The Urban Village and the City of Tomorrow Revisited

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0 Abstract

The paper describes the application of space syntax in the development of strategic masterplans for the redevelopment of two problematic modern housing estates in the United Kingdom. The estates examined are Chalkhill Housing Estate in Wembley, North London and Marple Square Housing Estate in central Nottingham. At first glance, the formal design philosophies of each estate would appear to be quite different. One could be characterised a 'city of tomorrow' model based on high-rise, high density, generous provision of green space and elevated 'streets in the sky', whereas the other as an 'urban village' model incorporating low-rise flats aggregated on a hillside geography and a pedestrianised pseudo-street system. Both possess a rigid separation between pedestrians and vehicles. It is suggested that despite this differing formal design philosophies, they both exhibit a common spatial design philosophy based on enclosure and repetition (Hillier, 1988). The paper proposes that careful analysis of patterns of movement and space use, and the urban context, can provide a powerful diagnostic tool for use in redevelopment aimed at improving the quality of the urban environment in existing housing areas.

Keywords: configuration, context. housing, pathology, masterplan

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1 Housing and the modern paradigm

In the recent history of the United Kingdom, there are few sectors of architectural design which have set the context of current theoretical debate so clearly as housing. Although from time to time it has been used for ideological statement, housing is pre-eminently social in its intent. It comes closest to public awareness, not only in the provision of dwelling space in which we all live, but also in the way it serves to construct the open space structure of the city through which we all move, work, socialise and take leisure. Housing is the main constituent building type of urban form. Yet for all its social intentions the failures of 'modern' housing have polarise the theoretical debate concerning the role of architecture with respect to all things social. The problem is posed as a paradox. If the main tenet of modernism - that form and function are related - were correct, how is it possible to explain the functional failures of modernist housing? If form and function are not related, than how can we blame the designers for the failure? This paradox has dogged the recent history not only of housing design, but also of architectural theory and practice. It has caused the retrenchment of serious architectural debate into the more subjective waters of taste and aesthetics, where '-isms' have replaced theories as the main products of critical analysis.

Yet at the same time architectural practice has been faced with a serious challenge. The housing estates of the 1960's and '70's, even some as recent as the '80's, are now the subject of a series of major redevelopment and refurbishment programmes. As much architectural ingenuity is being expended in correcting the errors of modernist

design as was spent on the original designs themselves. The process appears to be one of simplification whereby the highly contrived schemes of modernism are replaced with simpler prototypes - access ways with streets, scissor sections with simpler subdivision and bringing doors to the ground level. The solutions are intensely pragmatic and, on the face of it, pose a problem for architectural theory. They replace the products of apparently sophisticated theory with apparently simple, often normative, rules of thumb. The rules are developed and applied not through rigorous analysis and logic, but most often through the intuition and experience of designers on the ground looking at specific problems and trying to solve them.

In this paper we shall argue that this process actually backs up the proposition that:

- architecture is a theoretical subject;
- form and function are related; and,
- a properly constituted architectural theory can feed directly into the design process.

The argument will be based on the description of two recent cases in which space syntax has been used as a part of the design process for redevelopment masterplans for modern problematic housing estates. However, these cases are of interest not only in terms of the light they throw on how architectural theory can feed into design, but also for fundamental theoretical notions that they give rise to.

2 Synergy, Natural Movement and the Movement Economy

Previous research by Hillier and others has demonstrated that synergy - the statistical relationship between global and local integration - is a general property of a large class of settlements (Hillier, 1996; Karimi, 1997; Major, 1998). This is not a trivial finding. It is simple to design settlements in which the relationship between the local and the global is broken, and significantly we find this has been done in many of the problematic recent public housing schemes in the UK. These housing layouts are often referred to by residents as 'maze like'. Although we have no direct psychological evidence, is tempting to suggest that the human mind may act as a 'correlation detector' in activities such as spatial searches and wayfinding. Where no correlations can be found, confusion may result.

This analysis can go some way to explain what we mean by a 'sense of place' or a named local area in the otherwise continuous urban fabric of traditional cities. If we model a large urban area and then look at the correlation between the global and local measures of spatial integration we find a positive correlation. However, if we select a named local area - Covent Garden in London or Fisherman's Wharf in San Francisco for instance - we find that it forms a tight linear scatter of points crossing the main regression line at about 45°. This shows that for that area there is a locally much improved correlation of global and local spatial properties, and that as you move from space to space you are continually able to infer your position with respect the larger scale of the city. Local 'named' areas seem consistently to have this characteristic of intensified local intelligibility which we believe may provide a working

definition for the perceptual phenomenon of 'a sense of place'. Certainly, when we look at modern housing estates we find that both synergy and the local area effect are significantly decreased for the estate spaces. Often estates demonstrate a clear 'layering' of spaces into bands of different global integration values that conform to steps of depth from the surrounding streets. This means whether you are located in a locally important or unimportant space, your relationship to the larger context is the same and illustrates well the hierarchic and segregated nature of both modern housing design and the theories that underpin them.

One of the other most common accusations made against our modern housing schemes is that they lack 'vitality' and at worst turn into 'urban deserts' devoid of people even in the middle of the day. It is a long-standing question whether the design of the schemes is in any way at fault in this, or whether the blame rests with the way that the schemes are managed, with the socioeconomic status of the residents and so on. The multivariate nature of this sort of socio-spatial question has made it seem almost impossible to resolve one way or the other. However, space syntax allow us to approach some of the simpler questions at the heart of this issue.

Since we can now describe and quantify radically different spatial designs on the same basis we can begin to 'control' the design variable in studies of other aspects of urban function. It is possible to detect effects of spatial design on patterns of pedestrian movement simply by observing pedestrian flow rates at a number of locations in the street grid and then using simple bivariate statistics to look for the relationship between configurational measures of those locations and flows. A large number of studies has now established that spatial integration is consistently the strongest predictor of pedestrian flow rates (see Hillier et al, 1993, for a comprehensive review of the evidence). Spatially integrated lines carry greater pedestrian flows than more segregated ones. The effects are strong and consistent. The key discovery is that the correlation is between pedestrian flows and a purely spatial measure of the pattern of the street grid. No account has been taken of the location of attractors or generators of movement in constructing the measure of spatial integration. It seems that movement patterns result naturally from the way the spatial configuration of the street grid organises simplest routes (involving fewest changes of direction) to and from all locations in an area (Penn & Dalton, 1992). Of course this runs counter to the premises of urban modelling which hold that the key facts in urban systems are the distributions of activities and land uses that 'generate' or 'attract' flows between different geographic locations. These results leave us in little doubt that the primary fact is the pattern of space, and that if there is a relationship between land uses and pedestrian flows (which there certainly is - you find more people on streets with shops than on streets without) this is most likely to be due to retailers choosing their shop sites with care in order to take advantage of the opportunities for passing trade provided by the natural movement pattern resulting from the grid.

We can find support for this hypothesis when we look at samples of shopping and non-shopping streets (Hillier et al 1993). Consistently we have found that in areas that include shopping streets there is an exponential increase in pedestrian flows with integration. In non-shopping areas, however, the correlation is predominantly linear. A possible explanation for this would invoke a mechanism in which shops

locate themselves in numbers that are in proportion to the level of passing trade generated by the pattern of the grid. The shops then attract a number of additional trips in proportion to the attractiveness of the shop. We might then expect areas including shopping to exhibit a multiplier on the basic pattern of natural movement that would be consistent with an exponential growth in pedestrian flows.

