TECHNOLOGICAL DETERMINISM AND URBAN FRAGMENTATION : A CRITICAL ANALYSIS

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Introduction

A wide range of theories has been proposed to explain the process of urban fragmentation and its effects. These theories often differ over what is meant by or conceived of as the 'urban' and therefore what is identified as being fragmented : the urban structure ; the urban form ; the system of land uses ; public or private space ; the system of cities or the socio-economic and cultural integrity of the city etc . And of course the different urban disciplines of architecture, design and planning all have their own 'spatial fix' whether it is the building , the project or the city. Despite these differences three theoretical approaches can be recognised according to their basic presuppositions about what is ultimately driving socio-economic, political and cultural change and changes to the organisation of urban space . Similarly three theoretical approaches to the issue of urban fragmentation can be identified within all of the urban disciplines : the first is based on 'technologically deterministic' positions ; the second on socio-economic and political explanations and the third elaborates its explanations for the phenomenon in cultural terms. In reality all of these aspects are interlinked in the city but the question of which of them are dominant and determinant lies at the heart of disagreements over the causes of urban fragmentation. In this paper we shall examine and critically analyse the explanations put forward for urban fragmentation by the first of these three theoretical positions .Before proceeding it is worthwhile giving a definition of urban fragmentation : *' Urban fragmentation is a* ***spatial*** *phenomenon that results from the act of breaking up , breaking off from , or disjointing the pre-existing form and structure of the city and systems of cities '*

Technological Determinism and Urban Fragmentation

Technological determinism can be defined as the view that social organisation and culture are predominantly and ultimately shaped by the technologies of production, exchange, communications and consumption. As societies and cultures have to organise themselves in space it follows that the ultimate determinants of the system, form and structure of cities are to be found in the introduction and application of these technologies. Social and cultural change is generated by transformations in these technologies and this process unleashes a spatial dynamic that transforms the form and structure of cities.

That technologically deterministic views have recently been used to explain urban fragmentation is hardly surprising , given the persistence of this tradition in the social sciences and in all the urban disciplines.

From the Industrial City to the Post-Industrial City

In the social sciences, the idea that a particular 'assemblage ' of technologies at any one time configures the character and dynamic of its socio-economic organisation and culture goes back to the early 19th century and St. Simon's (1972) work on 'industrial society'. Industrialisation , he argued , would transform traditional, agricultural and rural societies into urban, industrial and modern societies. It was a process that was understood as functional, historically - progressive and rational, being based on the maximisation of efficiency through the application of science, technology and large scale bureaucracy. Interestingly, given the current interest in globalisation and in line with the universalist goals promoted by the Enlightenment , St. Simon argued that it was industrialism that promoted cosmopolitanism and internationalism.

The technologically-deterministic position was continued by Durkheim (1982) and Weber (1978) in the late 19th century but now the concept of industrial societies became embedded in nationalism : the social and spatial transformations brought on by industrialisation would proceed towards what Eric Wolf (1982) has called the creation of '*internally homogeneous and externally distinctive and bonded objects*'. The Functionalist tradition of Talcott Parsons (1952) Merton (1957) et al. continued to develop the position during the early years of Modernism but it was in the immediate post-war years of decolonisation , reconstruction and development that the technologically-deterministic position came to the fore with the exaltation of the virtues of industrialisation by Modernisation theorists and their pursuit by policymakers. The fundamental goal of transforming traditional into modern societies could only be achieved by a shift from a 'pre-industrial society' to an 'industrial society'. The implicit universalism of this technological determinism was reaffirmed by Kerr's theory of convergence (Kerr ,1983) : all societies were moving at different speeds towards the same point and industrial societies inevitably would become increasingly alike , no matter what their initial differences were. A strong technological determinism was later reasserted in Dahrendorf's contention that industrialism transcended broader differences in social and economic organisation such as capitalism and

socialism – capitalism he argued was only one mode of organising an industrial society (Dahrendorf 1959) ,.

In the contemporary period the tradition of technological determinism in the social sciences has focused on the concept of the **'post–industrial society'** and on explanations of globalisation as a technically-driven process. The theory of post-industrial society (Dahrendorf 1959 ; Bell 1973 ; Touraine 1974) can be seen as a continuation of rather than breach with the tradition of technological determinism. Now it is maintained that developed countries are no longer primarily based on industrial technologies and industrialism. Rather they have become post-industrial societies in which information and knowledge services (computer services, mass media and communications , finance , law, advertising, biotechnology and medicine and research and development) are the main basis of the society and economy rather than the manufacture of material goods. Now the principal technical elements determining the nature of social , economic and cultural organisation are the new transport, information and communications technologies which are increasingly integrated into global networks. The professionals who dominate this 'quaternary sector' now become the dominant social group and influence over a 'post-modern' or 'post–industrial' culture that is characterised by a shift to fragmentation and differentiation, pluralism and diversity , increased mobility , decentralized communications and globalism. The social, economic and spatial requirements of these new technologies demand a shift from Fordist to post-Fordist systems of economic organisation and regulation (JIT, flexible specialisation) and the fragmentation and reconstruction of the increasingly dysfunctional spatial forms adjusted to the requirements of the previous 'industrial society'. Post-industrial societies create **'post-industrial cities'** with all the spatial characteristics and trends identified as urban fragmentation.

Many contemporary concepts of the post-industrial or post-modern society and city are closely associated with technologically-deterministic positions on the globalisation process. The basic process driving globalisation it is argued is technological innovation and the structure of the global system is based essentially on differences in access to these space-adjusting technologies . Globalisation is understood as a socio-cultural phenomenon driven by the space-time compression effects and the 'dissembling' effects of the application of new transport (motorways , air transport, containerisation, high speed rail systems) and information and communications technologies (computerisation , telephones , wireless technologies , satellites , optical fibre cables etc.). These technologies underpin the concept

of globalisation as *'the compression of the world into a single place and the intensification of the consciousness of the world as a whole'* (Robertson 1992). Some aspects of this concept of globalization sit uneasily with the theory of post-industrial societies and cities (particularly the notion of a universal linear progression from a 'pre-industrial' to 'industrial' to a 'post-industrial' condition). Nonetheless the idea of convergence does reappear in the form of universal social and spatial models proposed for global cities and settlements where space is organised or reorganised according to the requirements of technical infrastructures , which have a global reach . Given the universal technical determinants , globalisation it is argued , will lead ultimately to social and spatial homogenisation and urban convergence, no matter what the original starting point.

