Spatial Co-design in Massively Multiplayer Online Game Environment

: Collaborative Space Design and Architecture in Cross-border Game Networks.

Heejung Kwon[1], Jinwoo Kim[2],
[1]*School of Business, Yonsei University, 134 Shinchon-Dong, Seodaemun-Gu, Seoul 120-749, Korea, junie@yonsei.ac.kr*
[2] *School of Business, Yonsei University, 134 Shinchon-Dong, Seodaemun-Gu, Seoul 120-749, Korea, Jinwoo@yonsei.ac.kr*

Abstract: How can a design team collaborate to produce a digital artifact in Massively Multiplayer Online (MMO) game environment? Why is the MMO game environment so important in the co-design research context? To answer these questions, the study conducted a single embedded case study proceeded 1 trial and 2 consecutive co-creation phases with active users among Second Life residents. The study facilitated a design space in the MMO game environment, and tested what 3D objects and functions were related to co-design process, and what interaction or social convention among the active users are useful and dominant to achieve a certain common goal of design. In virtual environments such as MMO games, the space itself is a collective artifact that has been completed by multi-layered collaborative works. To accomplish a complete space experience of game users, for example, each of participants take roles of a platform provider(such as Linden Lab), a visual territory provider(usually called a sim owner), and land designers(usually called builders).

In the study, we recruited active users in electronic music sharing scenes, and proceeded creative workshops that had tasks of experience space design, visual storytelling in the form of second life photographic arts, the exhibit presentation and communication design, and opening performance in the collaboration with sound artists. In the procedures, we collected the data of meaningful interfaces, and interaction of creative collaborations among participants in the co-design space. The participants shared a group interface to communicate and collaborate, and used their identity tools such as profile interfaces to promote their activities. Some interactive objects, such as artwork vendors, donation sign boards, group sign up boards, landmark giver HUDs, and teleport pads were produced to indicate and guide the experience space activities. In the help of the interfaces, the space functioned for creation and appreciation while they traced the visitors' information on how they recognized, used, and made feedbacks. During the phases, the research conveyed the idea of what will be the benefits of utilizing MMO game environment as a co-design space, and languages. The MMO game environment not only provides the space, but also delivers the tool of communication among users. By the communication, users are informed, motivated and engaged in a creative activity sharing a common goal, which will benefit their interests as a whole. In the result we draw a creativity circulation model based on an identity theory.

Keywords : Co-design, MMO game, space design, lead user research

1. Introduction

People work in virtual. The study on how people work and collaborate in the virtual world has been discussed and developed for many decades in the HCI research community. It has made arguments on how computer users recognize and use the computer interface as a workplace, what interfaces are more usable, and useful than other workplace metaphors, and how users communicate and collaborate through virtual environment so that they could improve their work productivity or efficiency. Our study developed the idea in three different aspects of current computer users, and environments changes.

First, the computer user population in hedonic purposes has been increased and expanded. Large populations who have been using the interactive environment for fun and enjoyment from their ages under 10, and very much adopted to the computer mediated communication in many different types of environments, such as the games, blogs, and social networking interfaces.

Second, the new virtual environments where users can participate in the co-production and open market systems, has structured the new types of online service businesses. They opened their technical standards, and application programming interfaces (API) so that users can access the right of modification and creation for the parts of the service experience. Therefore more and more open architectures in innovative market processes introduce the user participatory model that users can sell their digital consumer items and gain the profits from the virtual economic activities.

And lastly, the experience design as a virtual property has gained a great deal of attentions from the creativity research community, as the idea of virtual commodities has brought issues on its deep rooted interests : what factors influence upon individual and group creativity, and how the artifacts in a certain environment generate the creativity for both individuals and groups. In collaborative virtual environments, the group creativity is highlighted as the condition provides enormous variations and possibilities to differentiate the work environments. It reduces the collaboration barriers caused by the geographical, cultural, and temporal differences, and combines the unlimited sources of novelties that might have taken for some multiple years without an efficient cross-border collaboration networks.

