

The Performance of Space – Exploring Social and Spatial Phenomena of Interaction Patterns in an Organisation

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Abstract

It is often proposed that the design of the physical workplace influences social interaction and therefore organisational behaviour in one way or the other. Yet there is little accord among scholars on how exactly the relationship between the social space and the social structure of an organisation is constituted. In order to explore this relationship, we combine an interpretive, phenomenological approach with a correlational, syntactic approach. Using the example of a workplace environment studied on multiple layers as well as in detail we propose that physical space influences the formation of social structure and organisational behaviour in manifold, but analytically tractable ways. The application of qualitative and quantitative methods in tandem proves fruitful for understanding the complex phenomena that characterise the emergence of organisational culture.

Biography

Kerstin Sailer is a researcher in the field of workplace environments, building morphology and the sociology of architecture. She currently works on her PhD at Technical University Dresden and is appointed as Knowledge Transfer Partnership Associate at University College London in cooperation with SpaceLab architects. Her research interests include the mutual influences between space and society, specifically in workplace environments and public spaces.

Alan Penn is Professor of Architectural and Urban Computing at the Bartlett School of Graduate Studies, University College London. He is closely involved in the development and application of 'space syntax' methods and theories. Using these he has investigated the interaction between individuals, organisations and the design of the workplace, and the social and spatial cultures that characterise this.

Introduction

The contexts in which organisations operate have changed dramatically in recent years. The crucial importance of people and the intangible asset of 'culture' in an organisation has been discovered, and now has a firm place in management literature. The monitoring and steering of interaction patterns, knowledge transfer, and team work have become central issues in the discourse as a review of the literature on organisational learning and knowledge management shows.¹

However, in this context, the relevance of space "as a vector of social interactions"² is still not fully acknowledged, although the topic is slowly surfacing in the management and

work-related discourse.³ Psychologist Fischer has called space a 'forgotten dimension' in work-related research⁴ and Peters judged that space was the most effective tool in bringing about social change and enhancing learning efforts.⁵

Using an in-depth study of an organisation, this paper aims to investigate the relationship between social structure and social space. We are interested in exploring the way that the experiences of members of an organisation, including their patterns of interaction with others, are informed by and inform the spaces that they occupy and use. We are specifically interested in which aspects of individual experience are the common or shared experience of others. We ask how exactly space in its manifold constitution may promote or inhibit social behaviour and interaction. Starting from a qualitative analysis based on in-depth interviews with members of the organisation we move on to explore the emergence of characteristic spatial cultural forms with the help of quantitative methods of Space Syntax and Social Network Analysis.

Finally, this raises the methodological question of how to bring together analytic and experiential approaches in organisational research, and hence what phenomenology may contribute to space syntax and what space syntax may be able to offer to phenomenology.

Understanding the relationship between space and society

Innumerable attempts have been made to understand and explore the relationship between space and society. However, only a brief outline of the two main schools of thought that this paper refers to, space syntax and phenomenology, will be presented here.

Space Syntax is a theory of architecture and space based on the idea that configuration – that is the way in which the parts are put together – plays a crucial role in explaining the social meaningfulness of built form. According to Hillier⁶ the relational structure of any built form, such as an urban grid or the layout of a floor plan, itself shapes patterns of human movement, occupancy and individual experience. Integrated spaces which are well connected to, and shallow from, all the other spaces in the system will attract movement simply as a consequence of their strategic position. Social behaviours in space such as encounter, gathering, and use of public spaces, are defined as a by-product of movement, and give rise to the presence and co-presence of people as first order consequences of spatial configuration. These patterns of habitation then act to inform second order functional aspects such as the distribution of land uses or placement of facilities which in turn reinforce patterns of movement again through attraction. In this way spatial configuration and human habitation feed back from one another to constitute an emergent social milieu.

Phenomenology is an interpretive approach to study lifeworlds as humans experience them, based on the philosophical ideas of Husserl, Heidegger and Merleau-Ponty, it explores and describes phenomena, but aims at discovering "underlying commonalities that mark the essential core of the phenomenon."⁷ Due to its interest in detailed qualities and subjective experiences of people in everyday life, phenomenology is more concerned with place than with space, for place is "a central ontological structure of being-in-the-world partly because of our existence as embodied beings"⁸. Place is considered as a "pause in movement. (...) The pause makes it possible for a locality to become a centre of felt value".⁹

But how do both perspectives conceptualise the relationship between space and society? In the eyes of space syntax research, social behaviour and built environment cannot be

separated: "We should not expect the built environment merely to be the material backdrop to individual and social behaviour, as it is often taken to be. It is social behaviour, just as the use of language is a social behaviour and not just a means to social behaviour."¹⁰ Interestingly a similar view is taken by phenomenology, which acknowledges that, according to Heidegger's concept of 'Dasein', "people do not exist apart from the world but, rather, are intimately caught up in and immersed. (...) It is impossible to ask whether person makes world or world makes person because both exist always together and can only be correctly interpreted in terms of the holistic relationship, being in world."¹¹ Both perspectives can easily be seen as just one albeit with different forms of expression¹². This shows the common ground from which both approaches start, however with very different methodological implications.

Methodology

In the research described here a multilayered approach was chosen, combining qualitative and quantitative data collection and analysis, in order to fully and deeply understand the complex spatial and social phenomena occurring in organisations. The data presented in this paper is taken from a case study conducted in November/December 2005.

Firstly, semi-structured in-depth interviews with ten people covering different groups, positions and both genders proportionally were conducted, inquiring into perceptions and experience of organisational cultures, space use, opinions and perspectives. Twelve more interviews with members of neighbouring organisational entities were made to contrast the data. This was looked at in two ways: on a purely qualitative level we evaluated what people said and the experiences they related. Moreover, these data were analysed in terms of consistencies among individuals as well as among the different emerging concepts used by people in relating their experiences. Grounded Theory¹³ was used not only as an interpretative framework, but also to map co-occurrences between emergent categories of organisational life on the one hand and spatial aspects on the other. Secondly, all members of staff were asked to fill in a questionnaire on the construction and their experience of social networks. It surveyed how often individuals see each other and how useful for typical organisational activities everyone found their colleagues.¹⁴ The results were then evaluated using Social Network Analysis (SNA) methods¹⁵. Thirdly, the spatial layout of the organisation was analysed using Space Syntax methodologies¹⁶. Finally, patterns of space use (e.g. movement traces, interactions, people standing and sitting, group behaviours, as well as the locations of these) were observed and mapped. Taken together these methods give rise to a diverse and multilayered 'thick' description of the organisation from both first and third person perspectives.

Case Study: University School

The case study organisation is located in central London. It is a university faculty divided into five more or less autonomous organisational entities or 'schools', of which one was studied in depth. This School has sixty-nine members of staff and comprises a central administration and six different research groups (ranging from one to twenty-one members) that offer twelve Masters-Programmes of study with around 200 students in total.

To describe how the encounter of people and the underlying spatial worlds intermingle, the spatial situation as well as the organisational characteristics and interaction patterns of the studied organisation will be briefly introduced.

