

Discovering concept patterns in spatial design

Katam Al-Falou¹, Johannes Heck², Carlo Kriesi³, Martin Steinert⁴, Mirko Meboldt⁵,

^{1,3,4}*Department of Engineering Design and Materials, NTNU Trondheim
katam.al-falou@ntnu.no, carlo.kriesi@ntnu.no, martin.steinert@ntnu.no*

^{2,5}*Product Development Group Zurich, ETH Zurich
heckj@ethz.ch, meboldtm@ethz.ch*

Abstract

This research compares data from different case studies relating to the way in which creative spaces have been designed to date. The aim is to reveal the underlying patterns, if such exist, in the relationship between space and creativity,

Only in the 1990s [1] did researchers begin to envisage a potential connection between physical space and its influence on creativity. It must be stated, though, that a hypothesized correlation between these two has not yet been systematically explored and experimentally tested.

Until now, the actual design of the space of the workplace has not systematically incorporated particular relationships between its object components in terms of enhancing creativity. To bridge this gap in research, this study proposes to focus on the object components in physical environments in order to stimulate the effectiveness of creativity.

This imposes the overarching research question: How must we conceptualize space in order to identify, analyse and understand a direct object-creativity context?

Keywords: *spatial design concepts, creativity enhancement, product design and development*

1 Introduction

Die Mobiliar, a Swiss insurance company, has established Mobiliar Forum Thun as part of their corporate social responsibility programme. Mobiliar Forum Thun comprises a two-and-a-half-day workshop using prototyping processes and a specially designed physical space. The project is being jointly carried out by the Swiss Federal Institute of Technology (ETH) Zurich and the Norwegian University of Science and Technology Trondheim (NTNU). ETH is in charge of the process development and NTNU leads on the design of the physical space. For these particular workshops, Mobiliar rents out space in Schlossberg Thun, a historic castle in the city of Thun. The overall task was to design a space that specifically meets the requirements of a) the process and b) the space allocated in Schlossberg Thun.

The workshops are aimed at Swiss small and medium enterprises (SMEs), mainly in the field of product development. The workshops offer groups of 10 to 20 people an area in which they

can explore innovative and radical ideas, with the opportunity to actually build prototypes during the workshop.

During the workshops the space serves another purpose: it is also an experimental space for further research on space and creativity. In other words, it is also a real-time laboratory where assumptions regarding the direct relationship between objects and creativity can be tested qualitatively and quantitatively.

The process applied is based on the “Hunter-Gatherer Model” designed by Steinert and Leifer, [2] as shown in Figure 1. The Hunter-Gatherer Model by Steinert/Leifer. This model metaphorically describes the “how-to” of acquiring radical ideas within an innovative product development process by using the hunter/gatherer analogy. The main points of this approach are to implement diverse teams, to include divergent and convergent phases into the overall process, and to use iterative phases throughout the working process. The model also stresses the fundamental importance of prototyping.

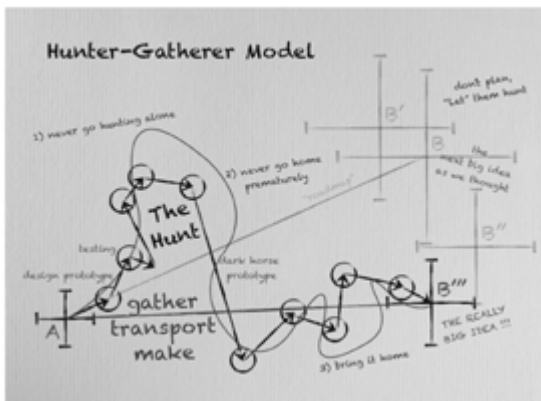


Figure 1 The Hunter-Gatherer Model by Steinert/Leifer

From this short introduction, the requirements for the concept of space and the interior design prior to the start of the project can be summarised as follows:

- An allocated space in the eighteenth-century Schlossberg Thun, Switzerland: four rooms on the first floor and two rooms on the second floor. For conservation reasons, no architectural changes were allowed
- A pre-defined process for workshops, based on the Hunter-Gatherer Model. The space needs to facilitate divergent thinking, convergent thinking, and mostly prototyping. One room was identified in advance as a digital¹ room
- Only participants from a Swiss entrepreneurial context, with a product development background, will take part in the workshops. Thus the space also has to meet the requirements of teamwork, as opposed to individual creativity
- The space is to be used in future as a laboratory for research on space and creativity

