Handbook of Research on Electronic Collaboration and Organizational Synergy

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Chapter VII
Hybrid Synergy for Virtual Knowledge Working

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ABSTRACT

Recent rapid technological advancement has influenced communication and information management. In addition, it has facilitated collaboration, an interactive process that engages participants who work together to achieve outcomes they could not accomplish independently. Using new technologies for remote collaboration from U.K., Finland, and Greece, we created our own collaboration and creativity technique as best practices for our team by utilizing an adaptation of Collaborative E-Learning and Six Thinking Hats. We call this model for knowledge working to enhance collaborative creativity Hybrid

Synergy. The question under investigation was "What tools, methodologies, techniques, and practices can support collaborative creativity of multidisciplinary teams for virtual knowledge working?" The results from the study conducted in an online course verified the importance of the individual contribution for the development and evolution of a virtual team as a whole. Furthermore, the propositions suggested the use of specific techniques and methodologies can enhance technology enabled organisational change.

INTRODUCTION

The new information knowledge society is now a critical resource for social capital and economics development. The concept of *intrapreneurship*, that is people who focus on innovation and creativity within one organization, suggests an economy that is increasingly dominated by knowledge using new technologies (Frazer, 2007). Therefore, organizations, educational institutions, as well as businesses have been investing in the integration of Information and Communication Technologies. One of the focus areas has been online education. In Greece, part of this integration is delivered by the Greek Ministry of Education. The planning, growth, and operation of the *Greek School Network* (GSN, http://www.sch.gr/en) has been advanced for this purpose. Acknowledging the Greek teachers' need for professional development through networking and exchange of experiences as an online community of practice for life-long learning, GSN provided the e-learning platform Moodle@GSN. Gradually, our e-learning team was formed, aiming at delivering online courses for the Greek teachers. Based on sound existing frameworks (e.g., Nemiro, 2002, we have developed methodologies and techniques facilitating our virtual networking to achieve cost- and time-effective results, encourage team collaboration (Nemeth & Goncalo, 2005) and expand our talents by combining educational traditions from the U.K., Finland, and Greece.

This chapter seeks to answer the question "What tools, methodologies, techniques, and practices can support collaborative creativity of multidisciplinary teams for virtual knowledge working?" Answers to this question aim at supporting entrepreneurs within one organization (intrapreneurs) since, as Sawyer (2006) suggests, there might be a great number of creative employees within an organization, but if they work in a stifling organizational structure, they will not innovate (Frazer, 2007, p. 16). In this chapter, we will present concepts and methodologies behind our e-learning team, such as knowledge working, collaborative creativity, best practices, and tools for online collaborative knowledge working, as well as ways to measure and assess performance.

KNOWLEDGE WORKERS AS AGENTS OF CHANGE

Knowledge workers are the employees who know more than anyone else about their organization (Drucker, 1966, 1973). They are the ones who, by virtue of their position or knowledge, are responsible for a contribution that materially affects the capacity of the organization to contribute, perform, obtain results, and share knowledge with other co-workers. These individuals are involved in occupations heavily reliant in knowledge, such as research and development, education and consultancy, and are mostly likely to be driven by the satisfaction of their work (Reilly, 2005). According to Reilly (2005), knowledge workers can be seen as an "awkward squad" by managers, as they

seem intolerant of unnecessary rules. He says that establishing relatively autonomous groups within organisations to generate knowledge has been common for research and development purposes. These kinds of groups create knowledge communities built up from informal networks among peers. These knowledge communities explore new ideas and generate knowledge for the organization, which prevents knowledge hoarding, allowing valuable knowledge to be passed on within the organization.

There is a growing demand for knowledge brought by the Internet. Following Romer (2004), we adopted the idea of *virtual knowledge workers* as the individuals who produce information delivered to its consumers in a soft manner, through online courses, and online work or publications. Romer uses the computing metaphor, which replaces the traditional categories of input (capital, raw material, production and nonproduction workers) with three broad classes of input: *hardware*, *wetware*, and *software*. Hardware includes all physical objects used in production (computers, peripherals, and so on), wetware captures the employees that produce tacit knowledge (social capital), and software includes all knowledge codified and transmitted to others within and outside the organization with any possible means (e.g., manuals, recordings, films, blogs, Wikis, publications, scientific principles and processes, and so on). After producing the first copy of the software, the process and the material can be reproduced, communicated, and used simultaneously by an arbitrary large number of people. However, according to Romer (2004), not many knowledge workers have this ability for software dissemination.

Until now, most organizations have, to a great extent, neglected the important role knowledge workers and software play on a massive scale. However, Davenport and Prusak (1998) claim that knowledge workers are going to be the primary force determining which economies are successful since they are the key source of growth in most organizations. For more information on the seven levels of knowledge work (i.e., work, functions, processes, programmes, transfer outputs, services, and social networks) see Wikipedia (http://en.Wikipedia.org/Wiki/Knowledge_worker). The hierarchy ranges from the effort of individual specialists through technical activity, professional projects, and management programs to organizational strategy, knowledge markets, and global-scale networking. This framework is useful for positioning the myriad types of knowledge work in relation to each other and within the context of organizations, markets, and global economies. It also provides a useful context for planning, developing, and implementing knowledge management projects, such as designing online courses.

This study focuses on *online social networks*, which enable knowledge organizations to co-produce knowledge outputs by leveraging their internal capacity (Tapscott & Williams, 2007). However, this process entails some prerequisites, which, according to Reilly (2005), are:

- Idea-sharing is a high priority for tacit knowledge transfer
- Bringing the right people together and establishing a supportive infrastructure such as space to meet and collaborative technologies
- Devising systems for evaluation and feedback to measure objectives
- Knowledge workers need to be pulled instead of pushed and suppressed
- Knowledge from knowledge workers should be openly exchanged and recognized
- Career progression is vital to knowledge workers
- Organizations should be clear about their visions in order to breed knowledge workers
- Employee management, support, appraisal, reward and risk-taking are essential
- Corporate objectives need to be balanced between personal and professional goals

- Managers need to act as coaches and facilitators of knowledge workers and involve them in decision making
- Find ways to encourage knowledge workers to stay with the employer
- Facilitate commitment to the organization through the belief that the leader is worth supporting, so as to feel encouraged to participate and learn
- Offer opportunities for greater development and contribution to the profession

Nevertheless, these prerequisites rarely preexist in most organizations, including the Greek educational authorities. For this reason, we tried to investigate the best practices for our profession in real and situated settings for virtual knowledge working.

It is worth noting that our team was not predefined. Rather, it emerged through a social networking process; we came together based on our special interest in educational project management and collaborative e-learning. For example, the last group member, Sofia Papadimitriou, was an e-learner who exhibited exceptional activity in the course and actively helped other members. Sofia herself proposed a contribution to the group. In the next section, we will present the way we worked collaboratively.