Our research conducted a single embedded case study in one of the advanced intercultural collaborative virtual environments, Second Life. Focusing on group creativity and artifact interactions, the research followed a design research process that performed user observations and interviews, creative sessions among users, conceptual design and communication, and finally a built-up process and feedbacks. During the course, the study evaluated the group creativity hypothesis, and reflected them on the built-up models.

2. Theoretical Background

2.1 Group Creativity

When individuals have a high level of intrinsic motivation, they could make creative content. It is very important how we identify differences and make relations among individual creativity, group creativity, and organizational creativity to define the collective creativity. Woodman and Schoenfeldt[30, 31] have proposed an interactionist model of creative behavior at the individual level. In this model, they suggest that creativity is the complex product of a person's behavior in a given situation. The situation is characterized in terms of the contextual and social influences that either facilitate or inhibit creative accomplishment. The person is influenced by various antecedent conditions, and he/she brings to bear both cognitive abilities and non-cognitive traits or

predispositions. This interactionist model provides an integrating framework that combines important elements for the personality[28] , cognitive[12], and social psychology [2] explanations of creativity.

The study of Woodman pointed out the intrinsic motivation as a core factor of being creative. Woodman[32] consisted research hypothesis using the incremental concepts of individual, group, and organization, to explain collective creativity. He insisted such as below, to explain the relations of creativity, attention control, and information exchanges. Individual creative performance will be decreased by reward systems that rigorously evaluate creative accomplishment and link these outcomes tightly to extrinsic rewards. Group creative performance will be increased by the use of highly participative structures and cultures (e.g., a high performance-high commitment work system). Organizational creative performance will be decreased by restrictions of information exchanges with the environment.

Sawyer[16] improvised the group creativity ideas from empirical studies on collaboration and creativity in groups. He argued three insights about this area. First, creativity researchers now believe that creativity cannot always defined as a property of individuals; creativity can also be a property of groups. Second, individual creativity is influenced by the *immediate* social and cultural context, the "domain" and "field" of Csikszentmihalyi's model[9]. Third, conversation analysts, organization researchers, and socio-culturalists have demonstrated that creativity is not limited to artists, and musicians. Group creativity is also found in everyday life. His major findings from Jazz musicians' collaborations highlighted several points of group creativity researches. (1) The study of group creativity requires a fundamentally social and interactional approach. (2) Interaction and communication among the performers is the essence of group creativity. Group creativity's essence is symbolic interaction, and a theory of group creativity must have symbolic interaction as its core. (3) The process is the product : the on-stage interaction among the performers is the only outcome that the group is working toward.

The conceptual composition of Sawyer's research is participants in creative processes, and collective actions in-situ. In this study, we investigate the factors of the collective intelligence that is categorized in spatial metaphors, interactions, and representations. Therefore we could propose the design principles of the system that has embedded collective creativity goals.

2.2 Identity and Social Commitments.

In the domain of design, the identity and symbolic factors has been discussed in diversified perspectives. As Sawyer[16] noted the model of group creativity is based on the nature of the semiotic mediation of the interaction. In group creativity, interaction between performers in immediate, durationally constrained to the moment of creation, and is mediated by musical or verbal signs. The process of group creativity is coincident with the moment of reception and interpretation by other participants. His observation could be interpreted as an organizational mechanism among creative participants who he defined as artists who improvise the novelty of creation, as well audience who might collaborate in the creative scene and own some levels of expertise.

Simon[21] referred this idea as a "semantically rich domain." As he argued, there is certain arbitrariness in drawing the boundary between inner and outer environments of artificial systems. However his idea on consequences of identification may explain the organizational loyalty which may result the group creativity. Organizational loyalty could be renamed as identification that is motivational and cognitive. The motivational component is an attachment to group goals and willingness to work for them even at some sacrifice of personal goals.

