

# THE NEED FOR CO-PRESENCE IN URBAN COMPLEXITY— measuring social capital using space syntax

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## **Abstract**

*The concept of 'cities as complex systems' is well established within academia but rarely applied within professional practice. Therefore, a translation of knowledge is required, from the high theoretical discussions found in academic research to applicable knowledge professional practitioners can use. This paper argues that the concept of 'co-presence' has the potential to bridge space syntax to complexity theory while contributing to our understanding of complexity in cities. By applying space syntax, a connection between spatial form and co-presence is feasible and advanced theoretical discussions, mostly within the academic sphere, make it possible to link processes in urban space in a very direct way. It is argued that an individual's everyday routines contribute to some of the most elaborate forms of societal organization, and these routines are partly made possible and visible through co-presence in public space. What makes this view relevant for architectural research is that both patterns of co-presence as well as the potential exchange between residents and non-residents among co-present people are largely influenced by the properties of urban form generated by urban design and architecture. While this paper mainly focuses on a theoretical discussion of the potential within space syntax to examine co-presence in a way that could be of critical importance in 'complexity theory', it also presents an empirical approach along with some preliminary results. Although the results do not yet prove that the study of local co-presence improves the understanding of urban 'complexity', we believe that the results are promising and that further exploration of possible connections is needed. The empirical data refers to the results from Södertälje and the preliminary results from Stockholm. The study examines the potential a neighbourhood affords, both regarding the size (or density) of co-presence in urban space, and the potential for an exchange with people from other parts of the city. Thus, the concept of co-presence is applied and refined to contribute to an understanding of how societal processes and phenomena are influenced by urban form.*

Why have people professionally concerned with cities not identified the kind of problem they had? [...] Cities happen to be problems in organized complexity.

Jane Jacobs, 1961

## 1. THE ROLE OF SPACE SYNTAX IN URBAN 'COMPLEXITY'

Few things have been reiterated more in the debate on urban development in recent decades than the inherent 'complexity' of cities. The use of the concept 'complexity' varies from simply being a synonym for 'complicated' to the more specific meaning of cities as examples of 'complex adaptive systems' (Wilson, 2000; Batty, 2005; Miller & Page, 2007). Through this latter meaning the concept has become critical in the face of current global challenges and crises (e.g. Rockström et al., 2009), where a more informed development of our cities, holding the majority of the world's population in a highly concentrated form, has become essential for the future. The need for a knowledge leap in planning, design, and maintenance of cities is becoming obvious and 'complexity theory' seems to hold the best answers. However, while often referred to in general terms, the true understanding of cities as complex systems often stays within a limited group of academics and is far from reaching a wider audience or the professionals concerned with such matters. The major reason for this limited exposure simply seems to be the inherent complexity of 'complexity'.

In the face of these challenges, there is an urgent need for a translation of academic and theoretical knowledge into practical and concrete knowledge. We define this translation of knowledge between academic research and professional practice as a 'transdisciplinary' knowledge challenge. This is becoming the major knowledge challenge of today, since our greatest problem is maybe not that we know too little, but that we do not know how to put what we already know to use. Approaches to this challenge are found throughout the history of design theory (Alexander, 1964; Simon, 1969; Schön, 1983; Cross, 1984, 2007; Lawson, 2006). We believe that space syntax research has a special role in such a translation of knowledge. With its firm foundation in architecture, a field with an inherent transdisciplinary character, space syntax is both defined by and identified with professional practice rather than academia. Hence, the transdisciplinary challenge has been central to space syntax from its beginning. Trade-offs have been needed to link the demands of academia to the demands of practice. For example, the descriptive principles of the axial map, which from an academic point of view lacks mathematical sophistication, makes intuitive sense to the practitioner. This acceptance of academic 'untidiness' is clearly deliberate and was identified early in the development of space syntax (Hillier & Hanson, 1984).

Furthermore, to frame space syntax research in 'complexity' theory seems apposite, since that is where many of the central concepts in space syntax can be given their most powerful definitions, e.g., 'modelling', 'self-organisation', and 'emergence'. The general approach in space syntax is to model cities as spatial systems with social properties and meanings embedded in their configurative structure. This gives rise to emergent patterns that resemble patterns in a similar vein to studies that rely on the concepts associated with 'complexity'. We believe relating the theoretical foundation of space syntax research to general 'complexity theory' is an exciting and useful challenge. Such an approach would give space syntax a solid theoretical framework and give professionals useful translations of academic knowledge about 'complexity' that can be applied to the practical problems inherent in cities. In this paper, we want to contribute to such a development through a discussion of one of the most central concepts in space syntax research, 'co-presence'. We also believe the concept of 'co-presence' could be applicable for the general understanding of 'complexity theory'.