Spatial Integration and The City as Organism

Throughout the 19th and 20th centuries in the urban disciplines (architecture, design and planning) there was always a strong tradition that affirmed the determination of urban form, structure and the built environment by the technologies of construction, infrastructure and mobility . Throughout the period the consensus view was that these technologies were being and could be deployed in such a way as to define , shape and structure cities that were clearly bounded 'spatial containers'. They had an underlying social and spatial functionality and efficiency that was derived from their well-defined spatial integrity and unitary identity. Given the instrumental nature of the disciplines it was believed that these qualities could be enhanced and rationalised in the pursuit of the 'good and healthy city' through the application of architectural, design and planning ideologies which had a particular conception of what these cities were and how they could best function.

As a result of a cognitive process that can best be described as 'reification' these conceptions were inevitably framed in terms of the spatial geometry, scales, forms, models and structures that conformed to the demands of the dominant technologies – they became systems - based technological models and the search for the urban utopia became essentially a search for the right technologies. In the late 19th and early 20th centuries the dominant spatial model of the Hygienists (Haussmann), the Garden City Movement (Howard 1946 , Geddes 1968, Unwin 1912 , and the Chicago School of Urban Ecology (Burgess 1925 , Hoyt 1939) was of the **'city as organism'**. In a period characterised by nostalgia for the loss of the organic integrity of the medieval city ; the growing urban dysfunctions associated with industrialization and the influence of Social Darwinism , organic analogies proliferated

(streets were circulatory systems , sewers waste disposal organs , green spaces lungs, etc.) The city it was argued could be improved by recognising its characteristics as a differentiated clearly-defined organic whole. Ubiquitous, standardised and integrated street grids and infrastructure systems combined with land use planning would bind the city into a whole whose cohesion and functional integrity as an organic unity would not only produce spatial and social harmony but also harmony with nature.

Spatial Integration and The City as Machine

In the period of Modernism that followed, this view of the city as a clearly-defined spatial and functional entity that was technologically–determined was reaffirmed , but now the integrity of the city was seen to be derived from its mechanical nature – **'the city as machine'**. Cities were seen as systemic mechanisms, which through rational architectural, planning and design interventions that responded to the new technologies for materials, construction and infrastructure could become good , healthy and efficient places to live. According to Charles Jencks (1996) *'modernist architecture was the universal international style stemming from the facts of the new constructional means adequate to a new industrial society and having as its goal the transformation of society both in its taste and social make-up'*.

Modernism's faith in progress through technical solutions for social problems in retrospect now appears naïve . Industrial technologies could solve all problems if they were combined with : *'an architecture of good intentions'* (Rowe 1994) ; design based on the principle of spatial restructuring for functionality and hygiene and planning based on universal social and spatial access to the new and old infrastructures for water, energy, light , speed, mobility and communications. These technologies were frequently celebrated as symbols of modernity and often became a focus for national or social integration efforts: *'Socialism'* Lenin remarked *'was Soviet Power plus Electrification'*. They also often became exemplars of functional and aesthetic design. The Bauhaus proposed a new unity of 'art and technology'. The combination of the new industrial technologies and materials with functional and aesthetic design based on truth to materials , logical consistency and simplicity could produce modern , fully-serviced , hygienic homes that were identified as 'modular units' by Buckminster Fuller (Mellor 1970) or as 'machines for living in' (Le Corbusier 1929). Towards the end of period Andy Warhol went so far as to declare *'I want to be a machine'* – and presumably not only for 15 minutes!

At the urban level cities were machines. The standardisation and rationalisation of their four basic functions (housing , work, leisure and circulation) would impart a 'mechanical unity' to the city which would become clearly bounded , integrated , functional and equilibrated machines –'clockwork oranges' so to speak. The clear social and spatial unitary identity, it was argued, was derived from the recognition that infrastructure stitched people and spaces together and was the defining element for forming a cohesive, harmonious and integrated whole. The key task according to Modernist planners was to integrate four elements : ubiquitous , hierarchical, standardised and bundled infrastructure networks which were organised as 'technical 'monopolies'; hierarchical road grids which had seven scales ; the system of public spaces and the mono-functional zones established by land use planning . The planning principles identified for integrating and rationalising the modern city as machine included : the separation of industrial and residential functions ; the concentration of commercial activities on circulation nodes and the manipulation of zonal densities to achieve rational circulation and mobility patterns.

Although it is true to say that Modernism did prioritize the need to provide for openness and circulation both in terms of the urban structure and form , its underlying concepts exuded a static spatiality and temporal constancy . Infrastructure networks and road grids were to be used to define a clear urban edge and desired morphology , which could be reinforced by density controls and green space policies. A static and constant urban form for a unitary place was generally embodied in holistic master plans that set out the technological and aesthetic requirements for the desired end state or 'blue print' condition - the city organised and integrated as a '*beautiful machine'* according to the the City Beautiful Movement (Wilson 1994). The idea that the processes of urban development and redevelopment could be contained within a 'spatially-fixed' mould also underpinned Modernist spatial concepts of urban structure. These concepts remained firmly based on a static and orderly arrangement of land uses. The urban structure was generally conceived of as a system of mono-functional land use zones organised into rings and sectors around a monocentric CDB specialising in commercial and administrative uses . In contrast to what was to follow the spatial concepts of modernism remained largely area-based – cities were understood in terms of zones , layers , centres and peripheries and spatial and social dualisms that could be dealt with by technical 'radical surgery' redevelopment solutions.

Urban Fragmentation and The Network City

Since the demise of Modernism in the 1970s, the dominant model of the city in the urban disciplines has once again changed. The technological determinism that underpins it, however , has remained. Now the principal technological elements determining the nature of social , economic , cultural and spatial organisation are identified as the new transport and information and communications technologies increasingly integrated into global networks. The basic process driving globalisation , which is understood as the emergence of the 'global network society' , is technical innovation and the application of these technologies . The global expansion and integration of these networks permits the general increase in the volume and intensity of flows of commodities , capital , information and people. The integration of societies and spaces at all scales into this global network of flows , it is argued , is the dominant dynamic of our times but the process is highly uneven , differentiated and asymmetrical as a result of unequal access to these technologies (Castells : 1996 , 1997, 1998 ; Pawley 1997).

