Look back to London

How a city or town works depends on the relationship of its parts to the whole. Bill Hillier analyses London and Milton Keynes — with research by Alan Penn and computer software by Nick Dalton — to see what makes a place buzz.
Milton Keynes

urban whole. In urban design terms, Milton Keynes stands for the idea that towns are assembled parts into a whole, rather than wholes in which good parts arise. If Milton Keynes doesn’t work, there is something wrong about the way we understand what makes towns and cities tick, and how the bits can and should be put together.

In a sense, all urban design is about parts and wholes. We either add a new part to an existing whole or design a new whole made of parts. Strangely, in spite of the clarity of its plan, the two things that Milton Keynes is most often said to lack are a local sense of place and the sense of the urban whole.

In contrast, big messy cities like London, which seem in plan to lack any clear part-whole structure, are usually said to succeed on both counts. The ‘deformed grid’ of outward-facing built islands defining an apparently undisciplined network of intersecting rings of space surrounding each block is a typical of historic cities. Somehow the sense of local place and global urban area is from an inner logic in this apparent disorder.

How does it happen? A substantial body of research, using computers to analyse the spatial and functional complexity of cities, suggests that the spatial form of cities, and especially their part-whole structure, may have been misunderstood. Urban forms have been conceived of essentially as static objects, with movement in well specified paths.
Milton Keynes

channels. Conceptually, we separate the form itself from movement in the form. In fact, the most powerful influence shaping urban form is probably movement. This may sound initially odd, since cities seem to create movement rather than respond to it; people scurry to and from stations, or vast fluxes into urban areas occur in the morning. Most urban movement is not this, but what we call natural movement. Natural movement is movement within urban spaces that is determined by the structure of the urban grid itself, rather than by specific factors such as buildings. Most urban movement, pedestrian and vehicular, is a natural movement in this sense, because all buildings in the city attract and generate at least some movement, and movement therefore tends to be from everywhere to everywhere else. Because this is so, most movement we see in an urban space is not movement through movement, and movement in space is determined by how that space relates to the rest of the grid.

By combining a new kind of computer analysis of plans with careful observation of movement, we find that a high proportion of movement in spaces — usually about three-quarters — can be predicted from a purely mathematical analysis of a property we call ‘connexion’, a term we use instead of ‘through movement’, and movement in space is determined by how that space relates to the rest of the grid.

By converting the grid into an urban grid, by treating each part of each line in a local system or the whole system, we can analyse an urban grid in such a way as to predict likely movement as well as explain actual movement. Because this relationship is fundamental, it can be applied in many other aspects of urban function, including the spatial pattern of crime, the evolution of land-use pattern, parks and values, location of retail, even the distribution of various grades and types of housing.

Scales of movement

This relationship influences the development of the urban form itself by shaping the matrix of public spaces through which all movement must pass. This happens not in a simple way, but in such a way as to ensure that different scales of movement in the urban grid — people moving in and out of buildings, those on local trips, those on longer trips, and those involved in long-distance travel — are continually co-present, or at least close to each other.

This creates what we call the multiplier effect of urban space. The multiplier effect happens when the spatial design exploits the simple fact that all trips produce a by-product in that each must pass through a number of intersecting spaces, to create patterns of natural co-presence which can be turned to economic, social and cultural advantage. It is this that creates urban life out of everyday movement, and eventually turns collections of buildings into cities.

How exactly does it work? Let’s begin at the smallest scale in the nearest part of the urban fabric. In the 1745 plan of the allegedly labyrinthine part of the City of London between Cornhill and St Paul’s, the Open space is broken up in two ways. The largest and fewest convex spaces, which are the biggest and longest straight lines of sight and access line passes through all the courts and offices.

By superimposing one on the other, we see how strongly the tendency for lines to pass through a series of convex spaces, making the line structure much simpler than it appears at first sight.

A closer look shows a principle. When entering the complex you make a turn, thus losing sight of where you have come from, then either the second line already shows you another way out, or it takes you to an intersection with a line which does show you another way out. This makes it difficult to get very far into the labyrinth. The line principle makes the complex easily navigable; both in itself and from the main grid, and as a result it is well used for movement. A similar effect is found at the larger scale urban grid, as an axial map of the city as it is today. If you enter the City at one of its gates, and take the longest entrance road you reach the main grid along with a longer line intersection from which the centre of the City at Bank railway interchange can be seen.

Beneath the apparent disorder of the City grid there is a concealed logic. Because people move in lines, try to approximate lines on more complex journeys, and are guided in movement by available lines of sight. The effect of this is that space is so arranged as to be a ramification of movement, and the relation between different scales of movement. Many of the picturesque properties of urban space — lines of sight passing through intersecting spaces — are coincides of incidence of lines of sight on building surfaces — we find themselves being guided in cities, but to be intrinsically related to movement, the most basic of urban functions.

Movement also shapes the whole structure of the City. If we take a small belt, say Leadenhall Market, and ask how it is structured, we find a pattern of segregation rather like a small-scale version of the city as a whole. Integrating lines link edge to centre in all main directions, making a kind of gridiron wheel form, with clustered ABAB integrating lines in the interstices
This makes the Lexden Hall Market area into an insalubrious social intensification of the grid, rather than a town in a local intensification of the road network in a region.

