STRATEGIC SPACES:
Patterns of Use in Public Squares of the City of London

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0 Abstract
This paper analyses how patterns of space use of public squares can be determined by the morphological properties of the urban grid in which public spaces are embedded. Twelve public squares in the City of London were analysed using the space syntax methodology and the principle of natural movement. This paper demonstrates that patterns of space use is a function of the configuration of the urban grid, expressed by the correlation between the number and integration values of axial lines that interface with the public space and the number of static people within the space.

1 Introduction: Ideas on liveable urban spaces
Among various deficiencies that our cities present today is the inability to promote successful public squares, where the population can take advantage of a good environment which is reflected by good levels of static occupancy rates. Despite attempts by many scholars to understand the morphology and principles governing patterns of space use of open public spaces, the current state of knowledge gives little effective guidance to designers. It is still possible to find many examples of current developments that failed dramatically to provide a dynamic environment where the population can make good use of it. Often, public areas either in housing estates, office developments or simply in areas of public domain are relegated to become more of a no-go area than a lively urban space; whereas other areas, perhaps not planned to work as "public squares" seem to incorporate all the necessary elements to become a popular place.

One reason for this seems to be that scholars have restricted their analysis to the study of the morphology independently of how the public space is embedded in the urban fabric. In fact, a very common interpretation is that liveable public spaces should observe enclosure and irregularity principles which were derived from studies of traditional medieval squares. Sitte's (1989), Unwin (1909) and Zucker (1959) to mention just a few regard enclosure, defined by the grouping of architectural masses around an open space, as the fundamental property. Only enclosed spaces could provide the users a sense of well being, comfort and pleasure, and therefore would ultimately determine the preference by the public to such public spaces. In addition, quality and variety of decorative elements and street furniture is another important property often discussed in studies on public squares. Several negative factors such as age, lack of maintenance or weather variables such as wind and shade are commonly mentioned (Miles, 1978; Gehl, 1980 and Herzog, 1992). Conversely, few authors discuss the importance of visual and physical connections with the surroundings as a necessary property to ensure a constant flow of pedestrians, like the work done by Project for Public Spaces (1982) and Whyte (1990). Although stressing a very important property, unfortunately these studies provide little evidence on how to represent and quantify those properties. In fact, a precise account of how the spatial morphology of

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the urban grid plays a major role in the performance of urban spaces is given by Hillier and the theory of natural movement (Hillier et al., 1993).

The theory of natural movement based on the space syntax theoretical framework refers to the relationship between the spatial layout and patterns of use, that is, the pedestrian occupancy and movement in space and how the pedestrian movement is affected by the spatial configuration. The theory of natural movement states that the pattern of pedestrian movement in an urban system is primarily generated by the configuration of the urban grid, as the pedestrians tend to follow the shortest and most direct routes. Considering that both forms and density are more or less homogenous and distributed in a grid like structure and given that people are moving from everywhere to everywhere, there will be a strong correlation between the integration values of axial lines of the urban grid and the pedestrian movement.

Hillier in two studies on the performance of public spaces (1984, et al. 1990) claims that a successful urban square depends on the correct balance between static and moving people, whereas the number of people choosing to stop and make informal use of the public space is a function of what is called the "strategic value", which is calculated by the sum of integration values of all lines which pass through the body of the space excluding the ones that merely skirt its edges (Hillier, 1984).

2 City of London: twelve public squares compared

In order to investigate the performance of public spaces, the City of London was chosen. As it provides a satisfactory basis for a comparative study, with public spaces showing different degrees of space use, that is, a variation on the number of static people making informal use of the public space during the day.

The criteria for selection was to have, if feasible, an even number of traditional public squares and recent office developments with different levels of space use, although until then no systematic observation of static people making informal use of the space

Legend
Public Spaces
1 Fleet Place
2 Fenchurch Place
3 New Change/Cheapside Corner
4 St. Anne, St. Agnes Yard
5 Love Lane Corner
6 North Guildhall
7 AB Churchyard
8 Whittington Gardens
9 Bank Corner
10 Royal Exchange
11 Finsbury Avenue Square
12 Exchange Square

Reference Elements
a St. Paul Cathedral
b The Barbican
c Bank of England
d Finsbury Circus
e Liverpoool Street Station
f Leadenhall Market
g The Tower of London
h Newgate Street
i Cheapside
j Moorgate
k London Wall
l Bishopgate
m Cornhill
n Cannon Street