However, the technological determinism underpinning the theory of the network society does not stop here. It is not just a matter of society getting 'tooled up' with the latest ICT and transport technologies but rather about societies becoming reconstructed as networks around the skeins of this infrastructure. This process has a dramatic effect on the organisation of space and gives rise to the dominant spatial model of the **' city as network '**. And it is here that the theory locates and explains the phenomenon of urban fragmentation. The central contention of the urban fragmentation school is that the urban structures and forms inherited from earlier periods are fragmenting and splintering as the spatial model appropriate for Modernism and Modernization **('the city as machine')** becomes dysfunctional for the requirements of the emerging global 'network society'. The new spatial model that emerges **('the network city'**) is one that fragments and disjoints the single function land use zones and the multiple hierarchies of networks, grids and public spaces in order to create a model where land uses and networks are reconfigured according to the complementarities of the nodes and synergies they generate.

The monocentric and well-defined city of single function land uses organised into sectors and rings around a specialised CBD undergoes a sort of 'liquefaction' (Woodroffe, 1994) and crystallisation as the old elements , networks and spaces are fragmented , splintered, unbundled and reconfigured into the spatial model that is functional for the development of the global network society. In this model the principal structural elements are

the spatial nodes interconnected by selected infrastructure 'circuits' that guarantee the all-important flows , exchanges and mobility.

A fuller analysis of the characteristics of urban fragmentation and its effects on urban structure and form can be found in the paper I gave to the Shanghai ALFA- IBIS Conference last year (Burgess 2004). However, the following five issues are important if we are to focus on the specific spatial adjustments imputed to the technologies of the global network society that are responsible for urban fragmentation :

- Space/Time Convergence
- Space/Time Differentiation
- Infrastructure Unbundling
- The Rebundling of Land Uses
- New Concepts of Space /Time and Spatial Models

Space/time Convergence

The first is 'space/time convergence' or 'space/time compression', a concept that refers to the rate at which places are moving closer together as measured by travel time or communications time . Improvements in transport and communications have made it possible to overcome 'the friction of distance' on an historically-unprecedented scale . Developments in ICTs have made it possible to transmit a message in one location and receive it in another part of the world virtually simultaneously. Complete space/time convergence occurs when a message can be transmitted and received within the same amount of time irrespective of distance or location. Under these circumstances , at least in communications terms, the world becomes a single place.

Technological determinists argue that this and other qualities mean that technology 'calls the shots' or 'sets the agenda'. The ability of these technologies to 'shrink distance' and 'stretch time' permits a dramatic increase in the volume and intensity of flows of information, commodities , finance and people on a global scale . It changes the spatial scale at which human activities are possible and the relative significance of particular scales for everyday life. It also permits the expansion and deepening of the spatial division of labour at a global scale. In the words of the Economist (1995) these technologies *´move the real world closer to the efficient market place'*. Without them, it is argued, there would be no globalisation.

Increasing space/time convergence at the global level also has other consequences for cities and city systems. The emergence of a global network society (i.e. a society that is increasingly being configured as a global network) unlocks a dialectic of **'local spatial fragmentation'** and **'global spatial integration'**. In a process that has been called a *'glocal scalar fix'* (Brenner 1998) the primacy of establishing global/local connections over intra-urban or national level connections is asserted in line with the concept of cities as 'staging-posts' for the organisation of global flows, exchanges and mobility. At the local level the process involves the rupturing of the spatial integrity of the bounded city and the selective reconfiguration of its spaces and networks. What generally emerges is a polynuclear metropolitan area with sharply-defined enclave spaces that have intensive global economic social and cultural articulations. However, the process also involves a new dynamic of spatial integration but at the global or global regional scale. The holism and the logic of integration are now to be found at this scale and not at the urban level. Cities and national urban systems fragment as their spaces and networks are selectively connected up to the global hubs and spokes of the network society. But they are then reconstituted and integrated either into an incipient global urban system - an idea first suggested by Doxiadis (1970) in his *Ecumenopolis 2060*- or into the emerging urban systems of global trade blocs. In both cases the dominant model is for the emergence of city systems on an immense scale strung out like beads on a string along major transport and communications nodes , arteries and corridors.

Space/Time Differentiation

The second form of spatial adjustment that accompanies the application of the new technologies can be called **'space /time differentiation'**. Although the process of space/time compression occurs 'universally' it also occurs unevenly (Castells 1996) and selectively and along with infrastructure unbundling generates a process of fragmentation of urban forms , spaces and networks and a breakdown in the relationship between contiguity and accessibility.

No really effective purely-technological arguments are put forward to explain this unevenness although some proclaim the inherently uneven and diversified characteristics of the new spatiality and others , in expectation of future convergence , point to the transient lack of integration with existing networks as the new infrastructures are rolled out . The most

widely accepted reason, however , is of a socio-economic nature - that the new networks are designed to service the needs of only those who can afford them - at all spatial scales. Urban fragmentation occurs as the most 'value-added' groups and the most valuable spaces for the global network society are differentiated in terms of uneven access to these networks.

Whatever the case , what drives the process at the local level has a fundamentally global logic - in many cases the new fragments and enclaves are so completely integrated into global networks that the movements, flows and exchanges between them and the distant nodes and spaces may be greater than those with their contiguous urban spaces and regional hinterlands . Globally-integrated spaces posted up on the Internet and in the airports and stock exchanges of the world coexist with 'off-line' or 'lag-time' spaces. The figured city coexists with the 'disfigured' city (Boyer, 1995). The result is generally a polynuclear metropolis with sharply-defined enclave spaces that have intensive global , economic, social and cultural articulations.

The space/time differentiation effect of the application of the new technologies breaks down the unitary order and the clearly- and constantly- defined urban form of the Modernist city and the bases of its spatial integrity. As urban development unevenly focuses on the nodes and the tissues of the new spatial networks, the parts are connected - but not as part of a local urban areal entity but as part of a global network identity.

Infrastructure Unbundling

One important current in the debate on urban fragmentation argues that the principal cause of urban fragmentation is the unbundling and splintering of previously integrated urban infrastructure networks - a phenomenon which is described as **'splintering urbanism'** (Graham and Marvin 2001). This position is based on strong but not exclusively technologically-deterministic arguments , and is embedded in the concept of the **'city as infrastructure'**. Their argument goes as follows:

Under Modernism 'bundled' infrastructure networks were laid out by centralised and publicly -or privately- owned 'technical monopolies'. The infrastructure networks had an inherent 'technical integrity' based on the hierarchical organisation of their systems (primary, secondary, and capillary elements plus input and output plants). Technical monopoly in these systems was required in order to achieve economies of scale ; to avoid duplication of costs ; to provide the large lumpy investments required to extend and improve the systems and to guarantee the necessary technical standardisation of services. The result was regulated ,

bundled and integrated networks that were geared to providing universal social and spatial access to a standardised service regarded as a 'local public good'. The harmonious integration of grids, networks and functional land use planning bound cities, regions and nation states into cohesive, functional and well-defined spatial entities.

