	0	0	6	2	2	10	6
Evaluate	1	3	4	0	0	0	8	5
Summarize	1	1	1	0	1	1	5	3
Other	0	0	0	0	0	0	0	0
Total	**3/34**	**26/18**	**16/27**	**19/18**	**16/35**	**73/55**	**153/187**	**100**

Note: The split figures in the total represent then number of tagged messages out of the total messages posted to that forum. Initially the students were not tagging the messages because some students needed time to familiarize themselves with the tools and their utility. This resulted in just 3 of 34 messages tagged in the earlier On DL forum. However, the learning curve is evident in the New DL Tools forums, where the students demonstrated knowledge of how to use multiple tags for compound messages.

the data outputs of researcher-coded Atlas.ti analysis to the data outputs of the HySynTag analysis, it became clear that the researchers produced more coded data than did the students with their tags. This can be due to several reasons.

First, the HySynTag tool is simplified to improve usability, which resulted in fewer distinct categories in the students' results. Also, the students could not tag different parts of the same message but they could tag the same message in more than way if they wanted to make that effort. Finally, as noted in the previous subsection, the students did not tag any of the social messages; perhaps they did not considered them important in their interaction on tasks.

Avatars

An overview of the levels of participation, as depicted by the avatars in Day 1, is provided for each student for two discussions per group (see Table 10). The teachers' messages were attributed to the highest poster who also was the group-elected team leader. These individuals are noted in the table with boldface text and their participation level was the standard by which other participants were rated.

It appears that the participants kept the same participation level in both discussions, even though the participation level was increasing throughout the course. This may be an indicator of person's presence, copresence, self-regulation, or engagement. It also suggests the idiosyncratic character of the students and consequently the coexistence of different interaction and learning styles. In other words, it can be implied that learning is a by-product of both passive and active participation and the feeling of being engaged in the course.

Visualization Network

Until recently, real-time SNA was rarely used in education, although in this study that emphasizes DL as a means for co-creativity and co-learning, we found it useful and informative both during the discussions and in analysis. In this paper, only one sample is displayed due to the

Table 10. Participation Levels (Indicated by Avatars) for Two Group Discussions (Day 1).

FT1			Dream-ITIN-Team			IMAGES		
Participants' Coded Name	1	2	Participants' Coded Names	1	2	Participants' Coded Names	1	2
AA1	M	M	**BD**	**H**	**H**	AA21	L	L
AA20	L	L	BDRDM	L	L	AM	M	M
BS	L	L	DJ	M	M	BM	M	M
BDVC	**H**	**H**	EG	L	L	**CC**	**H**	**H**
DX	L	L	LFG	L	L	EF	L	L
JA	L	X	SJ	L	X	LM	L	L
KS	M	M	WJ	L	L	SE	M	M

Note: There were 6 unique, mutually exclusive discussions, two for each group. Participation levels are **L**ow, **M**edium, and **H**igh, with highest individual in each group (indicated in bold) also serving as the team leader. See p. 80 for explanation of the various levels. The X indicates that those participants were absent during that discussion.

lack of space. We selected one discussion from the IMAGES group; this particular discussion contained had four ideas over 55 messages. This representative example of Visualization Network data is presented in Figure 2.

The red dots in Figure 2 represent the discussants, the lines represent the interaction via posted messages, with the directions to individuals indicated as arrows, and the numbers indicate the number of message exchanged. Other than the interaction visualization, it is interesting to observe reciprocity as a structural property between the participants on a dyadic level. However, other than self-explanations and one-way interaction, the social reality in e-learning lies beyond dyadic interactions to the total communication among all group members, since all members are exposed to all messages. It is also a clear depiction of early collaboration evident in the distributed discussion.