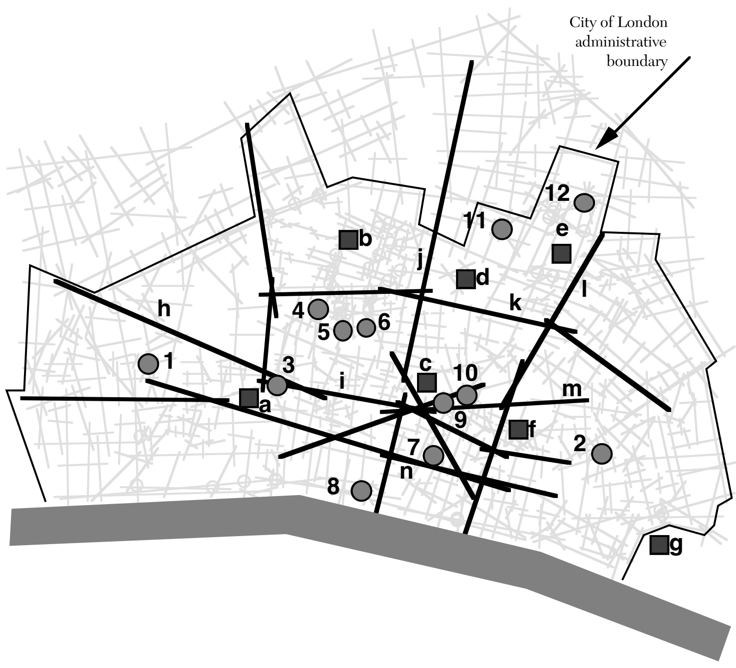

Figure 1. Schematic plan of the City of London with the selected urban squares and some major elements as reference.

was recorded. Likewise, the sample aimed to incorporate enclosed public squares and highly open ones with extensive visual connection with the surroundings. The quality of street furniture was also considered, which was defined by the amount of available places to sit. In addition, syntax elements were considered such as the level of integration into the urban grid and the proximity to major axial connectors. Finally, the presence of catering establishments were considered. Therefore, twelve public spaces were selected and their location in the City of London is shown in figure 1. Table 1 below shows a summary of how the selected public squares fit the criteria described previously:

Table 1

square nº	*square name*	*new development*	*nº static people*	*level of enclosure*	*quality of street furniture*	*nº axial lines*	*catering facilities*
1	*Fleet Place*	yes	medium	high	good	4	yes
2	*Fenchurch Place*	yes	medium	medium	poor	4	yes
3	*New Change*	no	medium	low	medium	2	yes
4	*St.Anne St.Agnes*	no	low	medium	good	2	no
5	*Love Lane Corner*	no	good	medium	good	3	no
6	*North Guildhall*	yes	low	medium	poor	2	no
7	*AB churchyard*	no	low	high	poor	1	yes
8	*Whittington Gds.*	no	medium	medium	medium	3	yes
9	*Bank Corner*	no	good	low	good	3	no
10	*Royal Exchange*	no	good	medium	good	3	yes
11	*Finsbury Av. Sq.*	yes	good	high	good	6	yes
12	*Exchange Square*	yes	good	high	good	7	yes

Table 1. Summary of twelve selected squares according to criteria.

The static observation was carried out during two weeks in late July 1996 with mean temperatures recorded during each day varying from 16.6 to 24.7 C. Each square was observed for two separate days which were randomly selected. Static people within the public spaces were observed for 12 hours, from 8 o'clock in the morning until 8 o'clock in the evening every ten minutes. Static people were recorded according to gender, activities and respective location. Also, in public squares that showed catering facilities, that is, either a wine bar or a public house, people were recorded if they were specifically using the catering facilities.

A second observation was done during early October 1996 when the mean day temperature was much lower, varying from 11.3 to 14.4 oC, in order to investigate if the number of people would keep to the same profile or colder days. The variation of the number of static people for the different places tend to be more significant, since in very hot days even under used spaces tend to receive a significant number of people making informal use of it. Each square was again observed for two separate days which were randomly selected. Static people within the public spaces were observed from midday until 2 pm recorded according to gender and activities as before.