Now it is argued, with the emergence of the 'global network society' and the new transport and information and communications technologies that these 'technical imperatives' have disappeared and been replaced by others. The application of these new technologies in the context of global neoliberalism has undermined the need for technical monopolies ; for integrated technical hierarchies ; for the delivery of standardised services ; for the status of these services as a public good and for the key role of infrastructure as an integrator of urban space. The total effect has been to splinter or unbundle the networks. The new decentralised technologies have reduced the cost barriers for entry into infrastructure markets ; and the development and application of ICT systems for control, monitoring and data management to infrastructure networks and the services they provide, has allowed both **'product differentiation'** and **'demand differentiation'** to occur . Standardised and homogeneous services can now be differentiated and customised to meet the needs of specific groups of local and global users , whilst the application of smart technologies to the operation of existing infrastructures has permitted precise and flexible control and monitoring of flows (e.g. electronic road pricing and congestion charging). The new technologies now allow for monopolistic networks to be splintered into markets for different competitive providers . The technical hierarchies can be segmented vertically ; horizontally or virtually (e.g. electronic toll lanes on public highways) and formerly public goods can now be provided as private goods , toll goods or common pool goods (Graham and Marvin 2001).

This process of the unbundling and splintering of infrastructure networks and the differentiation of the services they provide has profound effects on the organisation of space. A process of fragmentation of grids , networks and spaces unfolds as the unbundled infrastructure firms selectively target customised services and facilities on the valued global and local users and spaces and disengage from or ignore the less-valued users and spaces . Spatial barriers emerge that aggressively separate and exclude these users and spaces from the contiguous urban area and which break down the relationship between proximity and accessibility. Some of the spatial phenomena widely observed in the 'network city' include: the creation of multiple or dualistic water , sewerage and electricity systems ; the uneven wiring up of the city to optical fibre grids ; the self-containment of streets on previously open

grids ; grid erosion and enclave creation as limited access highways remodel grids into infrastructure ladders (Pope , 1996) ; the splintering of public highways into fast and slow tracks using electronic tolling technologies (allowing 'wormholing') ; differential access to information on the Internet (VIP status) ; fast track access through global transport termini using biometric smart cards; and the creation of physically separated gated communities which are served by customised water , electricity , waste and communications networks and surrounded by walls with electronic and private surveillance systems.

Attention in the current period has focussed on the new **'bypass technologies'** which allow the creation of parallel or substitute networks for the high value global users and spaces. They include '**local by-pass'** systems for circulation (private skywalks , tunnels and street systems in mega-developments) and for water, waste and electrical systems ; **'glocal bypass'** networks that allow rapid connection to global networks and spaces by bypassing the existing infrastructure (e.g. Shanghai's Maglev rail connection) and **'virtual by-pass'** technologies that use ICTs to differentiate and target infrastructure services on desired groups and locations (geodemographic marketing techniques , smart meters , prepayment cards, etc).

The Rebundling of Land Uses

The fourth spatial adjustment associated with the emergence of the 'network city' is the rebundling and horizontal segmentation of single function land use zones and sectors. This involves the creation of 'spatial nodes' and 'enclave spaces' that are interconnected by selected infrastructure circuits that guarantee the all-important flows , exchanges and mobility. Although these fragmented and enclosed spaces have a specialised character they are not 'mono-functional' but rather carefully packaged 'total environments' that bundle together the uses, services and activities required to meet the needs of the firms , institutions , communities and visitors locked into the global network society. On the periphery a landscape of ever-larger enclave spaces emerges : gated elite housing and condominium complexes ; satellite and new towns ; giant shopping malls with packaged residential and work facilities ; administrative districts ; entertainment, leisure and resort complexes ; offices and business parks and logistical zones. In the inner city the reconstruction of the fragments into introspective enclaves takes the form of megaproject developments and macrobuildings produced by global real estate, architecture , design and planning practices in public/private partnerships with local authorities using a 'project by project' approach to urban planning .

Increasingly they take the form of large strategic projects developing a total packaged environment involving atriumed , plaza-style developments and macro- building complexes that combine office, retail, leisure and cultural activities with gated condominiums or residential areas.

These enclave spaces and nodes can have an intensely global character depending on the type and level of the city's integration into the global networks . They include: inner city global financial enclaves , multi-media cyber-districts ; high technology innovation clusters ; export processing and free trade zones ; e- commerce and data-processing business parks and global logistics zones around transport termini. They are increasingly being built as 'cities within cities' or as corridor or 'spoke' developments. In all cases they involve a sharp physical differentiation from the contiguous urban areas through the use of customised infrastructure links ; bypass technologies ; private and limited access circulatory systems ; security and electronic surveillance systems, etc. These strong intra-urban spatial barriers attempt to hermetically seal the spaces of the new value-added individuals and businesses from the 'low value' contiguous urban areas. The result has been described as 'decentralised polycentricity', 'archipelago cities', 'galactic cities ' (Lewis, 1983), 'collage cities' (Rowe and Koetter 1984) or the 'dumplings and noodles' model – a mosaic of highly-differentiated spaces and zones which have an enclave-like character with sharply-defined barriers and edges separating them from the relatively disconnected, downgraded or obsolescent areas.

A wide range of technological, socio-economic and cultural explanations have been put forward to explain this phenomenon. Technological determinists point to a number of technically-defined issues .The increase technical ability to enclose, heat , ventilate and span ever-larger spaces is generally believed to have created what Koolhaas and Mau (1994) call *'a shift to bigness'* or *'the substitution of the city by the building'* (Cerver 1998). Again a precondition for their existence has been the ability to fragment and segment the infrastructure networks selectively and the development of access control and surveillance techniques have also played their part. However the single most important explanation offered from this perspective is the search for and generation of new 'centralities' that in turn has been made possible by the general increase in mobility, flows and exchanges that have accompanied the development of the technologies of the new network society. In the words of the world of commerce the bundling of these uses creates more 'footfall'. Economic explanations also point to the economies of scale involved in their creation and social and cultural explanations to the increased desire for social closure, privatism and introspection.

New Concepts of Space/Time and Spatial Models

The fifth spatial adjustment is associated with the new concepts of 'space/time' and the new spatial models made possible by the technologies of the 'network city'.