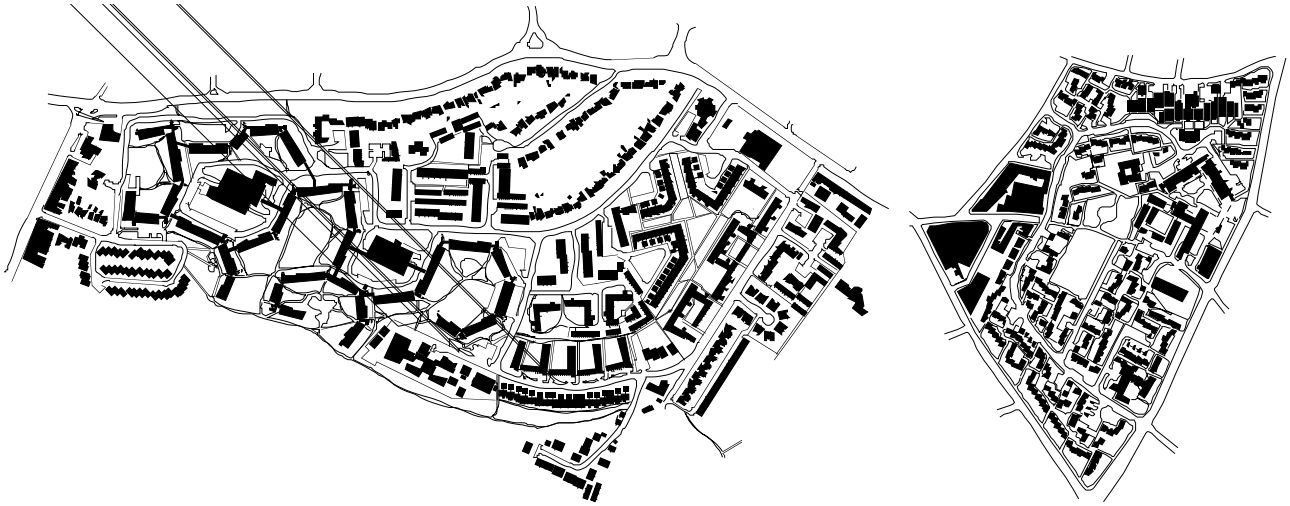
There is a marked shift in emphasis from existing urban theory suggested by these findings. Where current theory takes activities and land uses as the prime movers in urban systems the new results suggest that the spatial configuration of the city exerts systemic effects on both land use and flows. A new economics of the city would move from considering movement as a cost, to movement as a resource that brings potential transactions past land parcels. Trips are as important in terms of what they take you past as they are in terms of where they take you to or from. This moves the scope of urban theory from a subjective individual view in which origins and destinations are the important facts, to an objective social theory in which individual trips are primarily of interest in that they add together to create a probabilistic field of potential encounter and transaction which other members of society can take advantage of in deciding their actions. This suggests an economics of the city based on movement as its principal resource and spatial configuration as its main implement (Hillier & Penn 1989).

3 The probabilistic interface and social pathology

In the city which works well spatial configuration and its effects on the construction of transactions seem to go almost unnoticed. It is only where the problematic designs generated by the poor socio-spatial theories of the recent past have created practically unworkable pieces of urban space that the question of the relationship between design and social function seems to come up. These 'problem estates' are now helping us push forward space syntax as a more robust set of theories of the relationship between the city and society. One of the main ways we are doing this is by becoming actively involved in redevelopment masterplanning for 'failed' inner city housing estates. In these projects the space syntax is being used for three purposes. First, as a diagnostic tool to help pinpoint the precise problems of a specific estate, and so better to direct design effort and expenditure towards those aspects of a scheme that really matter. Second, as a model of pedestrian movement to predict both rates and patterns of movement, to help eliminate the under use and abuse of space that seem to characterise so many of their problems and to try and reintegrate their communities into the larger scale neighbourhood. Third, in order to achieve a natural relationship between local and global spatial properties so that they become more intelligible in their own right and as local areas with respect to their context. In each of these we are gaining new data and discovering new phenomena to theorise about. Live redevelopment projects of this sort always demand methodological development and form the core of the fundamental research activity at the Space Syntax Laboratory at University College London. Two recent projects have proven particularly valuable 'learners' in this respect.

4 The Urban Village and City of Tomorrow

The Chalkhill Housing Estate in Wembley, North London was constructed during the 1970's at the height of the vogue for industrialised building systems. The main part of the estate consists of a series of seven story 'Bison' slab blocks with inter-



a. Plan of Chalkhill Housing Estate, Wembley, London.

b. Plan of Marple Square Housing Estate, Nottingham.

Figure 1. Plans of Chalkhill (a) and Marple Square (b) Housing Estates.

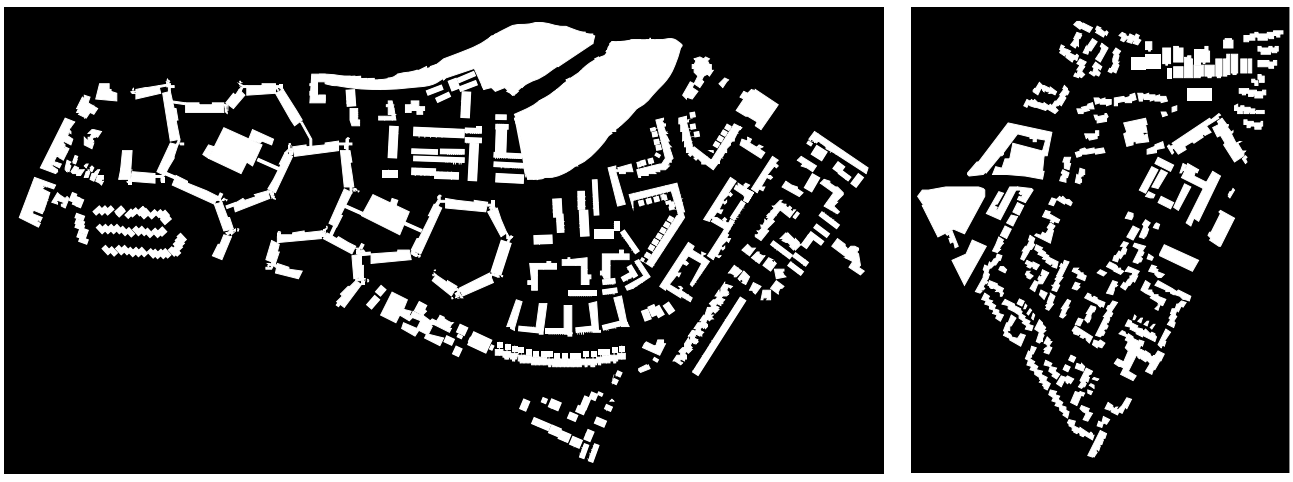
linked corridor access laid out in an approximately hexagonal grid around large enclosed courtyards. The plan is shown in Figure 1a.

The layout of dwellings in Marple Square Housing Estate, central Nottingham of dwellings is characteristic of the contemporary shift from the monolithic scale of high-rise, high density system build housing estates to low-rise, low density villages in the city. The plan is shown in Figure 1b. In this it provides a significant contrast in both scale and conception to Chalkhill. Although the underlying conception of this form of architecture is radically different, representing a shift from the ideal of an urban utopia to that of the romantic urban village, both architectural types might be seen to use similar spatial means in generating their plans although at different spatial scales. In Marple Square the plan is generated by the repetition and duplication of the simplest element of a single dwelling which is then either rotated or shifted in a geometric relationship with its neighbour, or a series of neighbours, in plan. In Chalkhill the element was the 'slab block', but the result in terms of enclosure of convex spatial elements is similar. This much clearer in the figure-ground of the estate with the buildings in white and the spaces between these buildings in black, see Figure 2a and b.

