Impacts of Large Scale Development:

Does Space Make A Difference?

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Abstract

Large scale development, a process to rapidly transform urban built environment since the industrial modernism, has been often criticized for creating fragmented environments that impair urban vitality. Many opponents of large scale development, especially the Jacobists, further addressed its destructive impacts upon those most directly affected, such as the communities and the marginal businesses in the vicinity. How far does an insertion of a large scale development impact on its surroundings? And how far do the surroundings impact on a development? Does space, or space configuration as defined by Hillier, matter in the two-way processes of interaction between a development and its surroundings at the urban design level? This paper gives a comparative study, through the appliance of space syntax methodology, of Canary Wharf in London and Brindleyplace in Birmingham from 1991 to 2001. During this period, Canary Wharf had slowly shifted evolving from development with deregulation in the first phase to a process of cooperation with local authorities, whilst benefiting from good links to the rest of London via a tube line and an express way, but it has been still criticized for failing to achieve social regeneration; Brindleyplace, however, at first applied a traditional urban design approach to integration with urban setting and has been appraised as a model of urban renaissance. This paper analyses whether the different spatial strategies result in the different spatial configurations, and then whether pedestrian movement dynamics and social aggregations respond to and shape the different spatial configurations before and after the developments. Evidence from these aspects direct the paper to suggest that spatial configurations at street level could play a fundamental role, prior to and beyond development size, in two-way impacts between a large scale development and its surroundings, whether positive or negative. Furthermore, it argues that whether a large scale development becomes a positive or negative attractor to its surroundings at a variety of interconnected levels could be primarily determined by the relationship between spatial patterns at different radii. The process of two-way influences between a development and its surroundings might shed the light on interaction between pattern and process in complex urban system and related social issue of urban fragmentation during the period of rapid but planned urban transformation after the Industry Revolution.

Introduction

Large scale development, a process to rapidly transforming urban built environment since the industrial modernism, has been often criticized for creating fragmented environments that impair urban vitality and diversity. Many opponents of large scale development, especially the Jacobists, further addressed its destructive impacts upon those most directly affected, such as the communities and the marginal businesses in the vicinity (Jacob, 1961; Fainstain, 1994; Foster1999).Some of them proposed small scale, incremental, local place-making and low-cost community-based initiatives rather than large scale trickle-down developments (Jacob, 1961; Gratz, 1994). However, many researchers pointed out that large scale developments have never stopped, although they have not good records. (Hall, 1998; Olds, 2001; Altshuler and Luberoff, 2003). Rossi (1992) explained that industry becomes the true protagonist in the modern city transformation via large scale developments. Olds (2001) argued that large scale developments are related to the nature of modernity, termed by Giddens (1991), where social relations are disembedded from local contexts of action. How to solve the problems of large scale developments? How far does an insertion of a large scale development impact on its surroundings? And how far do the surroundings impact on a development? Various studies, starting from the perspective of urban policy, urban socio-economy and urban planning, have set-up to tackle these problems. Jacob (1961) advocated public participation policy, mixtures of primary uses, high densities of population and retaining old buildings mixed in with new. Fainstein (1994) identified the importance of interrelation between global economic structures and individual decision-makings involved in the large scale development and further proposed participation planning and private-public partnerships as alternative ways to mitigate adverse impacts. Altshuler and Luberoff (2003) addressed that the "bottoms up federal bureaucracy", federal agencies becoming engaged locally, played a fundamental role in identifying negative impacts by new large scale developments in the United States. From the view of urban morphology, Jacob (1961) also suggested a continuous network of small blocks and frequent streets to promote local vitality in a new development. Krier (2003) further reinterpreted the European traditional typological of the street, the block and the quarter to create "locus foci" in new developments. However, all these approaches ignored both the importance of global spatial structure and relations between urban space and social activities. Space syntax theory and its techniques, generated by Hillier and his colleagues, could be another approach to tackle the problems of large scale developments. Hillier (1987, 1993, 1996) provided the theoretical models that the generic spatial laws can direct movement patterns, and then impact upon land use choices, and finally produce social consequences. Then, he (1996) articulated that it is global spatial patterns and dynamic relations between different scales rather than local and static spatial patterns to help us understand both the whole city and its parts. Moreover, he (1999) explained that urban live centres, termed as attraction inequalities in urban grids, are driven by both global position and local conditions measured by space configuration, and further argued that configuration generates attractor. Does space, or space configuration as proposed by Hillier (1996), matter in a large scale development? Do the interdependent spatial configurations, locally and globally, relate to social and economic dynamics before and after this kind of quick but planned urban transformation? Thus, this paper gives a comparative study, through the appliance of space syntax methodology, of Canary Wharf in London and Brindleyplace in Birmingham from 1991 to 2001. It analyses whether the spatial strategies in these two developments result in the different spatial configurations, and then whether pedestrian movement patterns and social aggregations in the developments and their surroundings respond to and shape the different spatial configurations before and after the developments.

Why study Canary Wharf and Brindlyplace together? In the first place, Canary Wharf, a major urban regeneration in London, has been always criticized for failing to achieve social regeneration in its surroundings (Foster,1999), but Brindleyplace, a flagship project in Birmingham, has been appraised as a model of urban renaissance (Healey, 1999). Both developments initially tried to create new urban centre in derelict brownfield sites surrounded by low-income groups. Canary Wharf is located in the poorest Borough of Tower Hamlets in London; equally Brindley is located in the poorest area of Ladywoods in Birmingham. However, there are entirely different comments on their social achievements after the developments.

