The concepts of *housing estate* and *street system* characterize two planning strategies involved in the formation and transformation of cities during the last century. This paper presents a comparative study which aims to explore the functional, social and cultural contents of the spatial configurations generated in cities through adoption of these concepts in planning. The Swedish city of Gothenburg is compared to the cities of Yazd and Abadan in Iran. The method of Space Syntax is applied in the analysis of the spatial systems of the studied cities.

The functional and structural position of the historic core in the cities of Gothenburg and Yazd reflects the original characteristics of these cities and their different courses of transformation. The urban structure in the old city of Gothenburg was based on a well integrated street network. The traditional city of Yazd, on the contrary, had a deep segregated spatial structure. In Gothenburg, in contrast to the city of Yazd, the historic core is now a well functioning city centre, a real public space. However, adopting two different planning models in the long course of urban development, Gothenburg has gained many of the global structural properties of Iranian traditional cities and Yazd has become more akin to the traditional city of Gothenburg.

In Abadan segregated self-contained housing estates determined the original structure of the city. Abadan is the first company town in Iran built almost a century ago. It was a product of the latest experimentation of advanced industrial capitalism of the day in social engineering. Nevertheless Abadan became a prominent example of emancipation from rigid modern paternalist urbanism. The later process of urban development in Abadan was managed by two parallel organizations, the Company and the Municipality. The result, however, was not a parallel but an integrating city. The control over the public space was strongly contested, leading to the appearance of a new human and democratic urban culture, a flourishing urban life with its street based spatial organisation. The analysis of urban structure in Abadan and Gothenburg displays interesting similarities though the processes of development of the two cities have been the reverse of each other.
Introduction

Society and built space are not connected with each other through simple cause and effect relationships. However, there are always associations between structural changes in cities and alterations of urban life. This paper discusses these associations in a comparative study encompassing Swedish and Iranian cities that have undergone different forms of urban transformations under the impact of different planning strategies. The method of Space Syntax is used in the analysis of the urban structures, the organization of public spaces, of the studied cities.

Public spaces in cities, in their entirety, constitute one spatial complex with the essential property of continuousness. This property, though necessary, is insufficient for cities to function. This continuous spatial complex, or urban grid as it is defined in Space Syntax, is also structured. This makes it possible to retain an intelligible picture of the grid that is necessary if it is to be used for accessing different parts of the city. Although the intelligible picture of the grid is based on its being structured, the knowledge about this structure is usually a tacit and intuitive knowledge of socially acquired kind. The analytic process in Space Syntax, which aims to convert this knowledge to explicit knowledge, can be described as a move from the observable feature of the built form of cities to the abstract spatial structure underlying the physical forms, and a return to the observable world through representing and modeling the spatial patterns and describing their properties by quantifiable measures.

The intelligibility of the continuous complex of public spaces in cities (the urban grid) is based mainly on the topological (not geometric) differentiation of each space, which is not visible from that space directly but can be explored through moving in the complex and experiencing the patterns of connections between spaces. This differentiation in syntactic analysis of the urban grid becomes clear by describing each space according to the way that it is accessible from all other spaces and the way that it may mediate and control the accessibility of other spaces from the whole system. This description is quantified as the value of integration of each space. The system as a whole is then described according to the distribution of spaces from which it is more directly accessible and more easily controllable. Ranking of all spaces in respect to their value of integration visualizes the order of configurational differentiation or the structure of the urban grid.

Another configurational property of the urban grid concerning its intelligibility is the differentiation and distinction of sub-areas in the context of the entire city. This can be explored in syntactic analysis of the urban grid by considering the way that the pattern of local integration of constituent spaces in a sub-area may correlate to the global position of these spaces. The local differentiation gives a picture of part-whole relation in the spatial organization of cities that can be different in respect to the way that sub-areas may overlap each other or be isolated from each other.