Figure 2. Figure grounds of Chalkhill (a) and Marple Square (b) Housing Estates.

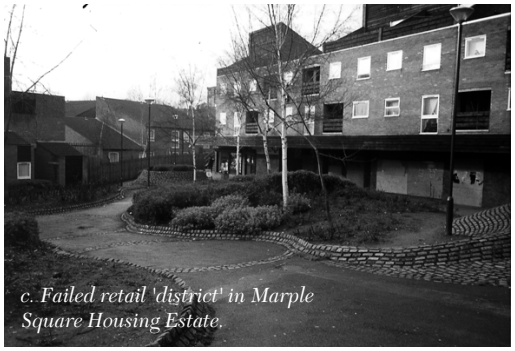
a. Figure ground of Chalkhill Housing Estate, Wembley, London.

b. Figure ground of Marple Square Housing Estate, Nottingham.

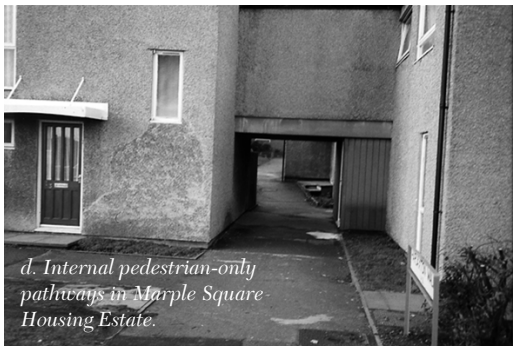


a. Upper level walkways connecting tower blocks in Chalkhill Housing Estate.

b. Ground level access to tower blocks in Chalkhill Housing Estate.



c. Failed retail 'district' in Marple Square Housing Estate.



d. Internal pedestrian-only pathways in Marple Square Housing Estate.

Figure 1. Views of Chalkhill Housing Estate, Wembley, London (a & b) and Marple Square Housing Estate, Nottingham (c & d).

In Chalkhill, vertical circulation towers formed the 'hinges' and links between blocks with ground level access via stairwells to each block, see Figure 3a and b. The corridor system on each floor was intended to replicate street life, and seating areas - now much vandalised - were provided for social use. At ground level shops, communal facilities and play areas were provided, with multistorey parking located in blocks in two of the courtyards. To the eastern end of the estate a series of lower blocks of flats and terraced houses front onto suburban streets. The estate backs onto a mainline railway and is separated from the mainly suburban surroundings on the other three sides by secondary traffic routes.

During the 1980's the estate came to be regarded as the London Borough of Brent's 'worst' estate. Flats were hard to let, and often used to house disadvantaged families and particularly refugees. By the late 1980's crime and vandalism problems led to steps being taken to redesign the estate as well as to improve its management and policing. The main steps were targeted at making the estate 'better controlled'. A system of block wardens was instituted and a police station built on the estate. The physical design changes concentrated on the stair towers at the hinges between blocks which were remodelled and enclosed with entryphone systems. This had two effects. First to block off access from one block to the next at upper and ground levels, and second to block off access from courtyard to courtyard at ground level which had passed through the 'hinge' links.

By 1994 it became evident that these changes would not be adequate to solve the problems of the estate. The London Borough of Brent decided to hold a design competition to select a designer/developer partnership to completely redevelop the estate. The brief was open to all suggestions, but required a complete financial and design package to address the problems of the estate. The Space Syntax Laboratory was approached by a consortium of Avanti Architects and CF Møller Architects to carry out a parallel study of the estate and the design options that were being developed.

On the other hand in Marple Square, one clear characteristic of the design is the use of the repeated single dwelling elements to enclose interior spaces of the estate onto which the entrances of dwellings open, thus dwellings within the estate turn their backs to the primary traffic-articulated streets and tend to conceal dwelling entrances from the larger scale streets of St. Ann's Way, Woodborough Road, Huntingdon Street and Alfred Street Central. In this way, the layout of the estate achieve a rigid separation between pedestrian and vehicle priority routes, see Figure 3c and d. This is a common trait in many 'problem estates' because of the belief that it was desirable to separate pedestrians and vehicles for safety reasons (usually focused on children) and entrances from movement for privacy and security reasons.

In 1994, we were approached by a local community organisation, Technical Aid for Nottingham Communities (TANC), to assist in providing suggestions about how the reputation and environment of the estate

could be improved. This exercise was done in collaboration with the Joint Centre for Urban Design as Oxford Brookes University with the Space Syntax Laboratory undertaking a comprehensive study of the current situation, that is how people moved and occupied space in Marple and how this was related to spatial layout, while the Joint Centre for Urban Design devise alternative redevelopment strategies based on the findings of our studies, and in light of our advice.

In Chalkhill Housing Estate we can begin to explore the concept of the city of tomorrow to arise out of the modernist paradigm whereas in Marple Square Housing Estate we can explore the concept of the urban village, which is now returning to fashion as a model for housing.

5 Methodology

The studies of both estates were in three main parts:

- an observation study of the estate and its surrounding context in which different categories of people (men, women and children) and types of space use (moving and static) were observed at all times of day during weekdays and weekends. These observations were broken down into weekday and weekend observations as well as into five time periods from 8-10, 10-12, 12-2, 2-4 and 4-6;

- a configurational analysis of the estate in its local context; and,

- predictive analysis of the different design options and schemes as these emerged during the design process.

The observational study generated maps of locations of different categories of people summed through each observation round, 20 for each housing estate. A conventional CAD package was used for the map to allow different categories and time periods to be stored on different layers with different symbols and colours so that the relationship between categories could be investigated visually. By analysing these observations graphically and statistically we were able to investigate how far the structure of space, and the pattern of space use within this structure, could be held to be responsible for the problems within the estate.

6 A Broken Interface

Figure 4a and b shows the 'dotmap' for all moving adults observed on weekdays in Chalkhill and Marple Square respectively. Figure 5a and b shows the same for static and moving children In Chalkhill, it is quite clear that the two categories use space in very different ways. Where adult movement is broadly edge to centre, static children cluster in large groups in quite specific, often deep, spaces. They appear to take over the large convex spaces of the courtyards, and congregate in greater numbers in those spaces that are least frequented by adult movement. The adult pedestrian movement dotmap of Marple Square shows high concentrations of movement along the perimeter of the estate along Woodborough Road, a high degree of movement bisecting the estate along Alfred Street Central, as well as high levels of movement along the southern section of St. Ann's Way. In addition to this we can see that significantly lower levels of people were observed in the north of the estate as opposed

Figure 4a. Pattern of adult pedestrian movement in Chalkhill Housing Estate during the weekday.

▶ Moving Adult

Figure 4b. Pattern of adult pedestrian movement in Marple Square Housing Estate during the weekday.