In his context of organization, identification with an organization also has a cognitive component, for member are surrounded by information, conceptions, and frames of reference quite different from those of people outside of the organization of in a different organization. Affected by their organizational identification, members frequently pursue organizational goals at the expense of their own interests. He claimed that "the added effort that is elicited by identification is a major and essential source of organizational effectiveness and is a principal reason for carrying out economic activities in organizations rather than markets." Therefore the social system design such as the one we have conducted should contain the identification role of organization that has its own semiotic, semantic, and motivational functions of an entity.

3. Methods

3.1 Spatial Design for Collaboration

3.1.1. Contextual Design in the Virtual World of Simulation

In contextual design process, the physical model reveals design constraints. It means that the physical environment constrains what people can do, but within those constraints people do have some control over their environment. Or we can say the other way also. In physical world, as people structure their environment to be convenient, the structures they create mirror their thought. The place she creates mirror the way she thinks about her work. In the virtual world of simulation, we simulate this physical space logic into the virtual space design agenda. [6]

(1) Organization of space : The research team acquired two plots in a Second Life private sim, sized 4,096 sqm (1,406 primitive supports), and 8 ,192 sqm(2,813 primitive supports) with total 4 ,219 primitive supports. From August 2008, the first gallery for co-creation experiment was built in the first plot, sized 4 ,096 sqm. We chose the gallery façade to deliver the metaphor of a creative space where various kinds of art forms are created and presented to audiences.

(2) Division of space : in the trial phase, a workroom for team collaboration was built in the location where only team members were allowed to access, while the gallery space for public use was set on the ground level to offer the widest openness to the public. Although the functions of the two spaces were different, visual conditions were exactly the same, so that creative participants could test their ideas just as in the gallery. During the co-creation period, creators often exchanged their full permission to move and edit each other's primitives. It allowed more efficient and easy brainstorming or creation processes.

(3) Grouping of people : The co-creation group launched an inworld community that has 7 different roles and tags positioning 2 administrative(owner, officer), and 5 functional(artist, sound artist, architect,

critic, collector) roles and permissions. It currently holds 28 members for creation and appreciation. It shares not only the information of the art community events, but also gives them an access to each others to discuss their creative works, and ideas.

(4) Organization of workplaces: Main exhibit spaces are on the ground level which provides better access to the public, and some experimental exhibits were built in the skybox to permit the degree of freedom to each installation artist.

(5) Movement : To collect the visitors data, and to offer the ease of navigation, the place limited the landing points, and steadily promote the landmark files to help users teleport.

3.1.2. Creating a Representation of a Community

Similar to an avatar creation for a single person, a group activity requires a certain degree of a visual representation. The idea of a gallery were assumed to be a explanatory metaphor that reveals the space utility where artists present their ideas to the public, and sell their creativity in any settled forms of transferable and sustainable values. Therefore the real life functions of a gallery had been transformed in to the virtual representation to install the functions of a galley in the pixel space. To inform the artists what to do, and guide gallery visitors to navigate the gallery metaphor efficiently, the visual representation requirements as an interface design guideline were summarized such as the below.

Table 1. Visual Representation Requirements

Item	Design Issues	Observation Notes
An idea of a gallery façade	Landing point	An entrance to the gallery experience that requires to present the style and the genre of the gallery
	Minimal design	Ambience concerns as well as economic concerns
	Ambience factors - terrains, - directions, - lights - wind/water sounds	
Cognitive factors	Intuitive alignments of each building objects to navigate through.	
	Vision - View in avatar moves - mouse view	mouse constants are diversified users to users
	Showing the navigational options	
	Concerning the residents' life environments, the gallery environment should be similar but enhanced reproduction of popular residential areas.	
Interface components	Exhibit Spaces Gardens Lighting System Avatar Actions	

	Teleport Pad Donate Sign Subscribers to group Sign Artwork Vendors Gallery Search System	
Communication Toolkit	Artist Statements Banners Posters LM HUDs	
Asset management rules	The group owns the land	Visible in the about land menu
Organizational Identity Garments	Group tags for the each role - Artists - Sound Artist - Everyone	Group role tags and Community loyalty difference Artist > Sound Artist > Everyone