The continuous network of public spaces in cities, the urban grid, depending on how it becomes configured, can form patterns of unintended but systematic encounter and co-presence. Such encounter and co-presence work as a social resource for citizens to have informal contacts, to develop engagement with ‘the other’, to reach a stage of greater psychological maturity and to establish new forms of social solidarities and collective cultural identities. Thus the urban grid can also be involved in the production and development of urban culture. The conducted study aims to explore these potentials of urban spatial structures and the impact of different planning strategies adopting the two concepts of housing estates and street system on the process of transformation of these structures.
The historic core of cities

The functional and configurational position of the historic core in cities reflects clearly both their original characteristics and the nature of their transformations. In Iranian cities in general the historic cores, in spite of their usually central position, are not able to accommodate the contemporary requirements of life in a modern city centre. The comparison between urban spatial systems in the Iranian city of Yazd and the Swedish city of Gothenburg, the historic core of which does function as a modern city centre, clarifies the spatial reasons to the functional situation of the historic cores of Iranian cities. Fig 1 shows the configurational properties of the urban system of the Swedish city of Gothenburg and the city of Yazd in Iran. The historic core in Gothenburg is the syntactic core of the existing city. It constitutes a highly intelligible substructure in the context of the whole city. This spatial property, if not the only is then an essential prerequisite for a local urban area to work as an active city centre. In Gothenburg, those who move into the city and reside away from the central areas become familiar with the ‘Centrum’ (the city centre), and begin to spend time there even sooner than they get acquainted with their home area.

The plan layout proposed by the Dutchmen in the first city council of Gothenburg, 1621, besides defence possibilities, provided a distributed network of public spaces. This urban network facilitated a distributed pattern of social contacts in an urban society based on civil principles, which are still confirmed. The city in the process of its evolution, in spite of some malfunctions caused by (the now criticised) planning strategies of some periods, has responded to these principles.

In the city of Yazd, the historic zone is not the syntactic core of the existing urban spatial system. Neither does it constitute any intelligible local structure in the context of the whole city.
This reflects the history of the Iranian city, the transformation of a city with quarters highly segregated from each other forming a deep spatial structure exerting high control over movements and encounters into a clearly new type of city with a spatial configuration in which the traditional spatial control over social contacts is abandoned.

The reverse courses of urban transformation, the impact of different planning strategies

The historic core of Gothenburg is still a popular public space because the informal social contacts facilitated by its dense encounter patterns, which are generated by the original preserved street system, are now mostly appreciated by citizens from all social groups in their everyday life. In the city of Yazd, the spatial configuration of the historic core limiting and conditioning encounter patterns is now an obstacle for the unconstrained informal social contacts fostered by the new social system that has replaced the traditional urban society. These requirements of the contemporary urban society in Yazd are fulfilled by the new distributed urban patterns vastly generated by the overall development of the city. In Gothenburg, however, there are few urban areas with the same spatial properties that characterize the historic core of the city and its adjacent areas.

The global spatial system of the two cities of Gothenburg and Yazd shows another significant aspect of the relation between the past and the present state of these cities. The city of Yazd has a global system three times more integrated than the global urban system of Gothenburg. This relation was almost the reverse in a comparison between traditional Iranian cities and the Western mediaeval city (Karimi, 1997). The traditional Gothenburg and other European cities with planned and / or organic growth had a well integrated urban system with a more homogenous distribution of highly integrated spaces over the whole city. In these cities neighbouring sub-areas overlapped each other. On the contrary, the traditional Iranian city (known also as the Islamic city) was characterized by deep global structures, the distinction and segregation of local areas from each other, and the dense concentration of highly integrated spaces. Today, the city of Gothenburg has gained many of the global structural properties of the traditional Islamic city, and the ‘modern’ Yazd has become more akin to the traditional Western city.

The transformation of the city of Gothenburg towards the traditional Islamic city can be explained by the adoption of the idea of the modern housing estate introduced and advocated by pioneer functionalist/modernist architects. Interestingly, the transformation of the city of Yazd from its traditional form, a process of change marked as modernization, can be explained by the adoption of what was strongly criticized and abandoned by the modernist architects; the concept of the street system.