The dominant spatial model that emerges from the fragmentation of the modernist city is of the **'city as infrastructure**'. The Modernists had recognised the importance of infrastructure but as an instrument for achieving the clear bounded identity , urban cohesion and spatial integrity of the city. The dominant concept of the urban structure , however, remained based on area-based land uses - a system of monofunctional land use zones organised into rings and sectors around a monocentric CBD. Now because of the space/time convergence and differentiation effects of the new technologies ; the splintering of the infrastructures and the emergence of spatial clusters and enclaves associated with land use rebundling , a new urban geometry and spatial model emerges. In this model infrastructure is now determinant - particularly infrastructure that is put to the service of mobility and communications. It is concerned with connectivity, exclusion and differentiation rather than spatial integrity and cohesion. The '*urban truth'* is now *'to be found in the flow' (*Kostof 1997) and the city is understood as a function of infrastructure and its circuits. The monocentric Modernist city of layers , zones , centres and peripheries fragments as the infrastructure networks remodel these spaces. Cities are now identified as 'terminals' on global connections – as hubs radiating spokes to other cities and being remodelled as hubs and spokes themselves. This creates space/time '**tunnel effects'** that increase connectivity to the valued spaces and diminish it to the non-valued spaces.

The structure of the network city is now understood in terms of hubs and spokes , nodes, clusters , centralities , enclaves and voids rather than in terms of area-based land uses and centrality is now defined not in relation to CBDs but in relation to global/local networks. The strong radiocentric urban form dissipates and is reconstituted into linear , tentacular or corridor forms along the lines of the infrastructure. Buildings too are identified as infrastructure terminals – what Pawley (1997) calls 'post–urban terminal architecture'. The house it seems is no longer to be regarded as 'a machine for living in' but now becomes 'the house as a smart terminal'.

Some observers and theorists of the network city believe that the space- adjusting effects of the new technologies have been so profound that they challenge our existing concepts of space , time , place , scale , separation , core and periphery and demand the

formulation of new concepts. Technology is now seen as being a formative influence on the construction of space/ time itself. Space/time it is argued is created and not given. Space can no longer be seen as a Euclidean plane or time as a universal container for events . Infrastructure networks 'wrap', 'stretch' and 'compress' the everyday experience of space/time depending on their availability and connectivity. The result is the creation of 'multiple space times' within the city and dramatic variations in the 'personal extensibility of space' (Adams, 1995) depending on the availability of infrastructure connections. Space and place, it is argued , cannot be identified outside of technical networks . The city it is argued can best be understood as a *'continuous topologically formed field structure'* (Angelil and Klingmann, 1999) whose cohesion depends on the connecting tissue rather than on a core periphery relationship . Cohesion is derived from the technical networks but as Latour (1993) has pointed out these are *'connected lines not surfaces that retain only a few scattered elements of these spaces'*. The city thus becomes a fragmented world of multiple space/times and multiple connections and disconnections.

CRITICAL ANALYSIS

At the beginning of the paper we identified three groups of theories that attempted to explain urban fragmentation , which were differentiated on the basis of their pre-suppositions about what ultimately drives socio-economic and cultural change and changes to the organisation of space. These three approaches were : the technologically-deterministic ; socio-economic and cultural approaches. Each provides a critique of the alternative explanations and all have their own difficulties. They purport to explain a complex urban totality that consists collectively of all the individual elements they prioritise. They frequently import explanations from the other approaches in order to overcome the conceptual problems that appear during the elaboration of their own position. The extent to which they do this reveals not just the consistency or not of their argument, but also the degree of rigidity of their determinism.

The paper has covered a range of technologically-deterministic explanations offered for urban fragmentation, and some of the criticisms advanced below will be more apposite to some of the positions than to others. Bearing this in mind we can recognise six particular areas for critical analysis:

- The concept of technology that underpins the approach.

- The socio-economic critique of technological determinism.
- The relationship between urban fragmentation and spatial segregation
- The problem of the functionality or not of urban fragmentation.
- The concepts of space , space/time and the spatial models used.
- The exclusion of the environmental dimension from the urban fragmentation discourse and practice.

The Concept of Technology

A major problem with technological determinism in general is that it is based on the 'reification' of technology. Technology is conceived of as a *deus ex macina* that determines the human condition but which is somehow outside of it. This of course allows its proponents to propose a spurious 'technical neutrality' and 'universality' for their concepts and praxis, and allows the socio-economic and cultural dimensions of urban fragmentation to be marginalised. Frequently, the 'technical realm' is counter-posed or differentiated from the 'social realm'.

However, technology is inevitably and supremely a social and human creation (*'homo faber'*) and cannot be considered outside of human determination . In reality technology mediates between society and space and humanity and nature and does not determine them. Attempts to overcome this contradiction through concepts of infrastructure as a 'socio-technical hybrid' (Graham and Marvin 2001 ,) merely conceal this determinism but do not overcome it.

The main problem with technological determinism is that although its premises may be incorrect , those who consciously or unconsciously subscribe to it act as if it were true. The full ramifications of this process were explored by the Frankfurt School particularly in Marcuse's 'One Dimensional Man' (Marcuse 1972) , and in Horkheimer and Adorno's 'Dialectic of the Enlightenment' (1972) . The latter claimed that humanity now worshipped technology as God.

Technological determinism in the urban context becomes a professional ideology that is 'internalised' by professionals and provides the rationality for that practice to proceed on the basis of a spurious universality or rationality. The real problem with technological determinism then is that those who create , manage and develop the city act in their

professional practice as if it were true. Their conclusion is that if urban fragmentation has a technological rationale then it should proceed.

The Socio-Economic Critique

Socio-economic explanations for urban fragmentation despite considerable differences amongst themselves provide a critique of technological determinism and offer alternative explanations for urban fragmentation . Despite these differences they all agree that technology is always embedded in a set of socio-economic relations and structures and it is these relations and structures that drive and shape spatial organisation and determine the development and application of technologies.

The argument, for example, that it is 'technical innovation' that drives globalisation and the evolution of the network society and city , is only true at the 'surface' level as becomes apparent when one poses the question : 'what drives technological innovation ?'. Technological determinists have some difficulty answering this question and fall back on vague notions such as the 'inquisitive human spirit' ; the 'inherent' dynamic of scientific rationality or the inherently competitive nature of human beings.