With these requirements and a budget set, the first task was to develop a conceptual approach to design the space, followed by the actual design of the objects, or interior, for the space to reflect the concept of the Mobiliar Forum Thun and the Hunter-Gatherer Model, and most

¹ “Digital room“ here means a dedicated room incorporating a computer, printer, camera and software tools for presentation purposes, due to sponsorship circumstances

importantly to enable prototyping within the two-and-a-half day workshops. Here the question arose: how should the Mobiliar Forum Thun space primarily be conceptualised?

The need for a concept originated from the practice-led experience of the researcher: as a practising designer, the starting point for a project is normally the choice of a particular concept, which later runs like a golden thread through the development and implementation of the project. Since the Mobiliar Forum Thun rooms also function as a laboratory for future research on space and creativity, the researcher's intention was to pay careful attention, and give considerable thought, to conceptualising and designing the researcher's "own laboratory", so to speak. The researcher therefore started by carrying out a literature review to identify validated concepts of spaces which offered the enhancement of creativity. To inform the researcher's own design brief, the first basic literature review was initiated to find research-based insights into the conceptualisation of spaces for the enhancement of innovation and creativity and to meet the aforementioned requirements. The literature review was based on three classifications made by Williams [1]: "The literature on creative physical press divides into three principal areas: creativity research within a) psychology (including visual perception, environmental and architectural psychology), b) design and architecture and c) organisational management and innovation management." [1, p. 19] In examining her work, these areas have been further narrowed down to focus on the most promising: "It is in the field of creativity and innovation management that physical space and creativity finally come together. While there is an important body of knowledge [...] that discusses creativity in its social and psychological environment [...] there is little cross-disciplinary work that links physical press to creative performance [...]" [1, p. 27] Williams's work was chosen as a basic reference at an early stage of this project, as her research maps out the detailed elements of different workplace interiors in a manner that is particularly useful for starting the practice-led part of the research, as detailed here.

Expanding on Williams' work, the researcher added personal requirements that were to be met by identifying further literature. This was carried out with the required design brief in mind and the aforementioned overall requirements:

- A relationship to innovation and prototyping in space; compatibility with the hunter/gatherer model
 - Practice-led design case studies
 - A rich and well-defined description of the concept and object details
 - Team creativity, teamwork
 - Appropriate to the Swiss cultural context
- Insights that have been validated, preferably quantitatively

During the analysis of the literature the researcher noticed that the range of writing generally met only one of these pre-defined requirements: for example, it considered space and team creativity but not the concept of space [3], addressed quantitative research but focused on individual creativity, not on team creativity [4,5], or examined the importance of space for innovation processes [6,7], but did this by comparing successful with non-successful business management. Mostly, though, the literature confirms evident gaps in research, such as the lack of empirical evidence: "However, despite much anecdotal evidence that the physical environment may positively influence creativity, there has been little empirical exploration of this phenomenon." [6, p. 127]; the lack of patterns on which to base general theoretical assumptions: "The few studies that do suggest a relationship between creativity and the physical environment represent quite diverse approaches." [2, p. 169], and the lack of a rich,

detailed object description: “Research on creative work environments rarely includes elements of the physical work environment.” [8, p. 8] Or the researcher felt the statements made were too vague to be the basis for a valid spatial concept brief [9, 10].

With these gaps in the literature and the need for a rich, detailed concept for the overall design of the allocated space in Thun, the researcher started her own case study research. The aim of this pilot case study was to identify concepts and recurring patterns in spaces of innovation, if these exist, and work from the ground up on a theory of conceptualising space for the enhancement of team creativity. This paper will present the results of the case study and answer two main questions:

- 1) Is there is a recognisable and recurring pattern in spatial concepts in the context of creativity enhancement?
- 2) If this is the case, what are the typical elements of these spatial concepts?

2 Methods

Methodologically, the research followed Eisenhardt [11] and Yin [12] to generate hypotheses from case studies. The data set comprised field study data, semi-structured interviews and field observations from co-working spaces and educational spaces, and a range of interviews with people who worked on space and creativity projects.