Second, both had a different background of spatial planning and development framework, although they have a similar spatial and functional location at the urban level. This helped to distinguish the different local and global spatial strategies in both developments. Canary Wharf is located between the City of London and the geographically isolated Isle of Dog; equally Brindleyplace lies between the artificially segregated city centre core, by the notorious Birmingham Ring Road, and the other urban areas. Both developments faced the problem of how to deal with connections to other urban areas. But they had different approaches. London Docklands development, the urban context of Canary Wharf, started with planning policy of deregulation in 1980s. LDDC put an emphasis on flexible market-led development and then had no visionary spatial framework of the whole Docklands even at the rescue phase of Canary Wharf from 1992 to 1998. (Gordon, 2001) Thus, London Docklands development finally created a fragmented urban environment (Foster, 1999). Although Canary Wharf had a masterplan and design guidelines produced by SOM in both the first and second development phases to ensure continuous and high quality open space alternatives within the site, the masterplan was considered as a welcome barrier to the adjoining poor area of Poplar (Brian, 1992). LDDC and private companies always used tube, light rail lines and highway to link Canary Wharf to the rest of city. In the rescue session, the Jubilee Line Extension, the Dockland Highway, and the Dockland light rail extension were all finished to sustain the running of Canary Wharf (LDDC, 1998). However, Brindleyplace is located in the BSRA (Broad Street Redevelopment Area), defined in 1984, where both the local authority and the city council always had a visionary spatial framework to maximize the accessibility to the BSRA as an urban centre (Birmingham City Council, 1994). It is partly due to the lessons learned from the notorious ring road around the urban centre core that destroy the vitality of Birmingham. Thus, The city council assembled the 40 acre site for public buildings in Brindleyplace by open and compulsory purchase from 1980s to 1990s, the same as LDDC did in Canary Wharf, but insisted on a holistic masterplan and flexible strategy rather than 1950s' comprehensive planning, which was praised by scholars and developers (Holyoak, 1999; Madelin, 1999; Healey, 1999). Moreover, Brindleyplace was optimized its accessibility to the surrounding areas at every stage of the masterplan, and even Space Syntax Limited gave spatial and movement analysis at the urban level that played a critical role in the revised masterplan (Holyoak, 1999).

Third, different metric scales of the developments were built in the cities of differing size, which helps to clarify the extent to which both metric sizes of the developments and their spatial configurations impact upon the surroundings in the new developments. Rossi (1992, p158), coming from a point of typology, argued that changes of scale do not affect the laws of developments. Canary Wharf is about 71 acres but Brindleyplace 17 acres， while London is much larger than Brindleyplace. Can Canary Wharf give more spatial and social impacts on the surroundings in the respect to its much larger metric size? Or can the relation between local spatial configuration and global one give more fundamental influences? Generally, it may partly illuminate the question of whether the fragmented urban transformation is essentially led by metric size of development or its spatial configuration.

Spatial transformation

Are there different spatial transformations in the two cases of Canary Wharf and Brindleyplace before and after the developments? This paper starts by comparing the spatial structures and syntactical values in axial maps of the two cases. The axial maps in 1991 and 2001 were produced to illuminate the spatial structures of the developments and their surroundings in the urban milieus. The proportion of the site area to its background area is about 6% in these two cases in order to ensure the same proportion of the site system to the whole urban context. Fig.1 shows that the axial maps of Canary Wharf and Brindleyplace according to integration in the radius of n and 3 before and after the development. It illuminates that before the developments there were not global or local integrated lines within two development sites, but there were global or local integrated lines glancing off the sites. After the development, Canary Wharf had a local integrated line but no global one, and its north surroundings had more think lines that suggested it became more integrated, yet its south surroundings still had few thick lines that meant it remained segregated. However, Brindleyplace gained both global and local integrated lines, and all surroundings had more thick lines.

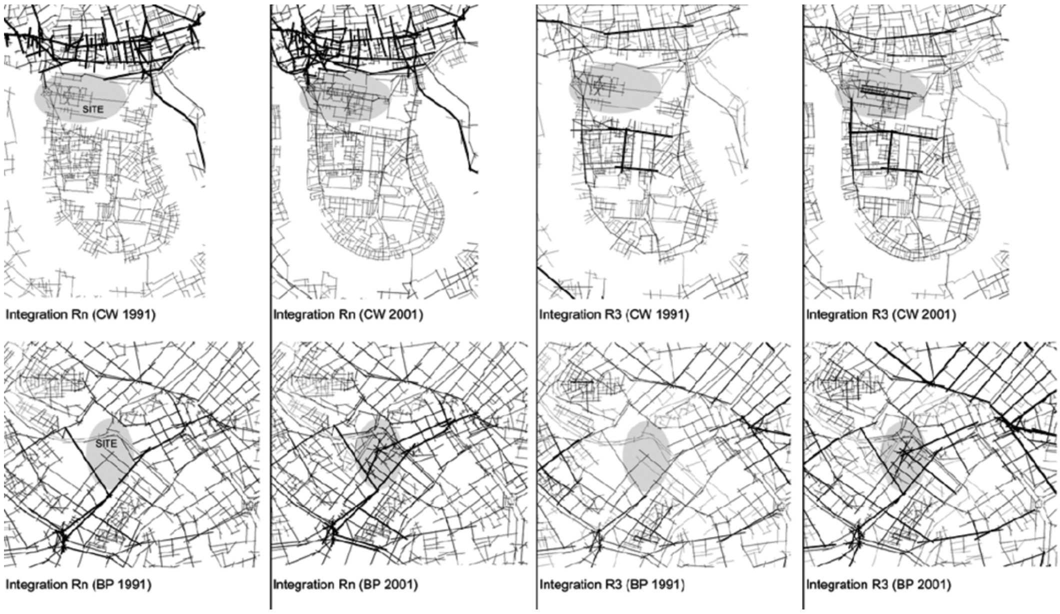


Fig.1 Axial map (CW: Canary Wharf; BP: Brindleyplace; Thicker a line is, more integrated the line is.)

Then, syntactical value of a sub-area is defined to compare different spatial patterns in sub-areas. Int. Rk of a sub-area is defined as the mean integration, at the radius of k, of axial lines within and across a sub-area to describe the topological position of the sub-area in the whole urban system. Inte. k of a sub-area is defined as a variable of R-square between Connectivity and Rk to measure the degree of intelligibility of a sub-area at the radius k. A series of Int.k of a sub-area could present its different intelligibility degrees within the space systems at the different radii. In this study, the surrounding areas in the two cases include the nearest neighbourhoods abutting the development sites. The surroundings of Canary Wharf is divided into north (N), southeast(SE), southwest(SW), and east & north east (E&NE) parts, whilst the surroundings of Brindleyplace divided into north, south, east and west parts , according to their natural boundaries, such as the quays or the canals, and main roads or rail lines(Fig. 2). Fig.3 shows that Canary Wharf remained its relative high local integration (Int. R3), high local intelligibility (Inte.3), but, low global integration (Int.Rn) and very low global intelligibility (Inte.n) after the development; Fig.3 also shows that Brindleyplace, however, gained high integration and intelligibility at each radius. It could be suggested that Canary Wharf remained spatially isolated after the development, but Brindleyplace was spatially embedded in the existing urban structure.