A summary of the data collected for the twelve squares during July and October are shown in tables 2a and 2b respectively. Each table gives a description of the total number of observed people, then occasional users such as couriers, construction workers, tourist or office smokers were subtracted. Finally the data is presented excluding (in addition to occasional users) people who were using the catering facilities in order to have a more realistic basis when comparing public spaces with and without public houses or wine bars which may work as attractors enhancing the overall number of static people in a particular square. Information according to syntactic elements, and metric size of the public squares is shown in table 2c.

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Table 2a

square name	*total nº people: all*	*total nº people less occasionals*	*total nº people less occasionl+bars*	*mean nº people: all*	*mean nº people less occasionals*	*mean nº people less occasionl +bars*
Fleet Place	1050.50	958.50	294.00	20.60	18.79	5.76
Fenchurch Place	892.00	852.00	449.50	17.49	16.71	8.81
New Change	881.00	866.00	154.00	17.27	16.98	3.02
St.Anne St.Agnes Yd.	275.50	211.00	n/a	5.40	4.14	n/a
Love Lane Corner	485.50	461.50	n/a	9.52	9.05	n/a
North Guildhall	256.50	196.50	n/a	5.03	3.85	n/a
AB churchyard	175.50	160.00	159.00	3.44	3.14	3.12
Whittington Gds.	1723.00	1689.50	476.00	33.78	33.13	9.33
Bank Corner	1235.00	909.50	n/a	24.22	17.83	n/a
Royal Exchange	1752.00	1545.00	488.00	34.35	30.29	9.57
Finsbury Av. Sq.	3887.00	3825.50	1043.00	76.22	75.01	20.45
Exchange Square	4411.00	4145.50	1349.00	86.49	81.28	26.45

Table 2a. Number of static people per public space during July 1996. (8 am to 8 pm)

Table 2b

square name	*total nº people: all*	*total nº people less occasionals*	*total nº people less occasionl+bars*	*mean nº people: all*	*mean nº people less occasionals*	*mean nº people less occasionl +bars*
Fleet Place	65.00	63.00	36.00	10.83	10.50	6.00
Fenchurch Place	75.00	72.00	65.00	12.50	12.00	10.83
New Change	36.00	34.50	26.00	6.00	5.75	4.33
St.Anne St.Agnes Yd.	35.50	27.50	n/a	5.92	4.58	n/a
Love Lane Corner	51.00	49.50	n/a	8.50	8.25	n/a
North Guildhall	9.00	9.00	n/a	1.50	1.5	n/a
AB churchyard	25.00	25.00	25.00	4.17	4.17	4.17
Whittington Gds.	66.50	63.50	48.50	11.08	10.58	8.0
Bank Corner	194.50	98.50	n/a	32.42	16.42	n/a
Royal Exchange	142.50	130.50	74.00	23.75	21.75	12.33
Finsbury Av. Sq.	93.50	88.00	55.00	15.58	14.67	9.17
Exchange Square	496.00	487.50	335.00	82.83	335.00	55.83

Table 2b. Number of static people per public space during October 1996, lunch time only. (12 to 2 pm)

Table 2c

square name	*Sum global integration: values*	*Sum r-3 integration values*	*square area m2*
Fleet Place	7.2101	12.3874	2924.5211
Fenchurch Place	6.2922	11.1664	853.2129
New Change	4.0584	7.4407	371.9767
St.Anne St.Agnes Yd.	3.9322	6.7447	879.7913
Love Lane Corner	5.2472	8.7859	1124.1435
North Guildhall	2.9997	4.1918	1705.3647
AB church yard	1.7119	1.6588	346.7677
Whittington Gds.	5.7425	10.6209	1109.8018
Bank Corner	6.6163	11.4320	1070.3848
Royal Exchange	6.4026	11.5450	1287.0679
Finsbury Av. Sq.	9.6194	19.1725	3244.1298
Exchange Square	12.0337	24.7218	6682.0799

Table 2c. Syntactic elements and metric area of each public square.

3 The City of London syntactic analysis:

This paper argues that it is not possible to fully comprehend the governing laws that effect patterns of space use of public spaces without firstly understanding the principles of the existing working grid where they are embedded. Therefore, the investigation started with the syntactic analysis of the City of London considering an adjoining area in order to eliminate the "edge effect" (Hillier, B. and A. Penn, 1992). Also for a more realistic assessment of the patterns of pedestrian movement, the major pedestrian routes within the public spaces were incorporated in the axial break up of the selected area and consequently in the syntactic analysis, as it can be seen in figures 3.1 to 3.12. The thick black lines represent the axial lines that interface with the urban square and were used for the analysis of the correlation between the integration values and number of static people. The thin black lines show the remaining axial lines of the surrounding area.