FROM COLLABORATIVE CREATIVITY TO COLLABORATIVE KNOWLEDGE WORKING

Collaborative knowledge working aims at problem-solving for best practices within an organization. Furthermore, it targets new ideas and innovation development within human social networks. The Internet itself is a network of individual creative contributions; according to Berners-Lee (2007), the Internet is not only a technological means, but also a social phenomenon.

We Live in a Creative Era

Several researchers assert that we live in the *era of creativity* (Cropley, 2006; Florida, 2002, 2005; Murakami, 2000) and utilize the term *creative industries* (Florida, 2002; Matheson, 2006) to specify economic sectors such as advertising, architecture, arts and antiques, crafts, design, designer fashion, film, leisure software, music, performing arts, publishing, software and computer services, television, radio, and education. Creativity has been recognized as a key factor not only for economic growth, but also for the physical survival of the society.

Creativity: Yes, but Which One?

The definition of creativity applied in everyday life is still a matter of ongoing debate (e.g., Sternberg & Lubart, 1996) and researchers confront a number of myths (Sawyer, 2006), and mysteries (Perkins, 1981) that are associated with the concept of creativity. As a result, there are many and contradictory definitions (e.g., Torrance, 1988), scientific theories (e.g., Sternberg & Lubart, 1999), implicit theories (e.g., Sternberg, 1985) and research approaches (e.g., Ryhammar & Brolin, 1999) for this very complex phenomenon, one of the "highest-level accomplishments to which humankind can aspire" (Taylor, 1988). Therefore, Sternberg and Lubart (1999) argue that employing multidisciplinary approaches would promote research on creativity, and Mayer (1999) calls researchers of creativity to develop an unambiguous definition and to utilize a combination of creative research methodologies.

However, when we study creativity in a scientific way, we must have at least a working definition. The words *novel* (new, original, unique) and *valuable* (appropriate, useful) are used in most definitions of creativity (e.g., Torrance, 1988). As a working definition, we adopt the conceptualization of creativity as "imaginative activity fashioned so as to produce outcomes that are both

original and of value" (NACCCE, 1999). The merit of this definition is that it explicitly specifies five fundamental characteristics of creativity: purpose, imagination, process, originality, and value.

Because of the different interpretations of the term creativity in the literature review, there is a need to create a signpost and build a common terminology for contemporary creativity. A number of researchers have made a clear distinction between two *types of creativity*:

- Traditional—New: Elliot, 1971
- Eminent—Everyday: Nicholls, 1972
- Historical—Psychological: Boden, 1990
- Capital C Creativity—Small c creativity: Gardner, 1993
- Elite—Democratic: NACCCE, 1999
- Sublime—Everyday: Cropley, 2001

The first type of creativity (traditional, historical, and so on) is ascribed to few, charismatic people who contribute to a field and whose contributions are recognized by the society. This type of creativity stresses the value of the creative product and creative person and it has almost no significance in the education milieu. In contrast, the second type of creativity (new, psychological, and so on) is regarded as an innate potential in all people and many researchers assert that it can be taught and enhanced.

According to the *creative cognition approach* (Finke, Ward, & Smith, 1992), the difference between the two types of creativity is one of degree rather than type, and human creativity utilizes ordinary cognitive processes, even in its most remarkable expressions. Our research (e.g., Kampylis, Berki, & Saariluoma, 2006; Kampylis, Fokides, & Theodorakopoulou, 2007) is primarily concerned with the latter type of creativity implemented in real life settings following the creative activity stages (Shneiderman, 2002, p. 113), in this case activities management for online courses:

- **Collect:** Gather Information and acquired resources
- **Relate:** Work in collaborative teams
- **Create:** Develop ambitious projects
- **Donate:** Produce results that are meaningful to others

Shneiderman's cycle follows the creative process cycle: information gathering, identifying the relationship between the information provided and synthesizing it for further development. In addition, Shneiderman suggests the return of investment to the community in the form of fulfilling others' real needs, implying a fair trade between the creators and the context of creation: resources provide the initial knowledge and produced knowledge must return back to the community. Therefore, Shneiderman's collect/relate/create/donate scheme is an essential part of collaborative creativity for real life settings. Such schemata are referred to as collaborative creativity techniques.

Creativity and Collaborative Creativity Techniques

There are many projects, consulting companies, workshops, advice books, and techniques worldwide that target personal and organizational creativity enhancement, and constitute the *pragmatic approach* to the study of creativity (Sternberg & Lubart, 1996). Nickerson (1999) calls into question the value of the one-time, one-week, one-size-fits-all commercial training programs that aspire to enhance personal and organizational creativity. According to Sawyer (2006), the pragmatic approach is damaging for the scientific study of creativity because its proponents have been very little concerned with testing the validity of their ideas. Moreover, the specific approach lacks any basis in serious psychological theory and leaves average people correlating creativity with commercialization. In addition, many creativity training programs and techniques assume

that creativity is an individual, domain-general ability and do not emphasize the importance of hard work, commitment and intrinsic motivation (Sawyer, 2006). The result is that these training programs and techniques reinforce cultural myths about creativity.

On the other hand, the scientific understanding of creativity should lead to even more practical applications (Simonton, 2000) in terms of curriculum design and lesson plans for students in a wide variety of disciplines at all educational levels in order to cover the demand for a more creative education (e.g., Kampylis et al., 2007; NACCCE, 1999; Starko, 2005). However, there is a gap between research-based and business-related training programs and techniques. According to Cropley (1997), we should use a long-term, multiple intervention strategy that includes (a) building requisite knowledge and expertise, including a firm grasp of principles; (b) creating exercises that build skills needed for working with this knowledge; (c) encouraging the search for novel solutions and effective strategies for testing these solutions; (d) openly evaluating progress and errors; and (e) extending these efforts into independent, collaborative projects.

Creativity applied in virtual working is still to find a place in university modules as the theory and practice have not yet found a common ground as best practices. One attempt to fill in this gap in virtual working is combining two distinct collaborative creativity frameworks: *Collaborative E-Learning* and *Six Thinking Hats*. They represent the division into research-based and business-related training programs and techniques.

Collaborative Learning

UNESCO has provided the most coherent definition for collaborative learning. 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 (Technology and Learning definitions, UNESCO, 2004).

However, researchers think there is a distinction between collaboration and cooperation. According to Teasley and Roschelle (1993):

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 (Teasley & Roschelle, 1993, p. 235).

Based on Teasley and Roschelle's definition, several researchers have provided a distinction between collaborative learning as learning occurring within group members and cooperation as filling different parts of the same puzzle (e.g., Dillenbourg, Baker, Blaye, & O'Malley, 1996). Anchored in this definition, collaborative learning is the most suitable approach to study, analyze, and actually use for group exploratory and creative thinking. Winograd (1987) suggested that rules and protocols need to pre-exist to suit a team's composition; techniques based on progressive dialogue can facilitate team-members' communication.