▶ Moving Adult

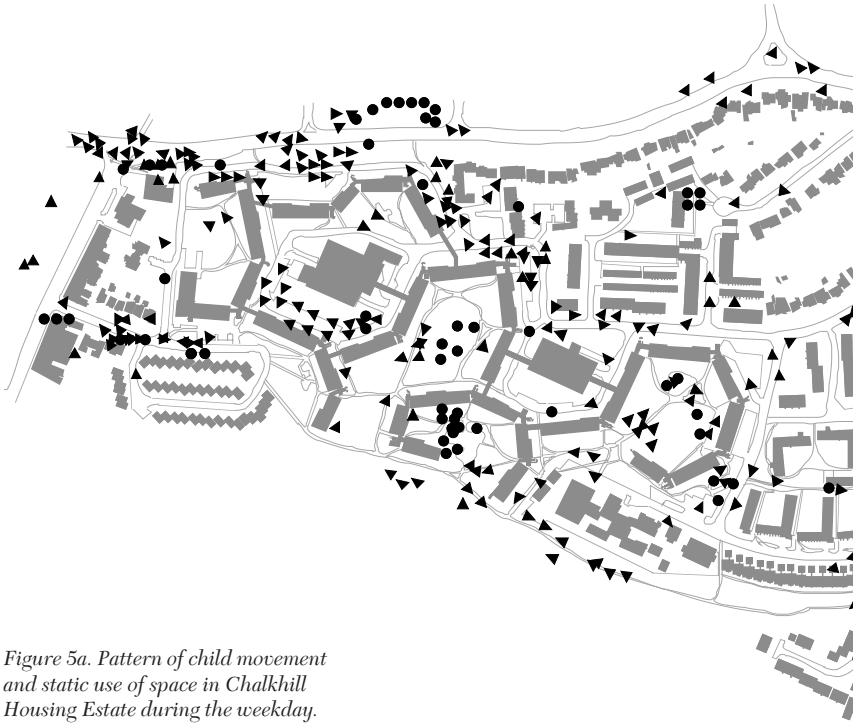


Figure 5a. Pattern of child movement and static use of space in Chalkhill Housing Estate during the weekday.

▶ Moving Child
● Static Child

Figure 5b. Pattern of child movement and static use of space in Marple Square Housing Estate during the weekday.

▶ Moving Child
● Static Child

to the south and that the number of people observed decrease the deeper into the internal pedestrian-only pathways one moves. The picture that this map provides us with would seem to suggest that movement in the estate moves along the perimeter street of Woodborough Road enters the site along Alfred Street Central or St. Ann's Way dispersing among the complexity of routes available from these streets whereas movement out of the estate would appear to operate in the opposite direction. Woodborough Road is clearly the main sink and source for all larger scale movement. At the same time, it is clear that a high number of children are focused in the recreation

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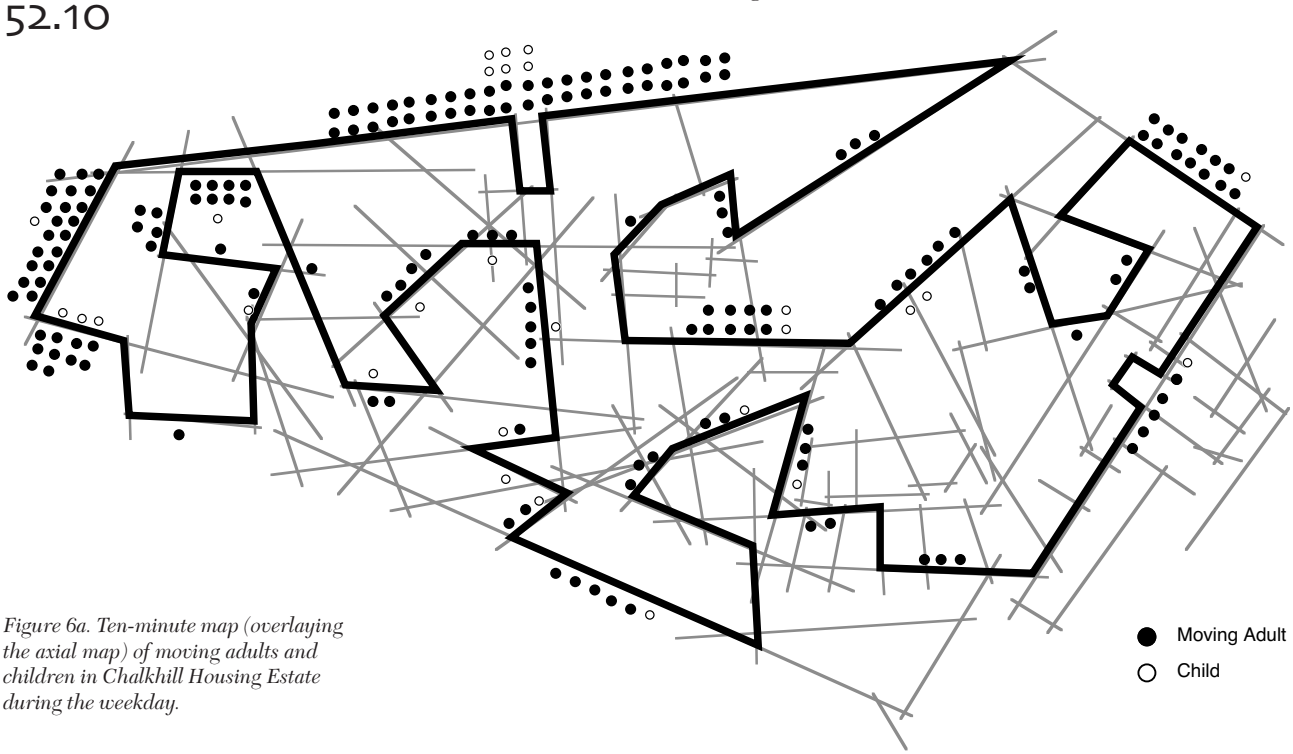


Figure 6a. Ten-minute map (overlaying the axial map) of moving adults and children in Chalkhill Housing Estate during the weekday.

Figure 6b. Ten-minute map (overlaying the axial map) of moving adults and children in Marple Square Housing Estate during the weekday.

ground area of the estate suggesting that this is working as a focus for children. In addition to this, some static children were observed in the area of estate west of Heskey Close and south of Alfred Street Central around the internal links off Norman Close. Although the recreation ground is successful in focusing children into a single space it does so to such an extent that the ratio of adults-to-children in the recreation ground during the weekdays is approximately 1 adult to every 6 children and during the weekend this ratio increases to 1-to-10.

We can see the effects of this separation much more clearly in Figure 6a and b. It shows the ten-minute maps for Chalkhill and Marple Square respectively. They show the typical number of moving adults and children (static and moving) one would encounter on a series of selected routes within each estate. We can see that in both estates there are a high number of adults in movement at the edges of the estates. The same is true of children but in these spaces they are greatly outnumbered by adults. However, internally within both estates these relationship breaks down to the point that in several spaces the proportion between moving adults and children falls to 2-to-1 or 1-to-1.

This is an effect of the spatial complexity in each estate in that for adults in movement it is more efficient and quick to move around the perimeter of the estate rather than pass through it. This results in movement levels falling rapidly the deeper one moves into the estates. This can be seen clearly in Figures 7a and 8a, which shows the relationship between movement and depth from the perimeter in Chalkhill and Marple Square respectively. A direct result of this spatial complexity and inverse relationship between movement and depth is the radical separation of moving adults and static children within the internal spaces of the estates, see Figures 7b and 8b. We have found that this broken interface, which we refer to the L-shaped Effect, is a common characteristic of housing areas utilising enclosure and repetition in their spatial design strategy. It has been found that this L-shaped effect can have a pervasive effect in people's perception of safety and crime within the estate, and eventually on the reputation of the estate as a 'no-go' area. This perception may not necessarily be based the actual conditions within the estate, for example the rate of crime and vandalism, but can be a powerful stigma on the people who live in these housing areas. We also believe that some of the problems of child socialisation, vandalism and abuse may result in part from this.

