Territorial Performance Analysis in (Sub)urbia

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1. INTRODUCTION

Planning of suburban areas in Sweden between 1930-80 followed a strong sociopolitical program and modernist planning doctrine. An initial analysis in 2007 identified patches of open space in such areas that are neither public, nor common, nor private. Preliminary conclusions were that open blocks, accessible back and front yards, facades lacking entrances and invisible property lines are aspects of urban form that create zones of uncertainty, a phenomena that we called “ambiterritory”. The term “ambiterritory” captures the territorial inconsistency present where there is a weak correlation between public and private use versus control (Ståhle 2007). From a real-estate maintenance perspective, territorially vague areas are harder to control, leading to lack of maintenance and depreciated environments.

Theoretical Background

According to geographer Robert David Sack, a territory can be said to exist in the act of an individual or group “delimiting and asserting control over a geographic area” (Sack 1986). Drawing parallels with Lefebvre’s triad of conceived, perceived and lived space, one could say that urban territories are concepts generated in planning and design, perceived in terms of real or perceived boundaries or assertions of control and lived in our social interactions as we decipher territorial cues and translate this into sanctioned (or unsanctioned) behavior as we see fit. Compounding this is current thinking in sociology, which has it that “undefined social spaces have come to be associated with uncertain, unattractive and unsafe areas in which no one wants to live,” as described by the sociologist Sören Olsson (Olsson 2000). However, empirical evidence of how exactly urban form impacts territorial behavior has been
lacking and the prevalence of ambiterritories in recent and current planning indicates a lack of awareness on the part of architects and planners of how residual territories actually end up being used.

Figure 1 shows unclear territory by urban design. Ambiterritorial patches, which lack boundaries or potential for oversight, present an obstacle not only to appropriation responses, but also to social coordination. Political scientist Ellinor Ostrom proposes design principles to facilitate collective action, which include “clearly defined boundaries (effective exclusion of external unentitled parties)” and “effective monitoring” (Ostrom 1990). Enclosed versus open courtyards are thus thought to perform differently in the types of territorial behavior that ensue. Approaching the question in this way stems from a performative view of urban morphology in which function is actually embedded in and constituted by the built form (Koch & Marcus 2005). In a performative sense, ambivalent territories represent the disjunction between the form and function of a space.

While precisely explaining the mechanisms of appropriation is beyond the scope of this paper, correlating intensity of appropriation with spatial analysis and utility analysis reveal some patterns and might contribute to understanding how accessible open space differs from enclosed space, how the scale of a space in relation to the number of potential users might impact use and how other morphological factors contribute to the territorial performance of urban form.

2. ANALYSES

The research project seeks to understand territoriality by correlating urban spatial morphology and utility. Utility is assessed both by gauging user experience by way of a questionnaire and user appropriation by site audit of appropriation traces.

Study areas

Seven study areas in Sweden’s third largest and most southern city, Malmö, were selected for the empirical study. The selection represents areas with major variations in morphology and population in order to capture differences in territorial outcome. (Continuing research, already underway, will incorporate a comparative study of eleven urban fabrics in Stockholm to verify the methodology and results). The selection represents areas with major variations in morphology and population in order to capture differences in territorial outcome. Closed-block formations in the areas from the first half of the twentieth century give way to open-block formations and point-house buildings in the more recent (post 2000) example. Morphologically, the areas are representative archetypes recurring in (sub)urban contexts throughout Sweden. The fabrics differ in size, density and context, but are all rental apartment buildings.
Areas 1 and 2 are closed perimeter blocks with small and large closed courtyards, respectively. Areas 3, 4, 5 and 6 are slab-type buildings configured with open yards.
in-between buildings. Area 7 is comprised of three point buildings with open space surrounding them. The areas are dispersed within Malmö, with areas 1, 2 and 7 located in the heart of the city center, areas 3 and 4 “mezzourban” outside the center and areas 5 and 6 “suburban” located at the perimeter of Malmö.

**Analyses**

*Questionnaire*

In Malmö, 1087 questionnaires were sent out by mail to residents of MKB (Malmö Kommunala Bostäder, the municipal rental housing company in Malmö) in the seven study areas. Addressees were selected and provided by MKB and respondents sent questionnaires back by mail in postage pre-paid envelopes. There was also a possibility to answer the questionnaire online. Questions were formulated in dialogue with the research group at KTH and environmental psychologist Maria Nordström at Stockholm University as well as statistician Hampus Trellid at MKB. 308 usable questionnaires were returned, hence the response-rate overall was 30%. (The Malmö questionnaire is outlined in Table 2).

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1 For clarity, “courtyard” will be used to denote only the closed courtyards, while accessible open areas between buildings will be referred to as “yard” throughout the paper.
### Table 2. Questionnaire questions and themes.

