
Visualising the Re-Production of Space with Multi-Layer Maps

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Abstract

The intrinsic logic of cities (LÖW) is a theoretical concept to define urban space based on a socio-spatial network approach. The concept is based on the assumption that highly specific and typical features and tacit processes have substantial influence in the re-production of places. LÖW's concept of space focuses on orderings of living entities and social goods and highlights the constitution of space in processes of perception, recall or ideation to manifest itself as social structure.

This paper links theories and methods to describe and visualise the attribution of meaning to a city. It introduces a mapping approach to visualise socio-spatial networks, trying to partially counter criticism by social theorists who discussed the ontological incompatibility of society-space relation and the spatial approach embodied in Geographic Information Systems (GIS).

1 Introduction

Transdisciplinary research has recently focused on the importance of the city and its urban population. In several 'Quality of Living Surveys', such as the annual Mercer Quality of Living Survey, cities have been ranked based on quantitative and mostly tangible criteria. With statistical measurements of safety, education, hygiene, health care, culture environment, recreation, political and economic stability and public transportation, cities all over the world are compared (MERCER 2008). Cities scoring highest based on these criteria draw a lot of attention in the general media.

However, these statistical facts only describe some aspects of the status of a city. While the ranking may give an overview or hypothesis of the most livable cities, it is not possible to describe differences and similarities, especially atmospheres, creative milieus or the climate for innovation and creativity of a specific place. This paper offers suggestions to include these dimensions.

2 Socio-Spatial Networks and the Re-Production of Space

2.1 Duality of space

The intrinsic logic of cities, a concept put forward by the sociologist LÖW (2008a), has been a much-debated topic in the sociology of space in recent years. In social science, space is mostly conceived as a product of social action or social structure (WERLEN 1995, LEFEBVRE 1991). LÖW considers the spatial perspective from these two points and attempts to show that the “structure-theoretical arguments tend to take account of the power of spaces to provoke social events, whereas action theory tends to conceptualize space more strongly as a result of or context for action” (LÖW 2008b, 26).

LÖW’s theoretical approach to define space provides the frame of reference for this research. The core concept of the “Duality of Space” focuses on a relational space which Löw developed from the theoretical basis of ANTHONY GIDDENS’s action-theoretical approach, the theory of structuration. Accordingly, space is as much an outcome of action as it structures action at the same time. *Structure*, understood as rules and resources (GIDDENS 1984), is embedded in the recursive processes of institutions. Institutions are the most deeply embedded structural properties as structural principles. Institutions are “[t]hose practices which have the greatest time-space extension” (GIDDENS 1984, 17). Rules accordingly configure meaning or the sanctioning of action. This implies approaches to negotiation processes within social relations to the point of codification. Resources “are media through which power is exercised, as a routine element of the instantiation of conduct in social reproduction” (GIDDENS 1984, 16). Resources are distinguished into material (allocative) and symbolic (authoritative) resources in relation to people. *Structures* (plural) are isolable sets of rules and resources (GIDDENS 1984, 17; WERLEN 1995, 77-82). Following GIDDENS’s theory the “Duality of Structure”, action and structure are interdependent.

The “Duality of Space” describes space by “spacing”, which refers to the process of placing subjects and/or objects in physical space, and by “synthesis”, the actual interlinking of these objects/subjects through perception, ideation and recall. Space is uniquely created in the interplay of these two processes (STEETS 2008, 98). “*Spacing* means erection, building, or positioning. Examples are the display of goods in a supermarket, the self-positioning of people in relation to other people, [...]. It is positioning in relation to other positionings. In the case of mobile goods or of people, spacing means both the moment of positioning and movement to the next positioning. Second, the constitution of space also requires *synthesis*, that is to say, goods and people are connected to form spaces through processes of perception, ideation, or recall” (LÖW 2008b, 35).

LÖW’s “synthesis” refers to processes of perception, ideation and recall which connect to the social production of space in LEFEBVRE’s sense of “spatial practice/perceived space, representations of space/conceived space, and spaces of representation/representational space/lived space” (LEFEBVRE 1991, 38). As LÖW (2008b, 29) is pointing out “LEFEBVRE [...] remains ambivalent in his assessment of actors. Although they create spaces through spatial practice, these spaces, subjugated to everydayness, are never more than a pale imitation of the state-capitalistic logic” and goes on “ [t]he only line of flight to follow appears to be spaces of representation, imaginings, memories, or manipulated perceptions

that point beyond the existing capitalistic space, and which make space conceivable as ‘something different’”.