Socio-economic theorists , however , would say that what drives technological innovation is the search for the creation of utilities within a specific set of socio-economic relations. What they call a 'global network society' in reality is nothing more than a capitalist society which is 'going global'. Globalisation is fundamentally a socio-economic process and not a technical process, and in a capitalist society what drives 'technical innovation' is the search for profit. The success of global neoliberalism in overcoming other socio-economic systems (pre-capitalist, socialist, mixed economy) has largely been the result of its ability to outperform them through the superiority of this incentive structure.

Socio-economic explanations for urban fragmentation must remain a subject for another paper. But in explaining the space-adjustment effects of the new network technologies, they point to the shift in capitalism from national, Keynesian mixed economy and welfare state models to global free market and competitive state models based on market liberalisation and privatisation.

Others prefer to understand the phenomenon (particularly of 'splintered infrastructure') as being the result of a shift from Fordist to Flexible Specialisation organisational models and the shift from 'standardised demand' to 'demand differentiation'.

We shall deal with some of the problems with the spatial concepts and models associated with technologically deterministic positions below. But it is argued by socio-economic critics that their inability to provide an adequate explanation of the 'space/time differentiation' effect of the new technologies is based on their failure to recognise the structural necessity for global capitalism to commodify all aspects of production , consumption , exchange and everyday life and to widen and deepen the social division of labour.

According to this line of criticism the inexorable need of capitalism to generalise the realm of commodities at the expense of other modes of producing and exchanging utilities means that even the most 'abstract' qualities such as space and time acquire a commodity status and can thus only be acquired by those who have sufficient effective demand to do so. The inherent inequalities in the capitalist system derived from the unequal distribution of the social product inevitably result in unequal access to these commodities , although in developing countries this is frequently compensated by access to other modes and forms of acquiring goods and services (e.g. subsistence forms and 'the informal sector').

The inability of technological determinism to recognise the commodity status of urban infrastructure and all aspects of the built environment means that it is incapable of identifying the reason for inequalities in access to the network technologies or the socio-economic consequences of the professional practice based on its premises. Technological determinists can eliminate any concern for the spatial and social equity effects of the application of network technologies because their utility is incontestable in their own terms of reference – technology is rational, neutral and creates utilities which meet needs, full stop . However , in-between science and technology there stands economics , and in-between utilities and needs there stands effective demand.

The reason for the simultaneous space/time convergence and differentiation effects and for the sharp increase in social and spatial segregation and social closure associated with urban fragmentation are not to be found in technologically-deterministic concepts such as the 'global network society' and 'network city'. In a capitalist city, space/time convergence and differentiation become translated into **'cost-space convergence and differentiation'** and this is how most people experience it in everyday life.

The fact is , according to socio-economic critics , that urban fragmentation occurs as a result of the application of new technologies that are embedded in a set of socio-economic

relations that in a capitalist society are inherently unequal . These inequalities are expressed in the urban form and structure – but now in a new form.

The refusal to recognise this fact becomes particularly consequential given the hegemony of global neoliberal development strategies that , according to all reliable statistics , widen and indeed encourage social and spatial inequalities precisely because they believe that by so-doing they can achieve an economic growth rate that will lessen or even eliminate poverty –a view shared by Bob Geldof, though he probably doesn't know it! According to this view the ability of the bottom sectors to get access to essential urban goods and services can actually increase whilst inequality increases . The attempt to eliminate poverty through increased inequality has been widely criticised , not the least because of its failure to come to terms with the long term social , economic and cultural effects of increased social and spatial inequality .

It is worth pointing out that most analyses that have examined poverty reduction achievements in the post-war period , point not to substantial improvements in income but rather to the improved access of the poor to basic services such as water , electricity, sanitation , health care etc. The question has to be raised of how these benefits can be continued in a context where infrastructure has been splintered and differentially-oriented to the valued global users and spaces and where the standardised networks have not received adequate investment for expansion , maintenance and repair. And one could also ask: what will the attempts to create network cities in developing countries do to diminish the basic infrastructure deficit ? You can only splinter an infrastructure network that is already there.

A similar set of difficulties appear with the identification of the globalisation process as a technical process and its characterisation as a 'global network society'. Understood in these terms globalisation can be conceived of as some abstract and undifferentiated process that exists 'out there' and which equally confronts all cities around the world with its technical prerequisites.

This leads to the illusion shared by many in the 'global cities' school that with the right policies there can be urban convergence. However when globalisation is understood as the globalisation of the capitalist system we have to consider another of the fundamental goals and achievements of capitalism, pointed out by Adam Smith (2003) in the 'Wealth of Nations' : capitalism has to develop and deepen the social division of labour with its inevitable concomitant , the spatial division of labour.

Cities around the world are inserted in and express this social and spatial division of labour, which is being increasingly organised at a global scale. Globalisation might affect all cities but it affects them differentially depending on their place in the global division of labour: as producers of raw materials (periphery) ; as producers of industrial products, energy and agricultural commodities (semi-periphery) or as producers of quaternary sector goods and services (core). The scale and type of spatial adjustment and urban fragmentation will depend on this insertion.

There is, however, an interesting case that can be made that the spatial adjustments associated with the network city and the emergence of global networks of cities represent a reorganisation of the global spatial division of labour, and that the 'zonal' or 'areal' representation of this division of labour is no longer adequate –that the division is thus reproduced internally in each zone.

The interpretation of differentiated capitalist , socio-economic relations in terms of technical homogeneity and integrity means that some of the most profound factors governing global spatial adjustment are ignored. The fact is that this conception of globalisation contains a hidden ideological interpretation of the nature of the globalisation process. And there are alternative models and interpretations. The world for example might be fragmenting into global trade blocs, and in many parts of the world the most important spatial adjustment that is occuring is the integration of cities and national city-systems into spatial systems organised at this scale.

The relationship between the local and the global offered by the proponents of the 'global network society' and 'global cities' school can also be challenged. The ability of global economic and spatial nodes and enclaves to dominate local urban spaces and urban systems in countries like China and India which have a huge potential internal demand could well be limited –unless of course they become the new core of the global economy.

Again the idea that specific localities can be integrated into a global spatial system that is in a sense 'discrete' from the local economy can also be challenged. There are the realities of multipliers ; employment effects ; material input and output obligations on Transnational Corporations ; tax revenues etc. Indeed the whole question of the nature of the relationship between the emerging global nodes and local spaces within cities is in urgent need of clarification and further research. Has , for example , the concentration of infrastructure expenditures on the new global spaces been achieved by diverting investment away from the standardised infrastructures in the local spaces ?