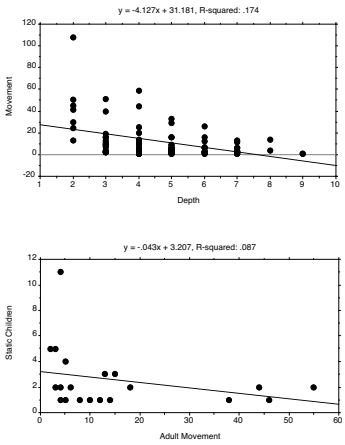


Figure 7a & b. Scattergrams showing that (a) movement decreases the deeper one moves and (b) the L-shaped effect between moving adults and static children, indicating a broken interface, in Chalkhill Housing Estate.

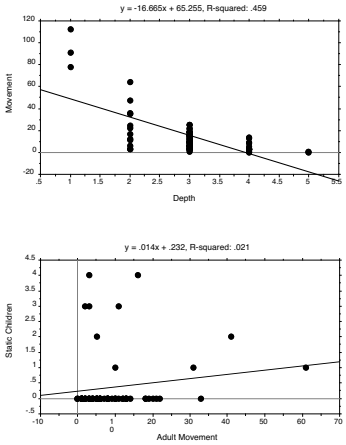


Figure 7c & d. Scattergrams showing that (a) movement decreases the deeper one moves and (b) the L-shaped effect between moving adults and static children, indicating a broken interface, in Marple Square Housing Estate.

7 Gender, Dwelling Entrances and the Separation of Pedestrians and Vehicles

A rigid separation between pedestrian and vehicle spaces forms a key component of the spatial strategy in both of these estates. Indeed, the spatial complexity of these estates can be seen as directly derived from this objective in that for highspeed vehicular movement it is, like pedestrians moving from area to area rather than to destinations within the estates, to travel around the perimeter. More than this however, there is a rigid separation designed internally within each estate for inhabitants with the creation of pedestrian-only 'green' paths and vehicle-only access roads. This leads to a very distinctive pattern of movement within each estate for different categories of user.

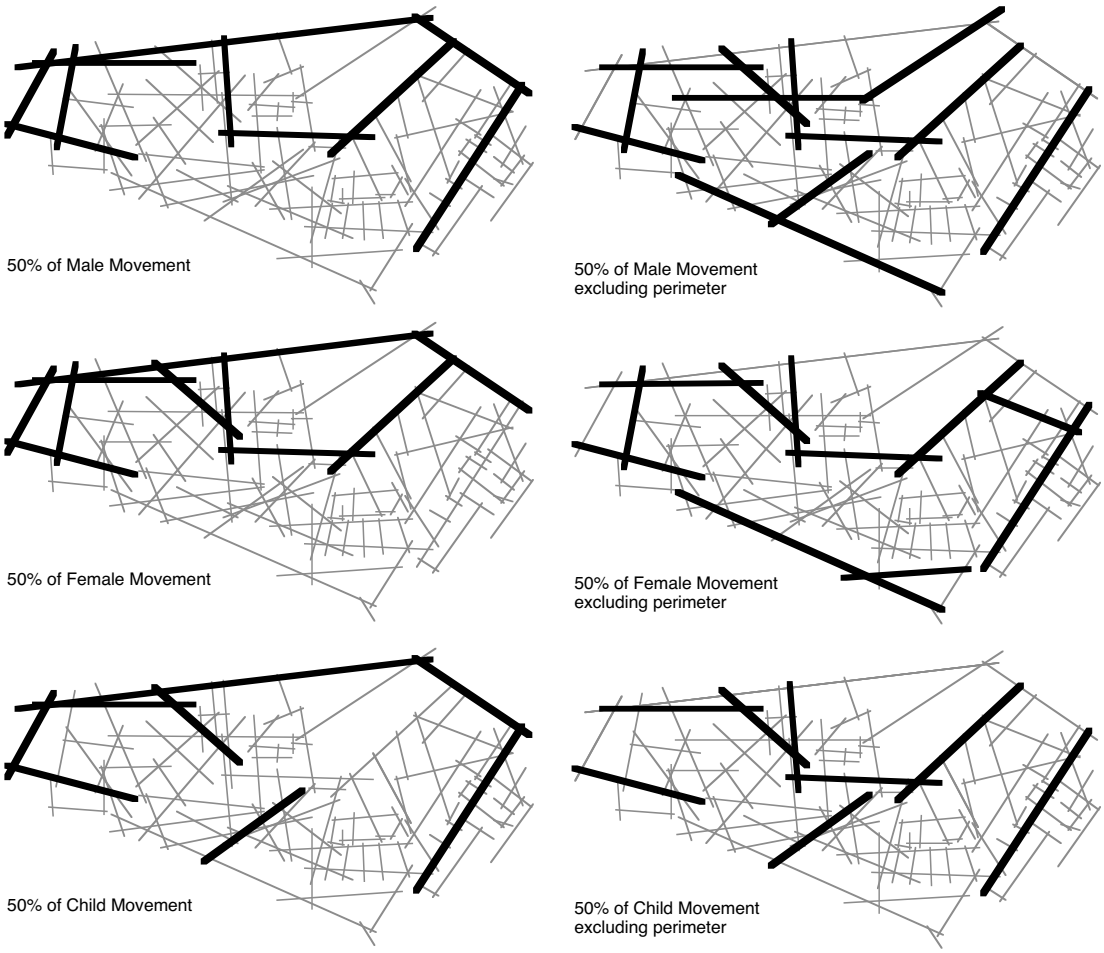


Figure 8a & b. Weekday Gender Maps showing the spaces utilised by the (a) highest 50% of movement and (b) the highest 50% of movement, excluding the perimeter in Chalkhill Housing Estate.