Thus, the relational perspective is conceived from the “Duality of Space” and is subsequently (re)connected to LEFEBVRE’s social production of space (see Figure 1) These spaces rely on the spatial ordering of subjects and objects in space equivalent to LÖW’s “spacing”. It is assumed that for the processes of spacing and synthesis it is equally important to have notions of place and therefore a place to produce space.

The social perspective is consequently pushed back into the centre of re-production of space and is using the relational perspective of LÖW’s duality of space. As LEFEBVRE’s triad of the production of space, Löw’s processes of synthesis (perception, ideation and recall) work as shown in the visualisation in Figure 1 interdependent and determine another. These processes of day-to-day life (synthesis) are interlinked to spacing which is shown as individual/collective appropriation within the process of spacing. The approach proposed in this paper examines these processes using network analysis by visualising a scientific representation of these spaces.

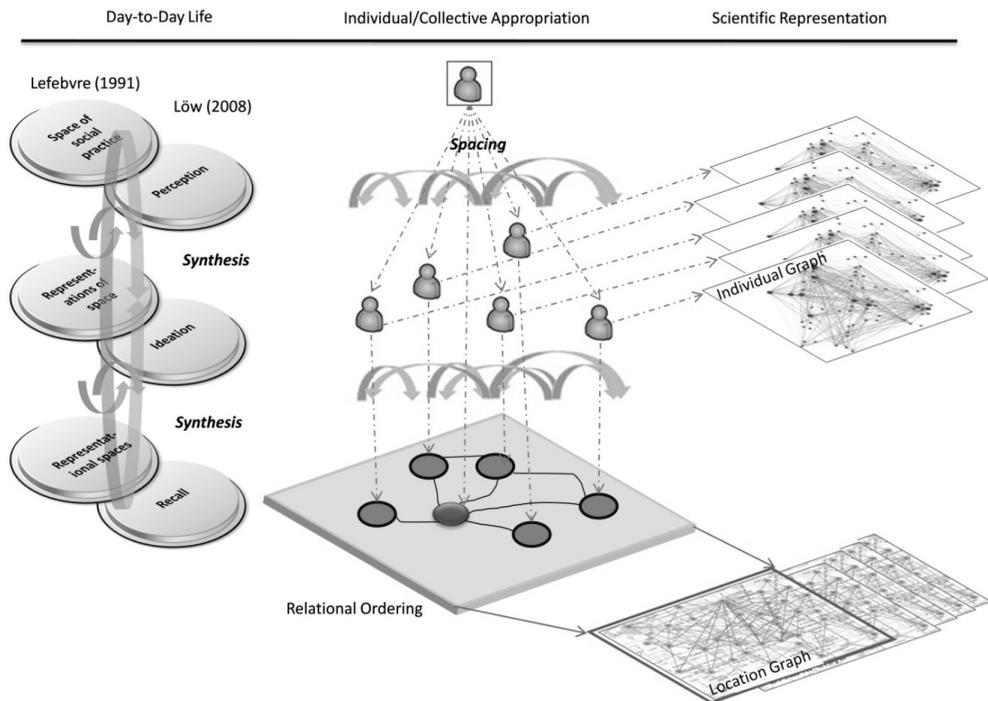


Fig. 1: Production of Space, Spacing, Visualisation (own diagram)

LÖW’s conceptual and theoretical focus on structure and culture, the focus on cities as places and the notion of the difference between cities has been proposed as an impulse for a re-orientation of urban research (LÖW 2008a). This reorientation has been criticized from several perspectives:

- concerns have been raised in localizing urban research and reducing cities to only a cultural perspective (KEMPER & VOGELPOHL 2011)
- A further criticism is that the sense of place as heterogeneous experience has not been focused on at all, as it has not touched on the issue of experience of spaces and its embeddedness in the perception of the city as a whole (KEMPER & VOGELPOHL 2011, 27). It is central that there are several intrinsic logics of a city which are influenced by the individual's embeddedness and a wide range of processes and factors. But how many we are able to perceive, and do we make the same distinctions between them?
- It has been pointed out that the concept suppresses socio-spatial differences within a city (GESTRING 2011, 47f.). Nevertheless, the proposed approach developed here intends to focus on the re-production of place and the process of perception, ideation and recall. The focus is on the differences and similarities in the process of re-production and their visualisation.