Following Eisenhardt, the initial scope of our case study was limited to creative places that focused on teamwork. This allowed it to be as close as possible to the objective in Thun. We selected two areas for further research: the creative team space in an educational context, and the creative team space in a professional context. This selection helped to focus the potential structure of the case studies. Educational spaces were a focus because we deal with non-professional creativity: we wanted to understand how people learn to be creative through their use of space. Additionally, professional creative team spaces helped us learn more about work dynamics in space and the implementation of creative space in an everyday work context. Also, the latter seemed to offer a potential source for our design inspiration. Following these a priori constructs, we initially selected two co-working spaces in Berlin, one art and design college and one workplace research centre in London.

Starting with an international selection of spaces, we learned about cultural aspiration and cultural cues within space during our research. In order for teams to understand space it is necessary to give cues: that is, objects, or *signs*, that are recognised. Also, teams enter space with a certain aspiration. Aspiration is dependent on cultural background, and meeting aspiration leads to an acceptance of the space, too. We revised our case study demographic and focused on educational and professional creative spaces in a Swiss context to meet the requirements of giving cues and meeting aspirations in our space in Thun.² As a result, we narrowed our field study down to an art and design school in Zurich, CERN, and two creative spaces in companies in different parts of Switzerland.

We collected data during our field research using interviews and observation. The interviews were semi-structured: beginning with nine main questions that concern the concept of creative space, these questions were followed by 26 more detailed questions exploring in depth certain aspects of space design. The latter were flexibly chosen during interview sessions. Notes were

² In this paper, for informational purposes we include all our case studies, not only those which include solely Swiss participants.

taken digitally during interviews. The main questions related to the purpose of the space, its context, the implicit and explicit objective of the space, the starting point of the space concept, inspirational sources for the space concept and the approach to the concept, amongst other things.

Observations were made according to the 26 flexible questions in the questionnaire. This allowed further comparison of observational data in the interviews. The questions formed categories, relating to the size of the space, the atmosphere of the space, objects in the space and the positioning of objects in the space. Because the observational studies were limited in time, it was not yet possible to observe users in the space to arrive at any substantial conclusion. The focus was clearly on qualitative evidence for concepts and objects in the context of creative space, since our aim was to design space, not to research the impact of the design, at this stage.

For the analytic strategy and data analysis technique, Yin’s method was followed. The analytic strategy was to “work through the data from the ground-up” [12, p. 136]. As this research did not follow a theoretical proposition, but emerged through a practice-led approach, this analytic strategy proved most useful for finding any patterns that existed. This inductive strategy is often used within a grounded theory methodology [12, p. 138].

The analytic technique used for this paper is cross-case synthesis. The coding categories were chosen according to the interview questions, shown in Table 1. Categories interviews. Corbin and Strauss [13] stress the importance of categories for theory development. The categories under the theme *Process* each resemble one significant part of the practice-led design. The categories under the theme *Background* reflect potential theoretical knowledge that contributes to spatial design concepts.

Table 1 Categories interviews

Categories interviews	
Process	Background
Inspiration	Context
Starting point	Objective
Approach	Hypothesis
Success/non-success	Pain points

In order to analyse the data time-efficiently, one of the standard software tools, NVivo, was used. Coding was carried out according to what Corbin and Strauss termed “open coding” [13, p. 12] and in line with the categories mentioned above. Sequentially, the observations were added to the cross-case analysis. Additionally, the theme of *Elements* was added to the observation categories: this included tools, furniture, facilities, aesthetics and atmosphere, as well as light, textures and colours, as shown in Table 2. Categories observation. These themes mirror the 26 questions in the questionnaire, mentioned above.

Table 2 Categories observation

Categories observation		
Process	Background	Elements
Inspiration	Context	Tools

Starting point	Objective	Furniture
Approach	Hypothesis	Facilities
Success/non-success	Pain points	Aesthetics & atmosphere
Inspiration	Context	Light, textures, colours

3 Results

This chapter will first give an overview of re-occurring patterns in spatial concepts. Second, re-occurring elements in spatial concepts are described in greater detail.

