

Atmospheres and Socio-spatial Patterns: Designing Hyperspaces for Knowledge Work

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Abstract. The paper focuses on the importance of socio-spatial patterns and atmospheric qualities for knowledge work in real and virtual environments. On the background of research in the fields of Knowledge Architecture, Online Worlds and Environmental Design we show the interdependence between architectural design and human-computer interaction. The paper presents a design approach for “hyper-spaces” that fuses the qualities and opportunities of both realms into defined design-patterns.

Keywords: Atmosphere, Socio-Spatial Patterns, Knowledge Work, Architecture, Environmental Design, Virtual Worlds.

1 Introduction

In processes of knowledge work like learning, researching, or innovating, interactive communication is commonly regarded a central factor for success. Yet, communication is a complex environmental mechanism that goes beyond the technical transmission of information between humans and machines. Our point is that interactive communication is strongly determined by physical, psychological, and social context. We therefore advocate additional modes of ambient communication - communication that transfers information and activity via social structure, via spatial design, as well as through the “atmospheric” conditions arising from the combination of both.

In this paper, specifically, we want to line out the importance of socio-spatial patterns and the impact of atmospheric qualities on interaction in learning environments. We will show the interdependence and mutual relation between these two factors.

As it comes to knowledge workers, research teams, or learning groups, communication is not only to link communities in physical proximity. More than ever, communication has to bridge between separated people, institutions and locations, sometimes over large geographical or organizational distance. For this, a central question is how to combine the advantages of near-physical contact and face-to-face communication with the demands of far-distance interaction. In order to support the creation of high performance work-environments with this capacity, the paper puts

forward an integrated approach that combines design sciences and behavioral sciences into a new form of “environmental conditioning”. As its very endeavor, the paper fuses research from the fields of Knowledge Architecture and Human Interaction Design into the concept of “hyperspaces for knowledge work”. The concept regards “Atmosphere” and “Socio-Spatial Pattern” as key success factors for successful knowledge workplaces. Employing this insight for physical and for virtual environments, as well as for their combination, a wide range of applications can be found in the context of work place design, in educational settings, and in R&D planning.

2 Atmosphere as Cognitive Primer for Knowledge Work

2.1 Environmental Factors for Cognition

The diffuse nature of cognitive processes makes it difficult to identify success factors for intellectual achievements. However, besides neurological and psychological determinants, environmental factors have emerged as a new focus both on macro and micro scale [2], [5]. The way a classroom is set up on micro-scale, or how a technology cluster is organized in a larger region, directly impacts on the knowledge performance of the respective place and its users. Still there are few investigations about the relation of intellectual performance and environmental conditions, that is: the social, psychological and physical conditions of knowledge creation.

Experiments and surveys have shown that besides the “hardware” of physical environments also a number of “soft factors” has to be recognized as essentially contributing to knowledge processes. To a wide extent, such soft factors may be organizational and administrative items, however a large part of them is atmospheric in nature. Common terms like “ambience”, “climate”, or “mood” indicate such vague yet highly determining kinds of environment. Good ideas are “in the air” and inventions come “out of the blue”. Generally, one easily recognizes a “creative atmosphere”, “a relaxing mood”, or “a climate of fear”. That is due to the very powers of atmospheres as a collective shared experience - which renders it a high-potential media for knowledge work too, for knowledge work itself turning into a complex group- and networking matter.

Atmospheric qualities are understood not only by individuals who emotionally respond within seconds, but also by large groups, or societies, who manage to quickly establish a common sense. As can be observed in music or sports events, atmosphere immediately tells and transmits even across large crowds. This distinguishes atmospheres from the “hardware” configuration of cities, buildings, or spaces: the latter may well control societies and their physical behavior, but they lose power when it comes to impacting on individuals mind (Fig.1). Individuals detach themselves from physically defined / defining environment by simply changing place, yet detaching oneself from an atmosphere, from a mood, or an environmental climate is far more difficult. It stays attached not only with the very location, but also with the persons who recognized it.