<table>
<thead>
<tr>
<th>Question</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where do you live?</td>
<td>GIS-location</td>
</tr>
<tr>
<td>Address, Gender, Age (20-29, 30-39, 40-49, 50-59, over 60) Ages of</td>
<td>General</td>
</tr>
<tr>
<td>children living at home (none, &lt; 2 yrs, 3-6 yrs, 7-12 yrs, &gt;13 yrs)</td>
<td>General</td>
</tr>
</tbody>
</table>

1. How often do you spend time on the ground near the building where you live in the spring, summer or fall? (several times daily, daily, once a week, once a month, almost never)  
2. How often do children play on the ground near the building where you live? (several times daily, daily, once a week, once a month, almost never)  
3. How do you most often use the ground near the building where you live? (play with children, eat barbecues, rest/relax, gardening, other)  
4. Do you find the ground near the building where you live functions as a place where spontaneous meetings occur? (very well, fairly well, not so well, very poorly, not sure)  
5. How often do you meet or socialize with neighbors on the ground near the building where you live? (several times daily, daily, once a week, once a month, almost never)  
6. Do you find that the ground near the building where you live functions as a place to find peace and quiet or space to be alone? (very well, fairly well, not so well, very poorly, not sure)  
7. Do you think the word “yard” is an accurate description of the ground near the building where you live? (very much so, partly, not really, not at all, not sure)  
8. Do you find that there is competition over space around the building where you live — do conflicts arise because there is not enough space for everyone? (yes often, yes sometimes, occasionally, not at all, not sure)  
9. Do you find the outside environment to be safe around the building where you live - at night, for instance? (very much so, partly, not really, not at all, not sure)  
10. Do you feel that the ground near the building where you live ought to be designed for more ages and interests than it is today? (very much so, partly, not really, not at all, not sure)  
11. Do you feel that the ground near the building where you live is mainly for residents? (very much so, partly, not really, not at all, not sure)  
12. Do you yourself regularly spend time on ground near other buildings in the neighborhood? (very much so, partly, not really, not at all, not sure)  
13. Do strangers spend time on the ground near the building where you live? (very much so, partly, not really, not at all, not sure)  
14. Do you feel that the ground near the building where you live belongs to your building? (very much so, partly, not really, not at all, not sure)  
15. Do you feel that the ground near the building where you live is more space you have control over? (very much so, partly, not really, not at all, not sure)  
16. Are you aware of where the boundaries between your building’s property and adjacent land (neighboring properties, municipal land, etc.)? (very much so, partly, not really, not at all, not sure)  
17. Would you use the ground near the building where you live more than you do today if the boundaries toward neighboring properties, municipal land were made clearer, through fences or hedges? (very much so, partly, not really, not at all, not sure)  
18. Do you find that the maintenance of the building’s ground differs from maintenance of municipal land (quality of upkeep, plantings, equipment, etc.)? (much better, somewhat better, no difference, somewhat different, much worse)  
19. Would you like to have your own private outside space near the building where you live? (very much so, partly, not really, not at all, not sure)  
20. Do you have good access to municipal parks or nature near where you live? (very much so, partly, not really, not at all, not sure)  
21. What do you like in terms of the ground near the building where you live? (fill-in response)  
22. What would make you likely to spend more time on the ground near the building? (fill-in response)  

The questionnaire responses were translated to numerical values and entered as location-specific data into MapInfo. This allowed for comparisons of responses between areas as well as comparisons with spatial properties.
Site audit

Systematic site audits were conducted between May 23-25, 2011. Three themes were analyzed: Interface elements, surfaces/boundaries and appropriation traces. In each study area, one or more representative yard/courtyard situations were identified and subsequently mapped according to a fieldwork protocol.

First, interface elements were mapped. These included building height (as number of storeys) number of points of entry to the yard/courtyard, number of entrances to buildings within the yard/courtyard, number of windows facing the yard/courtyard, number of balconies and number of blind doors (e.g. to utility areas). These were quantified and later transferred to the site audit table.

Second, the theme of boundaries and surfaces was observed. This included identifying whether access to the yard/courtyard was restricted (accessible yes or no) as well as the number of points of entry (in the case of restricted access). An assessment of the predominant condition of intervisibility at ground floor in each of the study areas was made (intervisibility yes or no) as a measure of possibilities for tacit control.

The number of distinct surface types was quantified as an indicator of the level of complexity in the treatment of the yard/courtyard on the premise that programmed movement through a space versus stopping to stay in a space is reflected in the materiality. Observations on-site confirmed the assumption that asphalt pathways give way to cement pavers and smaller scale paving and lawns in areas where stopping and using the space is encouraged programmatically. (Plantings and flowerbeds were not included as surfaces). Likewise, the definition of spaces-within-space by boundaries such as fences, hedges, trellises and low walls were identified. In an audit of copresence and surveillance in residential communities, Julianne Hanson and Reem Zako used the terms primary boundaries for those defined by buildings and secondary boundaries to denote fences and walls (Hanson & Zako 2007). In our audit, boundaries were differentiated into primary, secondary and tertiary boundaries based on height alone, whether permeable or not. That is, primary boundaries were those above eye-level, secondary between eye-level and knee-height, and tertiary boundaries those below knee-height (i.e. possible to step over). In this analysis, therefore, the materiality of the boundary was deemed less important than to what extent it constituted a barrier to access.