Legend
Public Spaces
1 Fleet Place
2 Fenchurch Place
3 New Change/Cheapside Corner
4 St. Anne, St. Agnes Yard
5 Love Lane Corner
6 North Guildhall
7 AB Churchyard
8 Whittington Gardens
9 Bank Corner
10 Royal Exchange
11 Finsbury Avenue Square
12 Exchange Square

Figure 2: Global integration map of the City of London showing the location of the selected public spaces.

Figure 2 below shows the global integration map for the city of London where the darker the line, the most integrated it is.

The analysis of the axial configuration of the City of London shows a good correlation between local (radius-3) and global (radius-n) integration values with a correlation coefficient of 0.64 for p = 0.0001, which indicates a good level of "intelligibility". In other words, in the City of London, at the same time a person is walking through the area not only does he/she have a good understanding how local areas are organised, but also he/she has an additional understanding how the local areas relate to each other as a whole.

In addition, as it can be seen from figure 4, the urban core (in this case showing the ten per cent most global integrated axial lines), that represents the spaces which are more easily accessible into the urban layout as a whole, shows clearly a edge-to-centre layout, where local areas are immediately accessible to the major connectors of the system. Furthermore, the axial configuration map reveals another important property firstly described by Hanson and Hillier (1992) named the "two step logic",