Fig. 2 Boundaries of sub-areas for spatial analysis

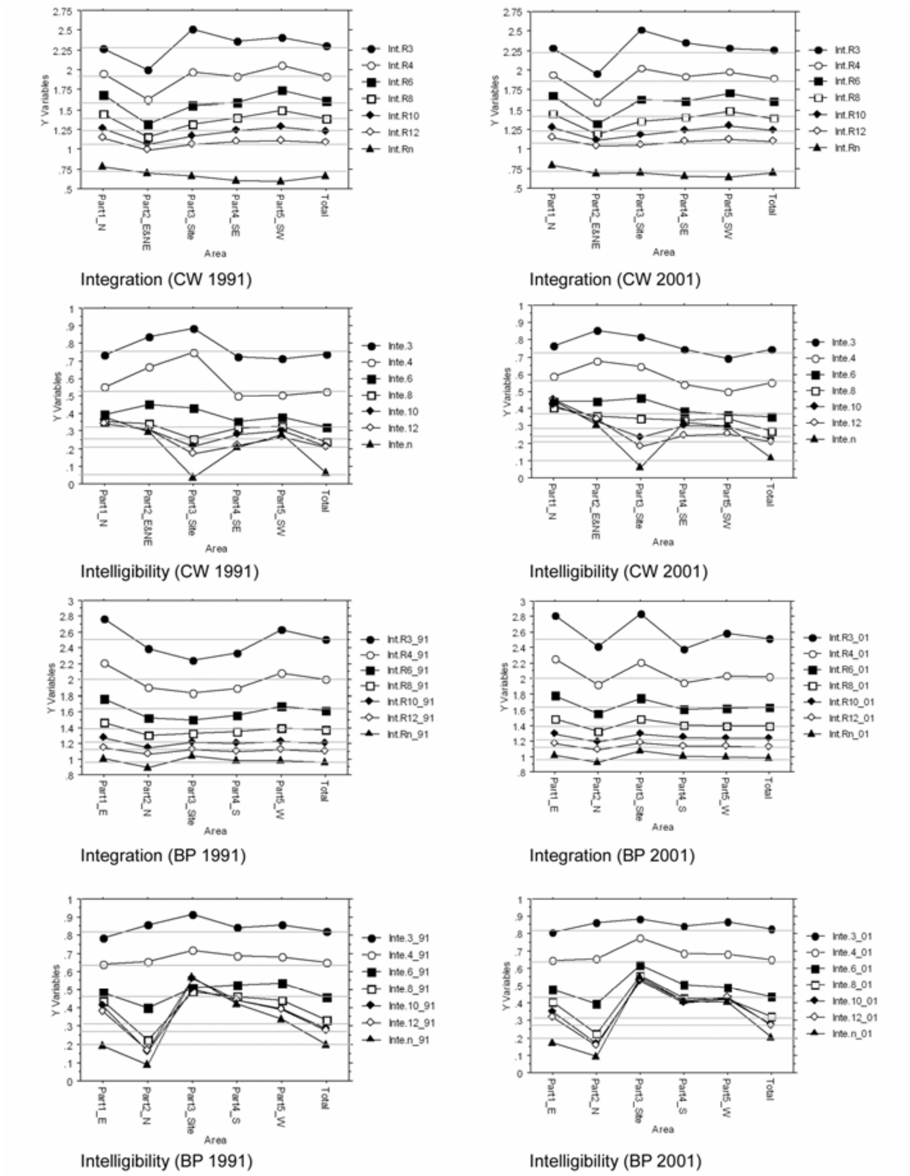


Fig.3 Integration and Intelligibility at different radii in the two cases (CW: Canary Wharf; BP: Brindleyplace)

Movement pattern and spatial configuration

Pedestrian movement patterns were very different in Canary Wharf and Brindleyplace. Do different spatial configurations relate to the different pedestrian movement patterns in these two cases? Further, pedestrian movement patterns before and after the Brindleyplace development were also different. Does the change of spatial configuration caused by the development make sense?

Different pedestrian movement patterns in the two cases

Fig.4 and Fig.5 are rendered to represent the movement patterns of the two sites on workdays in 2004. Each grey scale represents the same value across each case so that the comparison between them can be seen. In the case of Canary Wharf, the gates of high movement rate are almost entirely concentrated inside the site of Canary Wharf except a gate to the south east office area, and it faded away from the main entrance of Jubilee Tube Station to the periphery. In addition, along the site boundary, each gate inside the site had a much higher movement rate than the neighouring gate outside the site, which shows a jump of movement rate change between the development site and the surroundings. For example, at the north edge of the site, the average change of movement rate from the gates inside to the ones outside is up to 4.42. It is as if there is a barrier along the boundary of the development to prevent high pedestrian movement across the site edge, which was actually one of the ideas in the masterplan of Canary Wharf by SOM. Canary Wharf, it could be suggested, give few influence on the movement in the surroundings. However, in the case of Brindleyplace, the clusters of high movement rate were distributed in the development site, the city centre core to the east, and the Five Way area to the west. The moderate movement flows were between them. And, regarding the gates along the boundary of the site, not all of them inside the site had more movement rate than the neighbouring ones outside. Thus, the movement pattern did blur the site boundary of Brindleyplace.