Finally, installations and appropriation traces were mapped. Installations according to categories based on programmatic features, borrowing Edward T. Hall's notions of fixed-features and semi-features in The Hidden Dimension (Hall 1969). Fixed-features were defined as elements provided as part of the program for the physical environment, like sandboxes, trellises, and masonry grills etc. To clarify, these are features intended to invite use and therefore did not include landscape elements, such as dams, shrubs, trees, etc. Likewise, semi-fixed features were defined as moveable elements intended to invite use, such as furniture of an institutional
character, i.e. picnic tables, benches, free-standing grills, etc. Additionally, a category called common installations was defined to include institutional provisions with purely functional characteristics, such as waste-receptacles, lamp posts, bicycle stands, signage, etc. The aim in mapping the aforementioned features and installations was for purposes of comparing whether the relative intensity of features in the study areas had any correlation with utility of the yard/courtyards in question.

Evidence of appropriation was documented, including both traces of use and personalization, such as tended plantings, furniture, flower-pots, children's toys as well as those of negative connotation, such as graffiti, litter and vandalism. Quantifying traces aims to detect patterns (if any) in the type of appropriation in different morphologies and to be able to compare traces of use with reported use in the questionnaire. The notion of traces comes from the field of archaeology, referring to the study of material artefacts representing past cultural practices. Landscape urbanist James Corner uses tracing in contrast to mapping to refer to visualizing actual use and not envisioned potential (Corner 1999). Children’s toys left behind and private furniture left in a common yard/courtyard imply a use that is recurrent, where the convenience of leaving something behind “for next time” outweighs the possible inconvenience of losing it. Private plantings likewise represent a vested interest left behind for others to enjoy as well. Appropriation traces have the potential to be informative indicators about how residents perceive and take ownership of the space in question, as well as to identify particular sites of recurrent activity. In a territorial sense traces represent a permanenting of the relationship to a place.
Although actual users (specifically those inhabiting the space and not simply passing through) were noted in the site audit, differing weather conditions and time of day were considered to have a strong bearing on the intensity of users observed. Hence, focusing on traces seemed a measure that might make for more objective comparisons between areas. Thus, while accepting the limitations of this approach, it was hoped that as a component of the site audit, appropriation traces would be a useful complement to the analysis of interface and boundary/surface elements. In fact, appropriation traces might be said to represent the "lived" space, where the interface and surfaces/boundaries represent the "conceived" and "perceived" space of Lefebvre’s triad of spatial production (Lefebvre 1991). Admittedly, measuring appropriation by observed use would be a more accurate approach, deemed unfeasible in this phase of the research.
The site audit was concluded by transferring the mapped elements (interface, surfaces/boundaries, appropriation traces) to table form (Table 3). Where possible, the number of elements observed was quantified, otherwise a binary system of 1 for yes and 0 for no was used to simply denote whether the phenomenon in question had been observed at all. This latter method pertained to those elements difficult to quantify on-site – namely boundaries and intervisibility mentioned above.

**Spatial analysis**

Two types of spatial analyses were conducted in GIS (MapInfo software): Area analysis and location analysis. Area analysis, including density and spaciousness measures, was performed on property- (e.g. privately owned space) and block-level and collected to study area (fabric) level. Blocks are defined as adjacent conglomerations of properties; hence blocks are defined on the basis of legal territory. Location analysis captures different measures of spatial accessibility.

The area analysis encompasses measures of building footprint, length of facades, size of properties, block constitution (number of street facing entrances within 10 meters from street), number of floors, floor area ratio (FAR=floor area/study area)$^2$, ground space index (GSI = footprint/study area), open space ratio (OSR = open space/floor area), spatial compactness index (SCI = open space * floor area/study area$^2$), “block closedness” (% street-facing buildings). Most measures are standard within urban morphology. Some are new and under investigation within the research.

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2 FAR is sometimes referred to as FSI (Floor Space Index).
project. The SCI was introduced by Ståhle (2007) as a measure of the combination of open space and floor space that could capture the variation of typo-morphologies as well as the livability of urban fabrics. “Block closedness” is introduced in this paper, as a way to capture the spatial definition of the block in relation to street-space. Also “block constitution” is new and aims to capture the block’s connectivity of entrances towards external “public” street space versus inward-facing entrances. Evident differences in these two latter aspects are seen in study area 1 and 2, where both are closed, but area 2 is inward facing.

The area analysis results are compiled in table 4.