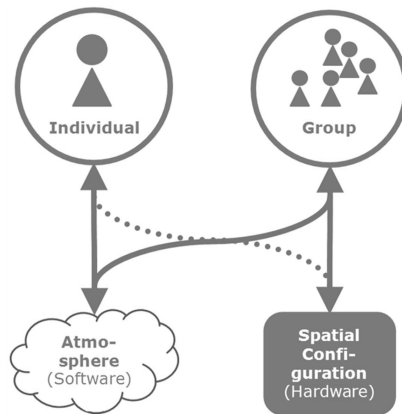


Fig. 1. Different impact of environment: Strong “atmospheric control” upon individuals and groups; weak “spatial control” on individuals (yet strong upon collectives)

2.2 Designing Atmospheres

Atmospheres play a decisive role in environments for learning and researching, yet they are almost impossible to design. Being commonly recognized as a chief environmental impact, they slip off the design and planning agendas though. Atmospheres appear to be sensitive items with far too complex dynamics as to cope with them with static schemes. Still, there is a dire need for atmosphere design, for approaches that address this kind of soft conditioning for knowledge work spaces.

Diverse philosophical and sociological inquiries have clarified that “atmosphere” is a field condition that arises from dynamic interaction - the interaction of people with people (“Milieu”), as well as from the interaction of people with things (“Ritual”), and even activity between and around things (“Aura”). For our case, these constellations may be re-interpreted as the relations of knowledge workers and their work ethics with their physical and social work environment.

2.3 Creative Microspaces

It may be difficult, if not impossible, to design atmosphere in large. On micro-scale, however, there is reliable experience and insight on how to condition atmospheres for learning and research, for creativity and innovation. Hence, the very focus of this paper is on microspaces, on places that allow face-to-face interaction among small groups, or teams. Thus a knowledge microspace may be defined as a place of limited extension, dedicated to creative production, innovation, and learning. The place is determined by specific hardware, software, and atmosphere. Here, “Hardware” may be understood as spatial division, furniture, surface material e.g. “Software” may be understood as administrative and organizational structures, communication processes, and / or control mechanisms. These architectural and managerial terms are relatively easy to describe and to design. However, “Atmosphere” as an ambient quality arising from the interplay of social and spatial structure, is more difficult to describe and

define. In order to conceptualize this third core measure, we have especially investigated Garage laboratories and Coworking spaces. These microspaces may be surprisingly far from conventional knowledge work environments, nonetheless they are of immense interest because of their outstanding intellectual and creative performance. Their configuration of hardware, software and atmosphere provides a setting which enables and empowers outstanding intellectual achievements. In other words: they feature a high “knowledge performance” which can be described as the ratio of intellectual output, or cognitive activity, in relation to spatial efforts (e.g. size, equipment, construction costs). Commonly, the power of such microspaces is due to their ambience, to a strong atmospheric definition which emerges as a result of spatial-organizational setup and the mental “operation systems” of its users.

Example 1: Garage Lab. Garage labs have become a myth as an environment of maximum entrepreneurial creativity. On the one hand, this can be explained by socio-spatial configuration: small work teams, high physical proximity, real-time interaction and intense communication. On the other hand, and as decisive as well, psychological and atmospheric determinants enable the very “Garage creativity”: detachment, seclusion, un-observedness, and a sense of low value environment. The combination of these factors generates a start-up spirit of experimentalism and challenge, a sense of alertness, activity, and motivation. Widely independent from environmental constraints, this clandestine setting is the very location for what economists call “Radical” or “Disruptive Innovation” (Fig. 2).



Fig. 2. Radical Innovators: Google in their startup garage at Menlo Park (Source: Abundance.com)

Example 2: Coworking Spaces. As a new trend worldwide, Coworking spaces are collective workplaces that attempt to translate the knowledge performance of garage environments to a more public and formal setting. Besides its formal architectural definition - which takes stylistic reference to the studio-environment of the creative class, a specific kind of atmosphere is being cultivated and enhanced. As a means of environmental enrichment, exchange and interaction are to be displayed, creativity to be demonstrated. Dictated by fast changing project work and team re-configuration, sociability and community spirit have become requisite conditions for the 21st century creative class - which is to be supported by adequate environments. (Fig.3).



Fig. 3. Creative atmosphere in Coworking Space (Source: Neonworx)

2.4 Online Games: Multi User Virtual Environments

Besides places of immediate physical interaction like Garage Labs or Coworking Spaces, online games and virtual worlds are increasingly gaining importance as places for social interaction and exchange. Especially so-called Multi User Virtual Environments (MUVIs) are used for communication and collaboration in learning and knowledge work. As a socially oriented variation, MUVIs have developed from online games; they differ from other online communication environments by their idea that - in addition to the persistence of an internal virtual world - also scenes from the real world are involved, creating thus a reference to architectural forms and typologies.

