Workspace, playspace: What space for creative design activity?

Ye Dong* and Céline Mougenot**

* Tokyo Institute of Technology, Human System Science Dpt., dong.y.aa@m.titech.ac.jp ** Tokyo Institute of Technology, Mechanical Sciences and Engineering Dpt., mougenot@mech.titech.ac.jp

Abstract: This study aims at designing a creativity space within an engineering and architecture university, the "Idea Studio", and at evaluating its impact onto students' creative performances, collaborative behaviors and subjective perception. The assessment of the Idea Studio was conducted experimentally in realistic situations of design activity.

Key words: Creativity, workspace, design education, design activity

1. Introduction

As illustrated by some innovative companies, working spaces of creative professionals are changing. They don't look like "usual" offices any more, as they tend to integrate entertainment tools or relaxing spaces. This evolution is exemplified by Google, which proposes some offices that provides comfortable seating spaces and entertainment objects and games to its office workers (figure 1). Several companies and universities, e.g. [Kress *et al.*, 2012][Tiensuu & Lammi, 2012], strive to design environments that are expected to enhance creative performances but the fact that these new working spaces actually improve collaboration and creativity in design innovation activities has never been demonstrated though scientific experimentation.



Figure 1. Google office



Figure 2. Stanford Imaginarium [Kress et al., 2012]



Figure 3: Creativelab, in [Tiensuu & Lammi, 2012]

In this context, our paper reports a research conducted within an engineering and architecture university in Asia, which aims at evaluating the impact of a "creativity space" onto students creative performances. Our experimental approach consisted in two main bodies of work:

(1) designing a creativity space within an university

(2) evaluating its effect on students' creative performances

In the first section of this paper, we introduce related studies about the effects of working spaces on creativity. Then we describe the design of our creativity space and finally we report the experimental assessment of the creativity space, with a focus on creative performances and subjective perception by the participants.

2. Influence of workspace on creativity

2.1 "Place" in 4Ps model of creativity

Because creativity is often described by the 4Ps, Person, Process, Product and Place [Davis, 2004], 'Place', from both physical and social points of view, is supposed to have a significant role in the cognitive processes of creativity. However, although studies acknowledge 'place' to be an essential ingredient to creativity [Shalley et al., 2004], the empirical support is weak. In a state-of-the-art paper, Martens [2011] shows that so far most studies on the effects of working spaces focused productivity, while the focus recently shifted to creativity. These studies attempted to identify various approaches to support creativity, such as:

- supporting creative interactions
- supporting flow [Csikszentmihalyi, 1996]
- supporting creative thinking and insight
- supporting personal qualities [Amabile, 1998]
- supporting a creative environment

2.2 Workspace and situated cognitive activity

With a similar approach and based on the idea that much cognitive work, including design activity, is "situated", Kristensen [2004] claimed that the plan must be acted out so that all kinds of situational adaptations occur. In other words, the physical environment where creators are physically located should support the cognitive processes of creativity. As a consequence, he proposed an embodied creative process (table 1), based on Wallas model of creativity, and described the layout of a large innovative company as a support of the design process. Indeed, each room and area of the company building was dedicated to different stages in the innovation process and was designed to specifically support these cognitive stages.

	Preparation	Incubation	Insight	Elaboration and evaluation
Value creation	Guiding principle	Guiding principle	Guiding principle	Guiding principle and benchmark
Scaffolding	Physical organization of process	Subject to altering and manipulation	No particular role	No particular role
Imagination	Perceptual rehearsal accumulates information	Perceptual rehearsal accumulates information	The moment of novelty	No particular role
Materialization	Preparation includes tools for materialization	No particular role	A new concept, solution or artefact is material or sensory	The material object or artefact is subject of elaboration and evaluation

Table 1. Embodied Creative Processes [Kristensen]

2.3 Workspace and situated cognitive activity

Using images of spaces, McCoy and Evans [2002] investigated the potential for creativity of various types of environments and attempted to depict the objective qualities of a workplace for creativity. In a similar study, Chung and Danko [2012] specifically studied the perception of "Net generation" participants. The experimental approach mainly consisted in subjective evaluation of pictures. Analyses identified five parameters that independently predicted greater perceived creativity:

- (a) complexity of visual detail
- (b) view of natural environment
- (c) use of natural materials
- (d) with fewer cool colors used,
- (e) less use of manufactured or composite surface materials.

In the same manner, Moghadampour *et al.* [2012] listed the elements of a virtual creative space which could foster creativity. Again, colors play an important role, as well as natural materials or environments.

In the final step, McCoy and Evans conducted an actual test of creative performance, consisting in the Torrance Test of Creative Thinking (TTCT) [Torrance, 1966] and in making collages [Amabile, 1989], in two types of spaces defined by the previous study: a "low creative setting" and a "high creative setting". The participants actually perform better in the high creative setting when making collages, but not in the TTCT.