<table>
<thead>
<tr>
<th>Size of study area (m²)</th>
<th>area 1</th>
<th>area 2</th>
<th>area 3</th>
<th>area 4</th>
<th>area 5</th>
<th>area 6</th>
<th>area 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>44145</td>
<td>8269</td>
<td>187527</td>
<td>51346</td>
<td>183021</td>
<td>224811</td>
<td>9811</td>
</tr>
<tr>
<td>Average size of building footprint</td>
<td>459</td>
<td>1003</td>
<td>920</td>
<td>931</td>
<td>702</td>
<td>814</td>
<td>454</td>
</tr>
<tr>
<td>Total building footprint area</td>
<td>20677</td>
<td>3008</td>
<td>38664</td>
<td>10236</td>
<td>30890</td>
<td>43975</td>
<td>1362</td>
</tr>
<tr>
<td>Building footprint in % (GSI)</td>
<td><strong>0.468</strong></td>
<td><strong>0.364</strong></td>
<td><strong>0.231</strong></td>
<td><strong>0.199</strong></td>
<td><strong>0.169</strong></td>
<td><strong>0.196</strong></td>
<td><strong>0.139</strong></td>
</tr>
<tr>
<td>Buildings per hectare</td>
<td>10.194</td>
<td>3.628</td>
<td>2.507</td>
<td>2.142</td>
<td>2.404</td>
<td>2.402</td>
<td>3.058</td>
</tr>
<tr>
<td>Length of facade</td>
<td>5805</td>
<td>613</td>
<td>7409</td>
<td>2102</td>
<td>5930</td>
<td>7837</td>
<td>303</td>
</tr>
<tr>
<td>Number of properties</td>
<td>38</td>
<td>1</td>
<td>15</td>
<td>3</td>
<td>12</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>Number of buildings</td>
<td>45</td>
<td>3</td>
<td>42</td>
<td>11</td>
<td>44</td>
<td>64</td>
<td>3</td>
</tr>
<tr>
<td>Number of entrances</td>
<td>122</td>
<td>22</td>
<td>151</td>
<td>49</td>
<td>114</td>
<td>165</td>
<td>3</td>
</tr>
<tr>
<td>Number of entrances within 10 m of street</td>
<td><strong>76</strong></td>
<td>2</td>
<td><strong>42</strong></td>
<td>18</td>
<td><strong>8</strong></td>
<td><strong>30</strong></td>
<td>0</td>
</tr>
<tr>
<td>Number of floors (averaged)</td>
<td>2.978</td>
<td>2.865</td>
<td>2.499</td>
<td>3.012</td>
<td>3.987</td>
<td>3.148</td>
<td>4.058</td>
</tr>
<tr>
<td>Floor Area</td>
<td>61636</td>
<td>8618</td>
<td>109388</td>
<td>30860</td>
<td>123968</td>
<td>114430</td>
<td>5528</td>
</tr>
<tr>
<td>Floor Area Ratio (FAR)</td>
<td>1.396</td>
<td>1.042</td>
<td>0.653</td>
<td>0.601</td>
<td>0.677</td>
<td>0.509</td>
<td>0.563</td>
</tr>
<tr>
<td>Open Space Area</td>
<td>23488</td>
<td>5261</td>
<td>128873</td>
<td>41110</td>
<td>152131</td>
<td>180836</td>
<td>6449</td>
</tr>
<tr>
<td>Open Space Ratio (OSR)</td>
<td>0.381</td>
<td>0.610</td>
<td>1.178</td>
<td>1.332</td>
<td>1.227</td>
<td>1.500</td>
<td>1.529</td>
</tr>
<tr>
<td>Spatial Compactness Index (SCI)</td>
<td>0.249</td>
<td>0.231</td>
<td>0.177</td>
<td>0.160</td>
<td>0.140</td>
<td>0.157</td>
<td>0.120</td>
</tr>
<tr>
<td>Property size (average within study area)</td>
<td>812</td>
<td>5148</td>
<td>8738</td>
<td>13656</td>
<td>10103</td>
<td>7519</td>
<td>7590</td>
</tr>
<tr>
<td>Property area (total within study area)</td>
<td>30844</td>
<td>5148</td>
<td>131066</td>
<td>40968</td>
<td>121237</td>
<td>172938</td>
<td>7590</td>
</tr>
<tr>
<td>Percent private property (within study area)</td>
<td>0.699</td>
<td>0.623</td>
<td>0.782</td>
<td>0.798</td>
<td>0.682</td>
<td>0.769</td>
<td>0.774</td>
</tr>
<tr>
<td>Average GSI on private property</td>
<td>0.687</td>
<td>0.584</td>
<td>0.313</td>
<td>0.249</td>
<td>0.256</td>
<td>0.259</td>
<td>0.179</td>
</tr>
<tr>
<td>Average FAR on private property</td>
<td>1.985</td>
<td>1.674</td>
<td>0.764</td>
<td>0.750</td>
<td>0.890</td>
<td>0.805</td>
<td>0.728</td>
</tr>
<tr>
<td>Average OSR on private property</td>
<td>0.275</td>
<td>0.248</td>
<td>0.998</td>
<td>1.006</td>
<td>0.720</td>
<td>1.005</td>
<td>1.127</td>
</tr>
<tr>
<td>Average SCI on private property</td>
<td>0.645</td>
<td>0.606</td>
<td>0.265</td>
<td>0.563</td>
<td>0.799</td>
<td>0.584</td>
<td>0.598</td>
</tr>
<tr>
<td>Facade length (on properties)</td>
<td>153</td>
<td>613</td>
<td>265</td>
<td>701</td>
<td>525</td>
<td>309</td>
<td>303</td>
</tr>
<tr>
<td>Closedness (of blocks within study area)</td>
<td><strong>0.995</strong></td>
<td><strong>0.929</strong></td>
<td><strong>0.274</strong></td>
<td><strong>0.153</strong></td>
<td><strong>0.209</strong></td>
<td><strong>0.222</strong></td>
<td><strong>0.063</strong></td>
</tr>
<tr>
<td>Street-facing entrances (on blocks, in %)</td>
<td>0.623</td>
<td>0.091</td>
<td>0.278</td>
<td>0.367</td>
<td>0.070</td>
<td>0.182</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 4. Spatial area statistics on the properties (blocks) in study areas.