The city of Yazd, like all other Iranian cities with a long history, escaped the imposition of the housing estate pattern of urban development. In the comprehensive plans prepared for many Iranian cities during the 1960s the common design principles were the planning of separate neighbourhood units within delimited areas defined by a hierarchically differentiated urban traffic system, catchments areas for defined public amenities, the location of service facilities including retailing in the centre of each unit, and the separation of vehicular and pedestrian systems. While these design and planning ideas were implemented routinely in Sweden, in Iranian cities they remained just on the paper. Of the proposals in the comprehensive plans, only the main land use and traffic systems were implemented and the urban development within these frameworks adopted the pattern of distributed and interconnected street systems.
In the comparisons between cities made above general and fixed dichotomizations were avoided to better understand the nature of different forms of urban transformations. Yet further comparison can be made concerning values in our cities and urban life. In the city of Gothenburg, urban developments for the past century adopted different planning strategies, but the city centre maintained its importance throughout. It was not abandoned by the citizens for local centres or large scale shopping centres with geographically peripheral locations. These centres have not usurped its fundamental function as the most popular public place in the city. The configurational property of the city centre of Gothenburg has been a value sustained by forces generated by the specific demands of the urban life of its citizens. To explore the social and cultural importance of this value, we want to compare Gothenburg with yet another Iranian city (the city of Abadan) that shows interesting relevance to be compared with this city, both with regard to issues of the segregated housing estates and the vital city centre.

**The city of Abadan, a precursor and an exception**

Abadan is the first company town in Iran. It was founded in 1912 when the Anglo-Persian Oil Company (APOC) built the refinery and the port of Abadan on land at the northern tip of the Persian Gulf. Company town is a term coined in the United States where this urban form proliferated more than elsewhere, and refers to a town owned, designed, maintained and managed by a single company – state or private (Garner, 1984). This urban model was later replaced by the less rigorous alternative of social welfare models. In Iran, other large industrial conglomerates (mostly state owned) later reproduced the segregated and hierarchic urban design of Abadan in the company towns they built.

However, Abadan is almost a unique case. It reflects an extreme form of urbanization under a rigid modern paternalism. Abadan was a product of the latest experimentation of the advanced industrial capitalism of the day in social engineering. In the blueprints all unpredictable and spontaneous elements had been eliminated, all details of collective as well as private life in the new urban space had been subjected to conscious planning and design. But nevertheless, Abadan also became a prominent example of the emancipation from modern paternalism. In the process of urban development in Abadan the control over the public space was strongly contested, leading to the appearance of a new human and democratic urban culture; a flourishing urban life with its own spatial organisation.

Of the two major goals in building the company town of Abadan, like any other company town, the first, to house the labour force, was transparent and self-evident. But the second goal, which was concerned with processing this labour force and moulding it into skilled and efficient, but also docile, ‘happy’, and modern ‘human capital’, and maintaining this capital was not explicitly articulated. This was pursued by the spatial means that provided possibility for hidden intervention in all aspects of the everyday life of this labour force and their families. The company town, from the point of view of the company itself, was like a second factory, built next door to the main plant.

Abadan was the site of the first airport, cinemas, mixed schools, technical schools, leisure clubs, sports’ clubs, bus services, mass transportation, luxury inns, well equipped hospitals, etc. in the region. At the same time all these amenities were segregated for different social layers and classes. This system allowed the social position and status of each individual employed by the company to be public knowledge through his residential address, and the rank of amenities he and his family were allowed to use. Transforming urban amenities and city spaces into symbolic capital was one of the most effective instruments of controlling the population in cities like Abadan (Bourdieu, 1980, Mitchell, 1988).
The authoritarian spatial design of company towns did not only reflect the social relations that prevailed within the modern industry, it was also the means for reinforcing and reproducing them. In the areas of Abadan developed by APOC, the obsession to use urban space as an instrument of controlling social interactions is evident in all details of the design of the housing estates and the relations between them. The internal spatial system of the housing estates was divided into smaller segregated sections in which each street and alley could be easily controlled or cordonned off. Neighbourhoods for different ranks of the staff of the company were built apart and separated by wide stretches of empty terrain, wide roads, pipelines, creeks and ditches, administrative sections and industrial installations including the enormous bulk of the main refinery. Roads did not constitute a distributed network. Rather they ended in several bottlenecks that allowed the surveillance of all communication between the different neighbourhoods and districts of the city. The entrances to the neighbourhoods were supervised by the police or company guards.