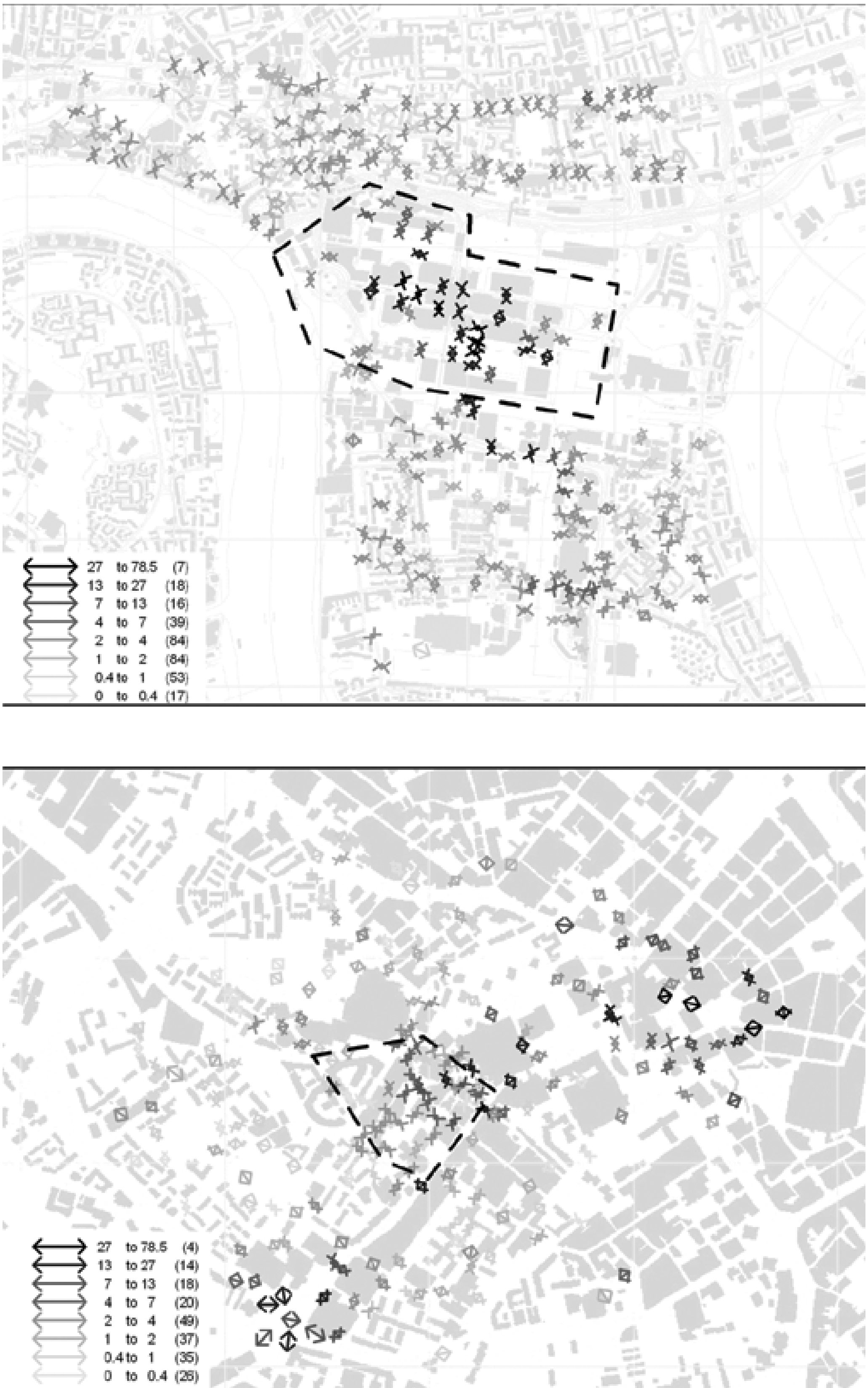


Fig. 4 Movement patterns in Canary Wharf (above) and Brindleyplace (below) in 2004

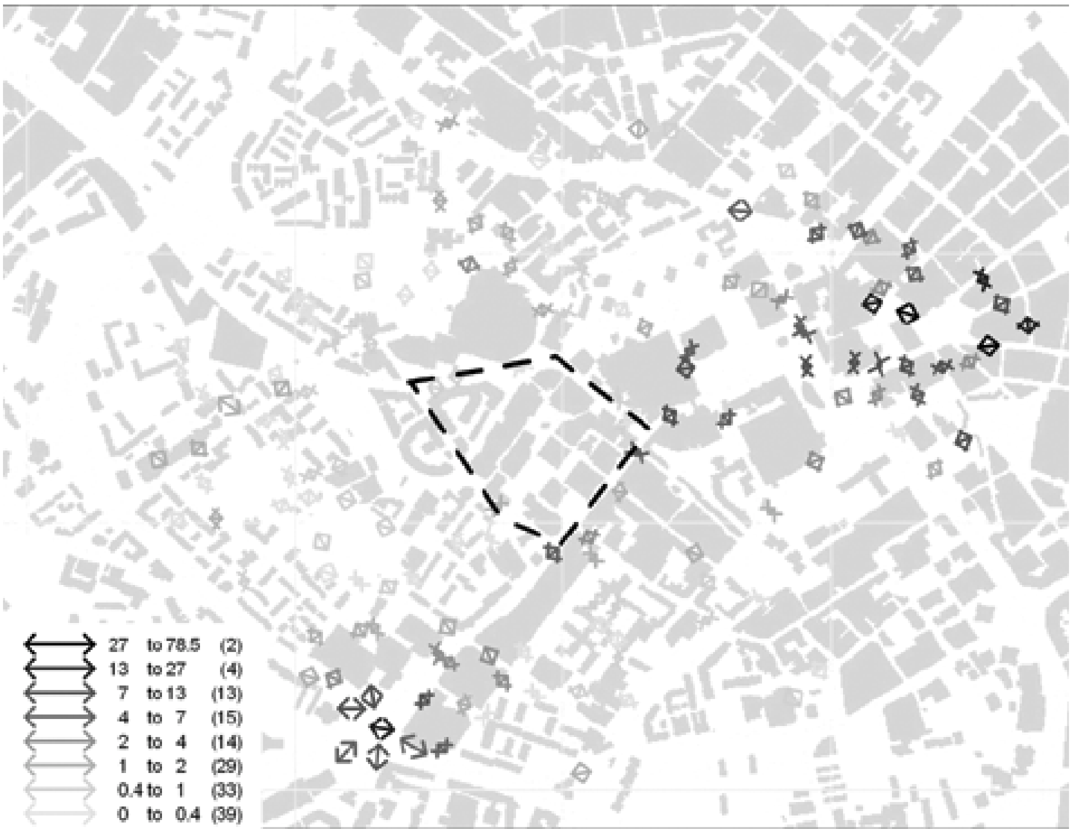
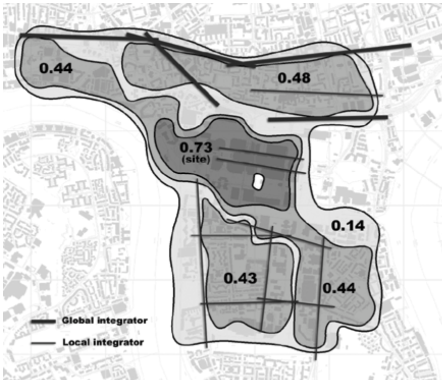


Fig. 5 Movement pattern in Brindleyplace in 1991 (Source: movement data from Space Syntax Limited)

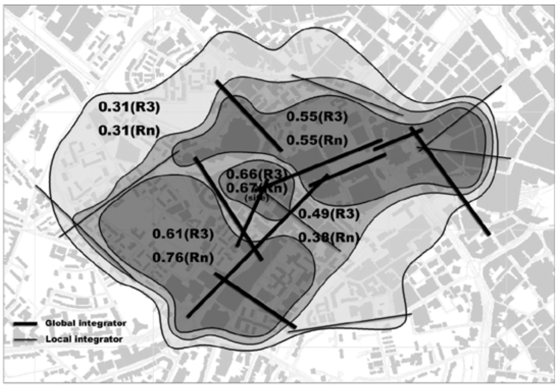
Does the predictability, namely correlation between movement rate and spatial integration, also illuminate that the different spatial structures correlate with the different movement patterns in these two cases? Hillier et al (1992) suggested a contiguous 'natural' boundary of area has maximal correlation between movement pattern and spatial integration. The poor correlation happens between two 'natural' sub-areas. Noah (2004) proposed the technique of correlation contour, namely continuous gradient correlations between movement rate and spatial integration from centre to periphery within sub-areas, could demonstrate space still correlates with movement in fragmented urban areas. Hillier (1999) also argued that configuration generates attraction inequalities through movement economy process in urban grids. This paper tries to explain different pedestrian movement patterns in the two cases through the appliance of correlation contour technique and 'natural' boundary concept.