Table 2.	Elements	of a v	/irtual	creative s	pace the	hat may	foster	creativity	[Mo	ghadam	pour	et al	201	2
													/ -	

Element	Description
Plants / Flower	Natural Plants or flower that are placed in the virtual space.
Television and piano	
Window	View to nature Visual access to see the trees, plants, rivers and other natural elements.
Furniture	Chairs, tables, etc. in the virtual space.
Quantity of light	The amount of light
Any window view	Visual access to any outer environment.
Sound (positive sound)	Good music or sounds of nature.
Privacy	The possibility of being secluded from the presence or view of others.
Calming colors	Colors that provide a relaxing experience (green, blue or blue violet).
Inspiring color	Colors that provide a stimulating experience.
Artworks	Creative art can be found in different parts of the building.
Game equipment	Chess.
Chopper	Play and fun.
Fridge	To preserve fruits and other items.
Fireplaces	To warm the room.
Aquarium, spiral staircase	To stimulate the senses.
Projector screen	Streaming multimedia.

2.3 Research question and hypothesis

The aforementioned study shows that some characteristics in the workspace can enhance the creative performances measured with a specific type of test (i.e. collages). Would this result be similar in the case of design activity? Based on aforementioned references, we formulated the following research question: As for design innovation activity, is creativity actually enhanced by working in a "creativity space"?

Our research hypothesis is the following: When conducting design innovation activities, people might have a better perception of a creativity space than usual meeting room and the perception of the workspace might influence creativity.

3. Design and evaluation of a creativity space within a university

3.1 Design of a creativity space

Based on the findings by [McCoy & Evans, 2002] and [Moghadampour *et al.*, 2012], we aimed at a complexity of visual details, easy access to visual information and a sensory stimulation at the same time, by showing a large amount of pictures on the wall and allowing the users to use a video-projector to show pictures or websites on the walls. The design is also aimed at providing "sensory stimulation", trough various sitting options and a soft carpet, and "surprise", trough a variety of colors and the option to sit on the floor. Another key point of the Idea Studio is its playground-like design. It is aimed at providing fun to the users who can manipulate various objects and interact with other people around (e.g. yoga ball).



Figure 4. Overview of the creativity workspace ("Idea Studio")



Figure 5. Students in the Idea Studio for a brainstorming





Figure 6. Students can play Figure 7 with various objects

Figure 7. Grass-like carpet provides sensory stimulation

A floor-to-ceiling whiteboard allows the users to express their ideas in a smooth and collaborative way. The use of the projector on the whiteboards also provides a visual stimulation that was shown by many researchers (e.g. [Goldschmidt, 2004]) as being essential to designers for enhancing creativity.

3.2 Evaluation of a creativity space

For the assessment of the Idea Studio, we experimentally compared the subjective perception in two conditions: in the Idea Studio and in the meeting room that is usually used by the students (control condition).

Method: Participants (N=24) were students belonging to three different universities in Japan, from various backgrounds (e.g. engineering, architecture, marketing...) and various nationalities from Asia and Europe. The groups were composed in a balanced way in term of backgrounds, genders and nationalities. Each group of four participants had to conduct two brainstorming sessions on different topics, one in the Idea Studio and one in the control condition (usual meeting room). The brainstorming topics were: "transportation" and "communication". The order of conditions and of brainstorming topics were counterbalanced across the whole sample of participants, as described in the following table. After the brainstorming session, the participants had to complete a questionnaire related to the their perception of the brainstorming activity in both the Idea Studio and the control condition, using 7-point Likert scale.

Group	First ses	sion	Second s	Second session		
1	Idea	Transportation	Control	Communication		
	Studio					
2	Idea	Communication	Control	Transportation		
	Studio					
3	Idea	Transportation	Control	Communication		
	Studio					
4	Control	Communication	Idea	Transportation		
			Studio			
5	Control	Transportation	Idea	Communication		
		_	Studio			
6	Control	Communication	Idea	Transportation		
			Studio			

Table 3. Experimental design.

Results: The data were analyzed by ANOVAs with SPSS software, with a special focus on the subjective perception. The questionnaires focused the perceived usability of the Idea Studio, as compared to the control condition, i.e. usefulness, efficiency, easiness and pleasantness. Other questions related to the feelings of the users were also added (e.g. comfortable, relaxing, stimulating, surprising...).

	Mean score	Mean score	Paired difference	Sig. (2-tailed)
	Control condition	Idea Studio	Mean	
useful	4.26	5.26	1.00	.002
efficient	4.37	4.74	0.37	.391 (NS)
pleasant	3.41	6.00	2.59	.000
easy to use	5.03	4.96	-0.74	.868 (NS)

Table 4. Perception for creative activity.

Table 5. Perception for communication between people.