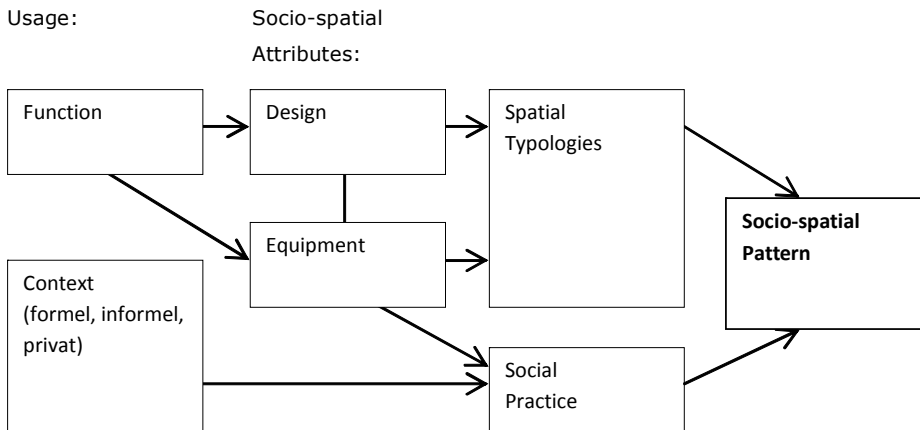


Fig. 4. Contents of Socio-spatial patterns of real-built environments (Source: [6], p.22)

Whereas spaces, as a part of a micro-context, signal the common presence of participants, their atmosphere indicates the social conditions of joint interaction. The commitment to a space-typology and to related socio-spatial patterns represents a contextualization of interaction based on well-known social rules. Socio-spatial patterns produce a recognizable form. They include specific spatial-typologies as well as instructions for action in terms of their social practice (Fig.7). Further, they also

induce spatial atmospheres which in turn associate with psychological factors like acceptance, motivation, or inspiration. By this chain of effect, socio-spatial patterns influence the social climate and thus the work attitude of users.

Better Face-to-Face? Interaction takes place on the basis of verbal and non-verbal communication and includes a high degree of socio-emotional information. In contrast, computer-based interaction is an exchange of persons who are not assembled at the same time in one location or room. Measured in terms of the high social contextualization of face-to-face conversations, computer-mediated interaction is as impersonal as its perception of another person is limited. It therefore leads to problems such as a reduced social presence of the participants and a limitation of a commonly shared knowledge background.

Example: 3D Online Worlds. Since a few years, 3D online worlds are available via local client and broadband internet connection, thereby giving path for bringing the third dimension into virtual environments. Despite their artificiality and lack of tactile qualities, online worlds very directly appeal to experiences and strategies of dealing with designed environments and associated spatial information and knowledge. Their affordances are completely legible only against the background of their social connotations.

Users and creators of online worlds design specific spaces and places for the social interaction of communities or social units. These buildings and spaces not only have metaphorical significance; they are symbols of social organization too. Their socio-spatial features and affordances relate to everyday spatial practices and form a basis for a common understanding, thereby influencing the success of social activities in online environments. Just as atmospheres, also spatial-typological references help to create an interaction background that can be read and accepted by all users (Fig. 4). This provides the chance for alternative social constructions, even social re-engineering: In online worlds it is easy to experiment with changing teams, projects, and spatial configurations. Architecture, as a deliberately designed, semantic and visible structure of the room, would be a symbol of social arrangement with the aim to enable space-related activities. Described as social spaces in online worlds and virtual environments they provide a framework of certain possibilities for action [1].

3D is more Atmospheric. Certainly, 3D representations open up more opportunities to adjust and tune atmospheric qualities. Thus, in turn, enables the psychological pre-conditioning as is necessary for high performance knowledge work (emotions, motivation, and thus impact on learning success. In our investigations, 3D spaces are seen to be more inspirational (“Never seen before!”) and easy-to-adjust (“Change wall pattern!”). In regard to contemporary developments in interactive design (emotion sensing, smart environments, ubiquity etc.) it may be claimed that space not only tunes emotions, but space itself becomes emotional, sensitive, and responsive (Fig. 5). Then, space cannot be seen as a tool to enact power and control over people, but rather as a participator on its own, an actor within creative communities. Then, architectural design in online worlds and interactive digital environments turn into active players, supporting social contextualization of online communication and collaboration processes [6].