The pattern, coupled with the consequent relation to building entrances, becomes particularly visible as a system of movement in the urban grid, giving rise to the multiplier effect.

The same pattern is found on a larger-scale in seventeenth and eighteenth century areas like Sobe, 14, and in quite nineteenth century residential areas like Barnsley, with its 'urban village' at its heart, powerfully connected to the supergrid in all directions.

And this century, the local 'deformed wheel' was the generic structure of London — the secret of giving a very big city a local sense of place, and of combining the free continuity of space with a differentiation in the spatial character of areas.

Wherever it is found, there is some kind of multiplier effect from space, whether contributing to the sense of urban safety that comes from natural co-presence in residential areas, or contributing to the urban life in public spaces. It is this property which is now being sought through new urban projects where the kind of analysis has been used in the design, such as Sir Norman Foster's King's Cross proposals, the Farrell-Simpson-Desktop Paternoster Square scheme, and Farrell's Broadgate project in Birmingham.

Unfortunately, twentieth century interventions on the urban fabric, especially housing, have tended to disrupt every aspect of this generic pattern, in particular the delicate relation between the definition of the part and the region in the whole. The relations between building entrances and public space, between local and global movement and between inhabitants and strangers are systematically pulled apart. Obsessed with internal layout rather than the relation between internal and external structure, twentieth century urbanism disrupts the past whole pattern, eliminates all multiplier effect, and creates zones that are so remote from the public realm that they no longer operate as urban space. The ambiguities and dangers of this type of space have become a major problem the world over in the late twentieth century.

The Romance of the cities

Why did this happen? It happened because false ideologies of segregated urban communities and collective territorialisations created concepts of space which were local, rather than global, static rather than dynamic, and too often visual rather than functional. The plain fact is that the romance of cities as created by flaneurs.

Cities are romantic in their outcomes, not their genesis. The effect of romantic urbanism, however successive its intentions, was to cover the tracks of twentieth century urbanism. Of course, we never did it to ourselves. We have only to contrast the fiascos of the street systems of east and west London to see

10 Axial map showing the freest and longest lines of sight and access of the City of London, coloured according to the spatial integration of each line: to move from any line to another involves passing through a minimum number of intervening lines, each line is a minimum number of changes of direction from all other lines.

This is the basis of integration: the less tortuous the paths on average, the more integrated the line. Red lines have the highest integration, down through brown, yellow and green to light blue and dark blue for least. 'Integration' indicates the movement potential of the line. Short trips — such as those by foot — tend to be calculated by integration calculated up to three lines away from each line. The colours result from analysing only the structure of the grid, and take no account of natural movement rates, land uses or built form densities — so the degree to which this pattern of integration in the grid predicts potential movement is remarkable.

11 Equivalent diagram of parts of Milton Keynes — the centre and some typical grid squares.

12 Larger-scale analysis of London's Sobe and 13, a Milton Keynes grid square.
Milton Keynes

that disorderliness is a form of architecture aimed at the less privileged members of our society.

We can now turn to Milton Keynes and ask what it is. Reality and experiment suggest that Milton Keynes is not the first town of a new kind of urbanism, but the first whole-scale expression of twentieth century disorderliness disguised as romantic urbanism — the end of a tradition, not the beginning of a new one.

Milton Keynes is not, I suggest, the city built for the car but the last town to systematically try to separate local and global movements between inhabitants and strangers. In doing that it extracts every movement, and canalises it into specialised systems. Each aspect of movement is separated from the other, and from the life that they could create together. In terms of the multiplier effect, Milton Keynes is a town of masses. What it provides through its built form, it provides more cheaply than elsewhere. But the town itself adds nothing through its design.

It is easy to see how it happened in the design of Milton Keynes, the strategic decisions pre-empted the tactical ones. Once the decision was made on the urban grid, land-use distribution and densities were in place. The invention of romantic urbanism was whirling in the wind. Cities and towns are invented by how they handle movement and the relation between movement and life. Milton Keynes is the town of separation. While its strategic design principles remain in place — a large-scale grid without buildings, grid square layout, which do not contribute to a larger scale structure, and separation of forms and scales of movement — Milton Keynes cannot be other than it is now.

Inertia, it seems, is not mysterious. Good space is lost space. Most urban space use is movement. Most movement is through, movement is the by-product of how the grid offers routes from everywhere to everywhere else in the grid. Most informal space use is movement-related, as is the sense and fact of urban life.

Land use and building density follow movement in the grid, both adapting to and multiplying its effects. The urban buzz, or the lack of it when it suits us, is the combination of these.

The architecture of the urban grid is fundamental to the life of the city and town. It must therefore be a primary object of architectural thought and creativity. The proper design of the grid is the pre-condition for urban success. If handled right, the grid, and the grid alone, can bring the whole system of yard uses and densities into a structure which maximises the multiplier effect which is the principal source of the distinctive life of cities and towns.