A STUDY OF THE EFFECTS OF PLACENESS ON COLLABORATIVE VIRTUAL WORKPLACE

JUMPHON LERTLAKKHANAKUL, SEOYOUNG LEE AND JINWON CHOI
Dept.of Housing and Interior Design, Yonsei University, South Korea
{jumphon, lsycubic, jchoi}@yonsei.ac.kr

Abstract. So far, there is no empirical study on how 'placeness' can affect virtual workplace model. This problem has continuously been overlooked. The research objectives are to verify the effectiveness of 'workplace metaphor' and to find out factors that constitute 'placeness', the properties of being a place, in collaborative virtual workplace. An experiment was conducted to test the framework. At the end, different virtual workplace settings can result in dissimilar user behavior in terms of teamwork and attitude toward the workplace as disparate settings imply different requirements on function, organizational culture, and social meaning. In conclusion, if architectural elements are carefully applied to the virtual office, it cans strengthen teamwork and enhances social interaction.

Keywords. Collaborative virtual workplace; collaborative virtual environments; office ecology; place metaphor; socio-spatial behavior

1. Introduction

The shift in working paradigm caused by globalization has changed the nature of work and promoted a new type of an interactive virtual organization so called Collaborative Virtual Workplace (CVW). By means of internet technology and virtual reality, people from different location can collaborate remotely in the same virtual environment with three-dimensional interface. Examples of CVW are offices of world-leading enterprises in *Second Life* (secondlife.com) and virtual offices provided by commercial groupwares such as *Qwaq Forum* (www.qwaq.com) and *Texio* (www.texio.com).

However, research in Architecture, Sociology, Psychology and Philosophy has shown the bond among spatial configuration, function, and social interaction that constitutes the essence of place. In office ecology, the way spatial settings are designed and implemented influences users' behavior, user's attitude and teamwork in real offices (Gorawara-Bhat, 2002; Becker et al., 1995). Nonetheless, regardless of the implementation of place-metaphor in various collaborative virtual workplaces, so far, there is no empirical study on how *'placeness'* can affect virtual workplace model. This problem has continuously been overlooked, thus, it obstructs the real potential of virtual workplace design and utilization.

The aims of this research are to verify the effects of 'workplace metaphor' and to find out factors that constitute 'placeness', properties of being a place, in collaborative virtual workplace. This research has been conducted to answer major questions as follows; (1) what are the effects of 'placeness' on virtual workplace?; (2) what are influence factors of 'placeness' on such effects? Further, we construct our framework based on research hypothesis that (1) we can apply the real-word theory of place-making and work ecology to virtual workplace; (2) disparate workplace settings can bring about the difference in user's behavior, attitude and work effectiveness; (3) virtual workplace with place metaphor is a richer communication medium than typical groupware with desktop metaphor, thus, it can enhance the effectiveness of virtual workplace.

2. Literature Review

This section contains summary of the state of the art in workplace and virtual environment research which is relevant to construct the fundamental of this research framework in the next section. The main idea is to provide ground understanding from place to workplace theory at both levels of real and virtual environments.

Place Theory: In order to create virtual environment embodying the essence of place, it is inevitable to investigate ground theories of space and place from various disciplines. To do so, one has to step back and consider the root of relationship between human and space. Hall (1969) stated that "Virtually, everything that man is and does is associated with the experience of space". According to his study, boundary of oneself extends beyond body. To him, the perception of oneself is more than one's body but including the sense of being in a place. People communicate through distance in space. Moreover, different settings and spatial arrangement of rooms and furniture could result in dissimilar effect on user behavior and attitude. In finding "what is place?", numbers of space and place definitions have been investigated. It has been found that notions defined in dissimilar disciplines are not identical but overlapped. In architecture, space is a fundamental unit of any design. It is considered as a basic entity to create a place. Kalay (2004) pointed out that "Place are created through inhabitation. People imbue space with social and cultural meaning, transforming a mere space into a place". On the contrary, what is perceived as 'social space' from sociology is pretty much related to architectural 'place'. According to Wise (1997), space is a practiced place, a place with actors. In addition, philosophers such as Martin Heidegger (1958) consider place in a more conceptual way as an embodiment of self. Despite these disparate notions, three common components of place are defined among some scholars. Canter (1977), Ralph (1986) and Cast ells (1996) expressed their 'place making components' including physical features (forms or spaces), functions (activities) and symbolic meanings. This is, however, congruent with Lefebvre's three moments of space (Lefebvre, 1974) encompassing physical, mental and social aspects of space. To Lefebvre, these three moments of space should be considered simultaneously.