Since the production of space, in LÖW's theory points to the processes of perception, ideation and recall as interlinking components of synthesis to the actual ordering of subject and objects in physical space, the process of perception is central.

Space is being perceived by everyone constrained by the (individual) setting of subjects and objects in space and the process of interlinking these subjects and objects as discussed earlier. "Although urban buildings, for instance, can be linked through movement, this linkage becomes a space only through the perceptual and/or analytical synthesis of the buildings" (LÖW 2008b, 35).

The constitution of space in everyday life and its dependence on perceptual processes, such as that in practical consciousness, social goods and people are interlinked through perception. Perception is from a psychological point of view constrained by different aspects. Cognitive psychology is dividing the process of perception in different sequences which are influenced by different preferences of the individual's senses. This cognitive process is also determined by personality and influenced by experiences, values and the belief system (FRANZ 2001). Where behaviour is mostly triggered by a stimulus, an action-theoretical perspective highlights goals and intentions as the most important factors influencing an agent and her/his action (WERLEN 2000, 313). Visualising cognitive processes in the multi-layer map is essential to visualising the process of synthesis within the re-production of space. The complexity of cognitive processes and the visualisation of all the factors influencing it is challenging. Thus, the focus will be on intentions and goals centred on an action-theoretical approach and orientated to the types of social action (WERLEN 2000, 324ff.).

2.2 Socio-spatial networks

In order to understand the processes of the re-production of place it is essential to understand those involved in the production of space. In order to visualise and analyse the relations of social and physical space in the production of space and therefore tangible and intangible infrastructures in the processes involved in the re-production of space, socio-spatial network analysis is discussed below.

In social networks actors are at the centre of the argument. Spatial networks are created by spatial components or agents intertwined with social networks. These actors who constitute

space individually are related to each other by social relationships that are constituted by direct and indirect personal or virtual communication. The connections can be represented by issues and links. Social network analysis focuses on fundamental aspects of social relations and the patterns of social order. Those aspects include social and spatial action patterns of a single agent and the relations to other agents. With social network analysis it is possible to examine how these patterns develop, evolve and what consequences arise of the actions within the network. Hence, social network analysis is a “comprehensive paradigmatic way of taking social structure seriously by studying directly how patterns of ties allocate resources in a social system” (WELLMANN 1988, 20 quoted in MISCHÉ 2011, 80). Network analysis has been used in different ways in social science in recent years. It is based on mathematical graph theory and was first used in socio-metric approaches in the 1930s (STEGBAUER 2008).

So far few studies consider the aspect that „networks are spatially biased“ (JOHNSTON & PATTIE 2011, 17). Even the relationship of social structures and the embedding of agents in physical space have been neglected. “With few exceptions, social network theory ignores geographic space [...]. Yet the multiple embeddedness of actors, in both physical and social space, has important implications for understanding social behaviour. [...] There is a growing recognition that associations between social structure and geographical nearness may affect social systems and social behaviours” (SGS 2007, 1).

The lack of connecting social networks to physical aspects has been a starting point for this research. The role of physical surroundings on the processes of re-production of space needs to be addressed. “Social networks are key to many of the myriad flows within society that diffuse information and knowledge, processes that in turn influence people’s behaviour and actions. [...] One aspect of this argument that has received somewhat less attention than others is its spatiality, or the geography of social networks. It is generally assumed that proximity/proximity are fundamental to network structures and operations. [...] If this is so, then the spatial concentration of social networks can have substantial implications for the geography of attitudes and behaviour“ (JOHNSTON & PATTIE 2011, 16).