Argumentation is a shared learning experience that has been considered an effective means for adult learning (e.g., Brown & Duguid, 2000). Collaborative learning activities are nowadays central to successful groupwork for group knowledge building (Wegerif, in press). There have been several attempts to model collaborative learning for practice used in real classroom discussions (e.g., Mercer & Wegerif, 1999) or design tools to

facilitate it (Jeong, 2005; Lambropoulos, 2007). The Initiate-Respond-Evaluate (IRE) scheme presented by Hoadley and Enyedy (1999) aimed at facilitating group learning. IRE triggered efforts to support collaborative learning dialogical sequences by predicting the forms of desirable dialogue. In other words, being aware of the collaborative learning techniques and stages, the interlocutors can coordinate their own idea generation. This means that collaborative learning can be taught and learned.

Wegerif (2007) proposed that collaborative learning targets the exploration of new ideas among group members as an exploratory dialogical process similar to the Socratic dialogue. Since this is not an automated procedure, collaborative effort must originate from the team members (Clarke & Wilkes-Gibbs, 1986, p. 26). Thus, the virtual knowledge workers as team members need to come with a willingness and attitude to collaborate. Trust, knowledge awareness, team members' presence and co-presence awareness, and awareness of interactional collaborative learning strategies are essential for achieving this (Berki, Isomäki, & Salminen, 2007; Jäkälä & Berki, 2004). Grice (1975) and Wegerif (2007) agreed that dialogic argumentation for idea generation requires:

- Trust between the team members
- Clear visions and goals to enable participation
- Clear and coherent argumentation
- Openness to criticism
- Consensus on decision making and actions

The aforementioned social prerequisites constitute the first level of collaborative learning and the progressive dialogue the second. Wegerif, Mercer, and Dawes (1998) have developed a model based on exploratory talk that builds on team members' interactions for new knowledge building, new for at least one of the members or for the team. Lambropoulos (2007) has proposed the following scheme as a process for *Collaborative E-Learning* based on collaborative learning studies and ongoing empirical work:

- Information
- Question
- Explanation
- Exploration
- Agreement and disagreement
- Evaluation
- Summary and conclusions

Lambropoulos' model was mainly structured for the development of tools to aid *Collaborative E-Learning.* However, even though the tools required specific structures to function, this is not a linear, but a spiral and dynamic process that is not preplanned, integrating and sometimes omitting stages, which leaves space for insights and immediate conclusions. As with collaborative learning, de Bono's (1985) *Six Thinking Hats* technique targets creative thinking.

The Six Thinking Hats Technique

In the mid-1980s, de Bono (1985) proposed the *Six Thinking Hats* as a technique of *lateral* (creative) *thinking.* Several companies and organizations have used this technique in enhancing creativity and productivity, problem-solving, and decision-making. The technique is also used in education at all levels, as it aims to:

- Encourage creative (lateral) thinking
- Focus on and improve the thinking process
- Improve communication between the participants
- Accelerate decision-making
- Focus on the holistic view
- Avoid unnecessary debates
- Give opportunities for contribution to all
- Separate ego from performance

The six coloured hats represent six distinct but complementary dimensions of human thinking. The thinker can put on or take off any of these metaphorical hats to indicate the type of thinking that he or she is using at any particular time. This putting on and taking off procedure is essential because it characterizes change in thinking. However, the hats do not characterize the persons who "wear" them. Any hat can be used not only to describe the thinking process required in a given situation but also to define the way someone is thinking in a neutral way. In other words, hats can be used to "separate ego from performance" (de Bono, 1985). They should be used proactively rather than reactively.

COLLABORATIVE CREATIVITY

Learning and creativity both involve central processes of cognitive change, and they are both inherently social (Candy & Edmonds, 1999). Furthermore, many creative products are overly outsized and complex to be generated even by the most creative and genius individual human beings. Instead, these products are created by teams, organizations, even entire societies, and require *collaborative creativity*. Movies, video clips, e-learning courses, operating systems, and complicated scientific experiments, to name just a few, require teams of creative workers and complex networks of experts (Sawyer, 2006). Even when we observe such complex products, we often assume they have been invented or developed by an individual because we conceptualize creativity at an individual level.

However, there are significant differences between individual and collaborative creativity (e.g., Mamykina, Candy, & Edmonds, 2002) that should be investigated, such as the role of individuals, the contexts, the processes, the products, and the team dynamics. The scientific study of collaborative creativity calls for a new perspective that allows us to shed light on how groups of people work and learn together, and how the collective actions of many people result in a final product.

We conceptualize collaborative creativity as the highest level of the creative process, involving more than one person interacting with one another, sharing ideas and experiences, and affecting the insights of the other members of the team. If we want to explain the creative outcomes of our team work, we should analyze not only the creativity of each member but also the group dynamics and the levels of collaboration between our team members. In other words, we need to combine *individualist* and *contextualist approaches* to explain collaborative creativity (Sawyer, 2006).

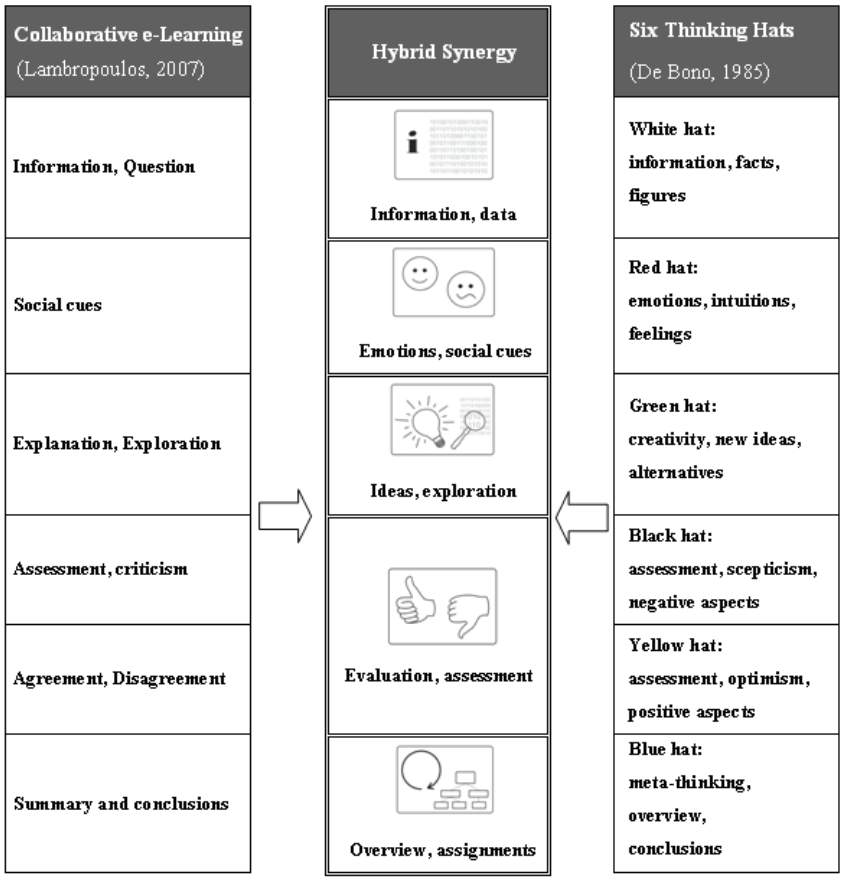
It is worth noting that collaborative creativity cannot be fully planned; each member of the creative team contributes with ideas and criticism and these individual contributions are integrated in order to structure the collective product. This collective product is not predetermined, and even small creative contributions may cause significant changes to it (Sundholm, Artman, & Ramberg, 2004). This spiral mobility has an internal structure that can be enhanced by specific collaborative creativity techniques such as *Hybrid Synergy*.