## **2. THE ROLE OF 'CO-PRESENCE' IN SPACE SYNTAX**

More than forty years ago, David Harvey (1969) made a distinction concerning theory in Geography: "We can extract the sense of general theory in geography as follows: it will explore the links between indigenous theories of spatial form and derivative theories of temporal process." Although theory in geography has travelled far since then, we believe the distinction still is fruitful and can be used as a point of departure also for architecture theory, another spatial discipline lacking in theoretical rigour. Such a theoretical foundation also offers ground for self-reflection in space syntax research: although spatial syntax has been successful in developing an indigenous theory of spatial form, it has been less precise when it comes to the choice of derivative theories of temporal processes that inform spatial form.

The predominance in much empirical space syntax research of the correlation between 'integration' (spatial form) and 'movement' (temporal process), while not at all stressed to the same extent in its theory, easily lead to interpretations of space syntax as a theory derived from transport science and more specifically accessibility research. In the worst case, this leads to a belief that space syntax aims to develop a kind of sub-department of transport science that is addressing pedestrian traffic. Although space syntax can be said to also have contributed to such a development (Marshall, 2005), this should be considered a side effect rather than a central aim. It is more proper to see 'movement' as a mediator of the much wider potentials originally set out in space syntax (Hillier & Hanson, 1984) and more recently expressed as "[s]ociety seen through the prism of space" (Hillier & Netto, 2001). Such a view contributes to the general understanding of societies by using an indigenous theory of spatial form.

Therefore, it can be useful to challenge the dominant position of 'movement' in space syntax discourse and focus also other central concepts, such as 'co-presence', that help point to other fields of theory of 'temporal process'. Certainly, 'movement' is a critical mediator in the creation of 'co-presence', but one can argue that 'movement' is more a means to what one wants to study in the end, whereas 'co-presence' is closer to the end itself. Complicating things is the fact that 'co-presence' often manifests itself in 'movement' (Hillier, 1996) and one can suggest that it is here that an unintended confusion of means and ends in space syntax often takes place. Furthermore, we believe that 'co-presence' is of critical importance in 'complexity theory', where space syntax has the ability to make connections between spatial form and 'co-presence' by using 'movement' as a mediator.

We will try to contribute to the establishment of such a link through a theoretical discussion and some preliminary empirical findings. We start with a short review of the concept of 'co-presence' and its uses and definitions in social theory. Then we look at its particular meaning with respect to space syntax and its potentially greater use in general 'complexity theory'. The empirical results, we believe, begin to show how local 'co-presence' in urban space creates emergent social phenomena on aggregated levels. These findings imply a tacit information exchange as the result of 'co-presence' in urban space and this may be of central importance for understanding urban 'complexity'.

## **3. 'CO-PRESENCE': FROM SOCIOLOGY TO 'COMPLEXITY'**

It is often said that sociology starts with social interaction, which leaves us to define what is meant by social interaction. It would be wrong to suggest that this excludes non-discursive interactions from social theory, since there are many examples from the very beginning of sociological thought of tacit interaction, especially when it comes to the study of cities. 'The anonymous crowd', for example, has had great impetus

for early sociological development. In line with the argument in space syntax, we find the concept of 'co-presence' more important as a kind of generic social concept for sociological theory than generally acknowledged. Although 'co-presence' often is seen as the precondition for social interaction, it is clear that such patterns of 'co-presence' largely result from architectural and urban design and therefore offer a crucial connection between architecture and social phenomena (Hillier, 1996). While 'co-presence' must be regarded as the least demanding form of social interaction, we also need to recognise its distinct generic role in any social theory.

Recently, Lasse Suonperä Liebst has noted that Durkheim used the concept of 'co-presence' as the founding principle for the second pillar in his outline of sociology, 'social morphology' (2012). However, this pillar more or less disappeared from sociology discourse and the difficulties to analyse it may be a major reason (Liebst, 2012). This is exciting, given Durkheim's influence on theories of space. Not the least of which is the classic distinction between his two principles that underlie social solidarity or cohesion: the 'organic' solidarity based on interdependence through difference and the 'mechanical' solidarity based on integration through similarities of belief and group structure. Organic solidarity requires an integrated and dense space, whereas mechanical solidarity prefers a segregated and dispersed space, presenting a distinct spatial dimension to social relations (Durkheim, [1893] 1972). These ideas have been picked up in space syntax where the cause of the different solidarities, according to Hillier and Hanson (1984), is located exactly in spatial prerequisites. However, while the grander plan for 'co-presence' in sociology was lost, the concept has resurfaced again and again in sociological theory, most prominently in the theories of Goffman and Giddens.