Workplace Ecology: Relationships between workplace settings and users' behavior including workplace ecology, teamwork, and organizational psychology are explored in this section. Against to the Modern paradigm, which the user for whom the product was designed for the time being was forgotten in the background, Gorawara-Bhat (2002) applied social-organizational perspective on her behavioral study for workplace settings. Her study investigated the ways in which physical space evolves into social space (social psychology), the ways such environments come to acquire meanings (architectural semiotics), and the consequences for behavior (environmental psychology). In her finding, workspaces are more than the physical setting; it becomes an integral part of social organizational culture. Thus, a physical change in any part of the organization would have consequences for the whole organization. Further, workers' quality of life and satisfaction are augmented when the physical setting of work is consonant with the organizational goals and the social psychological needs of the organizational actors.

Virtual Place: According to Kalay (2004), making 'places' in Cyberspace can borrow from the principles developed by architects, landscape architects, and town-planners over the last few thousand years. At the same time, it must adopt the abilities offered by the new technology. Kalay and Marx (2001) proposed the criteria for "Cyber-Placemaking" as follows; (1) the created virtual places are the setting for events providing a reason and a purpose of being there. (2) The places involve some kind of engagement with objects or with people promoting a sense of authenticity. (3) Therefore, the virtual places are adaptable and allow an ability to make them personal. (4) A sense of uniqueness is required to differentiate one place from another. (5) Furthermore, digital places also afford a variety of experiences and transitions disparate from the real world. (6) Finally, they are the memorable places where users desire to stay and to visit time after time.

Champion and Dave (2002), however, criticized that Kalay and Marx's criteria do not contribute to determine essential properties for different types of virtual environments. Furthermore, they appended Kalay's topology of virtual place by adding another hermeneutic layer. At the simplest stage with spatial representation and navigation, (1) virtual environment is achievable and useful for various scientific purposed. (2) The next dimension affords activity-based interaction with decision making for a more immersed experience. (3) Finally, a hermeneutic environment requires the ability to personalize and communicate individual perceptions through artifacts. The distinction between the three types of environments is determined by the degree to which the virtual environment can afford new social tasks and new perspectives, which in turn dictates the level and complexity of interactivity and interface needed (Champion and Dave, 2002).

Virtual Workplace: Perhaps, the pioneer in designing virtual office using place metaphor can be found in design of a student office in the virtual campus of the University of Sydney (Maher et al., 2000). Developed in *ActiveWorlds* (www.activeworlds.com), the project considered the built virtual environment design as an analogy to creating a real environment. All spatial units are treated as physical rooms consisted of typical office spaces. The project demonstrated how a virtual office could be creatively designed by architects. Nonetheless, details on practical usability are not available.

Apart from academia, many global organizations are developing their 'online' offices in a metaverse called *The Second Life* (KZero, 2007). Additionally, commercial collaboration tools such as *Virtual Meeting room*, *Qwaq Forum* and *Texio* apply spatial and place metaphor to facilitate group tools and collaboration. Nonetheless, spatial configuration in such systems is very limited. Only predefined templates are supplied with limitation in modification. However, as stated at the beginning, the notions of space and place are profound. The way spatial configuration has been utilized in these virtual environments is not based on empirical research. Moreover, the effect of place metaphor on those collaborative virtual workplaces is left and unknown. So far, there is a considerable gap between the groupware implementation and existing virtual place. This research objective, indeed, is to eliminate such problem through an empirical study based on socio-spatial approach.

3. Virtual Workplace Framework

Once interactive three-dimensional virtual environment is regarded as a real place, the next question is how one can create this virtual environment. Since the aim is to create a place for real-world working activities and the virtual environment is populated by a real person, not a virtual user (Harrison and Dourish, 1996), our fundamental hypothesis is that we may apply the real-world theory of place-making and work ecology to construct the virtual workplace. Based on the evidence of spatial behavior in real-world (Gorawara-Bhat, 2002; Becker et al., 1995), our approach is to apply socio-spatial approach to the office in the virtual environment.

'Workplace-making Process' is synthesized from work ecology and place theories. Here, the concept of trinity in place and space (Lefebvre, 1974; Canter, 1977; Relph, 1986; Castells, 1996) is expanded and integrated with social-place theory (Gorawara-Bhat, 2002) to capture both place-making and place-becoming processes. The whole process is divided into two parts; encoding process and decoding process. *Encoding process* begins after designers acquire user requirements such as expected *functions* based on users' activities, as well as *social and cultural symbols*. In workplace ecology, functions refer to office activities such as working, meeting and training. Basically, these functions will be eventually transformed into a designated area or space. On the contrary, social and cultural symbols embody abstract needs which finally indicate how each function is located and related to the others. Examples of social and cultural symbols in office are role, status and organizational culture. Thus, it is the designer's duty to gather both functional and social requirements and encode them into the environment