The interplay of networks, social capital and territories has been stressed by PISELLI (2007, 872). Social capital has been defined by COLEMAN (1990) as “material and symbolic resources that an actor (individual or collective) is able to obtain through the network of direct and indirect personal relations to pursue his or her goals”. Social capital, as material and symbolic resources, which corresponds to GIDDENS’s (1984) sense of structure and LÖW’s (2008a) duality of space, are the basis to understand intangible infrastructures and the re-production of space. In order to analyse social capital and its components, such as the “social network that enables the individual to obtain resources” (PISELLI 2007, 872), a visualisation of social and spatial networks reveals processes of re-production of space.

3 Multi-Layer-Maps: A Method for Analysing and Visualising Socio-Spatial Networks

The following section introduces a multi-layer mapping approach to the visualization of socio-spatial networks (FERBER 2012). The approach is a synopsis of different mapping tools like actor mapping and dynamical social network mapping as proposed in WIND-

HAGER, ZENK & RISKU (2008). Their mapping approach can be used to find new solutions to the visualization of complex social relations and dynamics in organisations, connecting socio-spatial network data with contextual information. The approach consists of several levels and is introduced below by its individual dimensions.

The first dimension is the relation of structures in social space to the actual movements in physical space along a time axis (Figure 2). This refers to LÖW's conceptual approach of "spacing" as one part of the constitution of space, leaving aside socio-cultural and symbolic meanings. The process of placing subjects and/or objects in space can be visualised and compared to the network relations of social space.

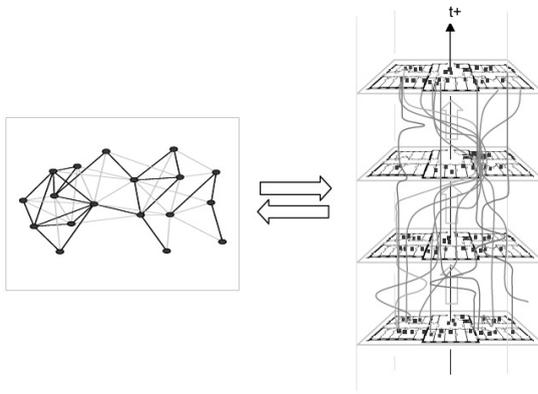


Fig. 2:
Social structures and their
relation to the spatial (WIND-
HAGER, ZENK & RISKU 2008,
243)

The next step is the visualisation of the processes of synthesis which consist of the interrelated processes of perception, ideation or recall that actively interlink subjects/objects in space. Different strategies can be used to visualise the dynamics of individual processes and activities, such as psychological and physiological dynamics, individual information processing, experience and action patterns (from left to right) and analyze these processes (see Figure 3).

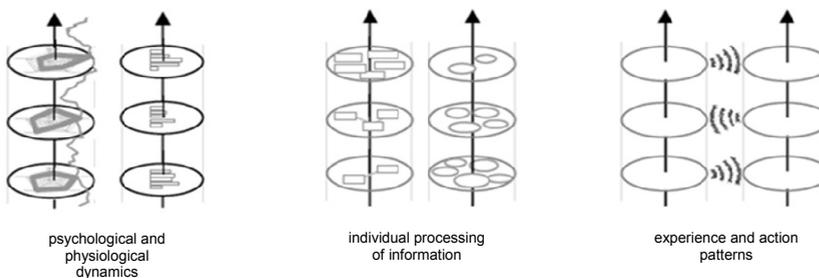


Fig. 3: Possibilities for the visualisation of dynamics of individual processes and activities (adapted from WINDHAGER, ZENK & RISKU 2008, 245)

As a result these dimensions, significant for the re-production of space, can be visualised in a synopsis map (Figure 4). This will convey the constitution of space and visualise

intangible infrastructures. A synoptic map shows several dimensions, such as the agent’s dynamics at a spatial level (left), at a cognitive level and in social space. By combining the information from several agents, a collective pattern of information for these three levels can be derived.