Hybrid Synergy

Anchored in *Collaborative e-Learning* and the *Six Thinking Hats*, we propose an analytical framework to facilitate collaborative creativity for written communication under the term *Hybrid Synergy* (Figure 1).

Both *Collaborative E-Learning* and the *Six Thinking Hats* follow a spiral argumentation development based on initial information input and build upon argumentation and rhetoric techniques. The major difference between the two approaches and *Hybrid Synergy* is the integration of positive and negative aspects of creative argumentation in collaborative creativity as part of a continuous evaluation process. In this way, both positive and negative aspects are viewed as steps for further development in knowledge building rather than as distinct states.

Figure 1. Hybrid synergy



A team of knowledge workers can use *Hybrid Synergy Steps* in many different sequences depending on the issue. In most cases, our team has used one of the following sequences (Figure 2).

Since the Greek team only worked online, the following section will present the tools used as the medium to enable remote communication and collaboration.

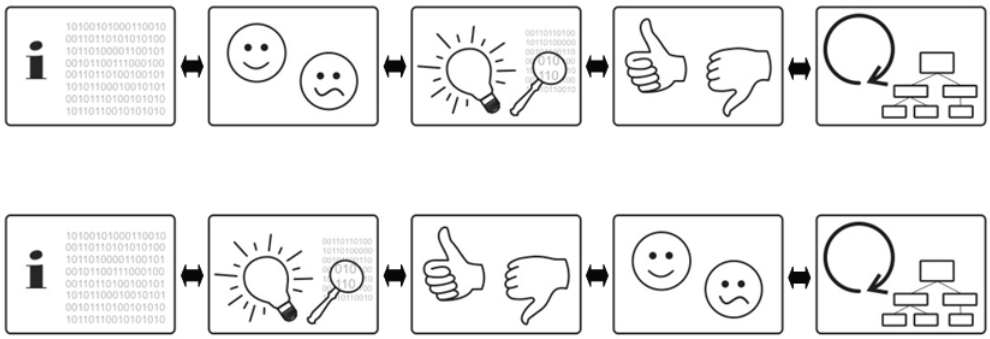
TECHNOLOGY FOR COMMUNICATION AND COLLABORATION

We use tools to expand our capabilities (Shackel, 1991). In return, these tools interact with our own personalities (Preece, 2000). To some extent, tools can restrict or allow activity coordination as well as measurement and evaluation of virtual working. It is also important to note the paperless green aspect of online written communication. The following section refers to the tools used to facilitate remote activities and tasks from afar.

Groupware (social software) can provide a balance to more formal processes by encouraging informal interactions through participation in information sharing, knowledge management and decision-making. Thus, we used the following *Web 1.0* and *Web 2.0* communication technologies:

- E-mail for *asynchronous communication* using text
- *Synchronous Communication Tools* utilizing text, voice, and video (e.g., chat and Skype)

Figure 2. Non-linear structures for hybrid synergy



- Video-Conference for synchronous collaboration via video and text as well as sharing applications (e.g., whiteboard)
- Wiki and blogs for collaborative authoring

All tools are used depending on the task and the kind of e-team interactions needed for each particular situation:

- *Reaching consensus:* Asynchronous and synchronous communication tools for:
  - initial targets and focus
  - strategies and methodologies
  - detailed planning
- *Immediate decision-making:* Synchronous communication tools for:
  - confirming understanding of statements
  - reaching consensus
- *Activity management:* collect/relate/create/donate using Wikis and blogs for:
  - work memos, such as diaries, archives, and collaborative writing
  - own coding for keeping document archives to cut duplication and needless revision
  - daily reports on "what work was completed?" and "what work are you going to do next?"

The tools also provide data for performance benchmarking and assessment based on *human-human* and *human-computer interactions*. Choosing suitable methodology is the key for evaluation, assessment and feedback.

RESEARCH DESIGN AND METHODOLOGY

Research methodology was designed to support the multidisciplinary and situated nature of the online course.

Ethnotechnology

Ethnotechnology was found to be the most suitable approach to support our aims and objectives. The ethnotechnological perspective suggests that the properties of a context cannot necessarily be accurately understood independently of each other. The ethnotechnologist is interested in how people make their actions intelligible to themselves and others (Guribye & Wasson, 2002); this is actually what the knowledge workers do. For this reason, we used descriptive data on the team's activities and examples of *Hybrid Synergy Analysis* presented in the following section.

The Study: The Project Method E-Course

The *Project Method E-Course* was implemented on the e-learning platform of the *Greek School Network* which utilizes *Moodle Open Source Software* (http://www.moodle.org) and addresses the needs of Greek State School Teachers in Primary and Secondary Education. The initial phase of the course involved three e-tutors and took place in November–December 2006. The content was re-designed based on the participants' needs as revealed during the progression of Phase 1, as well as the course evaluation process (Vivitsou, Lambropoulos, Konetas, Paraskevas, & Grigoropoulos, 2008). The renewed syllabus focused on the utilization of online collaborative tools (i.e., blogs, Wikis, and videoconferencing) for teaching purposes. This objective was coupled with the pedagogical principles underlying project implementation within an educational context, which was the focal point of the previous period. The second stage was launched in February 2007 with 162 participants, extended over five consecutive weeks and involved eight e-tutors.

In ethnotechnology, *human-human* and *human-computer interaction analysis* involves quantitative and qualitative methodologies. Because the aim of this chapter is to present the *Hybrid Synergy* technique for written communication in virtual knowledge working, and also due to space restriction, only some examples of the activities the e-tutors participated in will be presented next.

E-Tutors' Activities in Logs

Logging is a *Human-Computer Interaction* approach to view and evaluate users' visits in the system. Logs provide accurate and easy-to-use quantitative analysis. However, logging must be combined with other quantitative and qualitative approaches in order to provide an overview of the environment under investigation. The e-tutors' logs during the online course (February 26–March 28, 2007) and activities until August 1, 2007 were 11,555 and 29,193 respectively:

- E-T1: 761–2,174
- E-T2: 1,530–2,436
- E-T3: 467–467
- E-T4: 1,171–3,695
- E-T5: 4,342–9,767
- E-T6: 33–2,590
- E-T7: 644–2,537
- E-T8: 2,607–5,527

It appears that the e-tutors' activities may naturally occur during the course. However, depending on individual priorities, spare time and special interests, the e-tutors continuously visit the environment for further assessment and redesign. E-tutoring is an ongoing activity. The next sections refer to e-tutors' activities in written communication.