Spaces

The school was founded in 1993 through an amalgamation of all the research-based activities including most post-graduate courses across all fields and topics from the faculties' other schools to create a new interdisciplinary postgraduate school. It moved into a new building on campus, 500 meters away from the remainder of the faculty. Ever since its foundation the school has grown rapidly, due to its success in both research and teaching. Because of limited space available to the university and its location in a high rental area in central London, the pressure on space in the school is enormous. All the spaces are overused and with new members coming in, groups have to be re-located elsewhere. In 2005 at the time of the study, the school was spread over two different locations (being 300 metres apart from each other) with four individuals in one location (B) and the rest on three different floors in another building (A). The heart of the organisation is located on the 2nd floor of A where it occupies a whole building wing. Half a wing on the floor above and one group office a floor below comprise the school's spaces.

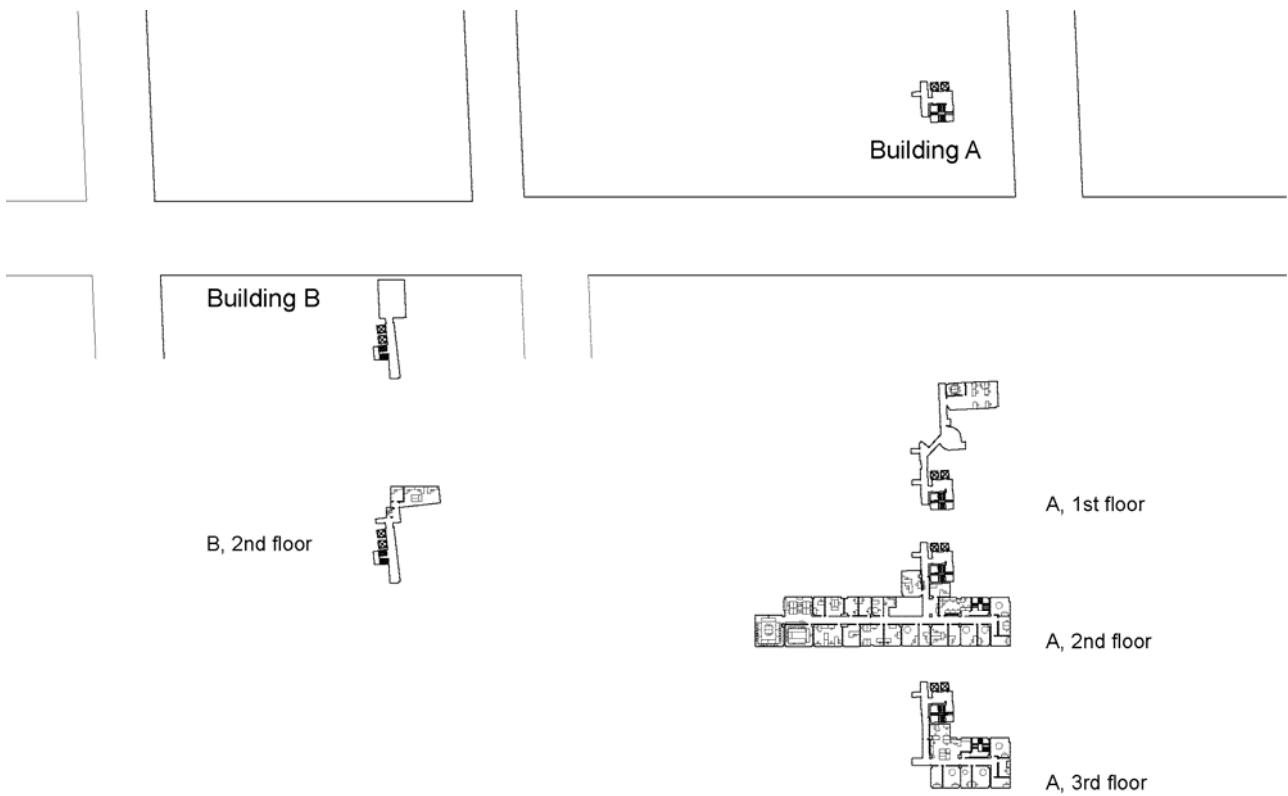


Figure 1: The organisation studied is located in two different buildings.

The spaces are structured into variously sized and shaped offices, with a majority of single and double cellular offices and some group offices occupied by three to seven people. On the third floor one open space work area is provided. The only more or less public spaces in the building are a small central area at the intersection of the two main corridors with facilities such as the photocopier, printer and water-cooler, the computer cluster at the one end of the 2nd floor with two seminar rooms nearby and the corridors

which are partly decorated with research posters and provide notice-boards with information.

Activities and characteristics

The school activities are strongly research-based although during term time teaching forms the everyday business as well with trails of students moving in and out, and bustling activities especially around the two seminar rooms and the computer cluster.

Being part of a university, the school tends to be loosely structured with high levels of self-responsibility, freedom to decide and autonomy: “you are your own organisation”¹⁷, “you don’t have the sense that someone organises you from the top”, or even “they are academics, you can’t lead academics really, they are difficult” are reflections of this. But at the same time this means that “once you are here, you are left alone, staggeringly left alone. You thrive by yourself, fail by yourself, can’t expect any intervention from outside your particular area.”

Additionally, only little awareness exists of being one whole organisation. The six distinct research groups are not perceived as regularly interacting or collaborating: “we are a collection of individuals, we happen to share the same space, we really do not have much in common. Some loose connections are in operation.” A similar pattern can be found at the organisational level, where there are only weak links between the schools within the faculty although people often admit that there should be more: “[Unit X] do interesting stuff, but you don’t know they exist, what they do.”

It seems as if the organisation as an identifiable whole, organising and structuring the everyday activities and businesses hardly exists at an experiential level. Often the organisation is read as a “mere shell”, a coincidental collection of individuals doing their job. This ‘organisational absence’ is mirrored in the lack of knowledge of how the whole is working or what it consists of: “it is difficult to get a measure of the place, certainly the wider organisation of the university, but I don’t feel I know that at all. Beyond the corridor of our school it all starts to get a little bit fuzzy.”

Interaction patterns and space

In order to understand the predominant interaction patterns within the organisation and how they form spatially, all individual statements from the structured interviews in this regard have been analysed and sorted into emerging categories of spatial features that are expressed as inhibiting or promoting interaction.

On the one hand aspects of social spaces and organisational disposition of space or activity can be identified to influence interaction patterns, such as events, aspects of usage, as well as sharing offices and facilities. For example people complain about the lack of or praise the few existing initiatives of common lectures, seminars or events in order to get to know fellow staff members as an incentive and foundation to interact with others outside of their field. Sharing offices is seen as beneficial to interaction (“Being in the open space can be a plus factor as well. You might feel bored and lonely in your work, (...) then if you are in an open space, there are others, like in a public space in the city, you can see and are seen and that is nice.”), but it is experienced as inhibiting as well (“if someone is working very hard, and you want to have a chat, you feel you can’t do it, can be quite irritating”). Moreover, the spreading of shared facilities (like the library or

cafes) over the campus is considered inhibiting, but the most crucial point that was made independently in nearly every interview was the lack of shared facilities, like a common room, since this is felt to inhibit the informal encounter and social get together between the staff members. People complain that “there is no place to go and have a cup of tea or find other people there. The random links are completely broken.” Others comment that “it would be hugely beneficial for both students and staff, to have discussions” or that “there must be a nicer way of meeting people than around the photocopier.”