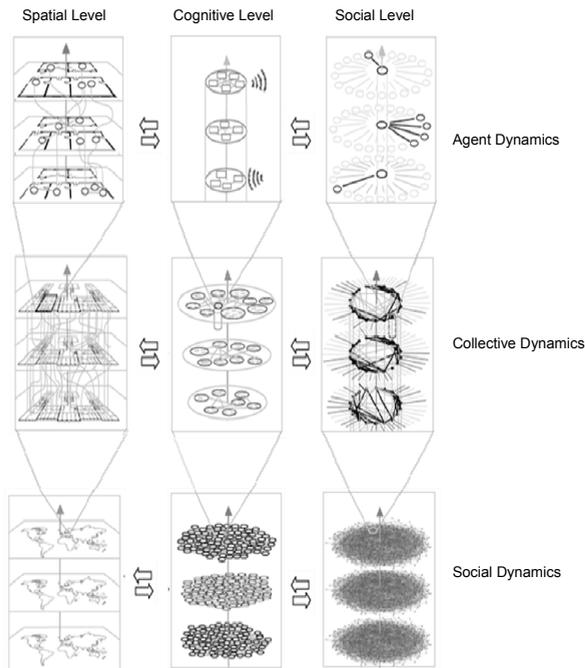


Fig. 4:
Multi-layer synoptic map
(adapted from WINDHAGER,
ZENK & RISKU 2008, 247)

4 Place and Cyberspace: New Media Networks and the Sense of Place

As the process of re-production of space has been defined above, it is useful to also define the term *place*. Conceptually, LÖW defines *place* as “the goal and result of situating and not – like people and social goods – itself an element situated in the process of spacing. Places come into being through situating, but they are not identical with situating” (LÖW 2008b, 42). If they come into being (structurally and functionally) then they are temporally situated. An example is a neighbourhood which consists of the house where someone lives, in a particular street with shops situated close to the church, and friends and family living nearby. This could be any given neighbourhood, but with perception, ideation and recall (synthesis) and its particular subjective setting (spacing) the neighbourhood becomes embedded in a framework of meaning and as a result the place becomes situated.

Everyday *face-to-face* interaction and *internet-based-social* communication are potentially equally important in influencing one’s sense of place. “Globalization and the new communication and information technologies have given rise to ‘virtual communities’” (PISELLI 2007, 873). Some positions state that communication via the Internet is destroying

social face-to-face interaction. On the contrary, others consider Internet-based communication as providing huge opportunities. FISCHER (2008, 583) points out that “the internet as a decentralised technological medium for horizontal communication [is] provide[ing] the material basis for self-directed networking. A broad public uses the internet as a tool for organization, collective action and the construction of meaning. Therefore networking constitutes new patterns of social practice that spread from the internet to our society transforming it to a network society where key social structures and activities are organized around electronically processed information networks. The network logic has impact on many processes in society like production, experience, power and culture.”

The increasing impact of communication technologies on our daily lives implies that it is worthwhile to include some reflections on the notion of cyberspace or virtual networks and its effect on perceived (physical) space in this paper. In relation to the increasing importance of cyberspace PISELLI (2007, 872) asks „have places – or local areas comprising the values, knowledge, institutions, productive skills, and feelings of belonging on which the recognition and self-recognition of local identity are grounded – lost their importance?” and answers „It appears that they have not”. New types of community may be emerging „based largely on interactions devoid of physical contact and reciprocal recognition of identities” (PISELLI 2007, 875) but this is just one of the many ways in which people interact: it enriches and expands, rather than replaces the “social networks that define and redefine places, which change their functions, features, and symbolic meanings” (ibid.).

FISCHER (2008, 586) points out that location-based social media (LBSM) are crucial for attributing meaning to a city as they create a new kind of visibility and memory about places, persons and activities. FISCHER also argues that they are significant for the subjective assignment of one’s sense of place. Considering aspects of social networks in the Web 2.0 era as crucial is important for analysing the processes influencing the re-production of place.

With LBSM, such as Foursquare, crucial information on an individual’s action and with that their intentions are revealed. Analysing LBSM data as framework information for spatial and social ordering can provide a broader understanding of intangible infrastructures and the processes of re-production of place.

The active interlinking of subjects and objects in space (synthesis) and spacing subjects and objects in space, i.e. the structuring of social goods (social capital), can be obtained from LBSM data (Figure 5). The data structure in location-based social networks, as illustrated below, shows the relations of five key data structures: 1) user, 2) venue, 3) check-in, 4) user location history and 5) category hierarchy.