Goffman (1963) developed a typology of the contours of interaction. A relevant term here is 'situation' (or 'situation at large'), which is discussed along with terms such as 'gathering' and 'social occasion'. The 'situation' is described as "the full spatial environment anywhere within which an entering person becomes a member of the gathering that is (or does then become) present" (Goffman 1963, 18). Furthermore, co-presence "[...] implies that persons must sense that they are close enough to be perceived in whatever they are doing, including their experiencing of others, and close enough to be perceived in this sensing of being perceived" (1963, 17). The very basic prerequisite of any kind of communication, whether unfocused interaction or fully focused interaction, is that people become co-present, so they can function as communicative instruments. Goffman acknowledges that physical space plays a role in this context. One place may facilitate multiple social realities depending on the circumstances. Goffman, for example, defines public streets as relatively unobstructed places, suggesting that the region of space in which mutual presence can be said to prevail cannot be clearly defined here.

Similarly, Giddens anchors 'co-presence' in the perceptual and communicative modalities of the body. The routines of day-to-day life are said to be fundamental to even the most elaborate forms of societal organization and it is in the course of their daily activities, when individuals encounter each other in situated contexts of interaction, that interactions happen among people who are physically co-present (Giddens 1984, 64). The 'context' is, according to Giddens, those 'bands' or 'strips' of time-space within which gatherings take place. Anyone entering such a band of time-space makes him or herself 'available' for moving into a gathering. The phrase 'available' has strong links to how Hanson (2000) describes the effects different urban design principles have; for example, spatial layouts designed as 'estates' actually minimise social contact as very few people are made 'available' as a result of its structure, the constitution of entrances, and impermeability etc. In this context, the decision to participate or not in a context or situation that might develop into a gathering does not lay with the householder, as a lack of such opportunity is built into such a spatial layout (Hanson, 2000).

Within space syntax, 'co-presence' is seen as a significant social resource that architecture affects. The potential to develop social networks is even argued to pass through the relation of spatial configuration and natural co-presence (Hillier, 1996). Hanson (2000) argues that the fundamental relationship between urban space and society is not 'encounter', but 'co-presence'. Moreover, Hanson argues that co-presence (or its absence) is a generic feature of societies. Although space does not determine what takes place, co-presence is seen as a pre-condition for face-to-face interaction. This is an important social function of cities: to structure co-presence among people of different ages and genders, among inhabitants and strangers or outsiders, among people of different occupations or social classes, and within economic, civic, and religious life (Hanson, 2000; Hillier, 1996). The effects of urban design are pervasive and insistent and are in their nature never absent. How these conditions are structured influences the potential for building different solidarities and the potential for building spatial and/or transpatial networks (Hanson & Hillier, 1987).

#### 4. THE POTENTIAL ROLE OF 'CO-PRESENCE' IN 'COMPLEXITY' THEORY

The origin of the modern history of 'complexity theory' is often credited with a report written by Warren Weaver to the Rockefeller Foundation in 1958 (Wilson, 2000; Johnson, 2001). Weaver outlined the coming challenges in science by dividing scientific enquiry into three systems: 'simple systems', 'disorganised complexity', and 'organised complexity' (Weaver, 1958). In 'organised complexity', the variables are interrelated (organised), so one has to calculate the feedback between the variables in the systems, either negative feedback (a dampening effect leading to stability) or positive feedback (an amplifying effect leading to instability) (Miller & Page, 2007). Hence 'organised complexity' (including positive feedback) poses the real challenge to scientific enquiry, as such systems are inherently unpredictable, and is the type of complexity most often associated with the general term 'complex systems' (Wilson, 2000). Such positive feedback on one scale, innocent as it might look, can be amplified and lead to unpredicted and quite decisive effects on another scale. This phenomenon, so characteristic for systems of 'organised complexity', is called 'emergence' (Johnson, 2001). In space syntax, we encounter this phenomenon repeatedly when we analyse how local interventions in the urban fabric generate global patterns.

As pointed out by Batty (2005), it is proof of the prescience of Jane Jacobs that she was the first to see that cities themselves posed problems of organised 'complexity' and "that the city was the example *par excellence* of 'organised complexity'" (Batty 2005). Not only did she see the possibility of putting a new label on the rather apparent messiness of cities, but she also provided proof of her deep understanding of the problem by pointing out how such 'organised complexity' worked in cities. These ideas were lost to most of her followers even though she famously concluded that "cities happen to be problems in organized complexity" (Jacobs, 1961). Her persistent argument about 'the dance on the sidewalk' was therefore not an argument for consumption of urban life as it has been interpreted to mean in mainstream discourse in urbanism today, nor was it about the potential to keep oneself *a jour*, a form of reading the daily paper. As Jacobs well understood, such purposes, important and commendable as they might be, do not need 'organised complexity' to be explained. In Jacobs' argument, 'the dance of the sidewalk' was one way of pointing out how the phenomenon of emergence is present in cities, i.e., how local interactions in cities generate global order. Jacobs, in her now famous example, demonstrated how one produces the global phenomenon of safety while individually consuming urban life by watching people. The sidewalk, for example, presents a space for exchange of tacit and non-tacit information (as unexpected messages) (Weaver & Shannon, 1963). By using public space, people inform themselves about a lot of trivial things while interpreting the state of society in general. Furthermore, consciously or unconsciously, people adapt

to this information. Because the amount of information that is processed in 'the dance of the sidewalk' is simply of an incomprehensible scale, we might infer with Jacobs that this phenomenon must hold critical clues to how cities work. For Jacobs, people meet on sidewalks not just for the pleasures of serendipity but also to evaluate their environment, information that they then use to make decisions about their daily lives, decisions that influence the way the city works and by extension the way global interactions function. That is, by using sidewalks people, among other things, actually can deter crime and create the global phenomenon of safe space. This is why she posed the problem of cities as problems of 'organised complexity', although not as another metaphor for the obvious messiness of cities.