	Mean	Mean	Paired	Sig.
	Control	score	Mean	(2-tailed)
	condition	Studio	Mean	
useful	4.30	5.67	1.37	.000
efficient	4.63	5.52	0.89	.009
pleasant	3.60	6.30	2.70	.000
easy to use	4.59	5.20	-0.59	.115 (NS)

For most evaluation items, the scores are significantly higher for the Idea Studio: it is perceived as more useful and more pleasant when conducting creative activity (table 4), it is also perceived as more useful, more efficient and more pleasant when collaborating with people (table 5). However, regarding perceived efficiency, there is not significant difference between the Idea Studio and the control condition.

Table 6. Global perception.

	Mean score Control condition	Mean score Idea Studio	Paired difference Mean	Sig. (2-tailed)
comfortable	4.37	6.29	1.89	.000
relaxing	3.48	6.40	2.93	.000
surprising	1.29	5.81	4.52	.000
stimulating	2.85	4.96	2.11	.000

As for the global perception, the scores are also significantly higher with the Idea Studio. Indeed, the Idea Studio is perceived as being more comfortable (F(1/24)=6.29; p=.000), more relaxing (F(1/24)=6.40; p=.000), more surprising (F(1/24)=5.81; p=.000) and more stimulating (F(1/24)=4.96; p=.000) than the control condition.

As demonstrated by the questionnaire, the perception of the Idea Studio is significantly better than the perception of the usual meeting room. The findings suggest that people feel better in the Idea Studio rather than in a usual meeting room, when conducting creative activities as well as when communicating with people

4. Conclusion

Although there is a growing interest in designing spaces that support creativity, there is still weak evidence that such creativity spaces actually enhance users' creativity. Through the design of a creativity space within our university, we experimentally evaluated the effects of the designed environment onto students' creativity, with a specific focus on design innovation creativity. The preliminary results tend to show that our creativity space is

perceived as being more pleasant, comfortable, relaxing, stimulating and surprising than a usual meeting room. These hedonistic qualities tend to support better creative performances as shown by the creativity assessment.

Assessing the effect of external parameters on creativity is not an easy task, but this study can at least inspired the design of playful and surprising creativity spaces in similar settings, like architecture and engineering universities.

6. References

- 1. Amabile T.M. (1989) The creative environment scales: Work environment inventory. *Creativity Research Journal* 2: 231–253
- 2. Amabile T.M., Schatzel E.A., Moneta G.B., Kramer, S.J. (2004) Leader behaviors and the work environment for creativity: perceived leader support. *The Leadership Quarterly* 15: 5-32.
- 3. Chung, S.S.E., Danko, S. (2012) Exploring the Myths, Realities and Mysteries of Creative Workplaces: A View from the "Net" Generation. *Proceedings of the Annual Conference of the Interior Design Educators Council (IDEC 2012)*. Baltimore, MD, USA. March 19-22, 2012
- 4. Csikszentmihalyi M. (1996) *Creativity: Flow and the Psychology of Discovery and Invention*. Harper Perennial, New York, NY
- 5. Goldschmidt G, Smolkov M (2006). Variances in the impact of visual stimuli on design problem solving performance. *Design Studies* 27(5): 549-569
- 6. Haner E.U. (2005) Spaces for creativity and innovation in two established organizations. *Creativity and Innovation Management* 14(3): 288-298
- Kress G., Hoster H., Chung C., Steinert M. (2012) Headspace: The Stanford Imaginarium. Proceedings of the International Conference on Design Creativity (ICDC 2012), pp 261-268. Eds: A. Duffy, Y. Nagai, T. Taura. Glasgow, UK. Sept 18-20, 2012
- 8. Kristensen T. (2004) The physical context of creativity. Creativity and Innovation Management 13(2): 89-96
- 9. Martens Y. (2011) Creative workplace: instrumental and symbolic support for creativity. *Facilities* 29(1): 63-79
- 10. McCoy J., Evans G. (2002) The potential role of the physical environment in fostering creativity. *Creativity Research Journal* 14(3-4): 409-426
- 11. Moghadampour G., Aro M., Abedi-Lartey V. (2012) Designing a creative space using Second Life Virtual Environment. OVET Project in Arkkitehtuuri 4/2012. School of Arts, Design and Architecture, Aalto University
- 12. Moultries J., Nilsson M., Dissel M., Haner U.-E., Janssen S., Van der Lugt R. (2007) Innovation spaces: towards a framework for understanding the role of the physical environment in innovation. *Creativity and Innovation Management* 16(1): 53-65
- Shalley C. E., Zhou J., Oldham G. R. (2004) The effects of personal and contextual characteristics on creativity: Where should we go from here? *Journal of Management* 30(6): 933-958
- 14. Tiensuu V., Lammi M. (2012) The impact of space on users' creativity in innovation activity. OVET Project in Arkkitehtuuri 4/2012. School of Arts, Design and Architecture, Aalto University
- 15. Torrance E. P. (1966). *The Torrance tests of creative thinking: Technical-norms manual*. Princeton, NJ: Personnel Press