On the other hand factors of physical constitution were mentioned repeatedly, though not quite as often as organisational and social issues¹⁸. Apart from one remark on the design of the corridors with posters and pictures of people’s work that were regarded as promoting interaction (“If you look around, it seems quite nice, the fact that they have all these posters that students worked on or research projects on display, that’s one of the ways of finding out what others do, to read their posters, I like that.”), all other physical aspects covered configurational features such as visibility, subdivision, and distance and proximity. Whereas little visibility and high levels of subdivision (i.e. closed doors, cellular offices) were criticised as inhibiting interaction, the views and judgements regarding proximity were somewhat ambiguous. Proximity was regarded as facilitating interaction for contact occurs through repeated encounter: “I and my next door office neighbour got chatting, and it turned out that his research interests are very complementary to mine, (...) he passed me lots of interesting papers and I passed him lots of papers, things may come up of that.” But distance works as well in enabling contacts and interaction: “Most annoying is there is no access to (...) a kitchen on my floor. Benefit of that is I am forced to get up and move. When I had researchers on a project upstairs, that gave me a good excuse to move through and have a look and give them the opportunity to recruit me.”¹⁹ In contrast, the influence of spatial separation on different floors or even different buildings was clearly and unanimously considered as inhibiting: “I feel spatially isolated, everyone else is on the second floor, I don’t meet people downstairs very often.”

Though clearly spatially grounded, there is also a temporal aspect to the interaction patterns of the organisation: “Space, to be truthful has an awful lot to do with that [low interaction], the lack of common (...) facilities, where you can just bump into people, all the cellular offices, contribute to you go in, do your bit, do it in isolation, also we are very busy”.

It can be summarised that interaction patterns – the possibilities to know, see and meet others within the organisation – are mainly felt to be caused by the social and lived spaces of the organisation. Physical space features are mentioned less frequently. The overall picture reflected in the comments is dismal: many possibilities for interaction and encounter in space are inhibited by inadequate layout (e.g. strong subdivision, little visibility), spatial practices (e.g. closing doors) and organisational behaviours (e.g. no allocation of a common room due to pressure on space).

So far this descriptive analysis has drawn a vivid picture of the characteristics, cultures and interaction patterns of the organisation. But we need now to immerse ourselves more deeply into the matter, taking up issues that emerged from the interviews and analysing them with respect to the more quantitative evidence available from the Social Network (SNA) and Space Syntax analyses in order to search for regularities and recurring relationships between social and spatial phenomena. Following an evaluation of the social networks, a syntactic analysis of linear (axial) and convex geometry and relations of the spaces of the workplace, in comparison to observed patterns of movement and co-presence in space will be used to probe the three aspects of visibility, subdivision and proximity, identified in the qualitative analysis. In this way we aim to consider the issue at

the level of not only individual's stated experience, but also of the individual in their social context, and their embedding in their environment.

Social Networks

The social structure of a human network can be analysed using SNA methods to investigate the relationships among social actors, and the patterns and implications of these relationships.²⁰ SNA analyses how information or resources flow through a network. In the case presented here, two different networks have been investigated: the one of seeing and being seen²¹ as well as the network of perceived usefulness²² of and by others. Analysing the usefulness networks is a powerful way of revealing how the various research groups function, in particular since it places value on social relations. Figure 2a shows the usefulness network including only links scoring more than 5 (from a range of values from one to nine).

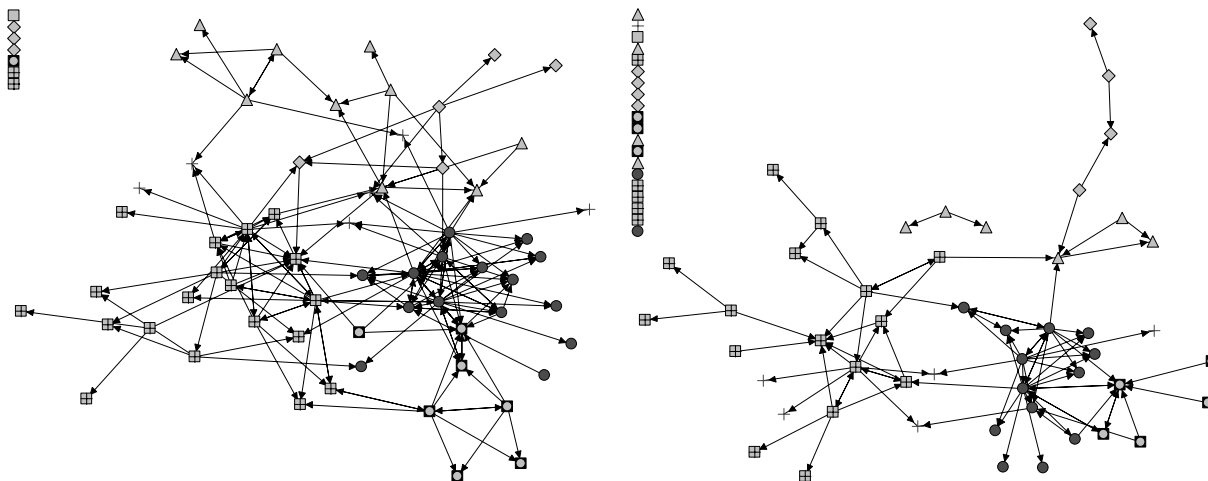


Figure 2a (left) shows the network of who finds whom useful (above the score of five on a 1 to 9 scale). Figure 2b (right) shows a reduced network with all links scoring less than seven removed.

Firstly, it is clearly observable that there are only few links in operation between the different groups. Secondly, the groups vary enormously in their internal network patterns. Whereas in group one (represented by circles) nearly everyone finds everyone else very useful, the formation of group two (represented by circles-in-box) is rather hierarchically structured, concentrated on the professor leading the group. This phenomenon shows even more clearly when we remove all links scoring less than seven (see figure 2b). One can easily see, that both groups are still interrelated, due probably to the fact that group two has only recently been founded originating from people from group one now also including newly recruited members of staff. Interestingly, a great part of group one occupies the only open-plan work area with its group leaders located in offices nearby. This seems to inform dense network patterns, as opposed to group two where the leader is spatially separated from the group with low levels of intragroup-relations.

Axiality and Convexity – Movement and Co-Presence

Axial lines and convex spaces are two ways of representing spatial structures, commonly used by Space Syntax. An axial map²³ in a workplace environment can be defined as the least set of straight lines covering all routes of movement and making links to everyone's

workstation. In contrast a space is convex whenever a straight line between any two points in the space lies completely within the space i.e. the whole space is seen from any point within it. Thus a convex map is the least set of fattest spaces that covers the system.²⁴