E-Tutors' Activities in Chats (November 11, 2006–January 1, 2007)

From November 11, 2006 to January 1, 2007 we conducted 10 chats; the total duration was 810 minutes with 17,741 words written. Not all e-tutors have participated in all chats; the number varied, there being two e-tutors involved in one chat, three and four in two chats, five in three chats, and six e-tutors in two chats. The chats had an average duration of 82 minutes and 1,774 words written.

Chat text richness appears to be related to chat duration and the number of e-tutors involved. Based on *Hybrid Synergy Analysis*, the following graph depicts the relationship between the number of e-tutors, chat duration, and idea generation (Figure 3).

This graph shows that a small number of e-tutors (≤3) is related to:

- A small number of issues discussed
- A short duration of discussion
- An even smaller idea generation

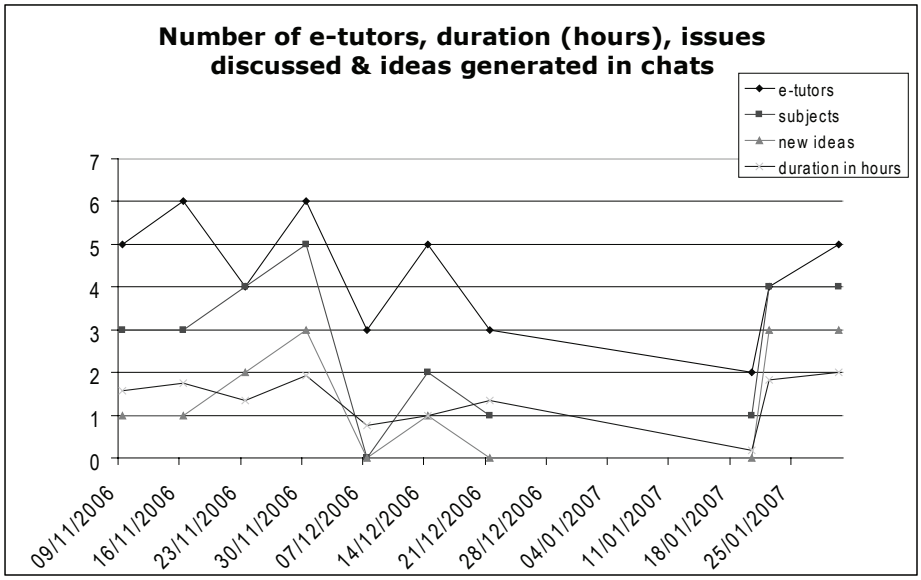
Idea generation (N=14) is interconnected to all parameters (e.g., number of e-tutors, duration, number of issues discussed). This means that if all related parameters reach a peak, idea generation reaches a peak as well. Next, we present an example of how *Hybrid Synergy Analysis* exhibits the idea generation in one chat.

Chat 23/11/2006: Hybrid Synergy Analysis

An example of *Hybrid Synergy Analysis* is presented from the chat on November 23, 2006. Four e-tutors participated in the chat for 80 minutes, producing a total number of 1,720 words. The chat analysis and argument development were as following:

- *Information*
  ET-8: themes for blogs
  ET-4: previous experience on blogs
- *Emotions*
  ET-8: emoticon
  ET-6: emoticon
- *Evaluation*
  ET-1: focus on Byzantine iconography
  ET-1: justification
  ET-4: justification on ET-8 presentation from one team to the other
  ET-6: agreement
- *Ideas*
  Propositions:
  ET-1: Wiki
  ET-8: team working
  ET-1: implementation of a cultural project in the Greek schools
  ET-8: creation of a blog and Wiki as part of the online course
  ET-8: decision-making by reaching consensus
  ET-4: teamwork rules and protocols: facilitate communication, avoid email overload, solve technical problems, message contribution, and exchange of opinions.
- *Overview, assignments*
  E-tutors: Agreement on online course subject

Figure 3. Chat analysis 23/11/2006



ET-8: Summary and agreement on regular newsletters
E-tutors: Overall summary and agreement as well as thanks for the collaboration

This discussion was one of the most crucial ones because the team had to decide on the online course provided to the Greek teachers from March 1, 2007 to March 31, 2007. In the information phase, ET-8 and ET-1 proposed blogs and Wikis, whereas ET-4 assisted the brainstorming in order to find specific contexts of implementation. ET-8 and ET-6 reacted with emoticons suggesting their satisfaction with blogs and Wikis. It is evident that progressive dialogue is essential for idea generation; for example, ET8 pointed out the need for specific collaborative approaches and this helped ET-4 to format ideas on team-working protocols. In the overview, two summaries and agreements indicated the end of the chat.

E-Tutors' Activities on Skype (February 27, 2007–March 27, 2007)

There were 14 discussions on Skype between February 27–March 27, 2007. The following graph depicts the correlation between the duration of discussions and the number of e-tutors participating (Figure 4).

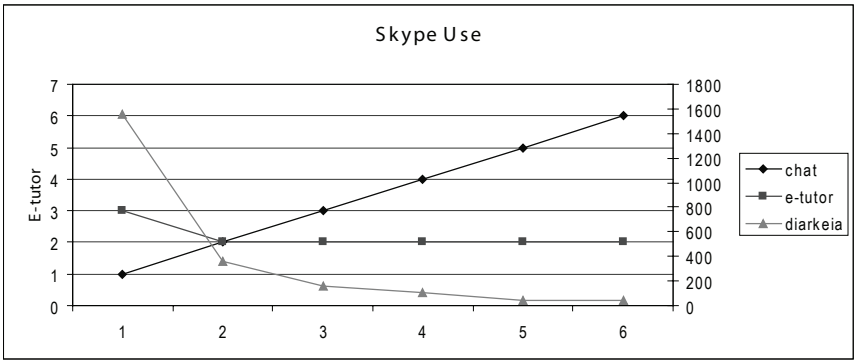
Initially two e-tutors participated in the chat on Skype. It is apparent that when a third e-tutor joined, the duration increased and the issues reached consensus in a total of 26 min or 1,560 sec. The above graph suggests that the greater the number of e-tutors participating in a Skype meeting, the greater the duration. This result is reasonable. In addition, the duration of the meeting was related to the subject. For example, during the first videoconference (VC) recording the e-tutors were discussing and solving the problems in VC when the participants were having their VC sessions, that is, in a synchronous mode. The unsolved problems were reported to the educational authorities responsible for Click2Meet, and were solved to a great extent.