Location analysis was conducted with various accessibility measures, such as space syntax\(^3\) integration and place syntax\(^4\) population with various radii.

The location analysis results are compiled in table 5.

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\(^3\) (Hillier and Hanson, 1984)

\(^4\) Place syntax is an accessibility tool for MapInfo developed at KTH that can measure attractions, such as population or shops, within different radii; euclidean meters (straight-line or network), axial steps or angular change.
4. FINDINGS

Questionnaire

Frequency of use findings:
The questionnaire results were analyzed according to a number of themes. In the category of “frequency of use,” it was found that 25-50% of respondents in Malmö never use their yards/courtyards at all (Figure 6). No respondents used the courtyards in area 1 on a daily basis. This might be due to the small size of courtyards in area 1 (low OSR on property) – an assumption confirmed by fill-in responses to the questionnaire, in which respondents cited lack of sun and high visibility as reasons they did not use these courtyards more frequently. However, 37% of respondents’ children in area 1 used the courtyards daily or several times a day. In comparison, only 43% of respondents’ children in area 4 used their open yard daily versus 82% of respondents’ children in area 2. The courtyard of area 2 is spacious, one property comprising an entire city-block. Additionally, entrances to the buildings are on the courtyard side – residents gain access to the courtyard from 4 entry points at the perimeter (using a key or entry code) and once in the courtyard can enter their respective stairwells. Having entry points on the courtyard side appears to translate to a higher frequency of meetings between neighbors (see Figure 6).

Table 5. Spatial location statistics in the Malmö study areas. Red numbers indicate values lower than average among the areas.

<table>
<thead>
<tr>
<th></th>
<th>area 1</th>
<th>area 2</th>
<th>area 3</th>
<th>area 4</th>
<th>area 5</th>
<th>area 6</th>
<th>area 7</th>
<th>avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2 integration</td>
<td>3.445</td>
<td>4.208</td>
<td>2.865</td>
<td>3.462</td>
<td>2.906</td>
<td>2.169</td>
<td>2.784</td>
<td>3.120</td>
</tr>
<tr>
<td>R4 integration</td>
<td>2.312</td>
<td>2.476</td>
<td>2.130</td>
<td>2.396</td>
<td>1.892</td>
<td>1.518</td>
<td>2.111</td>
<td>2.120</td>
</tr>
<tr>
<td>R6 integration</td>
<td>1.823</td>
<td>1.916</td>
<td>1.791</td>
<td>1.942</td>
<td>1.486</td>
<td>1.331</td>
<td>1.743</td>
<td>1.719</td>
</tr>
<tr>
<td>R8 integration</td>
<td>1.533</td>
<td>1.598</td>
<td>1.529</td>
<td>1.636</td>
<td>1.251</td>
<td>1.237</td>
<td>1.517</td>
<td>1.472</td>
</tr>
<tr>
<td>R10 integration</td>
<td>1.351</td>
<td>1.400</td>
<td>1.344</td>
<td>1.436</td>
<td>1.109</td>
<td>1.135</td>
<td>1.360</td>
<td>1.306</td>
</tr>
<tr>
<td>R15 integration</td>
<td>1.123</td>
<td>1.157</td>
<td>1.142</td>
<td>1.158</td>
<td>0.942</td>
<td>0.943</td>
<td>1.154</td>
<td>1.089</td>
</tr>
<tr>
<td>R20 integration</td>
<td>1.103</td>
<td>1.133</td>
<td>1.110</td>
<td>0.992</td>
<td>0.907</td>
<td>0.834</td>
<td>1.153</td>
<td>1.033</td>
</tr>
<tr>
<td>R30 integration</td>
<td>1.103</td>
<td>1.133</td>
<td>1.110</td>
<td>0.983</td>
<td>0.807</td>
<td>0.778</td>
<td>1.163</td>
<td>1.024</td>
</tr>
</tbody>
</table>