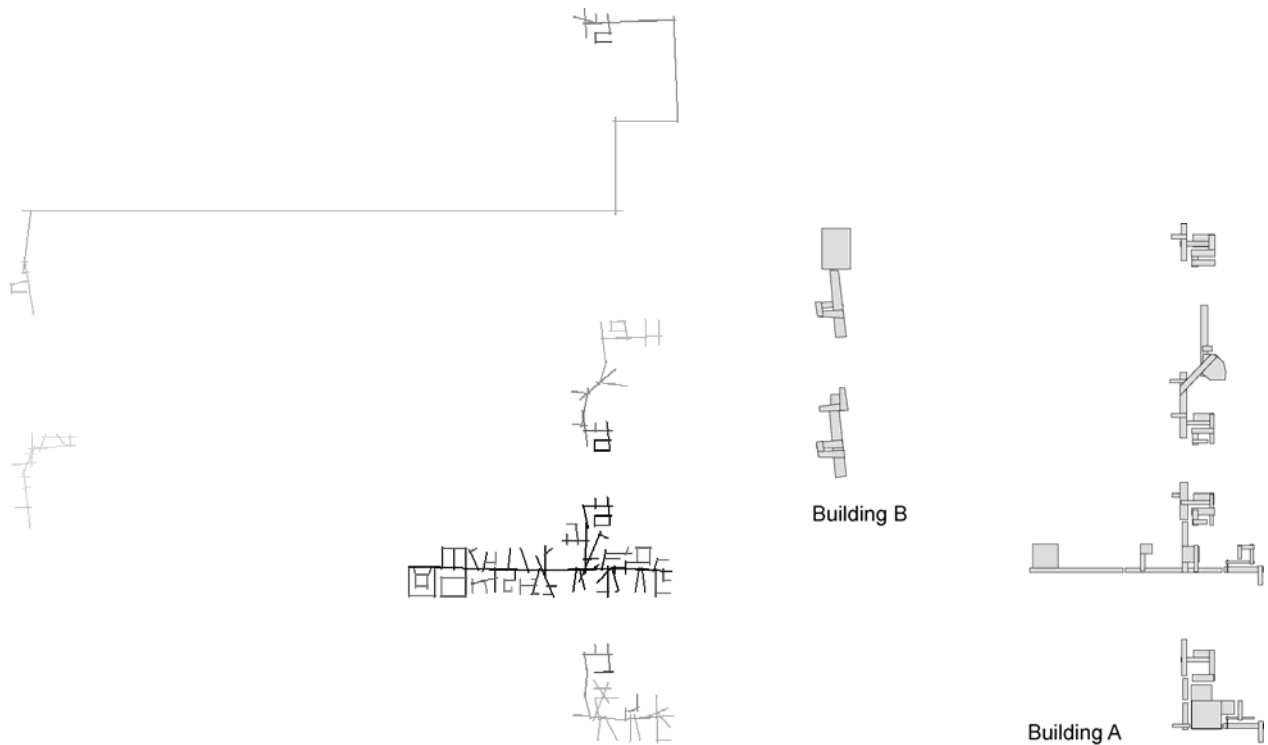


Figure 3a and 3b show the axial and convex maps of the buildings.

From a phenomenological point of view, Seamon has pointed out that axial spaces relate to 'lived-movement' from one place to another within a spatial system and experiential exchanges and interaction among the parts (like districts, but also thinkable for building wings or specific areas in the office) whereas convex spaces may be experientially linked to rest, locality, and 'events-in-place' and therefore to the nature of these parts within themselves.²⁵ Since every space can be covered by both representations, we need to distinguish between spaces that are perceived axial in their nature and those that emphasise convexity. More specifically, we might hypothesise that we would find most interaction taking place in spaces that allow for people meeting, i.e. corridors need to exceed a certain width – and so appear convex.



Figure 4a and 4b: observed activities of static and moving people

Psychological studies²⁶ have shown that distances between those interacting within a social environment range between 1.2 and 4.0 meters and that narrow corridors limit the possibilities of interaction since the interspaces produced by an interaction may be continually disrupted by people passing-by which makes people feel awkward.

This relationship between the perceptual width²⁷ and the numbers of static people proves to be highly significant ($R^2=0.64$, $p<0.0001$). If two single convex spaces are outliers (the corridor leading to the seminar rooms and the central corridor where the pigeonholes are), and if excluded from the set the correlation strengthens ($R^2=0.71$, $p<0.0001$).

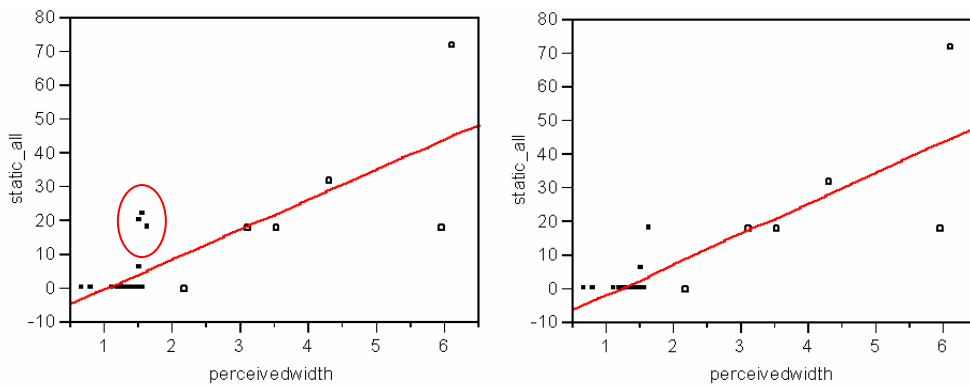


Figure 5a and 5b: Correlation between the perceptual width of a space with numbers of people temporarily standing around in these spaces. 5b shows a reduced data set with two spaces excluded and a risen $R^2=0.71$.

But why exclude these two spaces? The central corridor with the pigeonholes seems quite easily explicable as extraordinary, because people stop by at the pigeonholes to pick up things independently of the geometry of the space which then leads to interaction as others come by. For the corridor leading to the seminar rooms the wall decoration may explain its high interaction rates, since in this specific part of the corridor posters and images of people's work are displayed that may influence the choice to stop and pause (as mentioned in the interviews).



Figure 6: The narrow corridor does not allow for interaction although posters are inviting people to stop over.

Alternatively the space is highly trafficked by the from- and to-movement around the main student areas offering a greater opportunity for chance encounter.

It can be concluded that the inhibition of interaction possibilities reported by the users is – among other factors – a result of the spatial configuration and geometry. The spaces appear and feel too narrow and thus do not invite passers-by to stop and linger in their movement flows. This is mirrored in everyday experiences: “Downstairs it is awful, (...) there is absolutely no interaction on the corridors, it is horrendous.”

Visibility and Interaction

Interaction patterns depend very much on seeing and being seen. Often the need and motivation for informal and unplanned encounter arises only in the very moment of seeing someone. The more someone sees – and is seen – the larger are the possibilities for interaction. Hence it may be assumed that the more spaces someone is able to overlook directly or with little effort from one’s desk, the more someone is integrated into the social networks of seeing and being seen of the whole organisation.

In order to find out how integrated or central (in SNA terms) someone is within a network, we can use a measure of networks called betweenness centrality. It is based on the idea that the interaction between actor A and B might depend on a third party C that lies on the shortest path from A to B, i.e. there is no direct link between A and B. Network research has suggested that actors with a high betweenness may play important roles in the network and are able to control network flows, e.g. by not passing along messages.²⁸

The power of the idea to link high levels of visibility (hence visual control) with high betweenness (thus network control) can be illustrated by an example of the lifeworld of this case study. One of the professors who had his office in a rather segregated location, always went on a small round through the building before he left in the evening and said goodbye to his team, but to one of the secretaries as well (although there was a way out where none of the secretaries would have noticed). This has further consequences: both report seeing each other frequently; the secretary knows whether the professor is around and can pass this information to others, hence she would have a high level of

betweenness centrality. Due to her office location, she overlooks the organisations spaces quite well, too.

Correlating visibility²⁹ with network betweenness³⁰ for the whole data set shows no correlation ($R^2=0.06$, $p<0.06$) although a slight tendency in the data is observable. What this does show, however, is the role of the secretaries, since two of them are among the five people with the highest betweenness scores.