A range of scenarios is possible that are not considered by the proponents of the global network society. Will the global economy progressively subsume the local economy? Will the health of the global economy be achieved at the expense of the local ? Or will global capitalism as always articulate the local economy to get what it needs at the lowest cost and reproduce the synergy of the relationship in this way ? Each of these scenarios would have dramatic and different socio-economic and spatial consequences for the urban form and structure.

The Relationship between Urban Fragmentation and Spatial Segregation

The concept of technology as a *deus ex macina* can lead to the error of spatial determinism – technology moulds space and space moulds people. In this way the principle of the social production of space can be weakened and the spatial imperatives of technology asserted. Most contributions to the urban fragmentation debate do , however , remain embedded in the concept of the social production of space but the relationship between social and spatial organisation being proposed is often far from clear. This is particularly the case in two areas : the relationship between urban fragmentation and socio-spatial segregation , and in the concept of the relationship between social and spatial distance under conditions of urban fragmentation.

In this article we have argued for the characterisation of 'urban fragmentation' as a **spatial** phenomenon or process . In this context it is important to clarify its relationship to the concepts and realities of socio- spatial segregation . Spatial segregation refers to situations where members of one social group (races , ethnicities , classes etc.) are not distributed uniformly over space in relation to the rest of the population .The most common indicator is the index of dissimilarity which is similar to the Gini coefficient of inequality and produces a theoretical range of values from 0 (no segregation) to 100 (complete segregation).

Urban fragmentation is not coterminous with social and spatial segregation. Spatial segregation existed prior to urban fragmentation and exists without it. Urban fragmentation probably represents an extreme case of spatial segregation - it is the current form under which spatial segregation increasingly manifests itself. The sensitivity of the index of dissimilarity depends on the scale of the areal units recognised . Urban fragmentation results in fine -grained segregation . What were once gradients have now become boundaries . But urban fragmentation cannot be reduced to residential and areal segregation alone as it affects

the totality of urban land uses and activities and has a dramatic effect also on spatial mobility and spatial behaviour.

The relationship between socio-spatial segregation and urban fragmentation can also be conceived in terms of the relationship between social and spatial distance . As a tentative hypothesis it can be proposed that in the pre-industrial city, the social distance was great but the spatial distance was small (e.g. colonial slave-owning societies) ; in the industrial city the social distance became smaller (with the formation of the middle class) but the spatial distance greater (with the rise of socio-spatial segregation) and in the fragmented post-industrial city the social distance has become greater (with greater income inequality) and the spatial distance has become less **.** However , the relationship between accessibility and proximity has broken down under conditions of urban fragmentation. Urban fragmentation is associated with physical obstacles and enclosure and **'** lines have been drawn around spaces that matter .' In this context it is interesting to apply some concepts from the theory of 'social inclusion \ exclusion' to the definition of urban fragmentation : *a spatially fragmented city is one in which the ability to use and traverse space is dominated by the principle of exclusivity and a reduction in the number of places of universal encounter ; and a spatially integrated city is one in which the ability to use and traverse space is facilitated by the principle of inclusion and the places are conceived as places of universal encounter* . Contemporary changes in the relationship between private and public space are clearly important for understanding urban fragmentation .

The Functionality of the Fragmented City

The recognition of a condition or process of urban fragmentation implies the pre-existence of a condition of spatial integrity. What do we mean by spatial integrity? On what is it based? And if the condition or goal of spatial integrity is identified as functional does this mean that urban fragmentation is dysfunctional?

The question of whether urban fragmentation can best be understood as the break- down of an existing urban form or structure or whether it is part of a process that generates a new form and structure lies at the heart of the urban fragmentation debate. The dialectic of the fragmentation of space at the lower spatial scales (urban ,national) and the integration of the fragments at a higher (global) scale may well be the dominant dynamic. However , there are

also other ways of explaining urban fragmentation .The idea that urban fragmentation is a temporarily dysfunctional phenomenon associated with the transition from one spatial model to another can be reinforced by the contention that it results from the failure to complete the full and effective spatial integration of the networked city – it is dysfunctional because the network has not been 'completed '. A network is not truly a network until each of its nodes is separately and independently connected to each other and fragmentation occurs when some of these connections are absent (Ricardo Silva) . Of course for the technological determinist this is a 'technical ' failure and an aberration – and again in reality one has to look elsewhere for a convincing explanation of the persistent discontinuities and inequalities in access to infrastructure networks . However , bearing in mind this conception of the network one wonders about the wisdom of some network city analysts (Castells , Sassen?) in identifying the results of fragmentation as a new form of spatial dualism . But does urban fragmentation lead to the creation of dual cities ? In the Sixties and Seventies the concept of spatial dualism was widely discredited as being inadequate theoretically (because of its spatial determinism) ; methodologically (because of the use of ideal types) and empirically (because of the lack of recognition of articulations). The question is : to what extent does the revival of dualistic concepts associated with urban fragmentation (global city/local city) repeat the errors of the past (colonial/native city , traditional/modern city)?

Proponents of the 'global network city' also have little to say about the functionality of the spatial structures that are being fragmented , other than to put them in the past imperfect – modernist infrastructure and mono-functional land use zoning 'used to be functional'. Conversely, the inherent functionality of the new global enclaves and spaces and their connecting tissue is considered to be undisputable, given their technological rationality. But once the socio-economic context is considered, then what is functional or dysfunctional becomes more problematical. Lucien Goldmann (1969) pointed out in 'The Human Sciences and Philosophy' that the problem with Functionalism is that it is incapable of adequately explaining change . If everything is functional then how do you get change ? Discordant elements are stigmatised or categorised as 'temporary dysfunctions' that will inevitably disappear when the system is brought back into equilibrium . But, as Goldmann pointed out, what is called a dysfunction could well be a new and emergent function .Is urban fragmentation an example of such a temporary dysfunction or is it an emerging new

function ? The whole question of the functionality or not of urban fragmentation needs clarification.

Of course this is not too much of a problem if one accepts the dialectic of local spatial fragmentation and global spatial integration, but once one places the reality of the fragmented city in its socio-economic context , then the functionality or not of the fragmentation process seems to be contingent on this context. A wall can be used to identify the integrity of a totality more clearly (as in the medieval city) or to fragment or fracture it (as in the case of Cold War Berlin). But what has been fragmented? Is it the physical integrity of the city? or the functional efficiency of the city or the functional social equity of the city?