Synchronous Communication via Skype on March 2, 2007: Hybrid Synergy Analysis

An example of *Hybrid Synergy Analysis* is presented below from Skype on March 2, 2007. Three e-tutors participated in the discussion and the duration was 37.8 min:

- *Information*
  ET-5 to ET-1: Discussion about chat
  ET-1 to ET-5: Information and guidance about blog
  ET-1 to ET-5: Extension for the on-line course about blogs
  ET-1 to ET-5: Lengthy reference of creation of Wiki from the e-tutor ET2

Figure 4. Skype activities analysis 27/02/2007 - 27/03/2007



- *Emotions*
  ET-5: emoticon (y)
  ET-5: emoticon (ninja)
- *Evaluation*
  E-tutors' satisfaction
  Decisions on chat
  Evaluation of the course: negative aspects
  Expressions:
  ET-1: I suggested some links
  ET-6: AAA! Wonderful!
  ET-1: All of the participants were very pleased from the answers and the aid that we gave to them!
  ET-5: Bravo!
  ET-5: Therefore they liked it?
  ET-1: I'm certain!
  ET-5: 99.9% certain!
- *Ideas*
  All e-tutors:
  Creation of Wiki
  Course extension
  Blog creation
- *Overview, assignments*
  All e-tutors:
  Annotation about chat
  Satisfaction in participation in the course
  Create Wikis
  Technical problems using chat
  Blog for follow up
  Evaluation and final questionnaire

The above Hybrid Synergy Analysis presents an overview of the messages sent using Skype. The analysis depicts the need for initial information on the issues to be discussed, the use of emoticons for feedback, and evaluation expressions. The idea generation reached a rate of three in 26 minutes, equal to almost one idea every nine minutes.

The issues discussed concerned a chat with the e-learners and the launch of the online course: the number of participants in the chat, the quantity and quality of questions asked from the e-learners, questions on the blogs, the technical problems and in particular the reasons for difficulty connecting to Moodle@GSN. Immediate decisions were made and actions were taken. Reporting the problems to the GSN technical support was one action. The prediction of the persistence of technical problems indicated the need for the extension of the online course for one more week. Therefore, the course timetable on the pedagogical scenario, as well as the dates for evaluating the course had to be changed. Lastly, there was an overview and evaluation of actions taken until that point in time.

What about Discussion Forums?

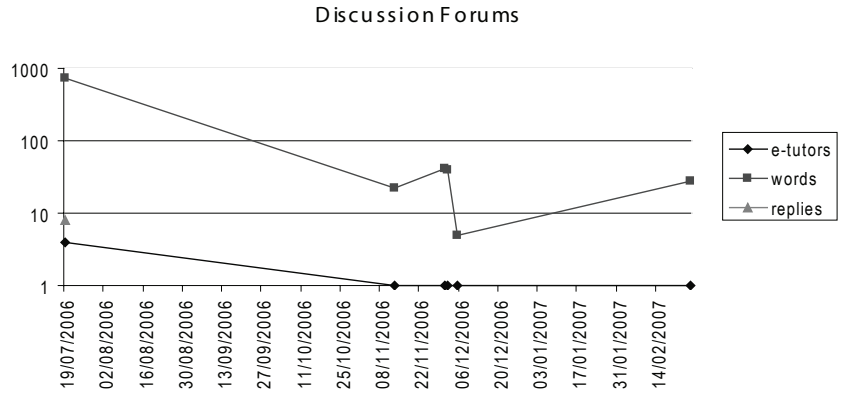
Even though there were 13 discussion forums, there were six discussion threads with only minor participation in one of them. One discussion prompted eight replies, while all others lacked any replies (Figure 5).

It is evident that the e-tutors preferred synchronous communication. The discussion forums were found difficult to use, as we needed an immediate space of action. In other words, we preferred discussions while we were working on the online course in order to save time.

DISCUSSION

Hybrid Synergy provides a transparent and coherent analytical framework for *virtual knowledge working* that can resolve the coordination problems as well as problems with social loafing or free riding (Karau & Williams, 1993). In this chapter, we attempted to present the concept and methodologies as well as the tools behind our effort as a Greek e-learning team: knowledge working, collaborative creativity, best practices and tools to achieve cost- and time-effective collaborative and virtual knowledge working, as well as ways to measure and assess it. Methodologies, planning, and coordination of activities can bring results for collaborative creativity when applied in situated contexts. As Shneiderman (1997)

Figure 5. Limited activities in discussion forums



suggested in his collaborative creativity model "collect/relate/create/donate," such processes can enliven the educational process. It is apparent that the e-tutors deliberately reinforce the *Hybrid Synergy* cycle, asking specific questions in order to elaborate on certain issues and, ultimately, to achieve consensus. In addition, they can assess their own behaviour and performance and review their own actions in a self-directed learning mode (e.g., Argyris, & Schön, 1996; Brockett & Hiemstra, 1991).

Based on the total number of idea generation following the *Hybrid Synergy* analytical framework (N=14), it appears that idea generation is interconnected to all parameters (e.g., number of e-tutors, duration, number of issues discussed). This means that idea generation depends on all related factors, and if the e-tutors reinforce the Hybrid Synergy cycle idea generation can be enhanced. Furthermore, the technique is predefined. However, the actual knowledge building process and possible products are not. It is interesting to see that this interplay and interchange of the dialogic process among group members is exactly what creates the argumentation and discussion towards new knowledge building on a team basis. In other words, individual contribution results in creative teamwork enhancement.

The results from this study cannot be generalized. We have presented our own work and experience in a case study. In addition, there are no similar studies for comparison. Therefore, further research is needed to explore the different Hybrid Synergy aspects and achieve replicability and generalizability.

CONCLUSION AND FUTURE TRENDS

This chapter aimed at answering the question "What tools, methodologies, techniques, and practices can support collaborative creativity of multidisciplinary teams for virtual knowledge working?" We used *Hybrid Synergy* to collectively share information for knowledge building and make decisions mediated by synchronous and asynchronous social software technology. This approach utilizes knowledge workers' different perspectives and can be used to allocate change and innovation. This holistic perspective has the advantage of examining the causes rather than the effects, and it supports greater clarity and distinct vision of different aspects in a given situation. Evidently, the *Hybrid Synergy* process can not only facilitate collaboration and cooperation between the e-learning team members but also support collaborative creativity. *Collaborative creativity* is a higher level of the creative process. As it involves more than one person interacting

with another, it facilitates the sharing of ideas and experiences, and affects the insights of the other members of the team.

Furthermore, *Hybrid Synergy* requires a degree of skill and practice, because it involves mutual respect and attunement with the ideas and intentions of other people in the team in order to achieve consensus. Regarding collaboration and communication using various media and *groupware*, it is evident that access to such apparatus, especially on a synchronous mode, and utilization of suggested techniques can unlock participants' creative potential, and provide opportunities for interaction, collaboration, and the active expression of the key components of creativity. These include purpose, imagination, originality, production, and value.