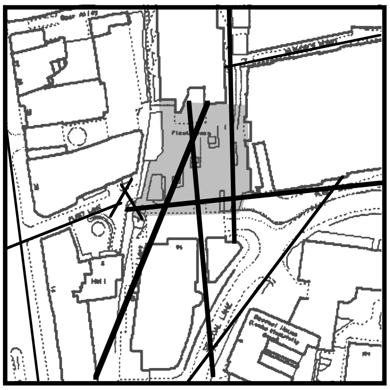


Figure 3.1. Fleet Place

Figure 3.2. Fenchurch Place

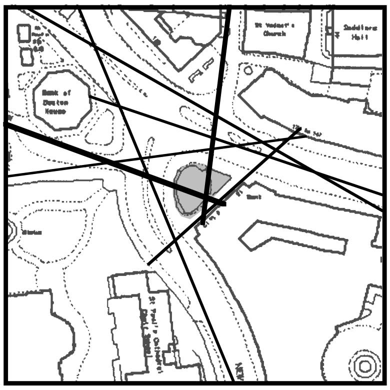


Figure 3.3. New Change/Cheapside Corner

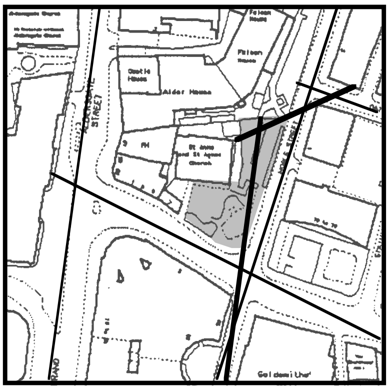


Figure 3.4.. St. Anne St. Agnes Yard

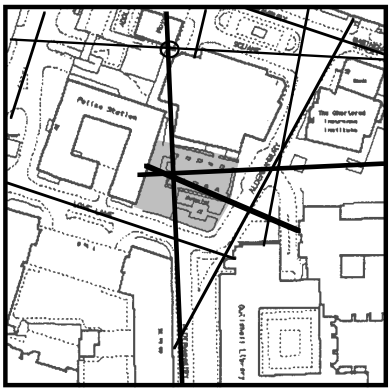


Figure 3.5. Love Lane Corner

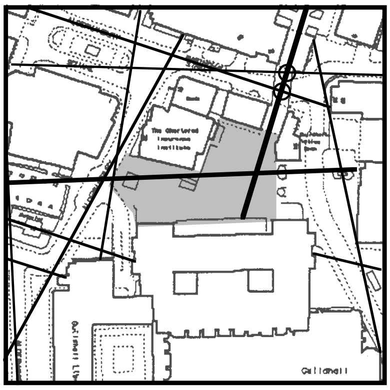


Figure 3.6. North Guildhall

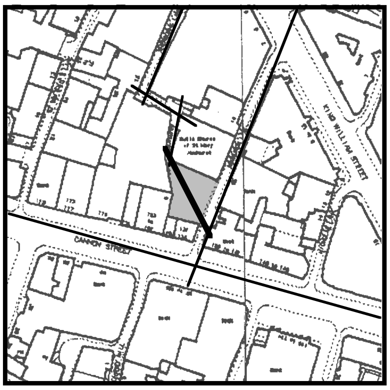


Figure 3.7. AB Churchyard

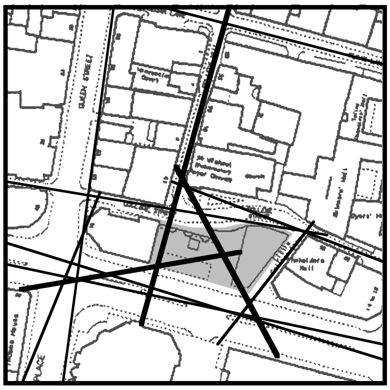


Figure 3.8. Whittihgton Gardens

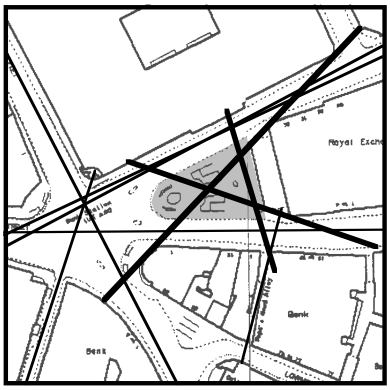


Figure 3.9. Bank Corner

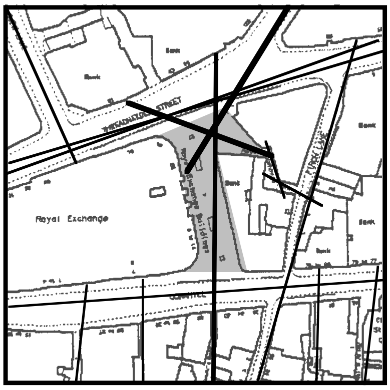


Figure 3.10. Royal Exchange

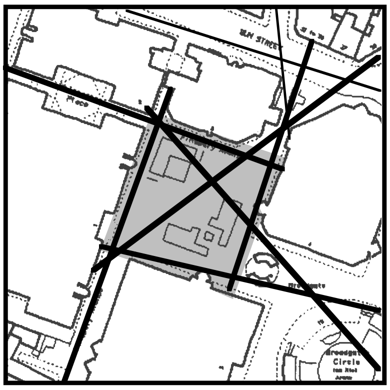


Figure 3.11. Finsbury Avenue Square

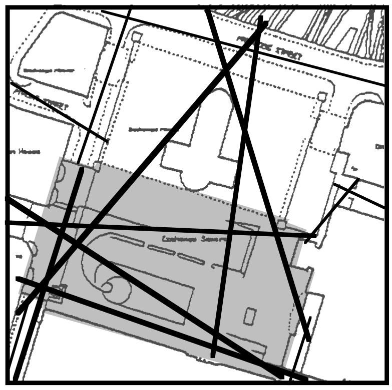


Figure 3.12. Exchange Square

Figures3.1 to 3.12. Location of the selected urban squares and respective axial lines. The public squares are highlighted in dark grey. The black thick lines are axial lines that interface with the public space. The thin black lines represent the axial lines of the surrounding area. All plans in scale 1:3000.

where by entering the City along any of the main traffic routes and taking the longest line available at each intersection, the second line that one passes along leads to an intersection from which it is possible to see the centre of the City at Bank Corner.

Legend
Public Spaces
1 Fleet Place
2 Fenchurch Street Station
3 New Change/Cheapside Corner
4 St. Anne, St. Agnes
5 Love Lane Corner
6 North Guildhall
7 AB Churchyard
8 Whittington Gardens
9 Bank Corner
10 Royal Exchange
11 Finsbury Avenue
12 Exchange Square

Figure 4: Axial break up of the City of London showing the location of the selected public squares and the ten per cent urban core. (black lines)

All these properties illustrate the articulation of local areas to the major grid structure of the City that makes City of London not only very accessible for people not accustomed to the area but also to the ones not familiar to it, therefore being able to promote and enhance the interface between "inhabitants" and "strangers".