5 These areas are comparable in terms of number of respondents with children; 12% in area 4 and 14% in area 2. Area 7 has only 19% of respondents’ children using the yard daily, however only 5% of respondents in area 7 had children.
Figure 6. Frequency of use theme: Frequency of use in general, frequency of use by children, frequency of spontaneous meetings with neighbors (top to bottom).
**Types of use findings:**

In the category of “types of use,” the questionnaire asked which of the following activities were most often engaged in on the yard/courtyard: play with children, eat/barbecue, rest/relax, gardening and other. It was found that barbecuing is the activity cited most on closed courtyards; in the smallest courtyards, it is the predominant activity by far (area 1: 37%). As previously mentioned, area 2 has a high rate of child’s play on its courtyard, however few respondents actually cite “play with children” as their primary use of the courtyard. Either children play unattended or the parents are present but otherwise occupied. For instance, as previously mentioned, meetings with neighbors are most frequent here (0.48 times per day) compared with the average for all areas (0.31 times per day) and the lowest in area 1 with smaller properties and courtyards (0.15 times per day).

**Appropriation findings:**

In the category of appropriation, area 1 and 2 with their closed courtyards were most readily identified as “yards”\(^6\) (88% and 82% of respondents respectively, found the term to be an accurate description) whereas respondents in area 7 with its open yard and point buildings were least likely to find the term accurate (13%). Further, the questionnaire was designed to test whether a yard/courtyard is perceived to be a physical or social construction. Hence, two similarly phrased questions were asked: “Do you think the ground near the building where you live belongs to the residents?” and “Do you think the ground near the building where you live belongs to the building?”. Responses to both questions were found to be consistent and to reflect the morphology to a great extent, with some notable exceptions. For instance, whereas area 1 and 2 respondents feel about equally strongly that the ground belongs to the building (82% in area 1 and 78% in area 2), area 2 respondents were far more likely to respond that the ground belonged to residents (91% in area 2 vs. 83% in area 1). While buildings define a physical space, use by residents appears to define a social space. In area 2, a high degree of contact between neighbors was reported, perhaps traceable to courtyard entrances in combination with the scale of the courtyard. In area 4, where residents have a park in direct connection with their open yards, 73% of respondents felt the yard belonged to residents compared to only 53% who felt it belonged to the buildings. Apparently the social function of building-adjacent outside space, whether “yard” or not, is not entirely dependent on the physical configuration, other factors also influence perception.

**Competition findings:**

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\(^6\) The questionnaire was conducted in Swedish using the Swedish term “gård” in these questions. This term has a more ambivalent meaning than the English *yard* – it is readily used both to denote closed courtyards as well as more open formations. Hence it is not such an apparently inaccurate term to describe either closed or open yards/courtyards.
Three questions were designed to capture negative aspects of co-presence in the theme of “competition”: competition over space, presence of strangers and problems with strangers. Area 4 with its close proximity to a large park has 60% of respondents citing that competition over space is never a problem (Figure 7). This raises the question whether competition is scarce due to spaciousness of the surroundings, as might be assumed, but also whether area 4 residents actually differentiate between their yards and the park. Site visits confirm that maintenance-levels and landscaping are similar in the park and yards and several respondents cited the park as something appealing about their yards. This can be taken as evidence that perceptions of what is park versus yard are somewhat blurred here (but without a negative connotation). 31% of respondents in area 2 reported sometimes or often experiencing competition over space.

Comparing responses to the two questions about strangers (presence of strangers and problems with strangers) reveals that respondents in area 4 were far less likely to notice strangers than respondents in area 2 (27% in area 4 versus 50% in area 2). This might be explained by the fact that only 20% of area 4 respondents and 47% of area 2 respondents found strangers to be a problem. Competition over space appears to prime residents to find the presence of strangers intrusive in area 2. While the adjacent park in area 4 might alleviate any competition over space (46% of respondents never use the yards at all), the low rate of noticing strangers might also have to do with the large scale of the yards in combination with through-access, making distinguishing strangers from residents difficult.
Boundaries and safety findings:

Respondents in areas 1, 2 and 4 were unlikely to find security to be a problem (only 6%, 12% and 9% respectively though safety was bad or not so good at night). Areas 1 and 2 have restricted access to their courtyards, while area 4 is located in a comparably affluent area (see table 1, social data). Finally, in all the morphologies showcasing open yards but for area 4 (that is, areas 3, 5, 6, 7) a majority of respondents would use the courtyard more if boundaries were clearer.

Site audit

Findings

The site audit results are compiled in table 3.

Courtyards in area 1 are small, dominated by one or several seating groups. The common installations, such as bicycle sheds, waste receptacles, etc. consume a large portion of these small courtyards. Also, the sectional scale (height in relation to size of courtyard) makes the control aspect of the windows facing the space crucial here. In spite of the smaller scale of the area 1 courtyard (relative to the other audited areas), there was a remarkable intensity of appropriation traces evident here: 43 objects were left behind, mostly in the form of flower-pots, children's toys and furniture.