3.2 The Phase 1 Study : Diachronic Interaction Design

In the early stage of the research, we explored various music and art groups to find participants, and communities to execute the co-creation process together. In phase 1, we recruited 6 artist volunteers who would lead the each case of creative processes. The first phase has been preceded by 1 trial co-creation project, and performed 5 longitudinal cases for 4 months. An half of the creative participants have experienced real life art practices, so that they could imagine, evolve, and lead what they had to do for the space. Another half of creative participants are also deeply related to the industry of taste, such as visual and sound creative practices in their real life so that modeled activities from the artists are effectively shared and enhanced by each others. For about one month of trial period, overall forms and functions of the space had been defined, designed, and built. The initial opening performance and exhibition was successfully delivered to public on 9th September, 2008. Since the opening event, we observed steady visitors and sales for artworks. One case after another, the co-creation process has been formalized. Necessary input data have been sorted out, while each creator's requirements were collected. The Second Life gallery forms and functions were continuously evolved according to each artist's requirements. Following to the evaluation process, more concrete co-creation process followed. Artists gathered and sometimes created her/his artworks for the show, defined exhibition themes. Artists had written down their ideas on the artist statement. Some artists have very specific ambience requirements; how space should look like, sound like, and what interactivity should be concerned. It helped the gallery metaphor be more usable, and accessible. During the procedure, the gallery was expanded, and renovated.

Each creative participant's activities in each phase are described in table 2. As it shows, real life art practices, artwork processing complexities, ambience sensitivities, message creation for marketing and promotion, nationalities, and genders are varied. The processing complexity was measured in term of artwork production and installation. Level 3 indicates the highest complexity that required a real life painting process, an inworld building process, and scripting. Level 2 indicates the inworld photo capturing and a post production process. Level 1 indicates the inworld photo capturing, and less or no post production process. Ambience sensibilities were the measurement to indicate the requirement levels of sound, vision, and space sensitivities against artworks. Build/design requirements accumulated the levels of direct creative participants' requirements to the additional space design and build. Message creation levels represent the activity levels of creative leads' self-generation for the exhibition themes and ideas. Active indicates the condition that the creative lead originally

generated t hem o nly f or t he p roject. I nactive i ndicates t he co ndition t hat t he cr eative l ead r eproduced exhibition themes from other participants' perceptions or written materials, or her/his owns for other exhibitions.

Table 2. Phase 1 Creative Participants Information

Personnel	Phases	RL Art Practice	Processing Complexity*	Ambience Sensitivity	Build/Design Requirements	Message Creation	Nationality	Gender
CL 1	Trial	No	2	Small	Ground Build	Active	Spain	M
CL 2	Case 1	Yes	2	Large	Test room	Active	US	F
CL 3	Case 2	No	2	Small	Frame Level	Inactive	France	M
CL 4	Case 3	No	2	Large	Frame Level	Inactive	Italy	F
CL 5	Case 4	Yes	3	Large	New Building	Inactive	US	M
CL 6	Case 5	Yes	1	Small	New building	Active	US	M

*Processing Complexity level [1 : low, 2: median, 3: high]