With the help of a very well known concept in analysing workplace interactions more sense of the data can be made. Tom Allen found that the probabilities of face-to-face communications between co-workers fall off dramatically above a distance of 50 meters between workstations. Spatial gaps like having to change the floor or even the building in order to communicate lower the probabilities even further.³¹

If we reduce the data set to only those that are located on the 2nd floor³² and additionally exclude PhD students (since they have very specific patterns of interaction and are widely unknown to the majority of staff members), the correlation is slightly stronger ($R^2=0.26$, $p<0.001$), though the relationship is still weak.

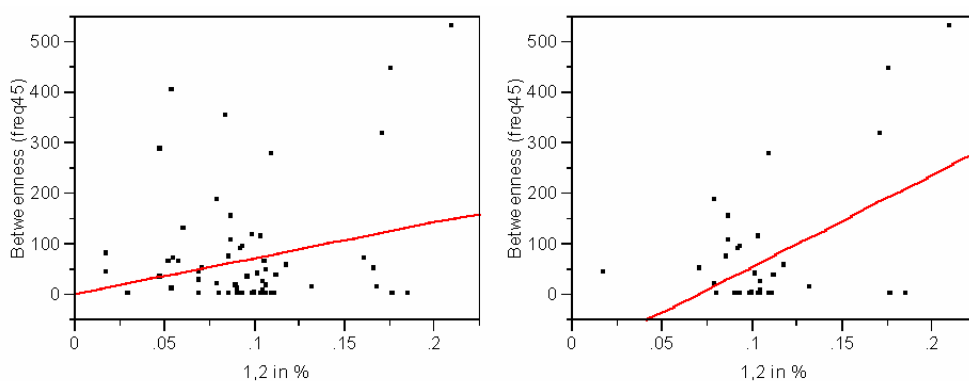


Figure 7a and 7b: Correlation between the visibility of spaces and network betweenness for the full (left) and a reduced data set (right)

To summarise, the results suggest that the formation and constitution of a social network of seeing and being seen may be partly informed by the ability to overlook and control the spaces of the organisation. To see who is around, who has arrived in the office or who has left already, may be associated with the power to control network flows. However, as the anecdote of the professor purposely constructing his route to pass the secretary's office shows, an individual's lack of a controlling location may be overcome by a behavioural response. This demonstrates a variety of possible interaction patterns and therefore structurally cannot explain the phenomenon of betweenness centrality scores solely or fully.

Subdivision

According to the experiences of the users of the school spaces, subdivision and compartmentalisation also account for the inhibition of interaction. "I don't understand organisations with corridors and closed doors, there is no interaction. (...) This is typical for universities; at least we have the window parts where you can see in, in traditional universities there is not even that."

From the perspective of correlational research it is of interest not only if this view is shared by others, but whether this experience is inscribed into specific spatial features of

the building. Therefore we tested whether the number of people someone shares an office with correlates with a network derived measure called the ‘eigenvector centrality’ which depicts how well-connected an actor is to other well-connected actors in the system. Thus it takes not only an individual’s links into account, but also to whom the links connect. People with high eigenvector values are powerful in transmitting information. One would expect that people who are highly compartmentalised through their office location, would be worse informed by having fewer links in total as well as fewer links to well-connected actors. In this way we evaluate both the networks of seeing and being seen and of usefulness³³.

At first sight the results are surprising: firstly, seeing and being seen doesn’t correlate with eigenvector centrality at all. Secondly, a trend is observable for usefulness networks, but it is (weakly) negatively correlated ($R^2=0.25$, $p<0.0001$): the fewer people someone shares with, the higher the eigenvector centrality values. Reducing the data set to the second floor respondents alone³⁴, again improves the correlation results significantly ($R^2=0.63$, $p<0.0001$).

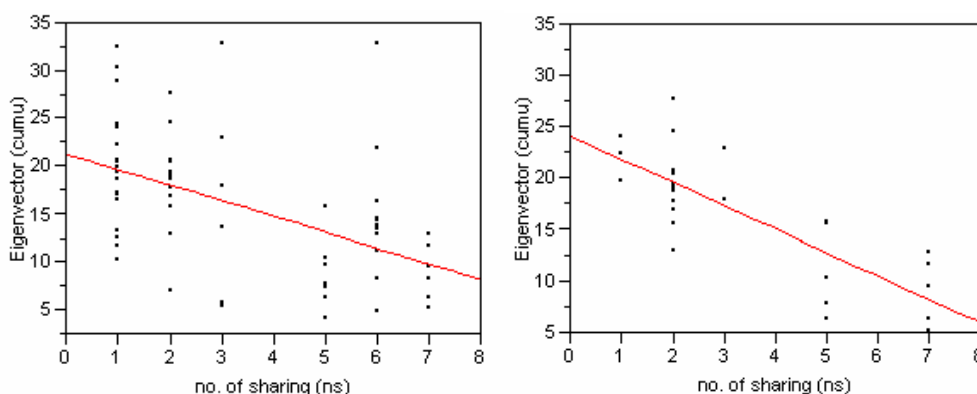


Figure 8a and 8b: Correlation between the number of a persons office sharers and his/her eigenvector values in a usefulness network. Figure 8b (right) shows a reduced set with $R^2=0.63$.

What does this mean? It reinforces the insight that spatial barriers such as floor to floor separation cut off one organisational group from another and that interaction patterns are disturbed by that. In trying to explain why people located in subdivided offices are better connected to well-connected actors, we might first consider status as a common cause. We know that professors and senior staff members are given more space and their own offices and we might assume that professors are well-connected to other (well-connected) professors. Interestingly, status and eigenvector centrality don’t correlate at all. Therefore one might assume that sharing offices has a determining effect on people’s networks (i.e. people sharing mainly find their office mates useful) whereas occupying a single office drives people into strategic connections due to feeling obviously segregated. To quote a person sitting in a single office and relatively new to the organisation: “Tomorrow the head of department is inviting me to go to one research meeting with him and he didn’t have to do that, it’s nice that he thought that I’d also be interested and bothered to invite me. Or another colleague showed me a research proposal and forwarded me to a journal that wanted a reviewer and she thought I’d be a good reviewer.” This shows that the person was able to make strategic relationships to important people in the organisation that then contributed to her work progress.

Distance and Proximity

Finally, we consider the influence of distance and proximity on interaction patterns. In contrast to the other spatial features promoting or inhibiting interaction, this will be considered at an aggregate rather than an individual level for the simple reason that individual relationships vary and cannot be pinned down to spatial effects that easily. What can be analysed in this case is a measure of network density. The density of a network³⁵ compares the number of actual links to the number of potential links. Distance is assumed to be a strong centrifugal driver that divides groups and reduces the densities of networks.

In detail, network densities of both the frequency and usefulness networks were calculated group wise and correlated with five different measures of distance: the average number of floor to floor separations to be overcome (1); the average number of office mates (2); the remoteness³⁶ from all group members to everyone else in steps of visual depth (3), axial topology (4) and metric distance (5).

Concerning the networks of seeing and being seen, the results are very strong overall with the highest correlations being delivered by the measures of remoteness (ranging from 0.72 for visual step depth to 0.76 for axial topology and 0.84 for metric distances). The plain office sharing measure turns out to be the weakest correlation ($R^2=0.40$, $p<0.18$), even topped by floor gaps to overcome ($R^2=0.59$, $p<0.07$).