Evidently, if different neighbourhoods were constructed adjacent to each other the provision of common services and infrastructure would have been far cheaper due to the economies of scales. Company towns were tremendously costly affairs to build and maintain (Crawford, 1995). The technically and economically irrational design of segregated neighbourhoods fulfilled a controlling and preventive social function. The imposed separation of neighbourhoods, the segregated and hierarchic landscape of the city, prevented easy intermingling and routine pedestrian interaction and potentially dangerous collective congregation between different city sections.

The development of Abadan was not limited to the self-contained housing estates of the Company. Tens of thousands of unskilled workers, and even a large number of skilled personal did not have access to the Company housing or services. The housing crisis and the economic potentials generated by the establishment of the largest and most advanced oil refinery in the world of the day led to the exponential growth of a different type of city, in spite of and against the wishes of the Company. The control and management of urban areas in Abadan became divided between two parallel organisations, the Company and the Municipality. However, the part that was outside the control of the Company became not a parallel but an integrating city, gradually taking form through a combination of spontaneous and planned developments.

The contested public space, the spatial configurations in the city of all citizens

In Abadan, the Company’s efforts to mould and create an ideal society, fit to satisfy its own needs was consistently subverted by an independent process of urbanization. The analysis of the urban system of the city of Abadan shows clearly the spatial principles of this independent, and at the same time integrating, urbanization. Fig 2 depicts the position of the industrial zones, the housing estates of the Company and the urban districts developed independently from the Company on the land left over between the housing estates under the control and management of Abadan municipality. In the districts managed by the municipality, people could own their houses or other real estate, unlike the housing estates, which were exclusively owned by the Company. Each district was inhabited by mixed groups of immigrants with occupations inside the company or in other areas. The relative separation of these districts was partially because of practical and technical problems like the location of pipelines and other installations, but also because of the influence of the Company imposing its general policy that was followed in the design of the separated housing estates. This caused the specific global spatial system of the city with indicative syntactic values.
The value of mean global integration in Abadan (0.6313) is much lower than the average of this value for the present state of a large group of Iranian cities with long historical background (1.1391), although there is no urban area in Abadan from the past with a deep traditional fabric (Azimzadeh & Klarqvist, 2001). Neither does the texture of the urban districts developed outside the full control of the Company show any similarity to the traditional urban texture.

The important characteristics of the spatial structure of the urban districts of the municipality of Abadan and the housing estates of the company concern their internal configurations, their relation to each other and the way they are embedded in the global system of the city. The street systems within all the districts of the municipality constitute local structures with remarkably higher degree of internal integration and intelligibility in the context of the whole city, compared to the housing estates of the company.

The district of Kufeysheh (area ‘a’ in fig 2) was an urban area that began to take shape independently from the Company at the early stages of the founding of Abadan. Originally, it was a stop where the British had a ‘Coffee shop’ that in an emerging local dialect gradually became Kufeysheh. The street network in this urban area constitutes the most distinct and intelligible local system within the context of the whole city. Fig 3a shows the integration map of Kufeysheh, the local-global scattergram of the district and its scatter within the context of the whole city. The value of intelligibility (r-squared) for the lines of the area selected in the local-global scattergram of the city is 0.71. The local system separately has a mean global integration of 1.8, and a value of intelligibility (r-squared) of 0.85. These syntactic values in the local area of Kufeysheh in Abadan show interesting similarities to the same values for the spatial system of the oldest urban area in the city of Gothenburg within the original fortifications of the city, fig 5a.
The urban district in Abadan that took the name of Abadan town, Shahr-e-Abadan (area ‘d’ in fig 2) was not the historic core of the city. It came into existence after the establishment of the Abadan refinery and the major part of its affiliated housing estates that were built on almost virgin land. The Company had separate shops for the different ranks of its employees selling almost all conceivable goods demanded by their separate groups of customers. However, Abadan town, which emerged firstly just as a fish market, grew into a complete market place and the liveliest urban area in the city. Unlike the housing estates of the Company, the town was not completely planned in advance and developed gradually, semi-spontaneously semi-planned, forming an urban system with no precedence in Iranian urban history, fig 3b.