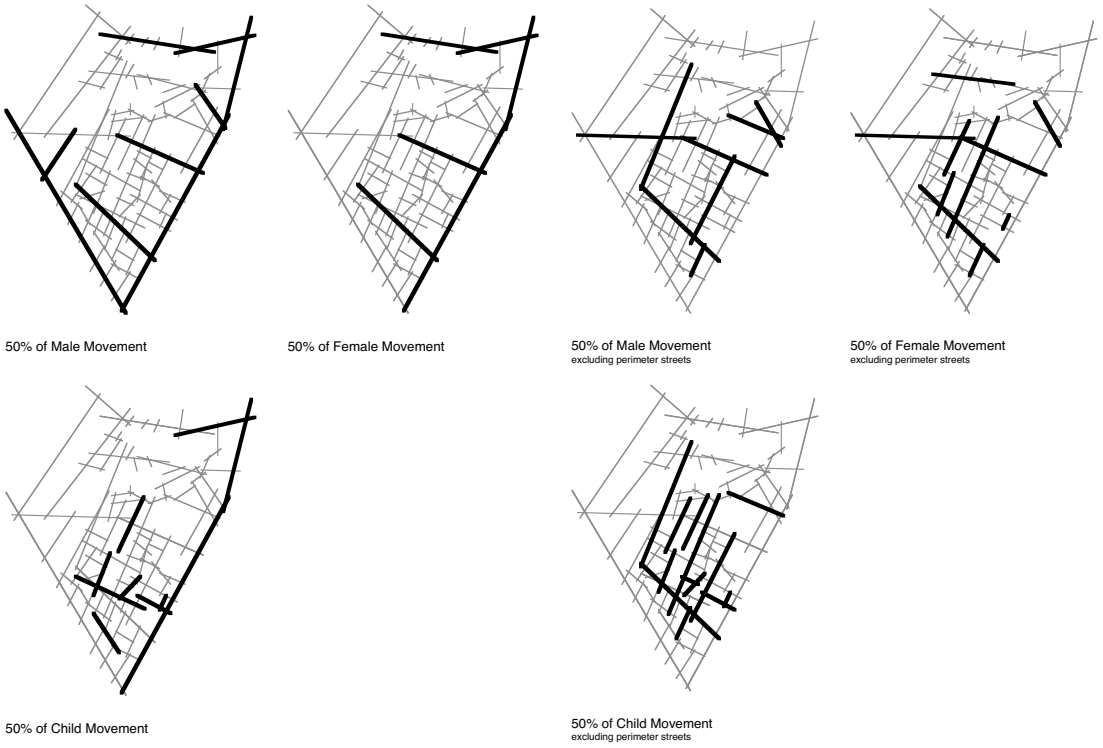


Figure 8c & d. Weekday Gender Maps showing the spaces utilised by the (a) highest 50% of movement and (b) the highest 50% of movement, excluding the perimeter in Marple Square Housing Estate.

Figure 8a and b demonstrates a clear relationship between the perimeter streets of the estate and how people are moving in Chalkhill. Figure 8a shows where the highest 50% of movement for males, females and children respectively can be found in the estate. We can see that the majority are distributed on the perimeter. Figure 8b again shows where the highest 50% of movement is in the estate, this time independent of its perimeter streets. This reveals two interesting points. First, the pattern of movement inside the estate concentrates around what we could call a 'secondary' perimeter which is immediately adjacent to the primary perimeter of the estate and to the majority of building blocks - hence only one step of depth inside the estate. Second, this 'secondary' perimeter of movement in the estate is focused on those few routes in the estate open to vehicular traffic. It would suggest that the residents in their everyday use of space have articulated a second perimeter of spaces one step into the estate, and near building entrances, which has resulted in the re-establishment of a relationship between pedestrian and vehicular movement which the planning of the estate and traffic calming within it have sought to separate.

In contrast, the situation in Marple Square is quite different because the segregation of children and adults is pervasive. Figure 8c and d again shows the patterns of space use by the highest 50% of movement by males, female and children, with and without the perimeter. Figure 8c demonstrates that for the most part there is a strong bias to the perimeter routes of the estate when the highest 50% of movement for each category is examined. Figure 8d highlight the lines on which the highest 50% of movement is concentrated for each category within the estate (excluding the perimeter streets). This shows that males are using the primary vehicular streets (on average one step from the perimeter), women also use these streets, but a greater amount of female movement is concentrated one step off these streets (and two steps from the perimeter), whereas children can be found on the primary streets just as males and females, but also in spaces which are two spaces from these primary streets (thus three steps from the perimeter). This would seem to indicate that different categories of people are using space quite differently from each other. We could infer from this that men are moving from their dwellings (usually from the back door) and then out of the estate either on foot or by vehicle. Women would appear to move on foot from dwelling entrances to primary roads then out of the estate to the perimeter roads and children appear to be either moving out of the estate along the same routes as women or moving from dwelling entrances and back doors deeper into the more secluded areas of the estate.

Statistically, this seems to be bore out. Figure 9a-c shows the statistical correlation between each category of user within Chalkhill (males and females, females and children, males and children). We can see that there is a statistically significant correlation between the movement levels of each category within the estate. Besides the interesting way in which users have reconstituted the pedestrian/vehicular interface within the estate, overcoming if you like the design strategy of rigid separation by basically abandoning the internal, deeper 'green' spaces of the estate, it would also suggest that the broken interface between adults and children in Chalkhill is primarily one of moving adults and static children. We can see statistically the different spaces males, females and children are prioritising in Marple Square in Figure 9d-f. In these correlations we can see a selective set of spaces which are being used primarily by

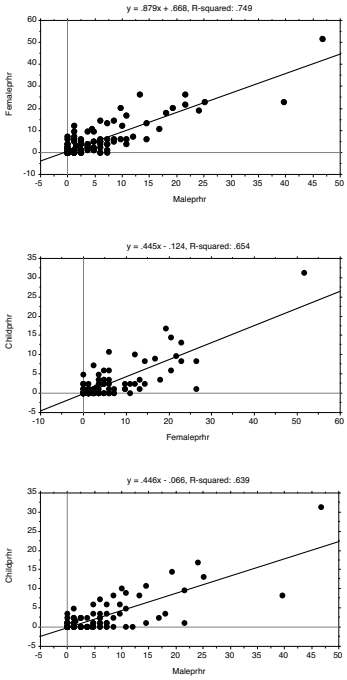


Figure 9a, b and c. Scattergrams showing that the relationship between (a) moving males and females, (b) moving females and children, and (c) moving males and children in Chalkhill Housing Estate.

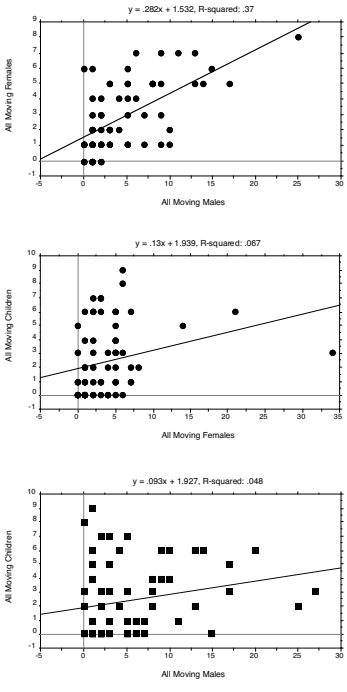


Figure 9d, e & f. Scattergrams showing that the relationship between (d) moving males and females, (e) moving females and children, and (f) moving males and children in Marple Square Housing Estate.