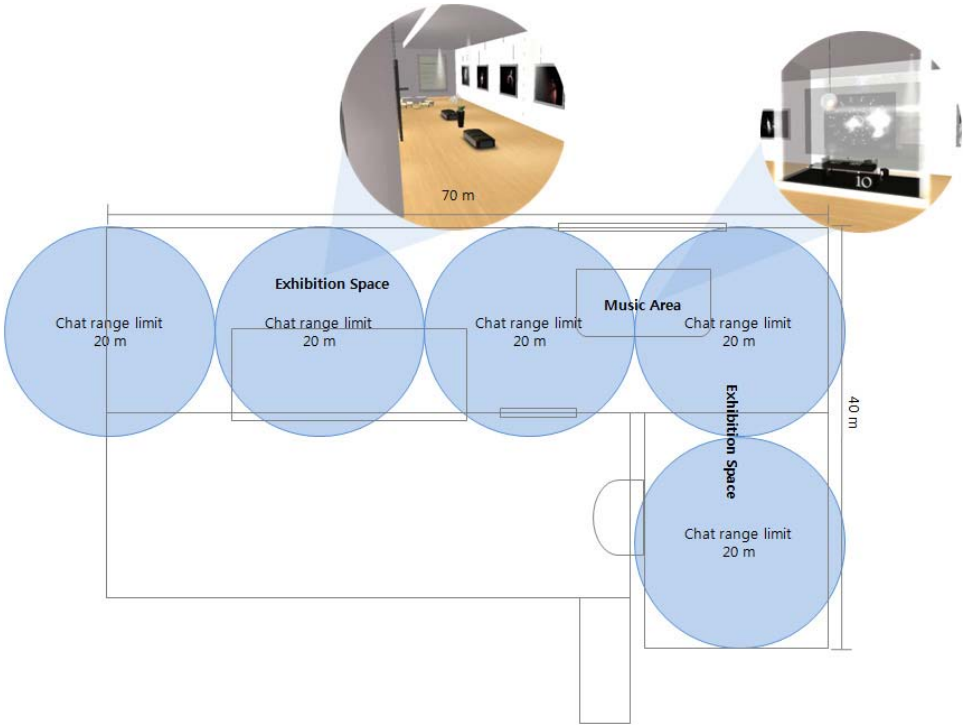

Figure 1. Case 6, and 7 chat ranges and gallery navigation design

3.3 The Phase 2 Study : Synchronic Interaction Design

In p hase 2 , t he r esearch t eam co nducted 2 co ncurrent e xhibits (Table 3) th at b rought s ynchronic i nteraction among cr eative participants. The research t eam b uilt up two d ifferent i nstallation s paces which h osted t wo different gr oups of c reative s essions, a nd e xhibits. The t wo c oncurrent session participants c ould watch comparable gallery space design, and art performances during their own idea generation and building process. Comparing to d iachronic in teraction a mong a rtists in p hase 1 , artists actively interacted an d o bserved each other's idea generation, installation, and the exhibit process. It produced several immergence outputs which were evaluated as noble and innovative later by audiences. (Figure 1)

Table 3. Phase 2 Creative Participants Information

Personnel	Phases	RL Art Practice	Processing Complexity*	Ambience Sensitivity	Build/Design Requirements	Message Creation	Nationality	Gender
CL 1	Case 6	No	2	Small	Frame Level	Active	Spain	M
CL 7	Case 6	Yes	1	Small	Frame Level	Active	Spain	F
CL 8	Case 7	No	3	Large	Installation	Active	Swiss	M

*Processing Complexity level [1 : low, 2: median, 3: high]

4. Results

4.1. The interdependency between synchronic interactions and diachronic interactions

The Virtual world of simulation offered the research team an opportunity to test the Sawyer's hypothesis [21] on group creativity. The most significant aspects of the contextual design and group collaboration experiments were creative participants' interaction and their traits on creative behaviors. As their ideas and rules were visualized in the 3D space metaphor, they learned the group knowledge and information by interacting with the virtual artifacts, and improvised the novel artworks during the group activities. The first diachronic interactions phase allowed the artists to learn group activities, and creative goals. It was not a user-to-user interaction; they gained and learned the information from man-machine interaction. The synchronic interactions in the phase 2, obviously have resulted more cases of emergent and novel ideas, and exhibit design. However, artists should have had the both condition of synchronic, and diachronic interactions to maximize the group creativity.