Whatever the case , the functionality of the fragmentation process can only be considered in its socio-economic and cultural contexts. Similar spatial processes in different contexts can produce different results. The question of the relationship between social and ethnic segregation and urban fragmentation is interesting here . Cellular fragmentation can have different consequences in a city where ethnic and class relations are expressed in multi-class ethnic columns and spaces (the cultural pluralism model) than in one where they are organised on the basis of single classes and a somatic norm (black or white). Or take the case of what is being fragmented – the pre-existing city. The urban fragmentation school, revealing its 'western' ideological bias, generally takes this as being the 'modernist city'. But what happens, as in Asia and Africa, when the pre-existing city is already based on a set of (often nested) enclosures of neighbourhoods based on religions , ethnic , and kinship identities. Under these circumstances, the same cellular fragmentation process rather than being a dysfunctional rupture , could acquire a greater functionality and be a manifestation of continuity. Baghdad's Green Zone and Beijing's traditional urban structure come to mind in this context.

Concepts of Space/Time and Spatial Models

A number of criticisms can be made of the treatment of space/time and the spatial models offered by the proponents of the 'network city' and 'global network society'. The utility of the type of thinking that produces spatial models such as the 'city as organism' and the 'city as machine' has been criticised by Kevin Lynch (1960) and others , and these criticisms are equally valid for the concept of the 'city as network'. Can we really believe in

retrospect that the organic or mechanical metaphor offered an adequate understanding of the nineteenth and twentieth-century city ?

But the treatment of space/time offered by technological determinism is also problematical in as much as it frequently leads an unacceptable level of subjectivity in the understanding of space/time . Is it really true, as has been suggested by some theorists that a unified urban space/time has now been fragmented through technological intervention to create a city of 'multiple space/times' –that space/time has been objectively created by the differential application of these technologies.

A number of objections can be raised to this concept, particularly its 'phenomenological' status, and the fact that it is based on 'mobility' alone. It could be argued, however, that we do not create space/time but rather exist in it , although we do change our ways of conceiving of it and measuring it through the use of technologies. Again the notion that the shift from 'area-based' spatial concepts that characterised Modernist spatial planning to the 'network' based concepts of the 'network city' represents a fundamental transformation can be challenged . It seems rather that we have left the world of Modernist abstract spaces, forms , layers , zones , sectors, centres and peripheries only to enter the Post-modernist world of abstract surfaces, nodes , circuits, flows and 'tunnel effects'. Both, however, continue to ignore the specificity of 'place' and the material world of nature –other than to identify it as a source of capital risk. We shall return to this issue shortly.

The 'partiality' of the concept of the 'city as infrastructure' can also be pointed out. It is predicated on the notion that cities can best be characterised as points or systems of flows , exchanges and mobility . But cities are and always have been more than just this , and infrastructure is really one of a range of material supports in the built environment (Pradilla 1984) . In reality the concept of the **'city as infrastructure'** is a conceptual recognition that cities have to be increasingly oriented to the global consumption, distribution and exchange process required by global neoliberalism.

The Exclusion of The Environmental Dimension

The last set of criticisms may well be the most important: The question of the environmental and sustainability implications of urban fragmentation seems to be excluded from the discourse –or at least is peripheral to its concerns , and there does not appear to be any compelling environmental rationality offered to justify urban fragmentation. Like their

Modernist predecessors, the proponents of the 'network city' have rooted their concepts of the city and the practices based on it in a social concept of space rather than a social concept of nature. This , given the myriad environmental problems that are unfolding is a serious issue.

It could be argued that the most important criticism that can be made of Modernism is that it 'dematerialised' the urban environment by reducing it to an abstract, quantifiable concept of space. One of the most serious consequences of this conceptual fallacy has proven to be the way it 'black boxed' the energy issue. Although the Modernists could hardly be blamed for being unaware of the environmental and energy implications of their architectural and planning practice given the ignorance of the issue at this time, the same cannot be said for the proponents of the 'network city' with their emphasis on mobility.

The fact is that like their Modernist predecessors they too have rooted their understanding of the city in terms of a social concept of space rather than a social concept of nature. This leads to a profound 'dematerialisation' of their treatment of the urban elements . In their analysis of infrastructure , for example , the material characteristics of the utilities that infrastructure provides is out of sight. However , infrastructure serves human needs , and the material needs of humans can only be satisfied by extracting utilities from nature. It is what goes through the pipes, conduits, cables and airwaves that counts. In this sense infrastructure is rather like the concept of the media proposed by Marshall McLuhan (1964) –they are extensions of the senses.

Place is space but it is space that is specified in nature . In the 'city as infrastructure' approach, infrastructure is generally considered as lying below, on or above an abstract surface (fragmented or not) . When the question of the embeddedness of infrastructure in the natural environment is brought up, it is generally only considered in abstract, mediated terms such as 'sunk capital'; 'the problem of the last mile' and as a source of capital risk. The same process of 'dematerialisation' and the reduction of physical concepts to network concepts of space can be detected in the analysis of other urban elements such as in Pawley's (1997) concept of 'terminal architecture' and 'the house as a smart terminal'.

Finally, I came to the question of urban fragmentation, as a result of my work on the 'compact city' debate. In this debate a compelling case is drawn up for urban compaction for sustainability reasons and in particular in order to minimise urban energy use and emissions. But what are we to make of this goal if the underlying dynamic is rather for the city to fragment?

In the compact city debate there are 'trade offs' between environmental and social goals (e.g. densification and the 'bad neighbour' effect). Although it is theoretically possible to have a compact fragmented city and this in reality is what exists in many global cities, the dominant pattern that seems to be unfolding is one of the low density, polynucleated sprawl of high density fragments. The walling-up and 'gating' of low density spaces and the high levels of social and spatial closure of the inner city fragments and enclaves bodes ill for those in the compact city debate who argue that high density compact cities could induce a shift to social cooperation –the 'good neighbour' effect of compaction could founder when confronted by the 'no neighbour' effect of fragmentation.

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Critical theories generally share a social and cultural analysis with an activist component based largely on the critique of oppressive and dominant economic and political forces, they have a desire for social justice and equality, and a need to represent marginalized perspectives (Tripathi, 2008). The term is also associated with the loosely connected though distinct field of literary criticism and theorists such as Roland Barthes.Â Critical theorists seek to challenge and destabilize knowledge which is seen as definitive and unitary.Â This myth, a version of technological determinism, propagates the belief that technological progress is independent of other social conditions to change or even render obsolete professional practices.