4 Spatial configuration of public squares and patterns of space use

But how does the interface between local and global patterns of pedestrian movement in the City relate to the performance of its public spaces? Initially, the results were analysed as to whether a correlation between pedestrian occupancy rates and the sum of the integration values of all the axial lines that interface with the urban square could be established. There was no distinction between the axial lines that terminate within the public space or are extended outside it.

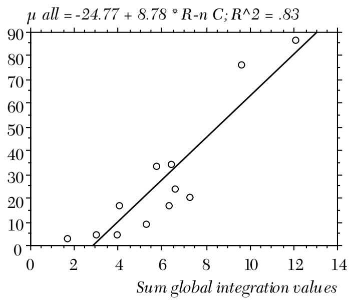


Figure 5.1. Scattergram for Rn values against static people, July 1996.

For the 12 selected squares, a scattergram plotted using the mean number of all static people observed during July with no exclusions, against radius-n integration which shows a good linear correlation with R-squared = 0.83 for $p < 0.0001$. The result proved consistent when the correlation was analysed between the mean number of all static people excluding occasional users and users of wine bars or public houses against radius-n integration showing a linear correlation with R-squared = 0.80 for $p < 0.0001$. Therefore, the same trend was observed despite the type of user as it can be seen in the figures 5.1 and 5.2:

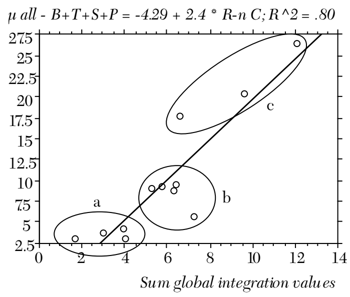


Figure 5.2. Scattergram for Rn values against static people ecl. ooccasionals, July 1996.

The same analysis was made correlating the number of static people against local (radius-3) integration values to investigate if the property would hold for local patterns of pedestrian movement and the results proved consistent with the previous ones.

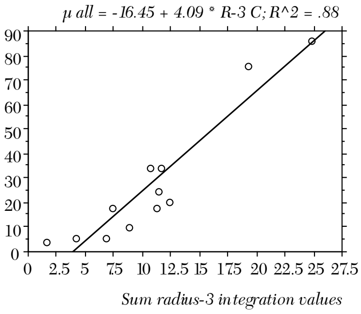


Figure 5.3. Scattergram for the R3 values against static people, July 1996.

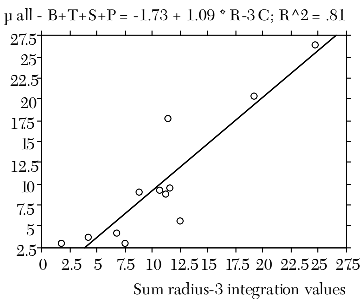


Figure 5.4. Scattergram for the R3 values against people ecl. occasionals, July 1996.

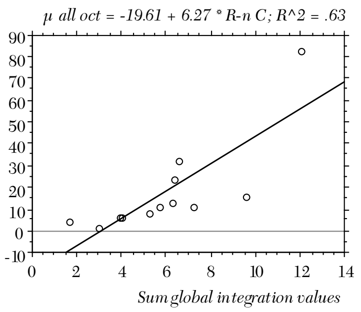


Figure 5.5. Scattergram for Rn values against static people, October 1996.

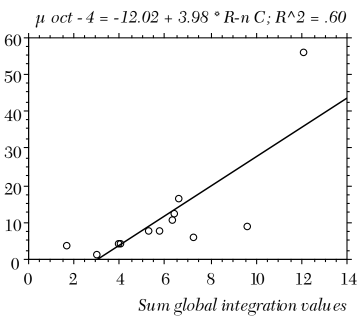


Figure 5.6. Scattergram for Rn values against static people excl. occasionals, October 1996.

The scattergram plotting the mean number of all static people against radius-ones. The scattergram plotting the mean number of all static people against radius-3 integration showed a linear correlation with R-squared = 0.88 for $p < 0.0001$ and the correlation between mean number of all static people excluding occasional users and users of wine bars or public houses against radius-3 integration with a linear correlation with R-squared = 0.81 for $p < 0.0001$, as seen in the figures 5.3 and 5.4:

Probably, the most important information that the scattergrams reveal, is that the public houses and wine bars are not effectively working as major attractors, otherwise it would be very unlikely to establish similar correlations when analysing the total number of static people and integration values for varies public spaces including some with catering facilities and some without. As Hillier (1996) points out: "Places do not make cities. It is cities that make places."(Op. cit.: 151). In fact, the catering facilities are taking advantage of the configuration of the grid and the patterns of pedestrian movement associated with it.