By far the most active courtyard is that in area 2. Several children playing and conversations between tenants were observed. Many entrances front the courtyard, but on each side only one connects to the street. The interface to the street consists of small shops and a very active urban square, Vårnhemstorget. The contrast between the bustle outside and the relative calm inside the courtyard is striking. Children leave many toys behind; an area behind some bushes is appropriated as a sort of play area with small carpets and toys. These site observations correspond highly to the answers given through the questionnaire. Area 2 was by far the most frequently used by children.

Area 3 is a serene, quiet area surrounded by parks. The water runoff is an attractive feature; fountains and dams abound in the area with 3-storey L-shaped buildings (1950’s). Several yards are open to a heavily trafficked road and traffic noise is dominant despite sound-buffers in the landscaping. Several plantings, gardens and signs of tenant engagement were noted, but no other traces were left behind.

The proximity to the park in area 4 is immediately evident. The yards appear large in plan but are inaccessible in the deepest portion of the yard due to some underground structures. The yards are also characterized by the fact that they are constituted by the front (entrance-side) of one building and the back of another. Residents reported wishing they had direct access to their own yards in the questionnaire, apparently in some cases they look out onto one yard but have access to another. Private terraces line the rear façade and are extremely private due to very tall hedges (over 2 meters
high) toward the yards. Some private furniture, plantings and a kitchen garden were found in one location, but were more the exception than the rule.

Area 5 is a large-scale homogenous fabric. Many differences in elevation result in broken sight lines and are presumably due to parking garages located beneath the yards. As a consequence, the landscaping is characterized by a complete lack of large trees, problematic since the scale of the yards is quite large. The yards, as in area 4 are fronted by entrance-sides of some buildings and inaccessible backs of other buildings. A large sum of installations, but little traces left behind.

Area 6, like area 5 is a large-scale fabric of similar modernist architecture. The interface is characterized by inactive ground floors with many blind doors and broken (axial) sightlines. Residual spaces under low balconies are a distinct type of ambiterritory prevalent here as well as unprogrammed fenced-in lawns toward the street.

Walking around on the lawn around the buildings in area 7 provides an awkward amount of sightlines in to the apartments. A wire-fence encloses the area toward the street. Plantings and trees are immaculately tended, but the yard is unbounded and maybe too exposed to view to invite longer stays. At best, it is a “through-passage” as one resident noted in the questionnaire, where you might run into a neighbor.

Striking is that traces of appropriation are consistently fewer on the open yards. The closed courtyards abound with children’s toys, flowerpots and private furniture, but the open yards appear swept clean of any such loose items. Conversely, another category of appropriation traces, including flowerbeds and kitchen gardens are evident in the small courtyards of area 1 (mostly as clusters of pots and plantings), but appear entirely absent from area 2, which has a higher use-intensity, according to the questionnaire. This form of appropriation was most abundant in some open yards of area 3 and in one location in area 4. Perhaps kitchen gardens crop up where space is both abundant and uncontested – according to 43% of respondents in area 3 and 60% in area 4, competition over space was never a problem.

Appropriation traces are here treated as a proxy measure of whether spaces are used in a way that indicate taking possession of a space – that is, taking greater ownership than one would in an urban park or public square. The hypothesis is that a relative lack of appropriation traces might be taken as evidence that use of a space is infrequent or fleeting. Traces of recurrent use in the form of objects left behind were most frequent in the closed courtyards in areas 1 and 2, but to a lesser extent also in areas 3 and 4. Thus, the site audit of appropriation traces appears to correspond with perceptions of and uses of yards/courtyards in the questionnaire. Interesting to note is that in spite of a relatively high intensity of installations and program features in areas 5 and 6, traces of use were few and mostly of the negative kind (litter mainly). In area 7, traces of use as well as negative traces were next to absent (2 pieces of litter). It would appear that attempts made by the rental company MKB to supply a qualitative environment in the form of fixed- and semi-fixed features and ample
common installations are not enough to incite use. (If this is the aim is another question.) This finding would support claims that morphological and configurative properties trump retrofit solutions and equipment upgrades in terms of use-value for residents.

Spatial analysis

Area Analysis Findings

Several interesting measures in the spatial analysis were found to correspond to user perceptions of the yards/courtyards. For instance, a high correspondence was found between the so-called “block closedness” measure (Figure 8), which quantifies the degree of building enclosure of the block formations. This was found to correlate strongly with user perceptions of whether they had a yard/courtyard: areas 1 and 2 are 99% and 93% closed, respectively. Area 6, in which one respondent went so far as to say “the yard doesn’t exist!” still placed higher at 22% than area 7 which is only 6% enclosed by other buildings. Morphologically, there is a leap in “block closedness” between the pre 1950’s fabrics (1 and 2) and subsequently built fabrics in the Malmö study areas.