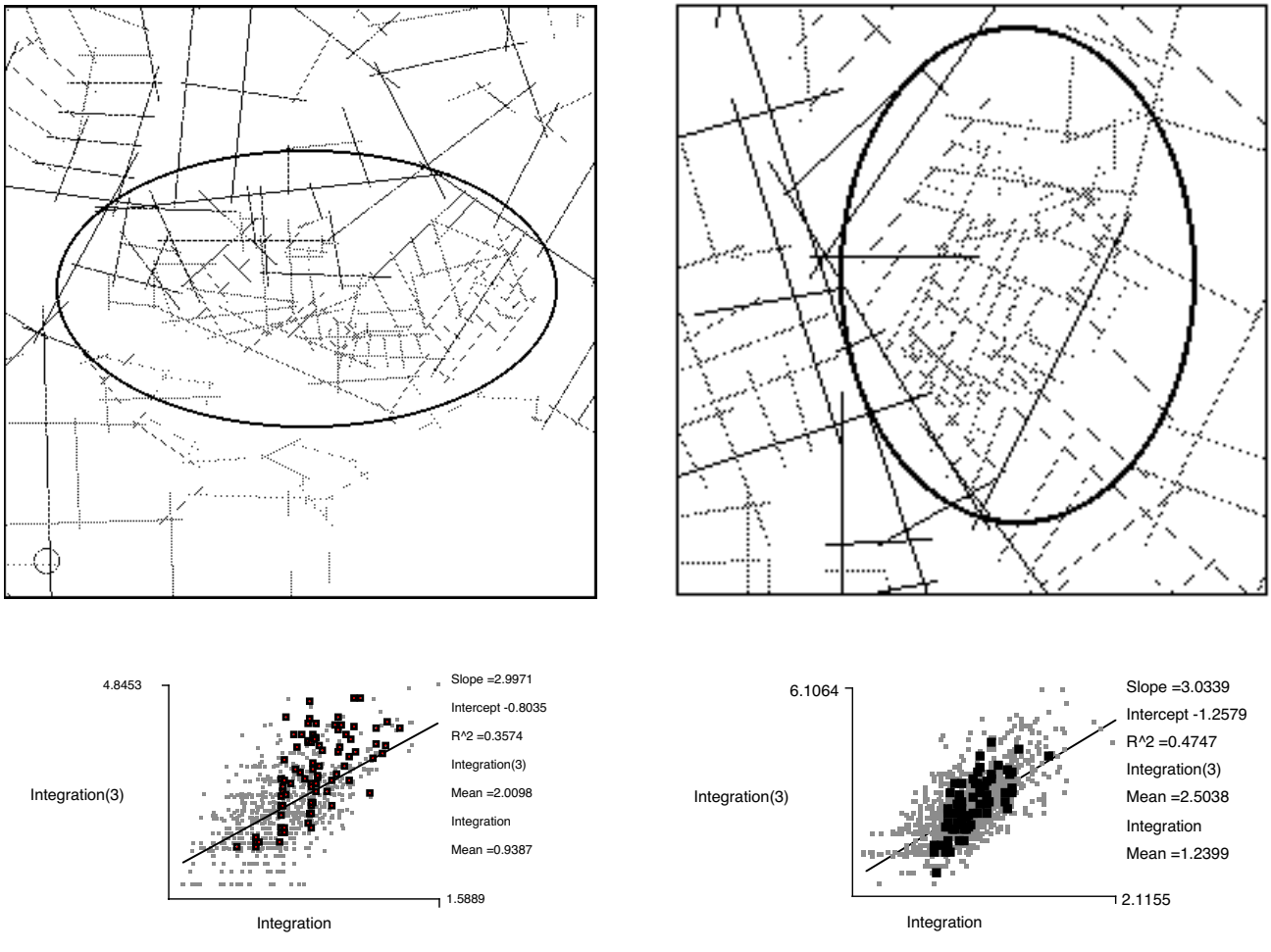
one category of people and not by the other. This would suggest that in Marple Square that the broken interface between adults and children is more pervasive, incorporating all children (both moving and static).

8 Spatial Surgery to Improve the Quality of the Urban Environment

A configurational analysis of the Chalkhill embedded in its surrounding urban area suggests that the fall off in rates of movement is also related to the pattern of integration of the estate with respect to its context. This is as might be expected since the axial map of the estate shows a high degree of complexity and break-up of lines of sight in the estate interior, see Figure 10a. Effectively, at each change of direction as you move into the estate from its edges the whole of the surrounding area is distanced by one step of depth and you are only brought closer to a relatively small number of the interior spaces. When we look at the spatial analysis of Marple Square embedded in a map of the its larger surroundings, see Figure 10b, we can clearly see the estate is also segregated and relatively complex in terms of the degree of spatial break-up.

The result of this degree of break-up, subtle perimeterising of movement and the consequent isolation from its surroundings is two fold. First, the estate behaves quite differently considered as a purely local spatial system and as a system bedded in its surrounding context. Considered on its own, as you move from space to space, each change of direction takes you away from some spaces and brings you closer to others. In fact as you move away from the edges of the estate you are brought closer to more and more of the spaces in the estate. The effect is to give a very poor correlation

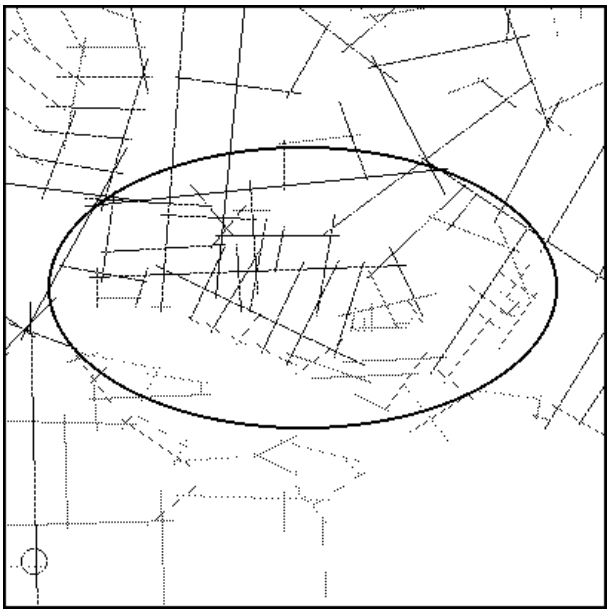
Figure 10a, b, c & d. Existing pattern of global integration and the correlation between global and local integration in Chalkhill Housing Estate (a & b) and Marple Square Housing Estate (c & d).

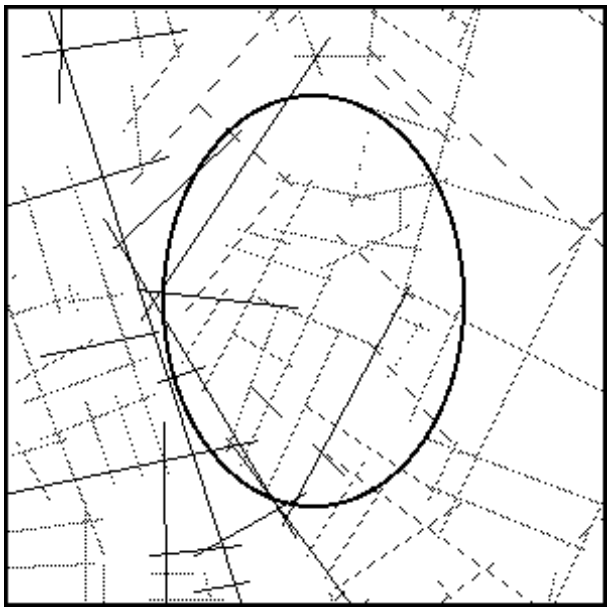


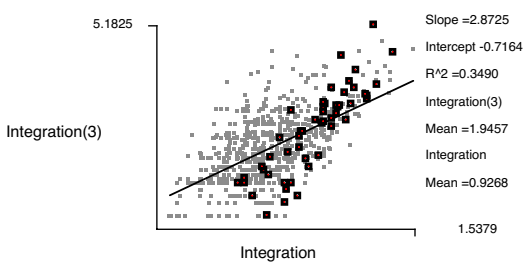
between the local and global spatial parameters for the estate. Figure 10c-d shows the scattergram of the relationship between local and global integration for the whole model area for Chalkhill and Marple Square respectively, but with the spaces of the estate highlighted. The scatter is almost completely random with no correlation between local and global properties on the estate. Second, and we believe more significantly, it leads the edge related global movement of adults to use a radically different set of spaces to those used by the children on the estate for their more locally related 'static' socialisation and playing activities. The result is a characteristic L-shaped distribution of adults and children we saw in Figure 7b and d. Where there are high numbers of the one there are low numbers of the other and vice versa.