It is interesting how one is left searching for the concept of 'co-presence' in the literature on 'complexity' when it is obvious how 'co-presence' is a prerequisite – a necessary but not sufficient condition – for complex systems to develop and be sustained. This is particularly true when talking about social systems. Here is the most concrete importance of space syntax research in relation to 'complexity theory'. Space syntax has developed descriptive theories and tools that have proven most successful in analysing how spatial form, in a most sophisticated way, generates variations of 'co-presence' in urban space. One central theme has been how urban form can work as an interface of different movement scales (e.g., Hillier, 1996), since the communication between scales is one of the most critical questions in understanding complex systems. So far, such interfaces between movement scales are inferred rather than proven in space syntax research, but in the following paper we will present preliminary empirical results that we believe begin to explain and perhaps even prove this. Using empirical studies currently in preparation, we aim to develop techniques and proof that make analysis possible of the influence of spatial form on the *size* of 'co-presence' and on the *constitution* of 'co-presence' (i.e., the degree of diversity in 'co-presence'). We believe such an approach will be an important step towards understanding and quantifying the extensive information an analysis of 'co-presence' can provide.

## 5. THE POTENTIAL ROLE OF 'CO-PRESENCE' IN 'SOCIAL CAPITAL'

In the following, we will position the role of 'co-presence' more specifically in the context of the theory of 'social capital'. Although the most widely spread social theory in recent decades, since conception 'social capital' has been hampered by how difficult it is to measure. In addition, it seems that 'social capital' specifically presents the reasons why quantification can be important. Therefore, we will present a way to quantify 'social capital'. The concept of 'social capital' is quite vague and has a long genesis and many interpretations (Ostrom & Ahn, 2003). The most famous is perhaps the interpretation developed by Robert Putnam (1993, 2000), which has been instrumental in the wider dispersal of the concept. In short, 'social capital' generally revisits the classic social theory discussions about social relationships and their role in building community. On a fundamental level, 'social capital' pertains to theories in 'collective action' and governance (e.g., Ostrom, 1990), where concepts such as 'trust' and 'cooperation' are significant.

Putnam defines 'social capital' as the "[c]ollective value of all social networks and the inclinations that arise from these networks to do things for each other". This definition implies that such networks form capital just as a machine can be seen as 'physical capital' and education can create 'human capital'. Putnam (1993) found that northern Italy is far more successful in implementing institutional change than southern Italy because northern Italy has a more developed 'social capital' – "established networks between individuals that generate trust and willingness to cooperate". That southern Italy has such weak social capital is paradoxical considering its tradition of strong family ties. Putnam (2000) defines two components to 'social

capital': 'bonding' and 'bridging'. 'Bonding' refers to social networks forming homogenous groups, and 'bridging' refers to forming socially heterogeneous groups. 'Bridging' is especially important in developing social capital. The family ties typical of southern Italy clearly constitute 'bonding' but not 'bridging', which may explain its weak 'social capital'. Putnam's distinction here comes close to one of his predecessors, Mark Granovetter. Granovetter refers to a similar paradox as "the strength of weak ties" (1973), as it happens, a notion of generic importance also for the development of space syntax.

It is clear how the fundamental concepts within social capital, such as 'networks', 'bonding', and 'bridging', could be given a concrete spatial interpretation.

Indeed, they could all be described as variations of 'co-presence'. Certainly, humans have developed many media for the development and support of social networks, currently primarily electronic (e.g., social media like Facebook and Twitter), which have given rise to the research field of 'virtual social capital' (e.g., Blanchard & Horan, 1998). However, these are signs of the increasing need for interaction in modern society and do not compete with but complement face-to-face interaction (Mitchell, 1995). If anything, recent decades have taught us how our enhanced ability to keep in touch with larger networks of acquaintances also leads to an increasing need of face-to-face interaction. There is quite a step between 'co-presence' and 'social networks', but we argue that social networks in general are still primarily supported and sustained by physical space.