It appears that the use of SNA in educational research—both real-time and after-the-fact—can depict several perspectives of a discussion at a glance. It can become a valuable and fundamental resource for understanding student interaction and active (as well as passive) participation and the feeling of engagement, particularly in real time. Such real-time knowledge subsequently can lead to an improvement in teaching techniques and methodologies (Martínez, Dimitriadis, Rubia, Gomez, & de la Fuente, 2003). Also, it has been reported that high interactivity is more likely in environments where trust and cooperation are evident (Sparrowe & Liden, 1997). In other words, students' interactions dynamics starting from social interaction, information, and information exploration, and leading to group knowledge building and idea generation can be inferred to be related to students' creativity and innovation in DL.
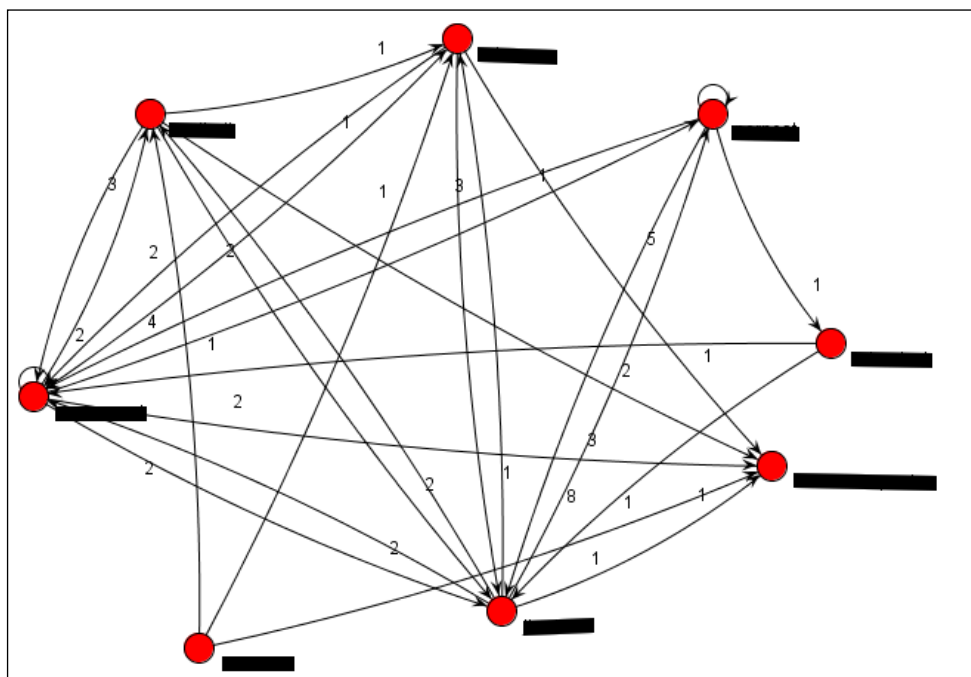
Figure 2. A screenshot for the SNA visualization of CSCeL participant relationships.
Note. The participants' usernames have been redacted through the use of black lines to protect personal data.

Reflections on the Totality of the Data

Based on the accumulation of the various data, collaboration was observed in all students' activities. Following Fredricks et al. (2004), all three types of engagement as evidence of collaboration were present: (a) behavioral engagement, through students' passive and active participation and the feeling of engagement; (b) emotional engagement, through students' positive feelings towards their e-course and their peers, in particular, as well as the e-learning environment in general evident in the active and increased participation in the course; and (c) cognitive engagement, evident in that the students made efforts toward acquiring comprehensive knowledge and skills, as demonstrated in the discussion visualization and the qualitative analysis of the messages contents.

In regard to technological factors, the tools facilitated presence and co-presence. The students reported at the end of the course that the tools helped them to reach such awareness; however, they were also aware of their constraints. Traditional tools implemented in Moodle or other learning management systems often are oriented more toward teacher implementation than student use. Furthermore, such learning platforms do not include tools that visually display interaction patterns, something the data from our research have shown is instrumental in facilitating active participation. Rather, most learning management systems provide access statistics (usually in terms of page views) for the teachers, researchers and/or policy makers to consider, but such data do not take into account students' reflections anchored in their awareness based on these results.

Lastly, in regard to research methodologies as such, when all results are triangulated, then a more holistic view of the discussions is possible. This can result in a high level of learning and understanding, as for example indicated in our data by the high number of messages exchanged (quantity) and number of ideas generated (quality). Furthermore, the attempt to use the same codes and SNA interaction subgraphs by all e-learning participants (e.g., teachers, students and researchers) can be found useful in the way each group interprets the user-generated data in the discussions. However, more detailed research in multiple contexts is needed in order to find the best level of agreement of such codes for all frameworks.

As with all research projects, this study has limitations. First is the nature of this e-research, due to the lack of control of several parameters in this study, such as the resources of information and individual interaction, as well as several problems of technical nature. Additionally, our sample was not representative and relatively small, and thus the conclusions drawn from this research has no generalizability to larger groups or to learning in alternative contexts. Further, the limited research in the field of measuring the motivation to implement DL as well as using the specific tools does not allow extended comparison of the results. Of course, researchers in intervention studies must always consider the Hawthorn Effect, a condition where participants change their behavior because they are being studied. And, lastly, the propositions need to be further tested and developed in different contexts to ensure their validity and reliability.

Nevertheless, this study makes contributions to the field in regard to observing how DL can facilitate both interaction and learning within a CSCeL environment. Methodologically, this study demonstrates the need for a variety of tools—many offered in real-time—which can provide not only an important means for the students and teacher to gauge the level and quality of interaction, but also to allow researchers the ability to gather data instantaneously,

which might facilitate researchers' efforts in employing other data-gathering methods to triangulate or enrich the data.

To conclude, this study supports the growing realization that using solely traditional research methods cannot provide a holistic view of discussion topics in a dynamic learning environment. Therefore, we note that, in the circumstances of an e-course, a diversity in evaluation methods and tools, both real-time and at the completion of the course, aids in the identification, development, improvement, and validation of the e-learning design defined by macro- and microscripts.

CONCLUSIONS AND FUTURE TRENDS

This paper presents a case study focused on students' rich collaboration in a short e-course. The e-learning design of a DL course over 2 days was scripted in order to facilitate the flow of students' learning and work, as well as the tutor's changing roles during the e-course. The effectiveness of the course was measured by the students' creativity and productivity, that is, the quality and quantity of students' texts that provided the background of their own learning based on idea generation as the indicator of achievement. In this way, the students had to take responsibility for their own learning. Diverse quantitative and qualitative data analysis methods and tools were used in order to provide multiple perspectives of the same data, and thus a more holistic approach in data interpretation and triangulation.