The syntactic properties of the urban grid in Abadan town; high mean global integration value, pattern of distribution of integration value, smooth variation of this value between lines and high degree of intelligibility, are remarkably different from properties of the urban grid in traditional Iranian cities. Abadan town is connected to the global system of the city through very limited links. However, because of its highly integrated and legible internal system and the
global importance of the links integrating it into the spatial structure of the whole city, Abadan town, after the small district of Kufeysheh, is the most intelligible local structure within the global urban system.

Abadan town with its rich variety of places embedded in a spatial structure facilitating, instead of restricting, movement and encounter did not only fulfil the demands of the urban life of its own inhabitants, but it attracted all the residents of the housing estates of the Company. While people who did not live on the Company estates were in actual fact excluded from them, Abadan town was fully accessible to all the citizens of Abadan, and was regularly and frequently visited by them and indeed owed its thriving life to this fact. It was the town for all Abadanis.

The segregation of the spatial system of the housing estates of the Company is mostly evident in the neighbourhood of Braim (area ‘k’ in fig 2). This housing estate was originally built exclusively for the British staff of the Company. The street network in Braim, compared with all the other housing estates and urban areas in Abadan, displays the lowest internal integration and the lowest degree of intelligibility as a local area in the context of the entire city, fig 3c. Braim was equipped with almost all thinkable amenities of high quality. Abadani people called this housing estate ‘Boghe Adamo Hava’, Adam & Eve’s Garden.

Remembering the story about the origin of Kufeysheh, we can speculate that the British in Abadan, far away from their homeland and longing for busy places in their own cities, were not fully pleased just living in an isolated tranquil paradise and looked for a livelier spot in Abadan to spend their leisure time. The British coffee shop, which became the nucleus of a well functioning local area in Abadan, must have been located at a well integrated point on the existing street network at the early state of building Abadan, and must have been at least as popular and as much visited as the exclusive clubhouses in Braim were.

In the housing estates of the Company, a common property is the isolation of these housing estates from the neighbouring urban areas; no matter whether another housing estate or a district of the municipality. This property is even observable in the most centrally located housing estate of Bahmanshir (area ‘g’ in fig 2). The most integrated lines in this housing estate stop within the local area and the housing estate is not linked to the neighbouring areas and the global system through these lines.

In contrast to the isolated housing estates of the Company, the urban grid in the districts of the municipality penetrates the neighbouring district/districts forming intelligible local systems of different scales in the context of the global spatial structure of the city. The result is that locally active spaces are linked together creating a continuous sequence of lively public spaces open to all citizens.

All of the districts of the municipality together form a large substructure within the context of the city, which shows more properties of a city centre than the central zone of the city encompassing the housing estate of Bahmanshir (area ‘g’ in fig 2), and three districts of municipality (area ‘a’, ‘b’ and ‘c’ in fig 2). In spite of the compactness of the central zone, the mean global integration of this area analysed separately is not more than this value for the urban grid covering the districts of the municipality (1.3595 versus 1.3567), fig 4. The value of intelligibility for the urban grid of the central zone is lower than this value for the street network of the districts of the municipality (0.4456 versus 0.4802). On the integration map of the central zone we can see that the lines with high integration values are mostly located at the edges of the districts and the housing estate, fig 4a.

The more remarkable difference between the subsystem constituted by only the districts of the municipality and the local area of the central zone of the city is concerned with the degree of their intelligibility within the context of the global system. In fig 4 we can see that the scatter of the central zone within the context of the local-global scattergram of the city is more
dispersed than the scatter of the subsystem of the districts of the municipality. The r-squared value for the lines of the districts of the municipality selected in the scattergram of the city is 0.4639, while this value for the lines of the central zone is 0.3423.