by means of spatial language. The encoding process keeps continuing as the workplace design is on the development and completes once the spatial setting has been constructed. *Decoding Process* starts as the place is populated by its users. Then, the users perceived their setting through their sensation. Note that, this sensation will be typically limited to visual and audio mode in virtual place case. Based on one's culture and social experience, each user decodes the symbols and functions embedded with spatial language into their conception. After that, they behave, communicate with the others, and utilize the setting. The way users interact with space is not one-way communication. In fact, people utilize, take control, and modify their space. Thus, this generates an ever-changing status making the place history. This decoding process will never end as long as the setting and the users remain. Accordingly, user behaviors in different settings are expected to be disparate as the settings are different due to dissimilar symbols and functions embedded in the space. Thus, we define the set of social meaning, activity and space as *'Place-making Variables'*. Consequently, as users occupy those different settings, they can distinguish one place from another and react differently according to their conception to the places. Therefore, *'Placeness'* is defined as property of being a place combining space, user conception and behavior. This research topic is to investigate the effects of placeness on collaborative virtual workplace, thus it requires an observation on differences in Placeness by looking at the change in Place-making Variables.

Virtual Workplace-making Variables: Based on the previous 'Workplace-making Process', it is possible to deduct that the way in which spatial language is used (how setting is designed) should take into account with careful consideration on user requirements regarding symbols and functions. In other words, the design should be based on expected users' behavior. Furthermore, changing in spatial language (or changing in settings) will alter users' behavior. On the basis of the main hypothesis, we define virtual workplace making variables as listed in Table 1 by deriving evidences from both real and virtual world studies as mentioned in Section 2, and set out an experiment to test their validity.

4. Comparative Experimental Design

Consequently, comparative experimental design is chosen as the research design model since it fits our study which aims at seeking to compare the effectiveness of different treatment modalities. Besides, it requires great labor-intensive works to gather numbers of existing virtual workplaces to investigate all workplace-making variables. Based on 'trinity of place' theory mentioned previously, variety in workplace settings can be mainly constructed. Four treatments (A,B,C,D) with different properties in spatial configuration, workplace symbols are mapped on the continuum between space and place metaphor as shown in Table 2.

The research population are employees who have experience in collaboration using normal groupwares. The research samples are thirty six workers from three global enterprises located in Bangkok (nine from each). All of them usually collaborate with colleagues located across nations or cities using groupwares. In accordance with the treatment design, each treatment contains workplace settings to be tested by a group of three users. Each group members will be given a new name and assigned with different roles; general manager, 'variable' manager (dependent on the subjects' discipline) and human-resource manager. The same task to select the best candidate as a new manager is given to all groups. The candidate qualification is shared but the job requirements are differently provided to each member. Thus, a group discussion is required to exchange resources and choose the best candidate.

TABLE 1. Virtual Workplace Making Variables

Type	Variable	Description
Symbols	Metaphor	different place metaphors applied to workplace
	Role and Status	users' organization role and status
	Personalization	degree of users' customization and ownership
	Collocation of team members	proximity between team members
Functions	Avatar	virtual representation of users
	Tool and Operation	virtual representation of functions
	Projection View	types of projection view on screen
Spaces	Environment and Exposure	exterior and interior environment
	Partitioning	method to articulate space
	Topology	spatial node and circulation
	Personal Workspace	personal working area owned by a user
	Group Spaces	shared activity areas used by all members

TABLE 2. Four Treatments with Properties
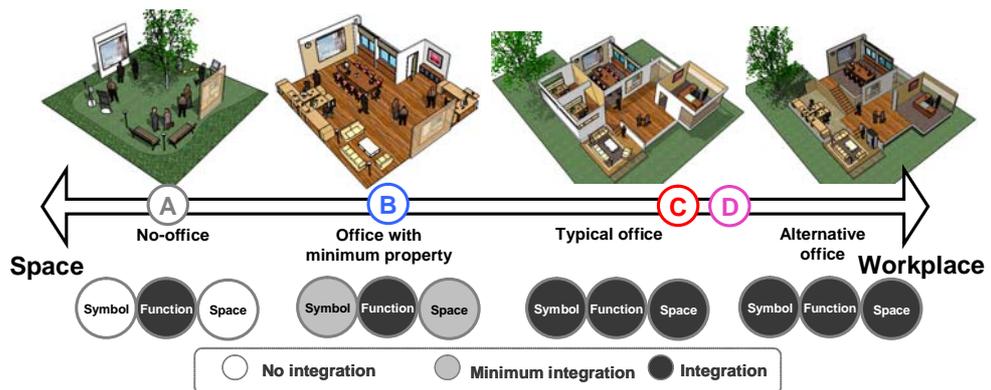
		Treatment A	Treatment B	Treatment C	Treatment D
activity conception	Metaphor	on field	studio	formal office	casual office
	Rank & Status	no	no	different ws type	different ws type
	Personalization	one self	own workspace	own room	own workspace/room
	Tool usage	tool based	user based	room based	room based
	Environment	outdoor	indoor	indoor & outdoor	Indoor & outdoor
space	Topology	a node	a node	hall	hall
	Partitioning	none	material	wall and material	level and material
	Personal ws.	no	opened	private & partitioned	private & opened
	Ancillary rooms	no	areas	rooms	rooms