The difference between the scattergrams that plot all static people and the ones that omit the occasional or specific users, is that the second ones show more clearly the difference amid the twelve public spaces as far as the levels of space use is concerned. By omitting occasional users such as tourists or people using the facilities of wine bars it is possible to analyse for all different public spaces the number of potential users of the space irrespective of the facilities available. A closer look to figure 5.2 (and the same analysis is valid for the local values as shown in the scattergram figure 5.4) revels three groups of public spaces that have similar patterns of pedestrian use although morphologically they vary substantially. At the bottom left corner we have a group (a) of 4 public spaces - AB churchyard, North Guildhall, St. Anne St. Agnes and New Change/Cheapside Corner with the lowest amount of recorded static people. Moving to the centre (b), an intermediate group made of Love Lane Corner, Whittington Gardens, Royal Exchange, Fenchurch Street Station and Fleet Place. Finally, the best performers which includes Bank Corner, Finsbury Av. and Exchange Square in group (c).

Could this property between the correlation of axial lines and integration values be a fortunate result associated to good levels of pedestrian occupancy rate during the summer? The same analysis was carried out investigating if the same property could be established with data collected during October 1996. The results proved consistent to the pervious analysis to all levels, even though the data was collected only at the lunch time peak periods as far as levels of spatial use is concerned. The scattergrams for the mean number of all static and mean number of all static people excluding occasional users and users of wine bars or public houses against radius-n integration showed correlation coefficients of 0.63 for $p = 0.003$ and 0.60 for $p = 0.003$ respectively as seen in figures 5.5 and 5.6.

Similarly, the scattergrams for mean number of all static and mean number of all static people excluding occasional users and users of wine bars or public houses against radius-n integration showed correlation coefficients of 0.65 for $p = 0.0015$ and 0.63 for $p = 0.0021$ as seen in figures 5.7 and 5.8.

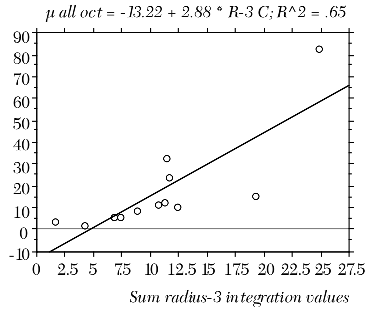
Having established that there is a correlation between integration values and levels of static occupation, the analysis raises other questions about the relevant aspects required to enhance the number of static people. For instance, is it enough to have one single very integrated axial line or would a multiplicity of perhaps less integrated lines induce better results?

A previous study on the morphology of traditional urban squares in European towns (Arruda Campos, 1995), demonstrated that traditional squares have a high number of axial lines penetrating into the public space. From a sample of 30 medieval European squares, research revealed that there was an average number of 5.5 axial lines per urban square. The squares that perform best in this current survey considering the total number of static people all day, Finsbury Av. and Exchange Square, are those that have by far the highest number of axial lines interfering with the public space - 6 and 7 respectively (figure 6.2, group a). As it can be seen from the scattergrams in figures 6.1 and 6.2, when the correlation between the total number of axial lines that interface with the public squares and number of static people has a correlation coefficient of 0.82 with $p < 0.0001$ and 0,75 with $p = 0.0003$ when occasional users and people using the catering facilities are excluded. Also, the scattergram (figure 6.2) shows, as previously, that the selected squares can be divided into three groups, where the public spaces with one or two axial lines interfacing with the public space (group c) are the ones where the least number of static people was recorded.