3.1 Overview of spatial concepts



Figure 2 Patterns in spatial concepts

Figure 2. Patterns in spatial concepts shows that the most important element in any spatial design concept is “people”. The identification of people as part of the conceptualisation of space was common to all the interviews in different contexts: for most, observing people was a starting-point or inspiration. Designing the space for people to engage with was another important aspect to be considered in the spatial design. In one case, even designing *with* people – including the people in the spatial design process – was key to its success.

Interestingly, the second most important aspect of the spatial concept was the recognition of “design” in the space, although here it was observed that the design styles varied according to the overall purpose of the space from case to case. This suggests that the recurring pattern – design – is a key element of spatial concepts, but may vary in style according to the specific purpose of the space.

The usage of space was almost as important as the design of the space. Whether this was functional use, communicative use or customer contact use varied, too. However, data analysis shows that the purpose of the use of a space has a direct influence on the concept of the spatial design.

Next in importance was the creativity-enhancing function of the space. This is interesting if put in context with the next aspect, the process-enhancing function of space. This points to the idea that space concepts should foster the enhancement of creativity more than the facilitating of process.

At this point, elements – furniture, technology, tools – come into focus for the first time. It is rather surprising that design is mentioned second and the actual objects further down the list. This may result from a vague definition of what design actually is, or an emphasis on the conceptualisation of space giving the overall impression of a designed space, with less attention paid to the details of the design of the objects. The sequence indicates that the choice of furniture comes first, the available technology second and the tools last. A reasonable explanation for this would be that items of furniture are the prominent objects in space concepts and thus define the style of design. Also, they are the least flexible elements once they have been invested in, and not as easy to change as tools, for example. The fact that technology is mentioned more often than tools demonstrates that most spatial concepts still embrace conventional office scenarios rather than future workplace concepts.

Whether a spatial concept is directly related to a certain discipline is regarded as more important than the stimulation of certain activities in a space. A possible explanation for this is that the common structure of organisations is arranged in terms of positions and disciplines rather than in relation to activities.

Aesthetics and atmosphere rate last in importance. Again, suprisingly, aesthetics and atmosphere are not mentioned in the context of the overall design of a space. A possible reason might be that non-professionals in design do not connect these aspects with design. Maybe the notion of aesthetics and atmosphere are too vague to be understood fully, and thus are regarded as “nice to have, but not necessary” for most spatial design concepts.

3.2 Details of spatial concepts

This section summarises the details revealed during cross-case study analysis, structured according to the process of conceptualising space: What might be the starting points? And what are the typical elements that are used to enhance creativity in spaces?

From the data shown in Figure 3. Approaches in space concepts it becomes evident that user interviews are mostly used for an initial approach to space concepts. User interviews are used to gain insights from many perspectives on space. Suprisingly, pilot spaces are next often used to find and test ideas for space concepts.