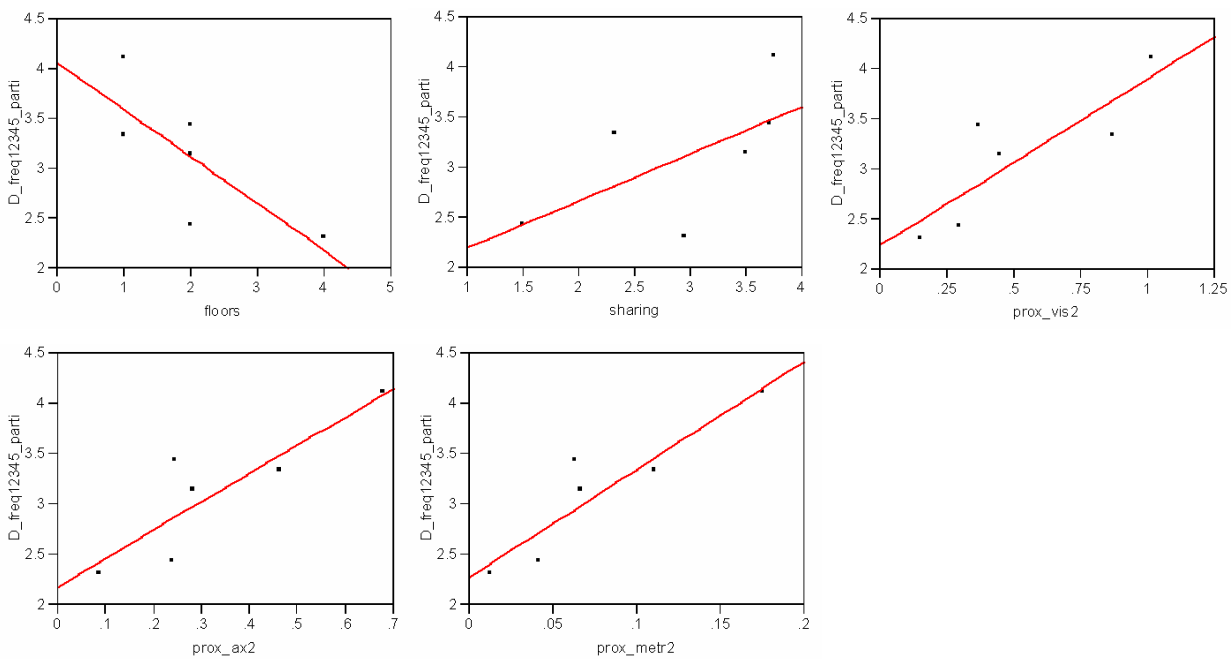


Figure 9a-9e: Correlations between various measures of proximity (9a: floor gaps to overcome; 9b: number of office sharers; 9c: visual proximity; 9d: axial proximity; 9e: metric proximity) with network densities of the frequency network

Nearly all the usefulness networks fail to correlate with distance measures; how far a group is torn apart, doesn't seem to influence how useful the group members find each other. Though there is an interesting exception: sharing offices tends to influence the network densities of usefulness within a group ($R^2=0.34$, $p<0.22$).

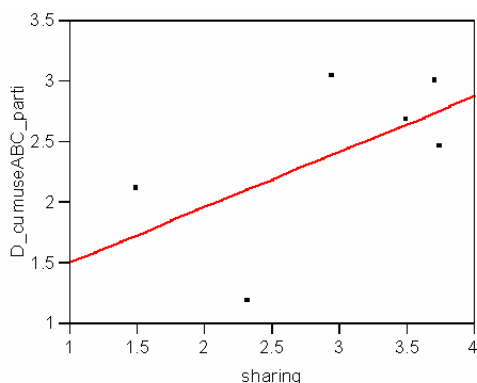


Figure 10: Correlation of average number of office sharers with network density of the usefulness network

This reconfirms the finding made by analysing subdivision: people sharing offices with many people find their fellow group members (their office mates) increasingly useful.

What does this mean for the everyday work experience of the groups? The following comment from a member of the group with the highest distances to overcome (in all categories) and the lowest overall network densities can give a hint: "A recent thing which I tried this week was to get some of our research students more involved with the course, this is not necessarily a negative thing, but I have to positively do rather than there is a progression into the course, it is something that has to be done extra." It becomes clear that the spatial feature of distance separates the group, a unification of the group and an intensification of interaction and collaboration then has to be sought for explicitly. It doesn't come naturally and produces extra costs.

We can conclude that distance is a strong and clear influence on the interaction behaviour of a group and hence also on individual interaction patterns.

The nature of space in suggesting social behaviours

We have been able to provide evidence that some of the configurational features of the spaces inhabited by the school influence patterns of interaction behaviour both at an individual, empathic level (analysing opinions and views of staff members) and on a statistical, abstract level (analysing social networks and the syntax of space). However, the evidence presented in some of the cases is rather weak: we either have only singular, unique statements that can hardly be generalised or abstracted, or we have to deal with correlations that can only partly cover the observed social and organisational phenomena. Yet this doesn't come as a surprise since space as the influencing matter underlying social behaviours is never fully determining.

Another example from the data set may clarify this matter. If we map the average frequency of being seen against a person's total usefulness scores, we find an interesting correlation ($R^2=0.71$, $p<0.0001$).

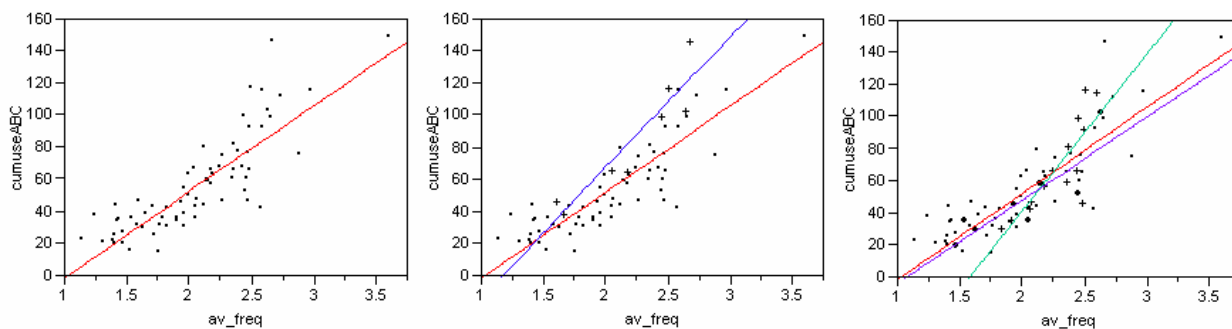


Figure 11a: correlation between average frequency of being seen with cumulated usefulness; 11b shows the regression line for professors only in comparison; 11c depicts the regression lines of two different groups.

Still we cannot be sure what is causing what – whether someone is found useful because they are seen so often, or whether someone is seen often because they are useful. If we unpack the relationship between being seen and being found useful further, and map the results by status (see figure 11b), it is noticeable that all professors are above the regression line. This means that for a given frequency of being seen they are found more useful. At the same time, the regression line is steeper with an even higher correlation which means that this relationship between usefulness and frequency of being seen is even more determining for professors. If they don't show up regularly, their usefulness rating will drop more quickly than for the rest of the staff. Analysed with respect to group membership (see figure 11c), the results show an interesting variance. Group one has a steeper regression line if looked at by itself whereas group two remains closer to the regression line for the whole organisation. This may be credited to the fact that group one occupies the open plan area where being seen is an obvious feature of its social presence.