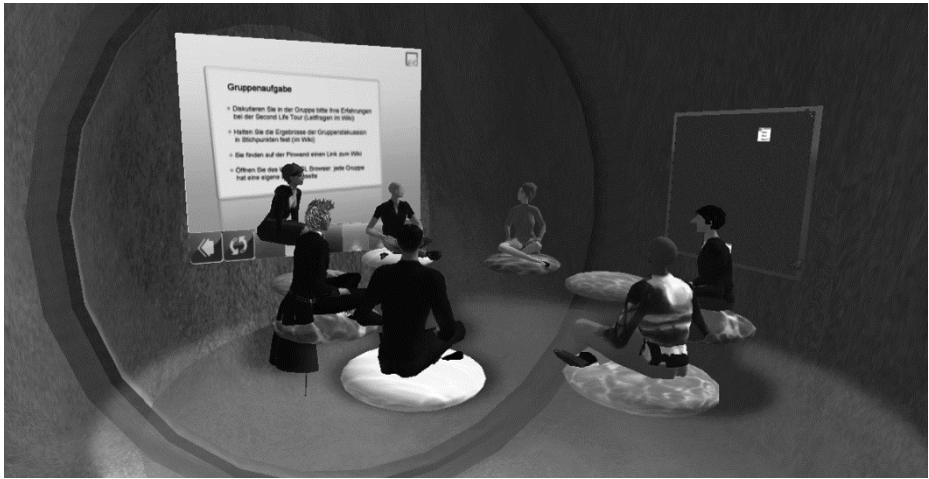


Fig. 5. Informal atmosphere in the Virtual World Second Life (Source: [6], p.IX)

2.5 Conclusion

Users of real and virtual environments select and use specific spatial settings for their interaction with other people. They prefer defined socio-spatial typologies as a means of socialization, and specific atmosphere as a means of mental conditioning. For highly interactive work and communication processes, knowledge workers depend on environments conditioned to a low-threshold of social participation and comfortable and informal atmosphere. There is a dire need for approaches that integrate appropriate soft qualities into comprehensive architectural planning and environmental design. As the term “design” seems not very applicable to the qualities at stake, new means and measures for a dynamic “conditioning” of atmospheric environments must be established. Before all, they may be found in the field of Environmental psychology and behavioral studies.

The benefits of adequate atmospheric conditioning in the context of knowledge work can be easily described: knowledge workers get primed for intellectual challenge, for creative activity, for sharing and cooperation. As environmental psychology holds, this can be suggested by certain environmental settings. Spaces and environments can be purposefully emotionalized, charged with semantics and with sentiments. The “sciences” of marketing and propaganda have developed powerful means for this purpose already. As shopping lanes and supermarkets can be purposefully set to trigger a mood of consumption, knowledge workplaces may be set for intellectual production as well. Stages, bars, and hotels explicitly show how ambience and atmosphere can be created. The mechanisms that induce certain social behavior thereupon are unclear, but powerful. That much can be said: Through conditioning suitable atmospheres social climate may emerge.

3 Research Design: Design Research

Transdisciplinary Approach. As a crossboundary endeavor, our research links design science and behavioral sciences, specifically: the fields of architectural and human-computer interaction design on the one hand and environmental and social psychology on the other. Within this combination, the emerging field of Knowledge Architecture investigates the correlation of spatial configuration, social interaction, and knowledge processes. Thus far, the importance of built environments for knowledge generation has been confirmed by investigations in the field of innovation management and creativity studies [4]. Digital communication systems and virtual environments in turn offer spaces explicitly designed for interaction processes and mutual exchange. Media design provides effective means to apply such insight to larger communication networks and information processes. The sociability of game designs gives an overview of the organization and structure of online communities. Users of virtual worlds and online games can be engaged with generating different types of spaces for social interaction. These spaces may consist of textual or iconic information, three-dimensional items or complex buildings like in a real-world environment. Visitors may not only perceive these objects, but even interact with them. Virtual spaces can offer options for activities just like real-life environments.