The urban situation of the subsystem of the districts of the municipality in Abadan shows an interesting similarity to the situation of the local system of central Gothenburg. In the map of the city of Gothenburg from 1900, fig 5b, we can see that the moat of the old fortifications of the city, the wetlands outside the moat that became a park and the large railway yards had some impacts on the urban development. However, until this date the street system was still the predominant concept in urban design and planning. By adopting this concept, the barrier effects of the moat and the large-scale urban installations on the continuous development of the traditional urban texture was counteracted. The urban areas in the central Gothenburg where the urban pattern from 1900 and earlier periods has been retained are (in similarity with the districts of the municipality in Abadan) the most active part of the city. This depends mostly on the configurational position of the central Gothenburg within the context of the global urban system.

Syntactic values and scattergrams representing the configurational properties and the local-global relationships in the two urban subsystems show clear similarities, fig 4b & 5c. The value
of mean global integration (1.4903) and intelligibility (0.5136) for the local areas of central Gothenburg are close to the same values for the urban subsystem of the districts of the municipality in Abadan (1.3567 and 0.4802 respectively). The r-squared value for the lines of central Gothenburg selected in the scattergram of the city is 0.4117. This value for the lines of the districts of municipality in Abadan is 0.4639.

Do all these many mathematical values have any association with cultural and social values? Is there any association between the urban life in Abadan and in Gothenburg? In the company town of Abadan, the Company could not ultimately manage to impose full hegemony upon the place it had created. The company town of Abadan was shaped by the disciplinary powers of separation, ranking, and surveillance that kept its residents under constant control. Its ‘public’ space was confined to clubs, sport fields, stores, and amenities that only the employees of the company had access to. However, the new integrating Abadan of the visible and accessible ‘free zones’, with its colourful stores, streets teeming with pedestrians and its rich variety of places, presented a lively, untamed and unsupervised public arena for all citizens, whether employed by the Company or not. It was a public place, in the more accurate sense of the term, for a multifaceted and vibrant urban life.
While Abadan matured into a cosmopolitan city with a sophisticated culture, the citizens, through their autonomous socialization, created new forms of solidarities and a general sense of social identity; that of being Abadani. Spontaneous civil institutions, networks of trade, guilds, social, cultural and political activities were always prominent in Abadan. Three decades after the building of the refinery, just counting the urban district that took the name of Abadan town, there were 45 union clubhouses. By this period, 95 percent of all the blue and white collar workers in Abadan were members of different trade unions. By May Day 1946, the Abadanis organised a rally of over 80,000 in Abadan (Abrahamian, 1981). The city had an important, and sometimes decisive, role in the national movements of the country. The question is whether all this could happen if Abadan, spatially, was confined to the housing estates of the Company.

Comparing the apparent features of the physical construct of the two cities of Gothenburg and Abadan we cannot find any remarkable similarity. But the urban functions of Abadan town, together with other districts of the municipality, as an active city centre very much resembles the function of the central Gothenburg. This functional association has been based on similarities in the configurational positions of them within the global spatial system of the two cities. Structurally, Abadan town and other areas of the ‘free zone’ have the same function of integrating a globally segregated urban system that central Gothenburg has in the segregated global system of the city. However, the processes of development of the two cities have been the reverse of each other. In Abadan, in contrast to the city of Gothenburg, the building of the segregated housing estates was prior to the formation of a vital and integrating city centre.

The shared configurational properties, providing unconstrained possibilities for accessibility, movement and encounter, make the two city centres a public place for all social groups of their citizens (irrespective of the different degrees of dependence of these groups on space for the maintenance of their social contacts).

In Abadan, the social groups that were more dependent on space for establishing social relationships for creating their identities perhaps gained more benefit from the subversion of the segregating spatial discipline. However, the same general demands for a vibrant and creative urban life that forced the generation of Abadan town, Kufeysheh, Karoon and Ahmadabad with the specific potentials of their spatial configurations, seem to have been backing the vitality of urban life in the ‘Centrum’ of Gothenburg by continuously utilising its similar spatial potentials. The cultural and social values of places in cities can be better sustained when the mechanism of formation and survival of configurational properties of the urban structures involved in the generation of these values in different courses of urban transformation and application of planning strategies are understood.
References