However, even if explored deeply and in great detail, the relationships between social structure and social space cannot be interpreted easily since manifold influences appear to operate simultaneously. This general contingency may be ascribed to the nature of space and the nature of human behaviour. Hillier et al have described spatial layout as a generator of a 'field of probabilistic encounter'.³⁷ While space can suggest certain behaviours, catalyse them and hence increase their probability, it can never impede activities truly wanted by humans. The environment is not determining in that sense – although it may exert probabilistic effects the individual maintains free will. Even if the photocopier area may appear “open and supposedly un-private” (as mentioned), people do gather there, start talking, and engage in discussion. Even if the various groups in the school share a space, this does not automatically push them into strong common identities, cultures or collaborations. Numerous other examples confirm the possibility of resisting spatial suggestions. Taking the phenomenological concept of people and the world being intimately linked, this view of space and its influencing powers can be evaluated. If people *are* their world, they actively shape it according to their perceptions, understandings and wishes, hence they use it as they wish no matter what the specific spatial suggestions are. Nevertheless, there are constraints put up by the materiality and configuration of spaces that influence the likeliness and ease to perform certain behaviours.

Conclusions

To return to the first question of how social structure and social space interrelate, we may conclude that physical space is an important constructive component in other sorts of spaces. It influences the social space consisting of every single person within an organisation and the way that each is constituted by all others – their links and networks. Evidence could be presented on how the physical remoteness of a group governs the density of a network. It could be shown that having a single office tends to drive people into strategic relationships with highly central and well-connected actors. Moreover evidence was given that the narrowness of space is a strong inhibitor of interaction.

However, physical space does not only impact the social spaces and networks between people, but also the conceptual spaces of group identity and research culture. Physical space may construct meaning, as was illustrated with reference to the case of the two groups described in greater detail in this paper. When group two was spun off from group one, its leader purposefully placed the group in a new space on the 2nd floor to distinguish it from group one and to help construct its own identity. Spatial boundaries and distinctiveness seemed to be necessary for this. In contrast, group one was content to occupy the open space area and still shows high levels of group identity and coherence due to sharing a common theoretical and methodological framework. Identity was constructed and maintained by distinct means. At the same time, the decision to provide an open space for group one had been deliberately taken by the group leaders on the basis of their theoretical understanding of space and organisation, a topic of their research, which then reinforced the cultural, social and spatial behaviours of the group. This example clearly shows that physical spaces, social networks and organisational life as well as research cultures and behaviours are closely linked and interact with each other, constituting a doubly hermeneutic system as described by Giddens³⁸.

Concerning the second question, on the advantages of combining methods as diverse as phenomenology and space syntax, we may conclude that a multilayered analysis allows one to see structures not obvious to the naked eye. Especially in the case of complex organisations where phenomena are intermingled on so many different levels (individual versus organisational, physical space versus social and conceptual spaces etc.), knowledge of the whole is needed in order to read and understand an organisation and its patterns of behaviour. So what does phenomenology add to space syntax and what does space syntax contribute to phenomenology? On the one hand, the hermeneutic interpretation of observed phenomena and thus phenomenological understanding is informed by quantitative data where on occasion inferences can be drawn, for example on the impact of distance and proximity as shown above. The knowledge of recurring syntactic features of space that tend to reproduce similar social behaviours offers new explanatory insights to phenomenology. On the other hand, a phenomenological perspective may contribute to space syntax by not only offering insights into socially meaningful topics to research, and as shown above by helping to identify the dimensions of interest, but also by suggesting ways in which to interpret the data. It can offer explanatory frameworks for ambiguity and contingency occurring through the complex lifeworld of organisations, individuals and the spaces they occupy. It adds detail, sensitivity and empathy to the purely statistical observation of phenomena. This seems to offer an example of what Michael Wheeler has described as the “Heideggerian philosophy-science nexus”³⁹ in which incorrect constitutive assumptions are propelled towards better assumptions by the force of explanatory difficulties in the face of the phenomena of the world.

The qualitative and quantitative evaluation of the same phenomena can be seen as inspiring each other and finding explanations that would otherwise not be easily revealed. Thus, not only can a richer and more complete picture of a socio-spatial situation be

drawn, but this approach enables us to clarify, assess, and qualify spatial influences in order to improve future design solutions.

References

- Thomas J. Allen, "Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R&D Organization" (Cambridge/London: MIT Press, 1984).
- Thomas J. Allen and Gunter Henn, "The Organization and Architecture of Innovation. Managing the Flow of Technology" (Amsterdam/Boston/Heidelberg/London: Butterworth-Heinemann, 2006).
- Alan Backhouse and Peter Drew, "The design implications of social interaction in a workplace setting,," *Environment and Planning B: Planning and Design* 19 (1992): 573-84.
- Stephen P. Borgatti, Martin Everett and Linton C. Freeman, "UCINET 5 for Windows. Software for Social Network Analysis, User's Guide", version 6.135 (Harvard: Analytic Technologies, 1999)
- Meinolf Dierkes, Marcus Alexis, Ariane Berthoin Antal and et al, eds., "The Annotated Bibliography of Organizational Learning and Knowledge Creation" (Berlin: edition sigma, 2001).
- Gustave Nicolas Fischer, "Psychologie des Arbeitsraumes," (Frankfurt, New York: Campus, 1990).
- Gustave Nicolas Fischer, "Individuals and environment: a psychosocial approach to workspace," (Berlin/New York: De Gruyter, 1997).
- Anthony Giddens, "New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies" (London: Hutchinson, 1976).
- Bill Hillier, "Space is the machine. A configurational theory of architecture" (Cambridge: Cambridge University Press, 1996).
- Bill Hillier, "Between Social Physics and Phenomenology: explorations towards an urban synthesis?" in Akkelies van Nes, (ed.), *Proceedings of the 5th International Space Syntax Symposium*, Vol. 1, 2 vols. (TU Delft: Techne Press, 2005), pp. 3-23.
- Bill Hillier, Richard Burdett, John Peponis and Alan Penn, "Creating Life: Or, Does Architecture Determine Anything?," *Architecture and Behaviour* 3 (1987): 233-50.
- Bill Hillier and Julienne Hanson, "The social logic of space" (Cambridge: Cambridge University Press, 1984).
- Shinichi Iida, "Segmen Reference Manual", version 0.53.5 (London: Bartlett School of Graduate Studies, 2006)
- Thomas Muhr, "User's Manual for ATLAS.ti 5.0", version 5.2 (Berlin: ATLAS.ti Scientific Software Development GmbH, 2004)
- Tom Peters, "Liberation Management. Necessary Disorganization for the Nanosecond Nineties" (London: Pan Books, 1993).
- Peter G. Richter, ed. "Architekturpsychologie. Eine Einführung" (Lengerich, Berlin, Bremen u.a.: Pabst Science Publishers, 2004).
- David Seamon, "The Life of the Place: A Phenomenological Commentary on Bill Hillier's Theory of Space Syntax," *Nordisk Arkitekturforskning* 7 (1994): 35-48.
- David Seamon, "Phenomenology, Place, Environment, and Architecture: A Review of the Literature" (Kansas), Kansas State University, published online at http://www.arch.ksu.edu/seamon/articles/2000_phenomenology_review.htm
- Yi-Fu Tuan, "Space and Place. The Perspective of Experience" (Minneapolis/London: University of Minnesota Press, 1977).
- Alasdair Turner, "UCL Depthmap: Spatial Network Analysis Software", version 6.0818b (London: University College London, VR Centre of the Built Environment, 2006)
- Stanley Wasserman and Katherine Faust, "Social network analysis: methods and applications" (Cambridge: Cambridge University Press, 1994).