Following the degree of enclosure measure, the open space ratio (OSR) reveals not a paradigmatic leap in the composition of built form and open space, but a fairly linear evolution toward greater spaciousness (Figure 9). In the utility analysis, area 2 was found to have some issues with competition over space (area 1 was presumably spared these problems since the size of the courtyards renders them unusable in

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Note that the secondary boundary wire fence surrounding this property, observed in the site audit, does not exist in the spatial analysis data.)
some respects). It is difficult to draw conclusions from the OSR alone, but the questionnaire results imply that the OSR of 0.610 in area 2 (0.25 on property level) might be nearing a threshold condition for congestion and territorial conflict in residential block open space. Decreasing the OSR as far as 0.381 might be too much however, as area 1 courtyards tended not to be used due to lack of sunlight and high visibility (see paragraph 4). In area 2 more respondents reported experiencing competition over space (31% responded “sometimes” or “often”) than in area 1 (OSR 0.610). Overcrowding (or lack of space) is thus both a social and spatial issue, in which the use-value of the yard/courtyard is evidently a factor.

More conclusive perhaps are the OSR measures when municipal land and roads are excluded from the analysis. The private property OSR (Figure 10) shows a leap in ratio of open to built space on private property.
Location Analysis Findings

When analyzing study areas in themselves, whether on fabric, block or property level, the emphasis is on local properties and features; less on the locational context of the area. Space syntax analysis reveals great discrepancies in how the areas are integrated into the Malmö street network. Additionally, when looking at density accessibility, it is evident that degrees of publicness differ between areas. Area 1 and 2 are highly spatially integrated, both locally and regionally. They are also set in a denser context. However, the size of the courtyards in area 1 are so small that spaciousness (OSR) is very low, resulting in a high degree of visibility and a lack of sunlight. These aspects have a negative impact on the usability of the courtyard as was also found in the questionnaire. In other words, the usability of a courtyard (or yard) depends on many characteristics, of which block closedness and OSR are two.

Figure 11. Integration analysis at radius 2, radius 6, radius 10 and radius 30.

What this research hopes to better understand is how to account for the differences between what appear to be morphologically more similar areas. The integration analysis reveals that areas 5 and 6 are neither highly integrated in their local area nor
in Malmö as a whole. In fact, these areas are consistently below the average integration of all seven areas. Area 7 is not locally integrated at r2 (3 axial steps), but is more regionally integrated at r30 (31 axial steps) than all the other areas. The opposite is true for area 4, which is locally integrated but less so regionally: As the radius increases to r20 and r30, area 4 is least integrated of the seven areas. Figure 11 illustrates that there is in fact a west to east shift that occurs in Malmö in terms of the integration. Comparing r6 and r30 reveals that western Malmö is locally integrated, while eastern Malmö is more regionally integrated. The most local scale integration (r2) corresponds well with perceptions of safety in the questionnaire – areas 1, 2 and 4 ranked well above the average in this regard (between 40-65% said safety was “very good”). Meanwhile, areas 3, 5, 6 and 7 all had more than the average number of respondents saying safety was “bad” or “not so good”. The average r2 integration of all seven areas is 3.120 – the four areas perceived to be unsafe are all below the average (Figure 12).

![r2 Integration (Local Integration)](image)

**Figure 12. Local integration values**

**Correlation Analysis**

Having introduced the new measure of “block closedness”, a test of the correlation between the closedness and site audit results was performed. The resulting correlation graph is shown in figure 13. However, a larger sample, such as the forthcoming addition of 11 Stockholm study areas will be needed to verify any such correlation. Preliminary site audits in Stockholm do appear to confirm that traces of personalization and appropriation are greater on the more closed courtyards.

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8 During the site audit, areas 3 and 7 had most noticeable traffic noise in the yards. Areas 1 and 2 also have major traffic arteries running near them, but the degree of enclosure ensures traffic is not intrusive inside the courtyards.
5. DISCUSSION & CONCLUSIONS

Understanding appropriation behavior as interplay between city as system, the urban fabric and architectural/programmatic elements, as well as demographic and institutional effects, seeks to better inform the discourse on urban territoriality. Appropriation behaviors are complex and depend upon a number of factors, but the methodology proposed in this paper, which will be further developed in a study in the Stockholm region, provides one triangulated approach to discern how patterns of use emerge in response to the territorial performance of urban form. A combination of spatial analysis, utility analysis and site audits ensure that spatial and social systems are accounted for at overlapping operative scales. As an analytical tool, the research project aims to ultimately hone the design process in terms of assessing stated intentions and program requirements against probable consequences.

Understanding utility in residential yards/courtyards in more precise terms than as transition-space between private and public means abandoning the conceived continuum of semi-states in-between (e.g. semiprivate, semipublic). In several respects, clear boundaries between the public and private realm appear to simplify social responses to spatial situations – appropriation may be facilitated and expectations about safety and collective-action better served, for example. However, boundaries should also serve as interfaces mediating different territorial realms. Open boundaries and territorial diversity are themes for further discussion within the research project, as well as a continuing assessment of our findings thus far.
6. REFERENCES