Recalling 'the dance of the sidewalk', the kind of intense information exchange that takes place in urban space was argued to constitute the link that makes action on the local scale possible to evolve into emergent global phenomena. This helps us argue that the very same kind of information exchange in urban space also could evolve into the emergent global phenomena of 'social capital'. There are two important dimensions to 'co-presence'. First, we should not idealise the kind of intense exchange that Jacobs' argument easily lead us to envisage. Cities are far more sophisticated technologies than that. Typically, cities construct a wide range of spaces with very different potentials for *sizes* of 'co-presence' to evolve. It is this *variety* that is a quality, not the maximum example. All these represent very basic notions in space syntax research (Hillier et al., 1993). Second, we also need to better understand the variety of the content of 'co-presence', that is, its *constitution*. If there is to be an exchange in information, there needs to be a difference in content, something pointed out by Jacobs in her concept of 'overlap' where she stressed the quality of both local 'residents' and visiting 'strangers' using the same sidewalk or street. Also here space syntax has been able to show how sophisticated the technology of urban space is in constructing such 'overlaps' (Hillier, 1996). Hence, it is easy to see how we can use this to translate the concepts of 'bonding' into streets *without* 'overlap', used only by local 'residents', and 'bridging' into streets *with* 'overlap', used by both local 'residents' and visiting 'strangers'. We then see why the latter can prove more important in building 'social capital' simply through its higher 'information content' – the possibility that we get to know something we did not already know.

This presents us with two variables – the *size* and the *constitution* – by which it is possible to measure 'co-presence'. In the following, we will present preliminary results from Stockholm where both the size and constitution is measured at different local neighbourhood centres. These are measured as the (calculated) number of accessible people from the local centre of each neighbourhood and as the percentage of people that are local 'residents' and the percentage that are residents of other neighbourhoods (i.e., visiting 'strangers'). These measurements will be correlated with properties of the spatial form of these neighbourhoods by using space syntax tools together with place syntax techniques (Ståhle et al., 2005). The properties in spatial form can be correlated with varieties in both *size* and *constitution* of 'co-presence' as a

way of informing urban design. Also, the results will be compared with some social data from these neighbourhoods. Hence, we see the potential to develop knowledge that can support and promote 'social capital' through urban design.

## 6. EMPIRICAL FINDINGS: THE INFLUENCE OF URBAN SPACE ON 'CO-PRESENCE'

How do we capture not only the size or intensity of co-present people, but also the constitution, the potential mix between local residents and non-local residents ('visitors') that a certain place facilitates? Several studies have developed methods of measuring accessible population (residential and/or working population) *density*— e.g., Marcus (2007), Ståhle (2008), and Legeby (2010). We have adapted several methods of measuring the degree of diversity in 'co-presence', i.e., the *constitution* of co-presence.

In Södertälje, the percentage of people visiting a local centre in one neighbourhood but living in another is higher at places that are spatially integrated (Legeby & Marcus, 2011; Hassanzadeh Khansari, 2010). Limited configurational access to one neighbourhood appears to limit the inflow of people from other neighbourhoods. The spatial properties in all four so-called deprived areas clearly differed from what is found in Södertälje's city centre and are rather different between each other when compared. Geneta and Ronna have more non-residents at their local centres and are much more spatially integrated than the other areas. Hovsjö has the fewest non-residents at the local centre, is most segregated on the global scale, and has the poorest overlapping of integration patterns, implying that there was no compression of different scales of movement as Hillier (1996) describes (Legeby & Marcus, 2011). According to the on-site-analysis (Hassanzadeh Khansari, 2010), Geneta distinguishes from the other so-called deprived areas as it had quite an even distribution between locals and non-locals at the neighbourhood centre (56% non-locals), whereas Hovsjö had fewer non-locals (28%). Apart from being well integrated, in Geneta more people were accessible from the local centre, and the proportion of working population (representing a non-local population) was slightly higher in relation to local residents (Legeby & Marcus, 2011). Although a correlation between configurative properties and the level of inflow has been established for Södertälje, there are obvious limitations when drawing general conclusions for other cities. To address these limitations, we have now started to study Stockholm.

### Five neighbourhoods in Stockholm

Part of the data is collected through interviews<sup>1</sup> regarding where people live, why they visit the centre, how long they intend to stay, and whether they perceive themselves to live *in* the area, etc. Those people who live in other neighbourhoods represent the inflow, or the potential for an exchange, that the centres offer (or potential for 'bridging' if one likes). Five neighbourhoods that have some similarities regarding their socio-economic character were selected, including answers from 595 informants (with a percentage of answers of 77%).

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<sup>1</sup> The interviews were conducted in May 2011 and in all, the study included 18 neighbourhoods.

The neighbourhoods, located in southern Stockholm, were planned and built between 1940 and 1970. During this time, planning in Stockholm was strongly inspired by ideas related to the Neighbourhood Unit principles, which is also in line with Swedish modernism (functionalism). It was believed that this way of building created a sense of community, but such relationships between social conditions and physical design were more of an assumption (Franzén & Sandstedt, 1981). In society in general, there was intent on communities that facilitated 'bonding' rather than 'bridging', a focus that also influenced urban design and architecture. All neighbourhoods have a local centre, planned as a meeting point and a place for service. Today, the levels of services vary; most of the interviewed people who have lived in the areas for many years describe a decline in service, supply, and selection. The neighbourhoods are all labelled as "to some extent deprived" by the City of Stockholm (2006), a finding based on a social index including levels of income and education, employment rates (aspects closely related to the concept of social capital), and the number of immigrants. In Stockholm at large, there has been a trend of a decrease of segregation when it comes to education levels and employment rates, although economic and ethnic segregation has increased (Stockholm Stad, 2006).