Virtual knowledge working can facilitate social and economical change in the new and creative era by adapting to new conditions of working that are independent of time and space in contrast to the previous industrial era. ICT is now deeply embedded in the industry and new technologies have suggested significant structural changes in the way business and organizations operate, similarly to the Ford revolution in the 20th century. Specific virtual working frameworks are needed. Therefore, such modules in universities would help employees' collaborative creative activities across the globe either for "off-shoring" or within organizations and business networks. The European governments are now considering changing their legislation and providing flexible working hours. Another example comes from the British Prime Minister Gordon Brown's speech on Work-Life Balance in the Trade Union Congress (April 30, 2007, http://www.tuc.org.uk/work_life/tuc-13245-f0.cfm) and the executive summary Interim Report of the Equal Opportunities Commission's investigation into the Transformation of Work under the title *Working outside the box: Changing work to meet the future* (http://www.eoc.org.uk/PDF/working_outside_box_summary.pdf).

Moreover, part of the methodology in this chapter indicates that virtual working can be an option for all *virtual workers*: as with face-to-face communication and collaboration, it can be tracked, measured, and thus provide assessment of employees' overall performance. However, current tools have not automated this process of benchmarking and assessment, and therefore, standards must be developed.

Technology-enabled organizational change is about looking after people, not looking after technology. In other words, defining clear goals, strategies and work allocation via joint planning, shared resources and joint management, as well as tackling low morale and poor job satisfaction, can improve collaboration, which in turn will improve productivity. Tools provide the media for achieving this. Thus, fostering a culture of innovation even within organizations with limited financial resources, such as educational organizations, can start from a research and development team with a bottom up and top down interactional perspective. To profit from innovation, people must be able to make their ideas come to life (Frazer, 2007). Therefore, an organization does not exist to implement change. Rather, it implements change to help itself to continue to exist and thrive (Newton, 2007) as well as create creativity for everyone (Shneiderman, 1999). *Hybrid Synergy* provides the means towards achieving this organizational goal.

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REFERENCES

Argyris, C., & Schön, D. (1996). *Organizational learning II: Theory, method and practice*. Reading, MA: Addison Wesley.

Berki, E., Isomäki, H., & Salminen, A. (2007). *Quality and trust relationships in software development*. Paper presented at the SQM & INSPIRE Conference 2007. Tampere, Finland.

Berners-Lee, T. (2007). Berners-Lee warns of changes ahead. *Computing Magazine*. Retrieved June 30, 2008, from www.computing.co.uk/computing/analysis/2186086/berners-lee-warns-changes-ahead

Boden, M.A. (1990). *The creative mind: myths & mechanisms*. London: Basic Books.

Brockett, R.G., & Hiemstra, R. (1991). *Self-Direction in adult learning: Perspectives on theory, research, and practice*. New York: Routledge & Kegan Paul.

Brown, J.S., & Duguid, P. (2000). *The social life of information*. Boston: Harvard Business School Press.

Candy, L., & Edmonds, E. (1999). *Introducing creativity to cognition*. Paper presented at The 3rd Conference on Creativity and Cognition. Loughborough, U.K.

Clark, H., & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 20*, 1–39.

Cropley, A. (1997). Fostering creativity in the classroom: General principals. In M.A. Runco (Ed.), *Creativity Research Handbook* (Vol. 1, pp. 83–114). Cresskill, NJ: Hampton.

Cropley, A. (2001). *Creativity in education & learning: A guide for teachers and educators*. London: Kogan Page.

Cropley, A. (2006). Creativity: A social approach. *Roeper Review, 28*(3), 125–140.

Davenport, T.H., & Prusak, L. (1998). *Working knowledge*. Boston: Harvard Business School Press.

De Bono, E. (1985). *Six Thinking Hats* (1st U.S. Ed.). Boston: Little Brown.

Dillenbourg, P., Baker, M., Blaye, A., & O'Malley, C. (1996). The evolution of research on collaborative learning. In E. Spada, & P. Reiman (Eds.), *Learning in Humans and Machine: Towards an Interdisciplinary Learning Science* (pp. 189–211). Oxford: Elsevier.

Drucker, P. (1966). *The effective executive*. New York: Harper Business Essentials.

Drucker, P.F. (1973). *Management: Tasks, responsibilities, practices*. New York: Harper & Row.

Elliott, R.K. (1971). Versions of creativity. *Journal of Philosophy of Education, 5*(2), 139–152.

Finke, R.A., Ward, T.B., & Smith, S.M. (1992). *Creative cognition: Theory, research, and applications*. Cambridge, MA. London: MIT Press.

Florida, R.L. (2002). *The rise of the creative class: And how it's transforming work, leisure, community and everyday life*. New York: Basic Books.

Florida, R.L. (2005). *The flight of the creative class: The new global competition for talent* (1st Ed.). New York: Harper Business.

Frazer, G. (2007, December). Nurture your inner entrepreneurs. *Computer Weekly*, 16–18.

Gardner, H. (1993). *Creating minds: An anatomy of creativity seen through the lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi*. New York: BasicBooks.

Grice, P. H. (1975). Logic and coversation. *Syntax and Semantics, 1*, 41-58.

Guribye, F., & Wasson, B. (2002, January, 7–11). *The ethnography of distributed collaborative learning*. Paper presented at the CSCL'02—Computer-Supported Collaborative Learning. Boulder, CO. Retrieved June 30, 2008, http://newmedia.colorado.edu/cscl/148.pdf

Hoadley, C.M., & Enyedy, N. (1999). *Between information and collaboration: Middle spaces in computer media for learning.* Paper presented at the CSCL'99—Computer Supported Collaborative Learning 1999, Stanford University, Palo Alto, CA. Hillsdale, NJ.

Jäkälä, M., & Berki, E. (2004). *Exploring the principles of individual and group identity in virtual communities.* Paper presented at the IADIS International Conference Web Based Communities 2004. Lisbon, Portugal.

Jeong, A. (2005, April 5–6). *Methods and tools for the computational analysis of group interaction and argumentation in asynchronous online discussions*. Paper presented at the Technology and Learning Symposium. New York. Retrieved June 30, 2008, from http://dev22448-01.sp01.fsu.edu/Research/Proposals/LearnTechSymposium/MethodsToolsAnalyzingInteraction_Jeong2005.pdf

Kampylis, P., Berki, E., & Saariluoma, P. (2006). *Can we "see" the sound? New and creative solutions in music and physics education through hands-on and ICT-based activities.* Paper presented at the EDEN 2006 Annual Conference. E-competence for Life, Employment and Innovation. Vienna, Austria.

Kampylis, P., Fokides, E., & Theodorakopoulou, M. (2007). *Towards effective computer-related learning environments for primary school students' creative thinking development*. Paper presented at the SQM & INSPIRE Conference 2007. Tampere, Finland.

Karau, S., & Williams, K. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology, 65*(4), 681–706.

Lambropoulos, N. (2007, July 11–13). *The evolution of online discussions in images*. Poster presentation at the EVA Conference, The Interdisciplinary Workshop, London College of Communications.

Mamykina, L., Candy, L., & Edmonds, E.A. (2002). Collaborative creativity. *Communications of the ACM —Special Section on Creativity and Interface, 45*(10), 96–99.