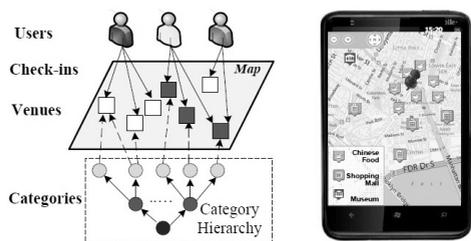


Fig. 5: Data structure in location-based social networks (BAO, ZHENG & MOKBEL 2012, 2)

In a location-based social network, a user enters and manages his/her profile information, such as ID, name, age, gender, and home town. Moreover, the user can also mark a venue (e.g. a restaurant) and leave some comments when s/he arrives there, which is also known as check-in in a LBSM” (BAO et al. 2012).

As the Internet and geomeia is increasingly important in the communication and negotiation process and as FISCHER (2008, 586) argued “Location Based Media might have an impact on the subjective sense of place”. The data gathered through LBSM could be valuable for examining the processes of spacing and synthesis. The data produced by collaborative authoring, i.e. communicating with a spatially explicit reference, partially visualises the actual negotiation process of the re-production of space and as such is evidence of it.

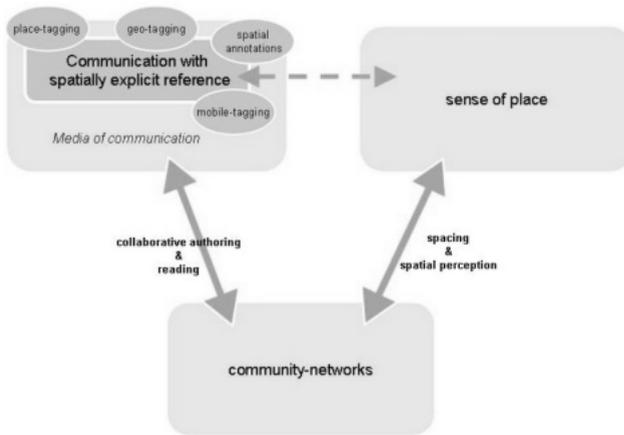


Fig. 6: Schematic view of the impact of LBSM on the sense of place (reproduced from FISCHER 2008, 586)

5 Strategic Implications and Conclusion

The multi-layer synoptic map includes several dimensions. With the spatial dimension an actor or a collective’s action pattern in space and as such the process of spacing and its implications for the re-production of space are going to be visualised. This is to be done by gathering information on action patterns with LBSM data. The advantage of LBSM is its data structure which is appealing to gather information on networks on a social, spatial and cognitive level. On a cognitive level, LBSM show the communication and negotiation process and with that indicate information on the sense of place. Qualitative data including information on synthesising (perception, ideation and recall) the situated spatial ordering reveals further details on the re-production of space. As it is intended to visualise the collective pattern of the re-production of space, a visualisation of the collective understanding of spatial, cognitive and social level is to be derived from several ego networks and its alter relations. Network analysis as a method is used to visualise and in an additional

step to contrast the network structure on social and spatial levels and additionally to synthesise information on the cognitive level to understand spacing and synthesis.

LÖW's theory of the intrinsic logic of cities has been extensively discussed in the sociology of space in recent years. Nevertheless, even if the fuzzy and ambivalent literature of this perspective might be contradictory, the qualitative, relational approach integrated in a multi-layer mapping approach is potentially attractive to complement and advance the mostly quantitative perspectives in GIScience. Furthermore the proposed approach shows great potential in moving towards a "spatially integrated social science" (JANELLE & GOODCHILD 2011). The integration of qualitative and quantitative data in the proposed multi-dimensional approach will enable a visualisation of socio-spatial phenomena which are not visible per se. Social network analysis in combination with the cartographic visualisation of spatial networks will enhance the comparability of these mostly intangible processes and aspects of re-producing of space.

The implications to use LBSM data within this approach is clearly based on the rapid changes in communication and technological developments for example smart-phone applications and their extensive impact on our everyday lives. The main motivation for this approach stems from the fact that the very detailed qualitative approaches in urban studies mostly lack comparability. In turn quantitative approaches in GIScience lack the integration of intangible phenomena. The research presented in this paper aims to help fill this gap.

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