## Results<sup>2</sup>

If we define those living within 1200 metres from the centre as 'locals' (walking distance), the inflow of non-locals is low in Östberga (19%), in Gamla Östberga (19%), and in Bagarmossen (22%). In Västertorp, 26% live more than 1200 metres from the local centre, and in Hökarängen as many as 42%. Thus, Hökarängen is the area that clearly differs from the other areas. If the same analysis is made with the radius of six axial lines, Östberga is the area with least inflow of non-locals (25%) followed by Bagarmossen (29%). Gamla Östberga and Västertorp have similar inflow – 33% and 36%, respectively – and Hökarängen has an inflow of 50% (Figure 1).

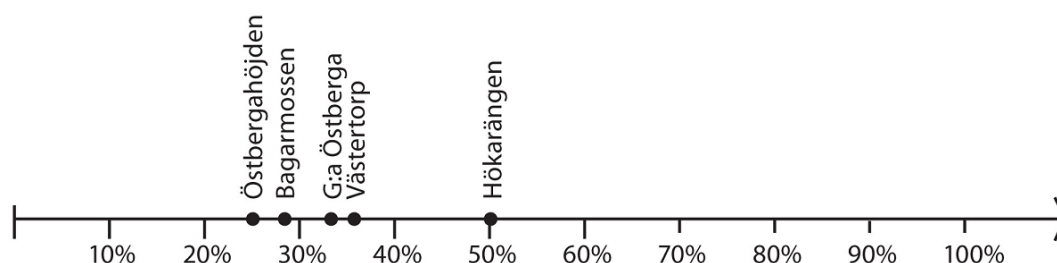


Figure 1. Share of co-present people who live outside a radius of six axial turns from the centre.

But who is really a 'local' resident? If we look where people actually live who perceive themselves as local (according to the interviews), we find radius 1200 metres to be a good match (captures 97-100%). However, if analysing what radius along axial lines represents the best match, it is as much as ten axial steps, a number that is rather surprising and indicates that these neighbourhoods tend to have more of a maze character. If

<sup>2</sup>The results from the Stockholm study are still preliminary. Census data used in this analysis dates from mid-2000. The axial line map used is a version from May 2011, subsequently subject for revision.

illustrating how the catchment area of each centre looks (which shape and range it has), interesting differences are exposed. Östbergahöjden clearly has the smallest catchment area at both radius six and radius 15, whereas Hökarängen and Gamla Östberga have much larger catchment areas. Surprisingly, there is a large difference between Östbergahöjden and Gamla Östberga, two areas very (geographically) close to each other but with weak spatial overlapping and clearly different spatial catchment ranges. From the interviews, we learned that there is very little exchange between the areas and they clearly have different identities, which is understandable according to the spatial properties. Thus, Östbergahöjden, with a population with fewer resources than those in Gamla Östberga, is configuratively significantly isolated from its surroundings, which most likely has a negative influence both on the local businesses and on social aspects. Hökarängen and Bagarmossen are areas that have larger catchment areas, but Bagarmossen is placed next to a large nature reserve, which means that the neighbourhood is more or less only connected to populated places to the west (Figure 2).