Correlation contour map and integrators

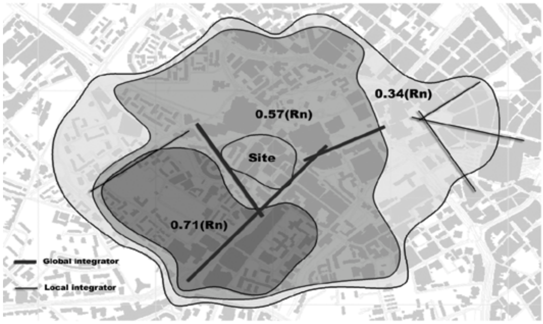
The correlation contour maps of the two cases (Fig.6) display that the different movement patterns are related to the different spatial structures that are mainly sustained by spatial integrators at the different radii. The contour map of Canary Wharf and its surroundings shows that Canary Wharf has the correlation of 0.730 between Int. R3 and movement rates, except for an outlier in front of the main entrance of Jubilee Station. If adding the factor of the point depth from the main entrance of Jubilee Station, Canary Wharf also has a higher correlation of 0.756 in the multi regression model, which demonstrates that the high movement rate inside the site was sustained by cooperation of the spatial configuration and the tube station. It could be due to only one depth from the main entrance of the Jubilee Station to the site integrator. However, Canary Wharf is like an inward island floating in the whole fragmented area with very poor correlation of 0.14. Three other contours, hatched in grey, present three sub-areas with the moderate correlation. The development site could extend to the north west and the south east to form a sub-area with moderate correlation of 0.44, while another sub-area to the north has the correlation of 0.48 and another to the south west has the correlation of 0.43. But a big gap with poor correlation is between them. Thus, it shows that the fragmented spatial structure at the street level could explain why the high volume of pedestrian movement in Canary Wharf has little impact on the surroundings. However, the spatial contour map of Brindleyplace and its surroundings shows that Brindleyplace also has the high correlation of 0.662 between Int. R3 and movement rates and of 0.674 between Int. Rn and movement rates. And, Brindleyplace is making progress in integrating pedestrian movements in neighouring sub-areas into a whole. It highlights three sub-areas, Brindleyplace in the centre, the city centre core to the east, and the Five Ways to the west, with high correlation between movement rates and local or global integration. They are all located inside the contour with the moderate correlation of 0.49, which indicates three sub-areas have been less separated compared with the contour map of Canary Wharf. It could be said that the correlation contour map could clarify the different movement patterns of two cases, which demonstrates spatial configuration has mattered the different impacts upon the movement patterns in these two developments. Further, it could be suggested that peak correlation contours in the whole system work together through the interfaces of the next tiers of contours between them. Deeper valley between peak contours, little multi-impacts between peak contours.



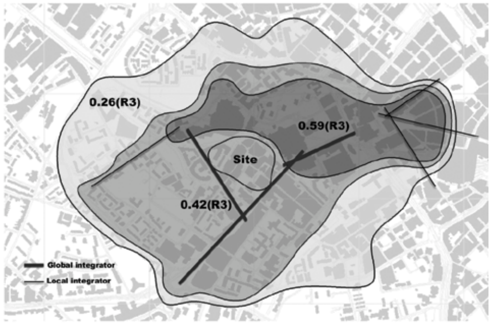
Contour map (CW 2004,Correlation between movement and integration R3)



Contour map (BP 2004,Correlation between movement and integration R3 & Rn)



Contour map (BP 1991, Correlation between movement and integration Rn)



Contour map (BP 1991, Correlation between movement and integration R3)

Fig. 6 Correlation contour map in the two cases (CW: Canary Wharf; BP: Brindleyplace)

Does the configuration of integrators act as factor to shape the correlation contour maps or the movement patterns? Fig.6 displays the different configurations of main integrators, both local and global, in regard to the contours in the two cases. The site integrators of Canary Wharf, the local integrators, are circumscribed within the peak contour and no other integrators in the surroundings go into the peak contour. Three clusters of integrators are separated by the valley of contour. In other words, three clusters of integrators correspond to three separated contours with moderate correlation. However, site integrators of Brindleyplace have crossed the peak contour within the site to connect other surrounding peak contours. Most of global integrators go through the valley to cross the centres of the peak contours and thus three peak contours could be within the contour with moderate correlation. It suggested that the contour map or ‘natural’ boundary might be constructed by the configuration of integrators both inside and next to the site.

The change of movement patterns and correlation contour map

The change of movement patterns before and after a development can present the impacts upon the movement by the interaction between the development and its surroundings. Fortunately, Space Syntax Limited provided the movement data of Brindleyplace in 1991. Fig.5 shows the movement pattern in 1991. Two clusters of high rate movements were in the city centre core and the Five Ways, but between them there was a low rate movement. Compared with the movement pattern in 2004, a new cluster of high rate movements appears in the Brindleyplace after the development and the whole area has more movement.

The change of correlation contour map could illuminate a dynamic interaction process between spatial configuration and movement patterns within and outside of the development site. Fig.6 displays two contour maps of Brindleyplace in 1991, one map based on the correlation between local integration and movement rate and the other based on the correlation between global integration and movement rate. In the first one, the peak contour is located in the city centre core; while in the other one, the peak contour is located in Five Ways. The movement in the city centre core had a better correlation with local integration (Int.R3) but the movement in the Five Ways had a better correlation with global integration (Int.Rn). The two clusters of high rate movement in 1991 could correspond to spatial configuration at different radii. It shows that Brindleyplace and its surroundings were fragmented before the development in 1991. The configuration of the integrators also displays this kind of fragmentation. The global integrator, Broad Street, is located in the peak contour of global integration and movement, while local integrator, New Street, lies in the peak contour of local integration and movement. The site of Brindleyplace was just right between two peak contours. After the development, three peak contours emerge in the contour map of correlation between global or local integration and movement. This was because the global integrators and the local integrators intersected already. Though the correlation between local integration and movement in the city centre core slightly decreased, the whole area gained better correlation in global and local radius.