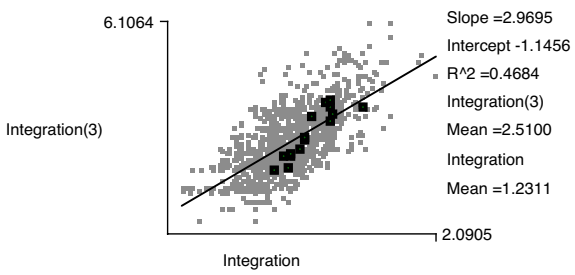
It was possible to show through this analysis that some of the recent steps taken to block off the vertical circulation routes in Chalkhill, and to control movement within the blocks and at ground level between the courtyards, had the effect of exacerbating the degree of segregation of the estate interior, and could possibly have led to an increase in the degree of polarisation of space use. The same also seems to be true of the recent changes to Marple Square to alleviate some of the perceived problem of the estate by blocking off the internal pedestrian-only routes in the north of the estate and limiting access. If we examine Figure 5b we can see that there is a strong bias of child space use to the south rather than the north. This is strongly suggestive that the effect of these changes was to shift the problem of child space use exclusively to the south, if you solving the problem for the north of the estate while intensifying it in the south. It seemed clear therefore that any approach to the redevelopment of

Figure 11a, b, c & d. Proposed pattern of global integration and the correlation between global and local integration in Chalkhill Housing Estate (a & b) and Marple Square Housing Estate (c & d).









the estate would need to tackle two main problems: the degree of isolation from the surrounding context and the lack of intelligibility of the estate both internally and with respect to its context.

The process of work at this point was iterative. The architects would draw up diagrammatic proposals for different ways of redeveloping the estate, bearing in mind the main issues the study had suggested needed to be addressed, and these were then analysed in relation to the context model. The main parameters that would be assessed were the degree of integration of the estate spaces and the strength of the local to global regression line for the estate spaces in the context of the whole area. Over a two dozen different scheme options for both estates were evaluated in this way, with feedback being given both graphically and in numeric form. The final proposal for Chalkhill Housing Estate in Figure 11a shows a high degree of simplification of the internal spatial structure of the estate, based around the use of fewer and longer lines of sight and access through the estate, and shows the effect of this strategy in the significant improvement to the pattern of integration in the estate interior. Figure 11b shows the spatial analysis of a scheme based on a proposal for Marple Square Housing Estate made by Oxford Brookes University. Several improvements have been made to the spatial design of the area based upon the recommendations of our report (Hillier & Major, 1994). First, the scale of space is much larger and compatible to the more traditional areas of Nottingham. Second, the patches of segregation created by the internal pedestrian-only pathways and dead-end spaces have been eliminated leaving the estate relatively free of segregated areas. Thirdly, the articulation of routes from the south to north makes movement through the estate simpler and complements the already strong west-east through-route of Alfred Street Central. Crucial to this proposals the internal remodelling of dwellings to reverse the entrances, i.e. back door becomes front door and vice versa.

Figure 11c-d shows the local area scattergram with the new Chalkhill and Marple Square spaces highlighted respectively. These now fall on a much tighter regression line indicating a greater degree of intelligibility, for the estate as a whole. If we compare these to the scatter of the existing systems in Figure 10c-d we can see that the high degree of layering typical of housing estates has been eliminated and that the estates make a more linear scatter across the slope of correlation. This suggests that with these proposed models of space a highly intelligible local housing area will have been created with good levels of natural movement, in which the boundary that defines it as an estate would have been mainly eliminated. If carried out as proposed both of these proposals should make it possible to reconstitute Chalkhill and Marple Square as an integral part of the city rather than as an enclosed enclave.

9 Conclusions

Although transaction would appear to be the proper interest of a spatial economics, encounter, and particularly the concept of the field of co-encounter between different social categories, would seem to have more far reaching social implications. These studies have shed light on the way spatial configuration constructs patterns of movement and encounter, and we believe on the social pathologies that can ensue. There is remarkable consistency in the way that post war public housing in the UK has sought to segregate its public open space from the surrounding street fabric.

This is demonstrated by substantially reduced integration values for housing estate spaces compared to traditional street areas in configurational analyses. As might be expected, presence of pedestrians also drops substantially in estate interiors, to the point at which they are sometimes referred to as 'deserts' or being in a state of 'perpetual night'. It seems that spatial segregation serves to isolate the estates from all through movement to the point at which you can be alone in space for most of the time. However, where we observe space use patterns by different categories of people simultaneously we find still more suggestive results. Patterns of space use by children and teenagers of school age differ radically from those of adults. Children gather in groups, often not moving much but using space to 'hang out' in locally strategic locations which are cut off from the outside world in the estate interior.

These locations tend to remove them from informal surveillance by adults as they move into and out of the estate, and if we look at the correlation between adult and child presence in estate interiors we find a characteristic 'L-shaped' distribution. Where there are greater numbers of adults there are low numbers of children, and where there are larger numbers of children there are lower numbers of adults. In normal urban streets there is a much stronger correlation between adults and children suggesting that an informal interface is maintained. These findings appear to be general. In recent doctoral research, Xu Jianming has studied a sample of postwar UK housing estates and detected a correlation between the mean integration of the estate and the strength of the L-shaped effect, see Figure 12. The more segregated the estate the greater its effect on separating the different categories of user. These findings are now being added to by more recent studies of crime locations which suggest that the strategic locations in estate interiors which are emptied of normal adult levels of movement by being segregated from through movement to and from surrounding areas become the favoured locations for specific types of crime and abuse.

It seems quite possible that the configuration of urban space through its effects on patterns of movement may construct informal probabilistic interfaces between different categories of people. The interface between shop owners and buyers makes transaction possible, that between adults and children may turn socialisation and control into natural and unforced processes. Alternatively, where space structures lead to a polarisation of space use by different social categories, we suspect that distrust, stigmatisation and crime result. It seems possible given this view of the relation between social processes and spatial configuration that the theories which gave rise to zoning of 'communities' in their own 'territories' served to foster the social pathologies they were intended to control. If this is so it is little wonder that 'theory' has gained such a poor reputation amongst practitioners and the public alike.

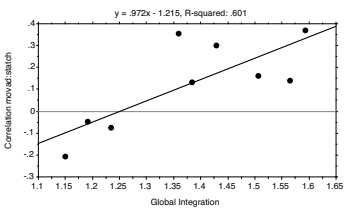


Figure 12. Correlation showing the relationship between the R^2 value of the L-Shaped Effect and Global Integration in nine Modern Housing Estates in the United Kingdom, including Chalkhill and Marple Square.

We believe however, that the new form of analytic theory which is being developed in studies such as these holds a great deal of hope for the future. We are now beginning to apply the knowledge gained through trying to understand and correct the mistakes of the past in new housing schemes on the urban fringes. At Linz in Austria for example we are working with a consortium of architects including Sir Norman Foster and Partners, the Richard Rogers Partnership and Thomas Herzog + Partner, to help develop the masterplan for a new 'Solar City'. In this scheme concerns for

environmental sustainability go hand in hand with the recognition of the need to generate a socially and economically sustainable urban form. By applying the lessons learned from studies of successful and failed urban areas we believe that it is possible to be both objective in assessments of different design strategies, and to deal with individual cases and their different contextual areas without recourse to the kinds of normative design prescriptions about which designers and the public alike are becoming so suspicious.

52.18

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