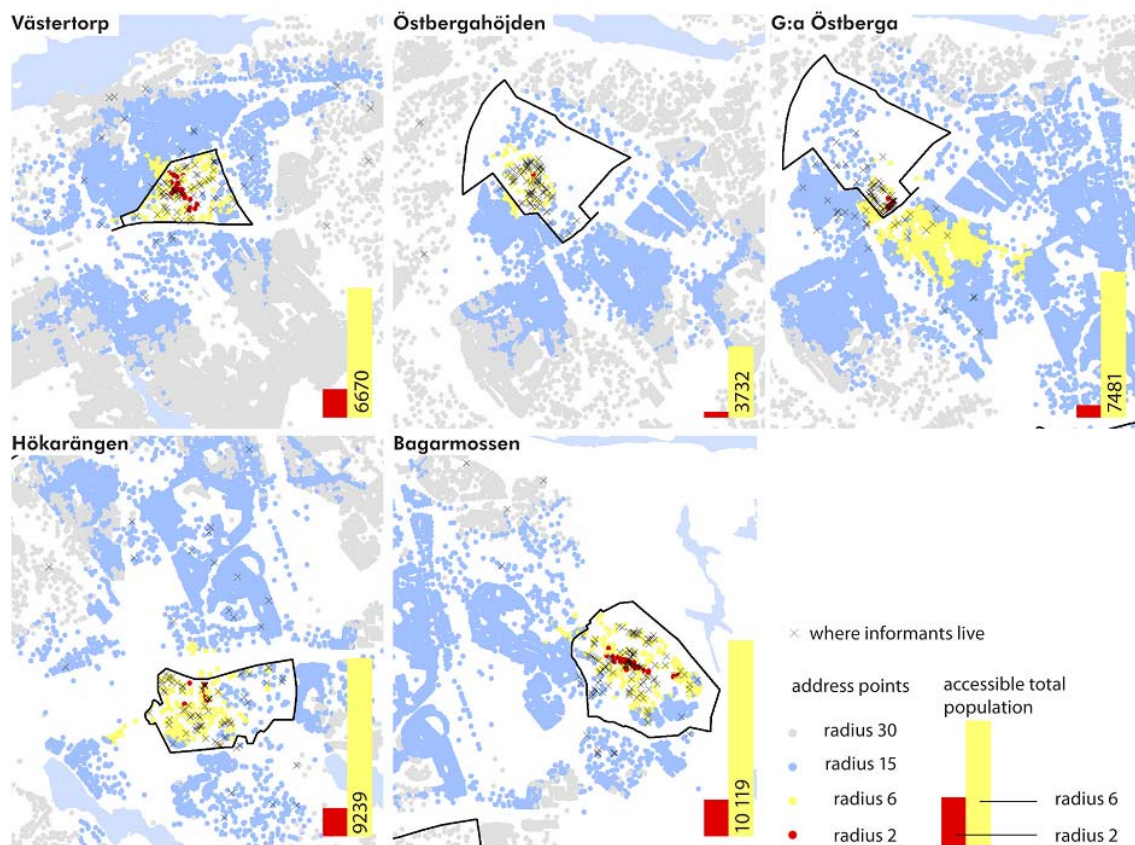


Figure 2. Spatial catchment area and accessible population.

To what extent is the level of inflow explained by configurative properties? The configurative analysis (global integration) shows that the local centres in Västertorp, Gamla Östberga, and Hökarängen are placed in a rather well integrated position, whereas the local centres in Östbergahöjden and Bagarmossen are not (at radius 30). At radius 15, only two of the areas – Gamla Östberga and Hökarängen – have their centres in a

well-integrated position. As the radius decreases, all five areas have centres that are connected to highly integrated lines (at radius six axial steps) (Figure 3).

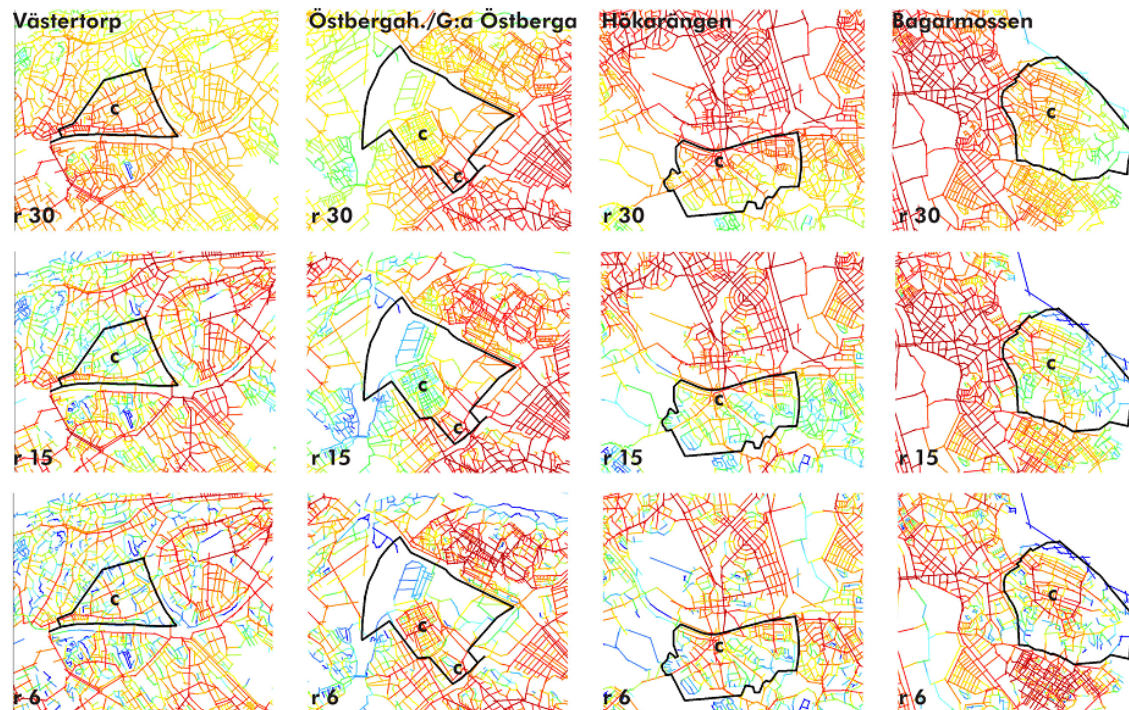


Figure 3. Integration analysis at different radii.