Matheson, B. (2006). A culture of creativity: Design education and the creative industries. *Journal of Management Development, 25*(1), 55–64.

Mayer, R. (1999). Fifty years of creativity research. In R. Sternberg (Ed.), *Handbook of Creativity*. Cambridge, U.K.: Cambridge University Press.

Mercer, N., & Wegerif, R. (1999). Is "exploratory talk" productive talk? In K. Littleton, & P. Light (Eds.), *Learning with computers*. *Analyzing productive interaction* (pp. 79–101). London: Routledge.

Murakami, T. (2000). *Encouraging the emergence evolution of new industries*. Nomura Research Institute.

National Advisory Committee on Creative and Cultural Education (NACCCE). (1999). *All our futures: Creativity, culture and education*. London: DSEE.

Nemeth, C.J., & Goncalo, J.A. (2005). Creative collaborations from afar: The benefits of independent authors. *Creativity Research Journal, 17*, 1–8.

Nemiro, J. (2002). The creative process in virtual teams. *Creativity Research Journal, 14*(1), 69–83.

Newton, R. (2007). *Managing change step-by-step*. Pearson Education.

Nicholls, J. (1972). Creativity in the person who will never produce anything original and useful: the concept of creativity as a normally distributed trait. *American Psychologist, 27*(8), 717–727.

Nickerson, R. (1999). Enhancing creativity. In R.J. Sternberg (Ed.), *Handbook of Creativity* (pp. 189–212). New York: Cambridge University Press.

Perkins, D. N. (1981). *The mind's best work*. Cambridge, MA: Harvard University Press.

Preece, J. (2000). *Online communities: Designing usability, supporting sociability.* Chichester, U.K.: John Wiley & Sons.

Reilly, P. (2005, September). Get the best our of knowledge workers. *People's Management Magazine*, *29*.

Romer, P. (2004). Beyond the knowledge worker. In *The Competitiveness of Nations in a Global Knowledge-Based Economy*. Retrieved June 30, 2008, from http://www.culturaleconomics.atfreeWeb.com/Anno/Romer%20Beyond%20the%20Knowledge%20Worker%201995.htm

Ryhammar, L., & Brolin, C. (1999). Creativity research: Historical considerations and main lines of development. *Scandinavian Journal of Educational Research, 43*(3), 259–273.

Sawyer, R.K. (2006). *Explaining creativity: The science of human innovation*. New York: Oxford University Press.

Shackel, B. (1991). Usability—context, framework, definition, design and evaluation. In B. Shackel & S. J. Richardson (Eds.), *Human Factors for Informatics Usability* (pp. 21–37). New York: Cambridge University Press.

Shneiderman, B. (1997). Between hope and fear. *Communications of the ACM, 40*(2), 59–62.

Shneiderman, B. (1999). *Creating creativity for everyone: User interfaces for supporting innovation*. UM Computer Science Department; CS-TR-3988 UMIACS; UMIACS-TR-9910, Digital Repository at the University of Maryland.

Shneiderman, B. (2002). *Leonardo's laptop: Human needs and the new computing technologies*. Cambridge MA: MIT Press.

Simonton, D.K. (2000). Creativity: Cognitive, developmental, and social aspects. *American Psychologist, 55*(1), 151–158.

Starko, A.J. (2005). *Creativity in the classroom: Schools of curious delight* (3rd Ed.). Mahwah, NJ: L. Erlbaum Associates.

Sternberg, R. (1985). Implicit theories of intelligence, creativity, and wisdom. *Journal of Personality and Social Psychology, 49*(3), 607–627.

Sternberg, R., & Lubart, T. (1996). Investing in creativity. *American Psychologist, 51*(7), 677–688.

Sternberg, R., & Lubart, T. (1999). The concept of creativity: Prospects and paradigms. In R. Sternberg (Ed.), *Handbook of Creativity*. Cambridge, U.K.: Cambridge University Press.

Sundholm, H., Artman, H., & Ramberg, R., (2004). Backdoor creativity—collaborative creativity in technology supported teams. In F. Darses, R. Dieng, D. Simone, & M. Zacklad (Eds.), *Cooperative Systems Design—Scenario-Based Design of Collaborative Systems* (pp. 99–114). IOS Press.

Tapscott, D., & Williams, A.D. (2007). *Wikinomics*. New York: Penguin Group.

Taylor, C.W. (1988). Various *Approach to and Definitions of Creativity*. In R. Sternberg (Ed.), *The Nature of Creativity—Contemporary Psychological Perspectives* (pp. 99–121). Cambridge: Cambridge University Press.

Teasley, S.D., & Roschelle, J. (1993). Constructing a joint problem space: The computer as a tool for sharing knowledge. In S.P. Lajoie, & S.J. Derry (Eds.), *Computers as Cognitive Tools*. New Jersey: Lawrence Erlbaum Associates, Inc. Publishers.

Torrance, E.P. (1988). The nature of creativity as manifest in its testing. In S. Robert (Ed.), *The Nature of Creativity—Contemporary Psychological Perspectives* (pp. 43–75). Cambridge: Cambridge University Press.

UNESCO. (2004). Technology & learning definitions: Collaborative learning. Retrieved June 30, 2008, from http://www.unesco.org/education/educprog/lwf/doc/portfolio/definitions.htm

Vivitsou, M., Lambropoulos, N., Konetas, D., Paraskevas, M., & Grigoropoulos, E. (2008). The project method e-course: The use of tools towards the evolution of the Greek teachers' online community. *International Journal of Management in Education (IJMIE).*

Wegerif, R. (2007). *Dialogic, educational and technology: Expanding the space of learning*. New York: Springer-Verlag.

Wegerif, R., Mercer, N., & Dawes, L. (1998). Software design to support discussion in the primary classroom. *Journal of Computer Assisted Learning, 14*(3), 199–211.

Winograd, T. (1987): A language/action perspective on the design of cooperative work. *Human-Computer Interaction, 3*(1) 3–30.

KEY TERMS

Collaborative Creativity: The analytical framework that investigates the role of individuals, the contexts, the processes, the products, and the team dynamics in a situated context in order to provide specific co-creativity techniques and methodologies.

Collaborative Learning: Takes place 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 (UNESCO).

Hybrid Synergy: A method of written communication analysis for collaborative creativity.

Six Thinking Hats: This technique is a "thinking tool" that was created by Edward de Bono. The six colored hats represent six different, but complementary, dimensions of human thinking that can be used in complex decision-making processes.

Social Capital: Refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. Social capital is not just the sum of the institutions which underpin a society—it is the glue that holds them together (The World Bank).

Technology-Enabled Organisation Change: Change implemented in an organization based on collaborative creativity and transformational leadership.

Virtual Knowledge Workers: The employees who, preferring working online, know more than anyone else about their organization, and by virtue of their position or knowledge, are responsible for a contribution that materially affects the capacity of the organization to contribute, perform, obtain results, and share knowledge with other co-workers.