The results show that the use of the NNMF algorithm, a quantitative analysis tool, can provide evaluation of the macroscripts, whereas the qualitative analysis, avatars' active participation levels representation, the HySynTag, and subgraphs of SNA can present a rich picture of interaction between and among the students. Peer support was also evident. In addition, real-time tools can provide formative feedback that supports self-regulation and critical self-reflection. Also these tools and techniques can scaffold the different learning modes occurring within an e-learning environment. Consequently, they can help tutors deal with diversity in e-learning environments by adjusting their pedagogical approaches and orchestrating students' activities. An important finding in peer meaning making suggests that both individualistic and social learning exist in collaborative learning (Stahl, 2010), which in turn is related to the internalization and externalization of knowledge. Furthermore, meaning making in collaborative learning, in combination with the idea generation, supports the significance of CSCeL scripts and associated tools.

Flexible macroscripting in this DL short e-course appeared to support learners' passive and active participation and the feeling of being engaged as vital in reaching organizational and personal objectives. Further improvements in e-learning design can focus on (a) comparing in detail the different effects of students' individual ways of learning resulting from students' learning styles and teachers' pedagogical approaches, depending on the length of an e-course; (b) the differences between real and blended learning environments as compared to e-learning courses on the same time scale; and (c) whether DL scripts can be implemented in an adaptive system in order to completely eliminate the need for instructional intervention by the teacher, whose focus then can be on his/her activities orchestration.

This experience of DL worked here within specific pedagogical situations: CSCeL, local teams, and simple IT deliverables as learning outcomes. In future research, we aim to explore

these frameworks in actual working situations, meaning actual IT projects, entrepreneurship projects, intercultural teams, and geographically distributed teams. Such real-world situations could allow for deeper exploration of various aspects of teams working on projects with actual IT deliverables and constraints. The use of CSCeL macro- and microscripts within teams cooperating during the creativity and innovation phases of an entrepreneurship project would also benefit from further investigation.

Contemporary project managers must be able to juggle the variety of activities within a project amid multiple constraints, such as a specific timetable, financing, and material and personnel resources, to name a few. Additionally, such activities require them to deal with technical and cultural issues, as well as challenges related to the unpredictability and the complexity of contexts. Therefore it would be valuable to explore how learning DL principles and practices through the application of DL principles and practices can have a wider impact on the lives and professions of students. In other words, can employing DL in learning environments intended to teach about DL simultaneously facilitate behavioral changes in the students by their employing DL competencies within their professional environments? We believe that this study provides a firm foundation for continuing the exploration of how CSCeL tools, frameworks, and techniques, coupled with the tenets and practices of DL, can further collaboration and idea generation in actual working environments.

ENDNOTES

1. The open access, open source innovation management e-course is available at http://www.intelligentq.net/e-learning/
2. All of the quotes from participants are provided without editing.

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APPENDIX

In Table A1 the levels of abstraction follow the stages of research analysis. Level 1 involves classification of concepts and Level 2 identifies the analytical definitions. Finally, Level 3 provides the overall umbrella for classification and design attributes.

Table A1. Collaborative e-Learning Episodes Codes Matrix for Idea Generation/Identification.

Levels of Abstraction

	Level 3	Level 2	Level 1
	Collaborative e-Learning Episodes Elements	Analytical Corroboration Definitions	Indicators for Classification
0	Initiation & Social Cues	Initiations, additions or superficial amendments, repetitions, uncritical information, social cues, etc.	*Information, statement, definition, emoticons, abbreviations, lexical items, quoting, images, audio etc.*
1	Question – Information	Question, proposition, instruction, opinion, history of something, etc.	*Recommendation, question, bullet points, I think, I believe, instruction, I know, have worked, I prefer.*
2	Explanation	Explanation and self-explanations, requirements, examples, summaries, etc.	*Because, this is why, thus, therefore, example, further explanation, help, nice behavior & suggestion.*
3	Agreement	Agreement, confirmation, corroboration, etc.	*It is very interesting, refer-to-a-name, same, Yes, I agree & you are right.*
3a	Disagreement	Disagreement, difference, discrepancy, flaming, etc.	*But, however, on the contrary & different.*
4	Exploration	Hypothesis, comparison, example, argument, resource interdependence, critical information, competition of ideas, reasoning, argument, etc.	*Alternative, I have an idea, something else, what about, what do you mean, I tried,* *if, might, could, would, should, think & suggestion.*
5	Evaluation	Comparison, assessment, best practice, etc.	*Best, it is important, comparison, easiest, worst, unfortunately & having no meaning.*
6	New ideas – Co-construction	Strategy, plan, method, plan, procedure etc.	*New idea, innovative approach, new solution.*
7	Summarize	Synthesis	*Summary, overall, we agreed & finally.*