It suggested that the development has been woven into the surrounding through the dynamic process of movement economy at different scales.

Social aggregation change and spatial configuration

Social aggregation change before and after the developments

Does space relate to the different social transformation inside and around these two developments? The paper chooses the index of socio-economic class in the census of 1991 and of 2001 to build the picture of the simple social transformations happening in the two development sites and their abutting areas. Then, it extracts the spatial configuration data within each sample in the axial map of 1991 and of 2001 to correlate with the social variables respectively, in order to make a comparison whether the different spatial configurations in the two cases correlate to the social transformations.

Unfortunately, the geographic boundary of census of 1991 and of 2001 is different at every level. In order to clarify the accurate relations between social variables and space configuration, the smallest census areas, ED 1991 (Enumerated District 1991) and OA 2001 (Output Area 2001), within the development site and the surroundings, are carefully aggregated to form the similar large samples across both years. But the limitation is that the aggregated process is a bit arbitrary. Yet, the boundaries of large samples aggregated from the small ones avoid cutting through the obvious neighbourhood units to map the full sub-settlements. And, these samples are located side by side to cover almost all areas within the site and the surroundings. It is hoped that this limitation is not critical to the study.

The index of socio-economic class indicates the distribution of socio-economic classes to build social coherence or social segregation. The census data of socio-economic classes were classified into six ranks in 1991 and four ranks in 2001 from Professional to Unskilled according to occupation. In order to grasp the general demographic picture, the paper classifies the socio-economic classes into two main groups, the rich group and the poor group. The rich group includes first two ranks from Professional to Managerial and Technical in Census 1991 and from Higher Managerial, Professional and Administerial to Junior Managerial and Professional in Census 2001; while the poor group includes last four ranks from Skilled to Unskilled in Census 1991 and last two ranks from Skilled to Unskilled in Census 2001. In this study, the percentage of riche or poor people in a sample area is used in order to make a comparison across the samples. The limitation is that the social variables in 1991 were from a 10% sample.

Fig.7 shows six sample areas in the cases of Canary Wharf and four sample areas in the case of Brindleyplace. Calculating all samples as a whole in each, Fig.7 also demonstrates the poor groups were much more than the rich groups before the developments in the two cases. But, after the developments, the rich groups overwhelmed the poor groups in the Canary Wharf case, whereas the rich groups were almost the same as the poor groups in the Brindleyplace case. It could correlate with the other research that Canary Wharf development caused the replacement of local poor groups (Foster, 1999), but Brindleyplace created a model of urban renaissance in the inner city (Healey, 1999).

If focusing on the social variables in the sample areas, the development of Canary Wharf intensified more uneven distribution of the socio-economic groups but the development of Brindleyplace improved relative coherence of different socio-economic groups. Although Fig.7 illustrates that the proportion of rich groups is negative correlated with the proportion of poor groups in the two cases before and after the developments, the detailed distributions were different in the two cases. Before the developments, both cases had the samples with higher proportion of poor groups than that of rich groups, such as the samples of N (north surroundings), SE (south east surroundings) and SW (south west surroundings) in the Canary Wharf case, and the samples of N (north surroundings), S (south surroundings) and W (west surroundings) in the Brindleyplace case. However, rich groups were 4 times the size of poor groups in two samples of the Canary Wharf case, the sample of CW (Canary Wharf & its part of east and south surroundings) and NE (north east surrounding). But, after the developments, the proportion of rich groups was over 65% in the samples of

NE, CW and NW of the Canary Wharf case, which means urban enclaves for rich groups. However, rich groups and poor groups reached a relative balance in each sample of the Brindleyplace case. Even in the sample of E (Brindleyplace and east surroundings) that had the highest proportion of high groups, high groups were only 2.5 times the size of low groups and were only 33% in the total population of this sample.

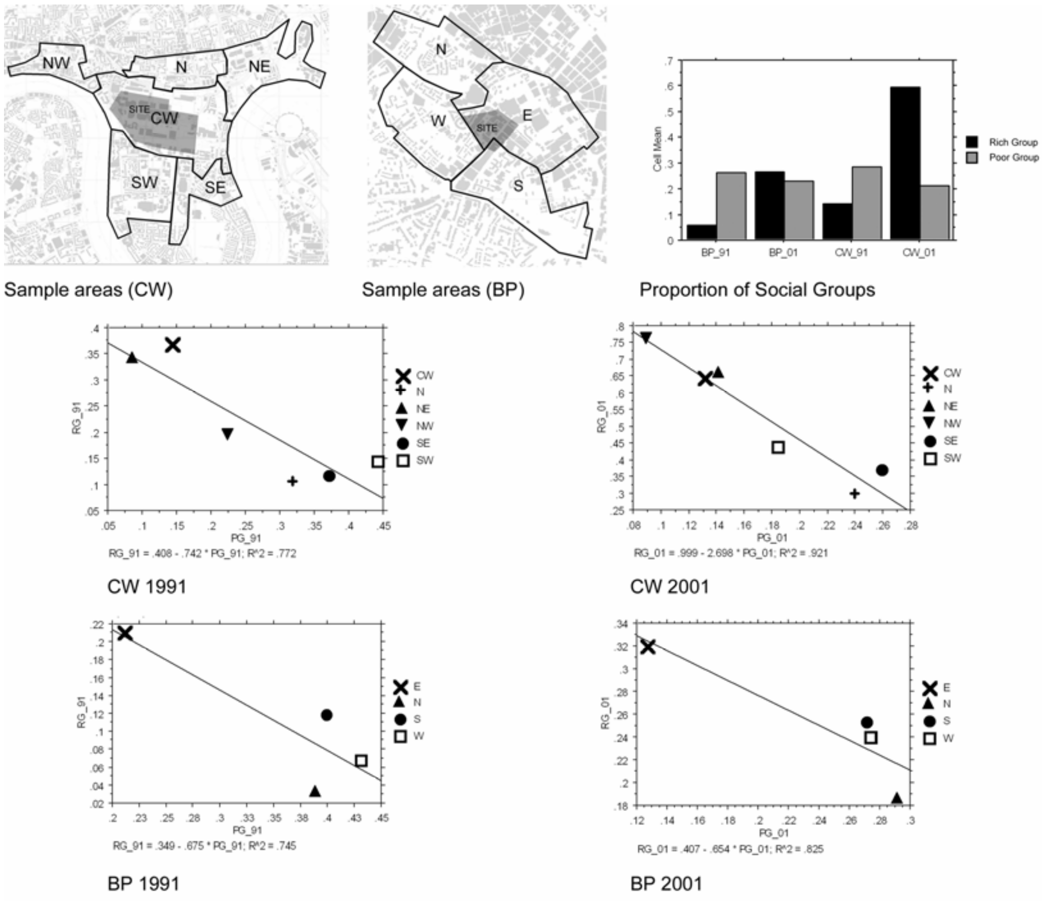


Fig.7 Correlation between rich group and poor group in each sample of the two cases before and after the developments (CW: Canary Wharf; BP: Brindleyplace; RG: rich group; PG: poor group)

Social aggregation and spatial transformation

Both Int. Rk and Inte.k (conn./Int. Rk)of each sample are extracted from the axial maps of the two cases to describe the spatial configurations of all samples. It tries to test whether there is a correlation between spatial configuration values at different radii and social variables across the samples in each case through the technique of correlation matrix. Then, a bivariate regression scattergram is created to test whether the correlation is at a practically significant level.