The results from the analysis of the potential for the *density* of co-presence at the local centres show that access to the residential and working population within a radius of six axial lines is lowest at the local centre of Östbergahöjden (3732 people). Västertorp centre has access to 6670 people and Gamla Östberga has slightly more with 7481 people. The local centre in Hökarängen and Bagarmossen reach the most people, 9239 and 10119, respectively (Figure 2). However, in Bagarmossen as much as 91% of the total accessible population are residents, which perhaps influences the low inflow of non-residents. In Hökarängen, the residents amount to 84% of the accessible total population.

## 7. DISCUSSION AND CONCLUSIONS: TOWARDS URBAN DESIGN OF SOCIAL CAPITAL

This paper shows how the concept of ‘co-presence’ – in terms of size and constitution – may be used as a way to link concepts of ‘social capital’ and ‘complexity’ to urban design. This approach is based on the belief that urban space as structured and shaped by buildings and cities construct support for social phenomena such as ‘networks’, ‘bonding’, and ‘bridging’ by creating distributions of varying potentials of ‘co-presence’. By applying space syntax techniques, we have demonstrated differences in how local centres facilitate and support the emergence of such social phenomena.

In Södertälje, the results clearly elucidated correlations between the spatial system and a potential for certain streets to be used by *both* local residents and visiting residents simultaneously – some centres encourage “bridging” and some centres encourage “bonding” (provided an adequate size of co-presence). These findings illustrate the influence that built environment has on the potential for developing social capital and how the configurative structure of embedded city properties give rise to emergent social patterns. Compared to the findings in Södertälje, however, the findings in Stockholm are less obvious. Although we see some correlations between the inflow of non-residents and the global configurational position of the different local centres and the size of the accessible population, the results are not conclusive. However, there are variations in the potential each neighbourhood has to encourage ‘bridging’ by providing, for example, access for non-residents to the local centre due to the configurational properties. Identifying the differences in catchment area that each local centre has is informative. Hökarängen, which has the highest relative inflow of non-residents, has a catchment area that reaches in several directions from the centre and a relatively high number of accessible people. Bagarmossen is far less integrated and largely surrounded by a nature reserve. Östberghöjden is configuratively segregated on the global level and has a very limited catchment area (e.g., at radius six axial step). In addition, Östberghöjden has an area with fewest non-residents at the local centre. Thus, Östberghöjden’s configurative properties make it less likely that people from other neighbourhoods will interact, leaving it noticeably isolated. This isolation is of great concern since people with fewer resources (e.g., ‘excluded’, or ‘segregated’ people) are more dependent on local urban (economic and social) life than people with more resources (or larger social capital) (see Hanson, 2000 and Vaughan, 2007).

It is difficult to identify configurative conditions that alone explain the variations between the neighbourhoods regarding exchange of people living in other parts of the city. However, there are some promising findings that point to a spatial involvement, encouraging us to continue to analyse the whole Stockholm material (which includes approximately 2300 interviews from 18 local centres). In addition, it will be necessary to connect the results more strongly to social data (e.g., employment levels and income levels) of the different areas to make the connection between social capital and urban design clearer. For example, half of the co-present people in Hökarängen – an area where income level has increased the most – are non-locals. In Västertorp, where almost a third of the population were non-locals, education level has increased.

Generally, modernist urban design ideas encourage a decrease in urban complexity by using spatial segregation that, in turn, segregates different groups of people. Such physical segregation may be seen as a way to respond to the problems of the nineteenth century industrial city caused by overcrowding and difficulties integrating industrial production within existing cities. A consequence of making mono-functional urban environments is an apparent loss of opportunities for face-to-face connections between people. Such urban design ideals may favour and encourage ‘bonding’ networks at the expense of ‘bridging’ networks. Mono-functional neighbourhoods were often shaped as enclaves to discourage the use of the area by non-residents. Now, as the complexity of cities is acknowledged and accepted, it is tempting to interpret the demand for a new urbanism to be one that can stitch the city together again, reintroducing qualities and properties in urban space that enable people to be co-present to a larger extent and reintroducing configurational qualities that facilitate the development of social networks or different forms of solidarity on different urban scales.

This study identifies to what extent local centres are used by *both* locals and non-locals, implying a certain potential for ‘bridging’ and/or ‘bonding’, but much more is left to investigate regarding the influence of spatial form on such social phenomena. However, this paper identifies methods and techniques to determine the size and constitution of co-presence in the urban context and provides a theoretical

discussion that suggests how the concept of 'co-presence' may be used to connect urban design to the concept of 'complexity' and to the concept of 'social capital'.

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