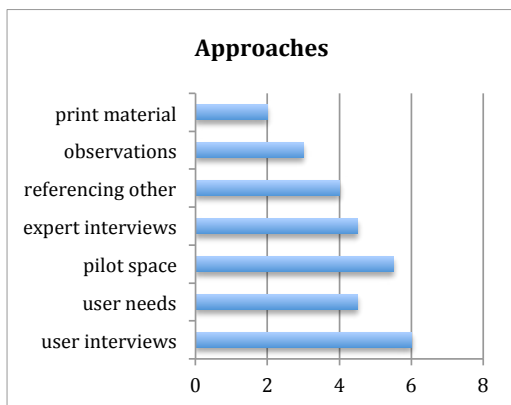


Figure 3 Approaches in space concepts

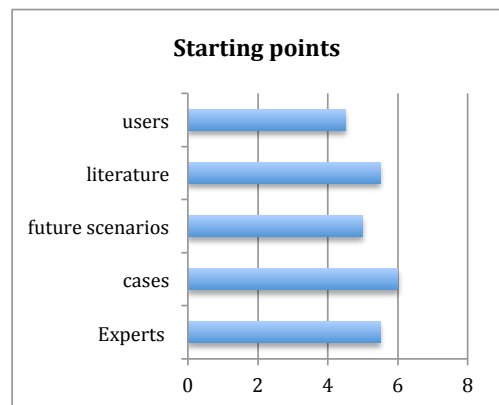


Figure 4 Starting points

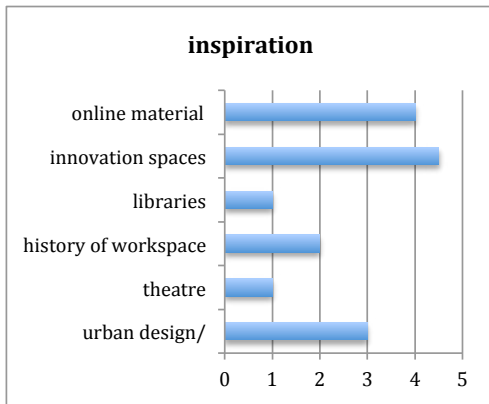


Figure 5 Inspirational sources

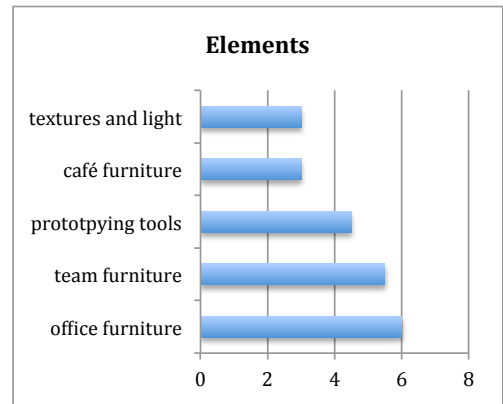


Figure 6 Elements in space

These are costly and time consuming; however, this is a recurring pattern in approaches and many interviewees stressed the invaluable insights they had gained from their pilot spaces. Expert interviews refers to consultation with workplace psychologists, architects, and facility managers. User needs were based on observations and interviews. Observations were extended beyond user observations to encompass different areas, such as theatres, set design and libraries. Referencing other work indicates other places and space solutions that were either studied or taken as direct references, such as the websites google Zurich, expedia, Swisscom and also set design. Print material refers to ethnographic, historical, anthropological, case-study, and research papers and books.

Figure 4. Starting points summarises real starting points. For most, concrete starting points came from studying other examples, such as co-working spaces, libraries, theatres, cafés, temporary event spaces and public areas. Again, interviews with experts, as mentioned above, were also concrete starting points for concept development. The literature also follows the patterns described in the approaches. It is interesting to note that some used real scenarios, such as other cases, for starting their own concepts while others used a theoretical approach, using literature as a starting point. Future scenarios came up unexpectedly. Future scenarios are theoretical pilot spaces: not as real, and devised more as an intellectual exercise. Scenario-building was used in the context of anticipating what workplaces in general will look like in the future.

Looking at inspirational sources, which are particularly relevant for the design brief to create moods and a theme, the recurring patterns follow the approaches and starting points.

The data analysis revealed that elements in spaces consisted mainly of conventional office furniture: desks, chairs, and cupboards. Office furniture was then complemented by team furniture. This incorporates white-boards, high desks and high chairs, used for teamwork. Prototyping tools were found in those cases that incorporated product development, less so in cases with a service focus. Tools ranged from construction machines such as laser-cutters and 3-D printers to handsaws and drills. Unexpectedly, elements often found in cafés, such as sofas, coffee-tables and chairs, were also used in some spaces. These elements were mainly used in social areas of spaces such as coffee-corners, where people meet and communicate. Common to all cases was the use of light and textures in space concepts. All the space concepts made a point of offering significant natural light, using light colours and a fairly

narrow range of textures. For furniture (if it was considered), wood was used, and textiles for carpets.

Elements also were often mentioned in the context of actions or explanations: for example, where elements were explained to have been chosen in order to develop customer engagement. Or they had to be in an optimum place for the elements to help people in their activities. Elements were also used to make users feel comfortable and to motivate their work. Elements were often used to create variety for people in choosing how to arrange their particular workspace setting. In one case, elements were used as stimuli, and reflected the process. Overall, elements made up the major and most aspect of the space concepts, and was the most flexible. From a design perspective, elements define the design of space and their importance can thus be judged on this.

4 Conclusions

To sum up, we can conclude that there are recurring patterns in space conceptualisation for the enhancement of creativity. Whether these patterns are “best-practice” or “state-of-the-art” is not yet evident. These patterns may occur because people are inspired by existing examples, and certain elements are repeated, as they may believe “it has worked for them, it should work for us”. Or these patterns may be recurring because they are validated solutions for the conceptualisation of space. Further study is needed to prove whether these are either empirically valid patterns or whether there is an unverifiable theory of spatial conceptualisation for the enhancement of creativity.