Fig.8 shows the scattergrams of two variables with high correlations in the Canary Wharf case. In 1991, the proportion of poor groups in each sample negatively correlates with Inte.3 and positively correlates with Int.R8, while the proportion of rich groups positively correlates with Inte.3 and negatively correlates with Int.R8. It could be suggested that social aggregation might correlate with intelligibility at the radius of 3 and integration at the radius of 8. In 2001, the proportion of poor groups positively correlates with Inte.9, while the proportion of rich groups negatively correlates with Inte.9, which demonstrates that social aggregation might correspond to intelligibility at the radius of 8 or 9. The rich groups preferred to occupy the segregated samples at the radius of 8 or 9, such as the sample of NE, NW and CW. After the development, the proportions of rich groups went up over 65% in these three samples. In addition, Fig.8 shows that less Inte.8 the samples in 2001 had, more proportion of rich groups increased. It also illuminates that the samples of NE, NW and CW were favorable places for rich groups. These samples also had very low intelligibility at the radius n. It could be simply concluded that Canary Wharf spatially failed to integrate the segregated surroundings as a whole, such that it accelerated rich groups aggregating in the spatially segregated sub-areas abutting to it. Further, if checking the point depth between local or global integrators within all samples as a whole, the maximum depths between them are eight. Thus, spatial configuration at the radius of 8 or 9 might reflect main spatial characters of the samples in the fragmented environment of the Canary Wharf case. Then, social aggregation process responded to the spatial configuration at the radius of 8 or 9 before and after the developments.

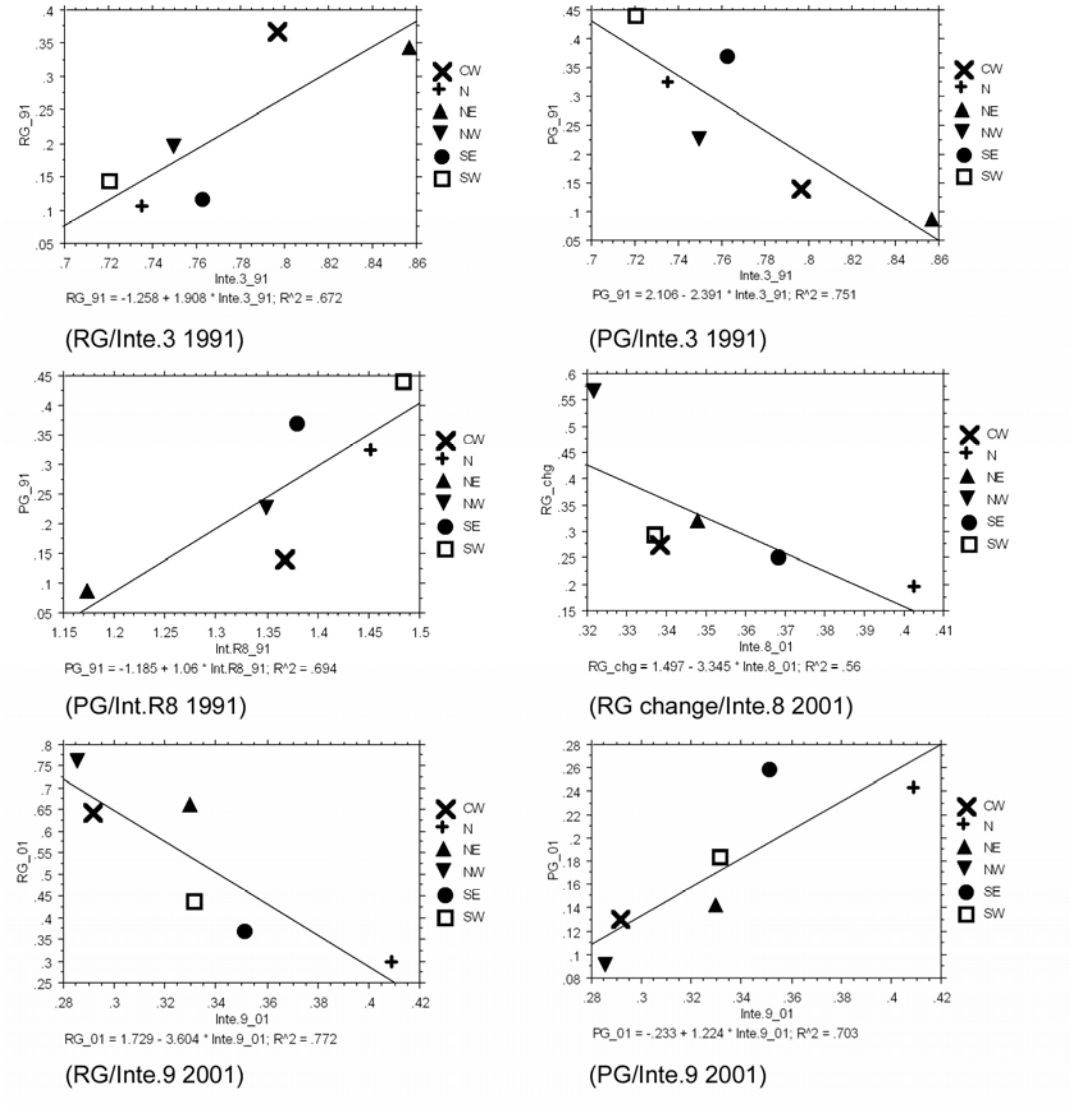


Fig.8 Correlation between syntactical value and social groups in each sample of the Canary Wharf case (RG: rich group; PG: poor group; RG change: change of proportion of rich group)