Data collecting method in this research covers behavioral observation, work recording, and post-experiment questionnaire. *Behavioral observation* records group interactions throughout the experiment which are activity log including time, location information, and conversation. *Work recording* captures information created in the workplace pertaining to work outcome such as records of decision making during group discussion. *Post-experiment questionnaires* are conducted by observers at the end of each experiment to acquire user's background and attitudes toward group, work and place. Second Life is chosen as the platform

to construct virtual workplaces since it provides robust engine for multi-user collaboration in real-time manner with high degree of content-customization by means of scripting ability. Objects were scripted to enable interactions to deliver workplace functions and to collect behavioral data during the experiment. The snapshots of constructed workplaces are shown in Figure 1.

TABLE 3. Summary of findings on treatment level

Subject	Treatment A	Treatment B	Treatment C		Treatment D	
Time spent	long	.	longest		shortest	
Difficulty	.	.	hardest		easiest	
Work process	least clear	clearest	.		.	
Size, Openness	.	largest	smallest		large	
Formality	very informal	very informal	least informal		informal	
Perception		.	long	largest	long	largest
Spatial perception	top func. least emot.	emotion	top refer. & emotion		emotion	
Ownership	very little	.	very high		high	
Equal right	.	strongly equal	a little equal		a little equal	
Compare w. groupware	slight worse	slight worse	worse		a little better	

p < 0.1	p < 0.05	p < 0.001

Figure 1. Snapshots of different workplaces (A,B,C,D) created in Second Life

6. Experiment and Result

Collaborative experiment was conducted coffee shops or restaurants with internet availability near the samples' office. Twelve sessions was conducted during 21st November – 13th December 2007. The average session time is between forty five minutes to one hour. Participants were asked not to talk nor reveal their real identity. Some of them were male but all avatars were female. Three types of data were captured during the experiment; user action log, conversation log, and screen recorded. Together with questionnaire, the data are, then, coded and analyzed using statistical method (t-statistics). The experiment results (see Table 3) indicate that *Treatment A* was the most unclear case. Participants were hesitating in performing tasks. Statistical analysis reports this was because of the utilization of outdoor without any architectural elements. *Treatment B* was perfect for teamwork as it acquired best attitude for clear work processes, group performance and group decision. The compact workplace was considered as large and informal with highest positive attitude for 'being in the workplace'. *Treatment C* was considered as worse than groupware especially on communication and relationship among team members due to the partitioning. Together with the utilization of 'private' workspaces, this even made the case less informal than the others. However, the level of social aspects in communication was very high. *Treatment D* was significantly easier and larger than treatment C by means of 'Partitioning' and 'Workspace'. Numbers of participant mentioned about nice atmosphere for working with beautiful view. Unexpectedly, it was the only case evaluated by their users as better than typical groupware.

7. Conclusion

At the metaphor level it has been proved that different virtual workplace settings can result in disparate user behavior in terms of teamwork and attitude toward the workplace. This was because disparate settings imply different requirements on function, organizational culture, and social meaning. These properties were embedded into the spatial configuration during the design process. This can be considered as encoding process of organization culture, social meaning and functions. It has been found that if architectural elements are carefully applied to the virtual office, it cans strengthen teamwork and enhances social interaction. Thus, the design of virtual workplace can both support and threaten the collaboration. Indeed, it should be congruent the objectives to create a virtual workplace. Therefore, it is inevitable to set up an organization context first at the very beginning of the design stage since this will affect user behavior eventually. In addition to the theory of social influence in virtual environment (Blascovich et al., 2002) which indicates how social interaction occur based on social presence and behavioral realism, we conclude that our research framework can serve as a method to increase 'Place Realism', a degree to which virtual workplace can facilitate users to be able to work and collaborate as they would in the real office. This can explain how unexpected issues are encountered during our experiment which could never find in any typical groupware such as invasion over workspaces, role-enhancement of space, reference of real place and work inspection during individual activities.

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