Priming by Design. Environmental and social psychology explains how people are get “programmed” by physical and social context (“priming”). Various means and measures were tested to track the cognitive performance of humans in certain spatial configurations and their dependence on factors like environmental perception or awareness. There is strong evidence that cognitive performance of knowledge workers - which widely depends on soft factors like motivation, inspiration, and cooperation mindset - can be influenced by spatial environments [3]. Physical or digital, they are strong atmospheric triggers for the necessary mental setup. So far investigations were carried out either in physical or digital contexts, and only rarely related to cognitive performance. Hence our assumption is that combined cyber-physical environments (“Hyperspaces”) whose emergence seems an inevitable future development, will heavily influence the performance of knowledge workers, be them in education, R&D, or administration. We have looked for exemplary models and design procedures - and found telling references.

3.1 Stage Design

Apparently the most promising microspaces for knowledge work are stages. Spatial settings in computer games and virtual worlds can be regarded a form of stage sets too. A stage is to establish ad hoc atmosphere and creative activity. It is an “atmospheric device” for stimulating defined moods and sceneries. Over the centuries, stage set and stage design have developed detailed routines for the application of shape, color, light, perspective, sound etc. Thus a stage enacts multiple powers to evoke atmosphere. At least three distinct modes of affect can be distinguished. Firstly, a stage set works as an image to look at. For the observers in

the ranks, a stage is to create an image, or a visual atmosphere. But viewer and scenery are separated: the stage presents a picture to be seen from a distance. Secondly, especially for the actors, the stage is an inclusive environment, a space container. The actors act within a scenery; they are immersed in a virtual space. Thirdly, the stage is an experimental laboratory for the enactment of a process of social interaction. “Staging” means in its broadest sense: Making place for human activity, and defining a point of view for its observation. The stage is an experimental playground for social interaction (drama), and atmosphere (scenery).

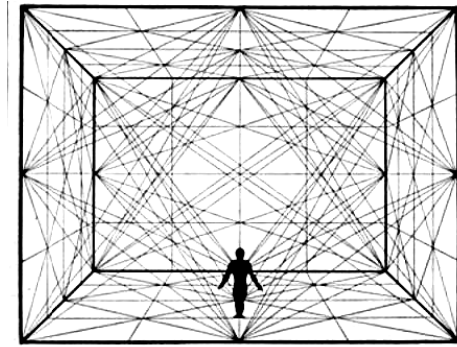


Fig. 6. Neutral stage for ad hoc atmosphere (Oskar Schlemmer)

In order to fulfill these different modes of atmosphere, the space as it is must be without specified qualities. A stage without drama is uncanny. A scenery without atmosphere dead. A good stage therefore appears as a rich neuter, physically empty, full of virtual stories and settings. Exactly this quality makes the stage a prototypical creative workplace. As a social workshop, laboratory, and showroom in one, it is a blueprint for high performance knowledge work spaces. A virtual environment that hints at the potential power of online knowledgespaces.

4 Outlook: Towards Hyperspace

People work, learn, and interact in real and virtual spaces alike. Whereas spaces of the built environment are medially determined and perceived, medial environments are spatially determined. Interaction similarly takes place in virtual and physical spaces, thus embedding itself in a “hyper-environment”. We hold that only an approach that conceptually integrates virtual and real-built environments will be able to respond to the current demands of knowledge work. Despite being increasingly based on communication media, knowledge work environments ought to employ the immediate power of “natural” spatial interaction, of direct personal and social contact, and of atmospheric conditioning. They may translate such features into digital settings, and explore uncommon new ways of interacting with, and tuning-in to spaces. In the digital architectural environments, the mental images and ambiances as evoked by the setting turn into eminent design items. Looking at the creation of atmosphere in stage

design e.g. as well as in digital media (computer game design) valuable hints can be gained on 1) how atmospheric environments may be purposefully created, 2) how they influence, impact and determine their variety of users. Studies have shown that especially atmospheric settings decide upon attitude and performance of the involved communication partners [6], [2].

We plead for common design patterns in the creation of real and virtual environments. Atmosphere shall be seen as a prime design objective in physical as well as in online architectures. The conditioning of social, psychological, and intellectual climate instead of designing configurations of things and objects appears to be a powerful approach. It introduces new creative procedures as well as new targets to design. It puts emphasis on items that seemed unrelated to design work hitherto but have emerged as key features in the recent past (human behavior and recognition). We have to extend our notion of communication. Besides the established modes of information logistics and data exchange, the diffuse yet complex media of space, environment and context come into play. They usher in a new type of ambient communication.

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