Fig.9 shows the correlation between spatial configurations and social groups in 1991 and 2001 in the Brindleyplace case. It demonstrates that rich groups had positive correlations with global integration (Int.Rn) and global intelligibility (Inte.n), and had a negative correlation with local integration (Int.R3), before the development. And, after the development rich groups gained stronger correlations with global integration and global intelligibility, and a negative correlation with local intelligibility (Inte.3). However, poor groups had positive correlations with local spatial configurations (Int. R5) before the development, while after the development they had a negative correlation with global integration (Inte.n) and a positive correlation with local intelligibility (Inte.3). It could be suggested that rich social groups preferred to occupy in the more global integrated but less local integrated sub-areas while low social groups concentrated more at the less global integrated but more local integrated sub-areas, but both social groups did not form social enclaves after the developments. Further, Fig.8 also shows the change of proportion of rich groups negatively correlates with global integration (Int.Rn) and Int. R6 in 2001, which means the proportion of high groups increased slowly in more globally integrated sample areas, such as the sample of E and S. However, the change of proportion of poor groups positively correlates with more local integration (Int. R5). It suggests that the global and local space configurations can correlate to the social aggregation in the Brindleyplace case. Rich groups occupied more global integrated or intelligible but

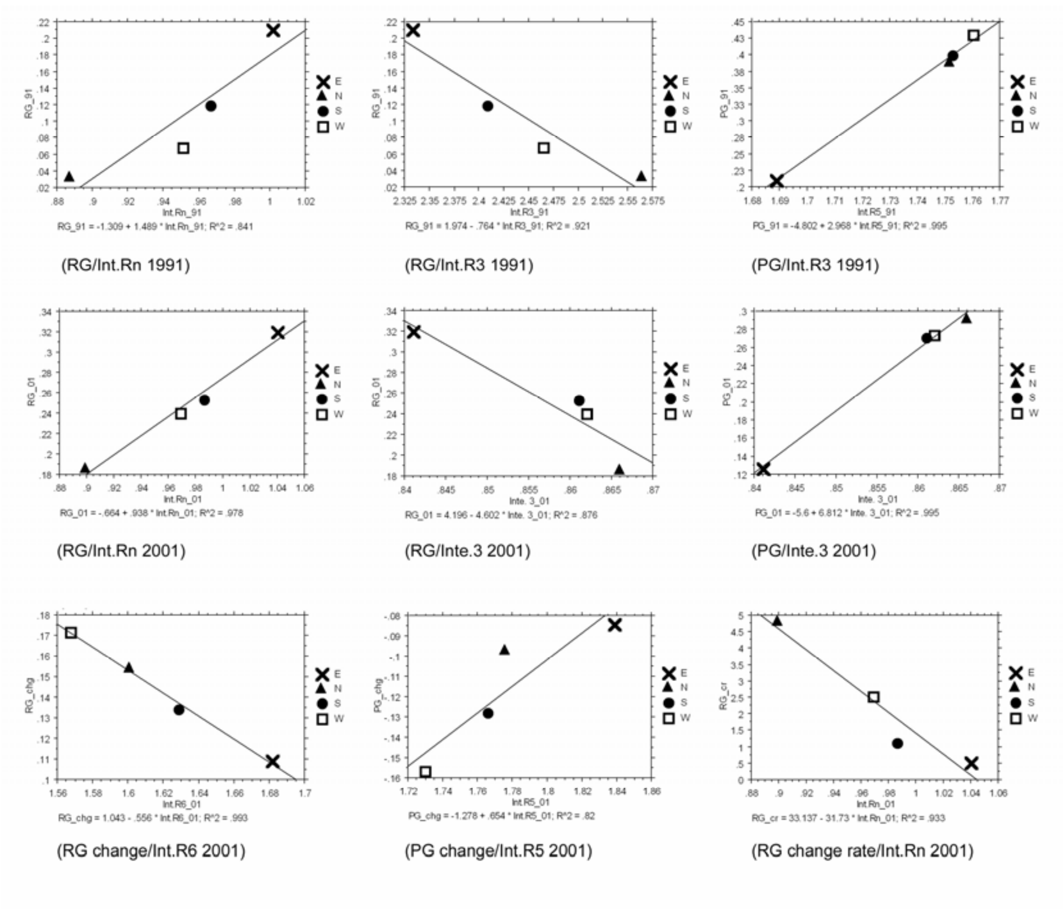


Fig.9 Correlation between syntactical value and social groups in each sample of the Brindleyplace case (RG: rich group; PG: poor group; RG change: change of proportion of rich group: PG change: change of proportion of poor group; RG change rate: change rate of proportion of rich group)

less local integrated sub-areas; while poor groups stayed more local integrated or intelligible but less global integrated sub-areas. However, rich groups increased slowly in more integrated areas, and poor groups decreased slowly in these areas. It could be suggested that Brindleyplace embedded in its surrounding could promote social coherence to some extent.

Conclusion

This paper presents that different spatial configurations in the two cases can explain the different two-way impacts between the developments and their surroundings. Canary Wharf has been spatially segregated from its surroundings, though it has a strong local integrator. Then, its pedestrian movement has been spatially imprisoned within its 'natural boundary', thus that its spatial configuration acts as a negative attractor to the pedestrian movement in its surroundings. Further, this negative attractor accelerates the spatially segregated neighbouring sub-areas to form high social group enclaves. Though Canary Wharf has been sustained by a tube line and a light rail to keep its vitality inside the 'natural boundary' after the rescue phase, it could be concluded that its own inward spatial pattern limit it to revitalize the surroundings. However, Brindleyplace has been spatially embedded in its urban setting, through which it gained high intelligibility at the global and local levels. Thus, its pedestrian movement does blur its 'natural boundary' and extend to the surroundings. Moreover, it acts as a positive attractor to make social coherence within and outside of its site, although higher proportion of rich social groups stay at more integrated areas.

Further, it could be suggested that spatial patterns at different radii might sustain movement patterns and social aggregation patterns at the different scales. The change of spatial patterns between different radii might be the nature of dynamic urban system. In the more integrated urban systems, such as the Brindleyplace case, global and local syntactical values could correlate to movement patterns, social aggregation patterns and their changes at global and local scales. However, in the more fragmented urban systems, such as the Canary Wharf case, local syntactical values or syntactical values at certain radius could matter movement patterns, social aggregation patterns and their changes at local and sub-regional scales.

Finally, Serres and Latour (1995) suggested that prepositions or relations rather than nouns or even process-verbs spawn objects and beings and the size is not a property of character. This paper argues that it is spatial configuration prior to development size that could give an impact, negative or positive, upon the surroundings of a development, although this paper does not deny that development size could give an impact on the surrounding at the urban or regional level.

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