4.2. Identity Circulation Model

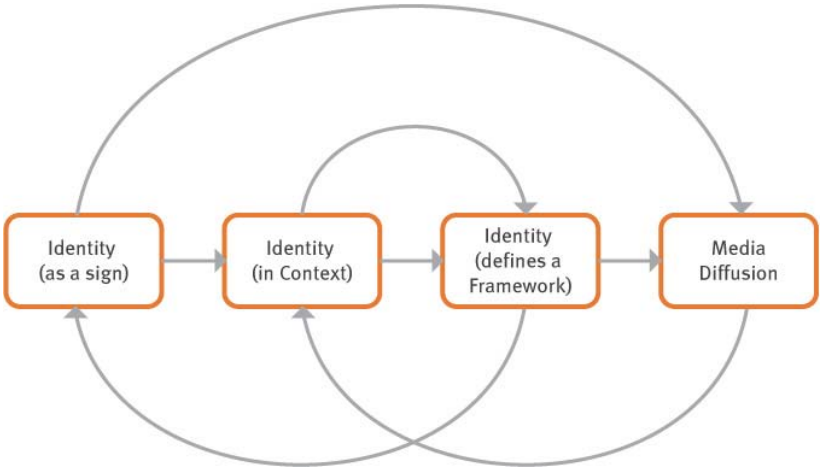

Figure 2. Identity Circulation Model

The underneath mechanism of how artists learned and creates the novel and emergent artworks was deeply related to symbolic functions of communication and interactions. As the study explained in Sections 3. 1.2., design research process preceded stepwise identity design workflows in Second Life, the virtual reality envrionment as well as the Web communication interfaces. The Web communication interfaces have been used among creative participants in the diachronic interaction purpose. The participants communicated and reviewed their ideas, and design progress in the various channels such as blogs, Flickr, Twitter and Facebook. Therefore the integrated media plan, covering cross media communication, has driven the more effective group identity

communication that defined what ideas, design, and performance should be created in group/organizational perspectives. The research found the 3D spatial metaphor, and synchronic and diachronic interactions among artists were the basic mechanism and process how group creativity has been laid and enhanced. Especially contextual design elements of environmental constraints have a significant influence on group communication characteristics, and the group identity followed the feedback. (Figure 2) The identity circulation model in cross-border game networks has promising benefits of design research interests in future. We need to develop the research in the area, and invite more participants and concerns upon it.

5. References

[1] Amabile. T. M. (1979). "Effects of External Evaluation on Artistic Creativity." *Journal of Personality and Social Psychology*. 37, pp. 221-233.

[2] Amabile. T. M. (1983) *The Social Psychology of Creativity*. Springer-Verlag, New York

[3] Amabile. T. M. (1990). "Within You, Without You: The Social Psychology of Creativity and Beyond." In M. A. Runco & R. S. Albert (Eds.). *Theories of creativity*, pp.61-91. Sage, Newbury Park:CA

[4] Amabile. T. M.. Goldfarb. P.. & Brackfield. S. C. (1990). "Social Influences on Creativity: Evaluation, Coaction, and surveillance." *Creativity Research lournal*. 3, pp. 6-21.

[5] Amabile, T. M. (1996). *Creativity in Context,* Westview Press, Boulder: Colorado.

[6] Beyer, H., & Holtzblatt, K. (1998). *Contextual Design : Defining Customer –Centered Systems*, Morgan Kaufmann Publishers, San Francisco : CA.

[7] Chandrasekaran, B. (1990). Design Problem Solving: A Task Analysis, *AI Magazine*, Winter, pp. 59-71.

[8] Chapin, W. et. al. (1994). Design Space : A Manual Interaction Environment for Computer Aided Design. *In Proc. CHI 1994*, ACM Press, pp. 33 – 34.

[9] Csikszentmihalyi, M. (1988). Society, Culture, and Person : A Systems View of Creativity. In Sternberg, R.J.(Ed.). *The Nature of Creativity* : ppl 325-339. Cambridge University Press, NY.

[10] Finke, R. A. et. al. (1992). *Creative Cognition : Theory, Research, and Application*, The MIT Press, Cambridge: Massachusetts.