It became evident that certain patterns recur in a cross-case context and at the same time some cases show the specific implementation of elements. This suggests that for space conceptualisation there are some valid overarching rules, and some special requirements that are dependent on the kind of space that is envisaged. Building on this, further study needs to prove the following hypothesis: General rules and theories of spatial conceptualisation are applicable to the way in which space is organised, but are not applicable to the functionality of space. This requires specific case-by-case evidence.

For the implementation of Mobiliar Forum Thun we decided not to go with the flow, and we departed from the results of the case study analysis in most aspects. Though the starting points, approaches and inspirational sources are comparable, the elements in Mobiliar Forum Thun were designed to be inspirational rather functional. The elements there neither recall traditional office furniture or café furniture, nor can they be bought “off the peg”. This was a deliberate strategy, not to discount the results of the case studies but to intentionally test our hypothesis that objects can enhance creativity further if they deviate from conventional workspace furniture in design. The use made of the Mobiliar Forum Thun will either prove or contradict this hypothesis. Having said that, this is part of our future research.

Acknowledgement

I would like to acknowledge with much appreciation the crucial role of Die Mobiliar for supporting this work by offering all the equipment and the necessary materials required to accomplish the design of the space in Thun.

Citations and References

- [1] Williams, A., “A Grammar of Creative Workplaces”, Unpublished PhD thesis, University of East London, 2013.

- [2] Steinert, M. & Leifer, L., “‘Finding One's Way’: Re-discovering a Hunter-Gatherer Model Based on Wayfaring”, *International Journal of Engineering Education*, Vol.28, No. 1, pp 1–2, 2012.
- [3] McCoy, J. M.,”Linking the Physical Work Environment to Creative Context”, *Journal of Creative Behavior*, Vol. 39, No. 3, pp 167–189, 2005.
- [4] Amabile, T. M., R. Conti, R., H. Coon, H., J. Lazenby, J., M. Herron, M., “Assessing the Work Environment for Creativity”, *Academy of Management Journal*, Vol. 39, No. 5 (October 1), pp 1154–1184, 1996.
- [5] Amabile, T. M. & Gryskiewicz, N.D., “The Creative Environment Scales: Work Environment Inventory”, *Creativity Research Journal*, Vol. 2, No. 4 (September), pp 231–253, 1989.
- [6] Moultrie, J., Nilsson, M., Dissel, M., Haner, U-E., Janssen, S., Van der Lugt, R., “Innovation Spaces: Towards a Framework for Understanding the Role of the Physical Environment in Innovation”, *Creativity and Innovation Management*, Vol. 16, No. 1, (March), pp 53–65, 2007.
- [7] Lewis, M. & Moultrie, J., “The Organizational Innovation Laboratory”, *Creativity and Innovation Management*, Vol. 14, No. 1, (March), pp 73–83, 2005.
- [8] Dul, J., Ceylan, C., Jaspers, F., “Knowledge Workers’ Creativity and the Role of the Physical Work Environment”, *Human Resource Management*, Vol. 50, No. 6, (November), pp 715–34, 2011.
- [9] Van der Lugt, R., Janssen, S., Kuperus, S., de Lange, E., “Future Center ‘The Shipyard’: Learning from Planning, Developing, Using and Refining a Creative Facility”, *Creativity and Innovation Management*, Vol 16, No. 1, (March), pp 66–79, 2007.
- [10] Vithayathawornwong, S., Danko, S., Tolbert, P., “The Role of the Physical Environment in Supporting Organizational Creativity”, *Journal of Interior Design*, Vol. 29, No. 1–2, (September), pp 1–16, 2003.
- [11] Eisenhardt, K.M., “Building Theories from Case Study Research”, *Academy of Management Review*, Vol. 14, No. 4, (October 1), pp 532–50, 1989
- [12] Yin, R.K., *Case Study Research: Design and Methods*. Fifth edition. Los Angeles: Sage, 2014.
- [13] Corbin, J.M., & Strauss, A., “Grounded Theory Research: Procedures, Canons, and Evaluative Criteria”, *Qualitative Sociology*, Vol. 13, No. 1, pp 3–21, 1990.