5 Discussion:

Looking at the three most successful urban spaces, two of them are part of the Broadgate Development with similar morphological characteristics. Finsbury Av. (figure 2.11) and Exchange Square (figure 2.12) are enclosed public spaces, both have well provided street furniture with plenty of places to sit, and wine bars. On the other hand they could not be more different to the third most successful public square - Bank Corner. Bank Corner (figure 2.9) is a completely exposed public space to its surroundings where the encircling streets show a high number of vehicular movement. There is not a single catering establishment in the vicinity and although it has a good number of seats, it is common to see people sitting at the steps of the Royal Exchange building because there are not enough seats available during the peack period of lunch time. The same mixture of elements is found in the second group. Love Lane Corner (figure 2.5), like Bank Corner, does not have any catering facilities in the vicinity, it is reasonable exposed but a very popular destination for city workers. Fenchurch Street (figure 2.2), with bad quality street furniture (it can be very dirty and poorly maintained) is also another popular destination for city workers. Moving to the third group, in AB churchyard (figure 2.7) there is a wine bar facing the square, it is very enclosed (with poor visual connections to the exterior) but nevertheless this was the square that recorded the smallest number of static people during both July and October.

So, are there common morphological characteristics that can be established for public squares to enable predictions to be made when new or exiting public spaces are being re-developed? Although it is believed that some of the factors mentioned at the beginning of this paper such as well designed elements for the public square, provision of places to sit and relax, and even enclosure that maybe does provide a



26.9

Figure 5.7. Scattergram for Rn values against static people, October 1996.

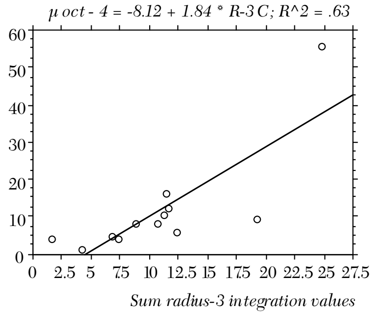


Figure 5.8. Scattergram for Rn values against static people excl. occasionals, October 1996.

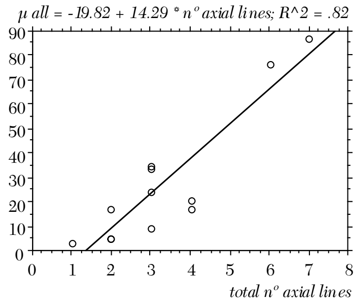


Figure 6.1. Scattergram for sum of static people against total number of axial lines.

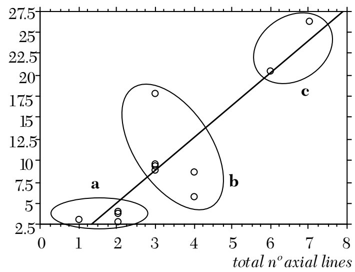


Figure 6.2. Scattergram for sum of static people excl. occasionals against total number of axial lines.

pleasant feeling for some, can add to the performance of public spaces. So far there has not been any significant conclusion that those factors are determinants for the performance of public spaces in the City of London. This paper demonstrates that the degree that the public space is embedded in the urban fabric is the most important property as a predictor for their level of performance. Some properties have been investigated and it is demonstrated that the number of static people deciding to stop in a public square not only is a result of the number of axial lines that interface with the public space, but the sum of it global and local integration values. Therefore this results confirm the original findings by Hillier (op. cit. 1984) in so far as the strategic value and levels of static occupation are concerned.

According to those parameters, the only square that in fact under performs according to the integration values of axial lines is Fleet Place (refer figure 5.2, group b). One explanation is that being a fairly recent development (it was finished in 1992), the buildings surrounding it are not fully occupied. But, definitely, more research specifically about Fleet Place must be carried out to confirm this. On the other hand, the square at Bank Corner (refer figure 5.2, group a) over performs with reference to the sum of the integration values of axial lines that interface with the space. It could be a result of the two step logic described previously. From interviews made with the users of public spaces during the summer of 1996, many respondents answered that they would go to Bank Corner to meet friends for lunch because Bank Corner was a very easy place to find. This illustrates how the spatial layout can enhance or diminish the encounter potential.

6 Conclusions:

Cities are the by-product of the spatial configuration of its urban grid and its potential to generate social interaction. Analysis of traditional squares in medieval cities (Arruda Campos, op. cit.) described how public spaces where located in strategic areas taking advantage of the good patterns of pedestrian movement at both local and global levels. This can be expressed and the results demonstrate that the number of people choosing to stop and make informal use of the space is a function of the number and degree of integration values of axial lines passing throughout the body of the public space for the City of London.

Modern developments most notably Broadgate manages to take advantage of these principles and locate the public spaces in a way that they are well integrated in the grid at local levels, but at the same time with strong proximity to the major connectors of the City. As a result, the perfect combination is established to generate contact with a good balance between the inhabitants and strangers in order to produce liveable public spaces.

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