[11] Garzotto, F. & Rizzo, F. (2007). Interaction Paradigms in Technology-Enhanced Social Spaces: a Case Study in Museums, *Proceeding of Designing Pleasurable Products and Interfaces*, 22-25 August, Helsinki, Finland.

[12] Hayes, S. C., & Hayes, L. J. (1989). The Verbal Action of the Listener as a Basis for Rule-Governance. In S. C. Hayes (Ed.), *Rule-Governed Behavior: Cognition, Contingencies, and Instructional control* : pp. 153-190. Plenum, New York.

[13] Kaptelinin, V. & Nardi, B. (2006). *Acting with Technology : Activity Theory and Interaction Design*, The MIT Press, Cambridge: Massachusetts.

[14] Neustaedter, C.& Fedorovskaya, E. (2009). Capturing and Sharing Memories in a Virtual World. *In Proc. CHI 2009*, ACM Press, pp. 1162 – 1170.

[15] Newell, A. & Simon, H. A. (1972). *Human Problem Solving*, Prentice-Hall, inc., Englewood Cliffs, New Jersey.

[16] Sarmiento, J.W. & Stahl, G.. (2008). Group Creativity in interaction : Collaborative Referencing, Remembering, and Bridging, *International Journal of Human-Computer Interaction*, 24(5), pp. 492-504.

[17] Sawyer, R.K. (2003a). *Group creativity : Music, theatre, collaboration*. Mahwah, NJ:Lawrence Erlbaum.

[18] Sawyer, R.K. (2003b). Sociological Methods & Research, 31(3), pp. 325-363.

[19] Sawyer, R.K.(2006). Group Creativity : musical performance and collaboration. *Psychology of Music*. 34(2), pp. 148-165.

[20] Simon, H. (1967). "Motivational and emotional controls of cognition." *Psychological Review*. 74, pp. 29-39.

[21] Simon, H.A. (1996). *The Science of the Artificial*, The MIT Press, Cambridge: Massachusetts.

[22] Smith, S. M. et. al. (1995). *The Creative Cognition Approach*, The MIT Press, Cambridge: Massachusetts.

[23] de Souza, C.S. (2005). *The Semiotic Engineering of Human-Computer Interaction*, The MIT Press, Cambridge: Massachusetts.

[24] Stahl, G. Group (2006). *Cognition : Computer Support for Building Collaborative Knowledge*, The MIT Press, Cambridge: Massachusetts.

[25] Von Hippel, E. (1986). Lead Users: A Source of Novel Product Concepts. *Management Science*, 32(7), pp.791–806.

[26] Von Hippel, E. (2005). *Democratizing Innovation*. Cambridge, MA: MIT Pres.

[27] Vygotsky, L. (1978). *Mind in society*. Cambridge, MA: Harvard University Press. (Original work published 1930)

[28] Wooman, R.W. (1981). "Creativity as a construct in personality theory," *Journal of Creative Behavior*, 15, pp. 43-66.

[29] Woodman, R. W., & Sawyer. J. E. (1991). "An interactionist model of organizational creativity." *Paper presented at the annual meeting of the Academy of Management*, Miami.

[30] Woodman. R. W., & Schoenfeldt, L. F. (1989). Individual differences in creativity: An interactionist perspective. In J. A. Glover. R. R. Ronning. & C. R. Reynolds (Eds.), *Handbook of creativity*: pp. 77-92, Plenum Press., New York

[31] Woodman, R. W., & Schoenfeldt. L. F. (1990). "An interactionist model of creative behavior." *Journal of Creative Behavior*, 24: 279-290.

[32] Woodman, R.W., Sawyer, J. E., & Griffin, R.W. (1993) "Toward a theory of organizational creativity" *Academy of Management Review*, 18(2). pp.293 – 321.

[34] Yin, R.K.(2003). *Case Study Research*, Sage Publication, London, 2003