Michael Wheeler, "Reconstructing the Cognitive Mind: the next step" (Cambridge: MIT Press, 2005).

¹ For an overview of the literature on organisational learning and knowledge management see: Meinolf Dierkes, Marcus Alexis, Ariane Berthoin Antal and et al, eds., "The Annotated Bibliography of Organizational Learning and Knowledge Creation" (Berlin: edition sigma, 2001).

² Gustave Nicolas Fischer, "Individuals and environment: a psychosocial approach to workspace," (Berlin/New York: De Gruyter, 1997).

³ Compare for example: Thomas J. Allen and Gunter Henn, "The Organization and Architecture of Innovation. Managing the Flow of Technology" (Amsterdam/Boston/Heidelberg/London: Butterworth-Heinemann, 2006).

⁴ Gustave Nicolas Fischer, "Psychologie des Arbeitsraumes," (Frankfurt, New York: Campus, 1990).

⁵ Tom Peters, "Liberation Management. Necessary Disorganization for the Nanosecond Nineties" (London: Pan Books, 1993).

⁶ Bill Hillier, "Space is the machine. A configurational theory of architecture" (Cambridge: Cambridge University Press, 1996). p. 163

⁷ David Seamon, "Phenomenology, Place, Environment, and Architecture: A Review of the Literature" (Kansas), Kansas State University, published online at <http://www.arch.ksu.edu/seamon/articles/2000_phenomenology_review.htm>, p. 3

⁸ Ibid., p. 7

⁹ Yi-Fu Tuan, "Space and Place. The Perspective of Experience" (Minneapolis/London: University of Minnesota Press, 1977). p. 138

¹⁰ Hillier, "Space is the machine", p. 92

¹¹ "Phenomenology, Place, Environment, and Architecture", p. 5

¹² Bill Hillier, "Between Social Physics and Phenomenology: explorations towards an urban synthesis?" in Akkelies van Nes, (ed.), Proceedings of the 5th International Space Syntax Symposium, Vol. 1, 2 vols. (TU Delft: Techne Press, 2005), pp. 3-23., p. 10

¹³ The data evaluation with Grounded Theory made use of the software Atlas.ti, see: Thomas Muhr, "User's Manual for ATLAS.ti 5.0", version 5.2 (Berlin: ATLAS.ti Scientific Software Development GmbH, 2004)

¹⁴ The return quota of questionnaires was 67%.

¹⁵ Data regarding the social networks was evaluated with the software package UCINET / Netdraw, see: Stephen P. Borgatti, Martin Everett and Linton C. Freeman, "UCINET 5 for Windows. Software for Social Network Analysis, User's Guide", version 6.135 (Harvard: Analytic Technologies, 1999)

¹⁶ An axial analysis was done using the GIS software Mapinfo with the additional package Confeego; a visibility analysis was done with Depthmap, see: Alasdair Turner, "UCL Depthmap: Spatial Network Analysis Software", version 6.0818b (London: University College London, VR Centre of the Built Environment, 2006) and the segment analysis was based on Segmen, see: Shinichi Iida, "Segmen Reference Manual", version 0.53.5 (London: Bartlett School of Graduate Studies, 2006).

¹⁷ All following citations (if not marked otherwise) are taken from the in-depth interviews conducted in November and December 2005.

¹⁸ Physical aspects sum up to around 30% of all aspects mentioned, while organisational and social spaces account for the remaining 70%. This was calculated as the sum of the importance, $IMP = \sqrt{(Q \cdot I)}$ with Q as the number of quotes on this aspect and I as the number of individuals mentioning it

¹⁹ Note the use of the term 'recruit' – this shows that the individual was consciously aware of the space syntax theoretical views regarding interaction in the workplace (following Backhouse and Drew's usage of the term), and offers evidence for the doubly hermeneutic nature of our field. See: Alan Backhouse and Peter Drew, "The design implications of social interaction in a workplace setting,," Environment and Planning B: Planning and Design 19 (1992): 573-84.

²⁰ Stanley Wasserman and Katherine Faust, "Social network analysis: methods and applications" (Cambridge: Cambridge University Press, 1994). p. 3

²¹ based on the question 'How often do you see the following people?', ranging from daily (score 5) to never (score 1).

²² Based on the question 'How useful do you find the following people regarding your activities in research, teaching and support?' with possible answers ranging from average (score 1) to highly useful (score 3). All members of the organisation were asked to score all others. A 67% response was achieved and the cumulative results allow an analysis of how each individual is constituted by all (or some sub group of) others.

²³ For the original definition concerning urban structures see: Bill Hillier and Julienne Hanson, "The social logic of space" (Cambridge: Cambridge University Press, 1984). p 92

²⁴ Ibid.

²⁵ David Seamon, "The Life of the Place: A Phenomenological Commentary on Bill Hillier's Theory of Space Syntax," Nordisk Arkitekturforskning 7 (1994): 35-48.

²⁶ Edward T. Hall, 1966, "The hidden dimension", taken from: Peter G. Richter, ed. "Architekturpsychologie. Eine Einführung" (Lengerich, Berlin, Bremen u.a.: Pabst Science Publishers, 2004). p. 198 and p. 267f.

²⁷ The perceptual width was calculated as the smaller dimension of a convex space, i.e. width if width is smaller than height, otherwise height.

²⁸ Wassermann/Faust 1994, Social network analysis: methods and applications, p. 188ff.

²⁹ measured as the proportion of space of the whole organisation that is visible within two steps of visibility.

³⁰ Betweenness was computed on the basis of the reduced network of high frequencies of being seen (several times a week or more).

³¹ Thomas J. Allen, "Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R&D Organization" (Cambridge/London: MIT Press, 1984).

³² Unfortunately, this is the only floor offering enough people to do a proper statistics, it would be interesting to compare the results to future case studies with more people being more evenly distributed on various floors.

³³ Usefulness was evaluated by asking questionnaire-based whether people were found useful on a three point scale, divided into the major activities of research, teaching, and support.

³⁴ limiting the set to people on the 2nd floor and additionally by taking into account only those that answered the questionnaire which makes sense in this case due to methodology reasons.

³⁵ Since the data on social networks only had a return quota of 67%, the actual densities calculated by UCINET lack the remaining 33% of answers which disturbs the data. Therefore the densities of those that took part in the survey have been calculated group-wise and extrapolated to the whole group.

³⁶ The calculation counts the total number of steps from one group member to all others, divided by the size of the group $n-1$ (= mean depth MD). $1/MD$ of each group members is then multiplied by \sqrt{ns} (=no. of people sharing the office) and finally summed up for the whole group.

³⁷ Bill Hillier, Richard Burdett, John Peponis and Alan Penn, "Creating Life: Or, Does Architecture Determine Anything?," *Architecture and Behaviour* 3 (1987): 233-50.

³⁸ Anthony Giddens, "New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies" (London: Hutchinson, 1976).

³⁹ Michael Wheeler, "Reconstructing the Cognitive Mind: the next step" (Cambridge: MIT Press, 2005).pp144-5