Living - Working - Shopping in Delft Central Station

Introduction

This article analyses the potential of large urban infrastructure project in the city of Delft as a future place for living, working and shopping. At present, the railway station in Delft plays an important role in the economic development of the city. Everyday more than 20,000 passengers stop at Delft railway station. By the coming of the Stedenbaan, a rapid transit system in Randstad Holland, the Dutch railway company expects the amount of the train and the passengers to be doubled in Delft Central Station by the year 2010. Therefore the municipality of Delft proposed a new master plan to upgrade the quality of the infrastructure. This proposal eliminates the existing barrier effect of the railway by building underground railway tracks, which gives a new opportunity for redevelopment of the urban area around the existing station.

A lot of studies have dealt with the location strategies on retails, and also on the relationship between the railway station and the retails location. However the analysis of retail location mainly stayed at the abstract planning level. There is still a lack of knowledge on the 'street-level' distribution pattern of retail activities around railway stations. This study therefore investigates the influence of spatial element, using 'movement layer' techniques to uncover space-structural detail within urban fabric as a field of movement and activity, on the distribution pattern of retail and service firms around Delft Central Station.

A 'central' urban place and the 'movement layer'

It is assumed that configurationally the cities consist of different scales of movement. These scales are layered, distinguished by the scales of mobility, and are designed to convey different scales of movement[1]. The hierarchy or functional layering built into the shape of the urban grid of Dutch cities involves:

1. **The regional movement network** - which conveys movement at a scale which cities as points or destinations within it; this can be in the form of a freeway network or shipping routes. The regional scale appears locally most often in a nodal node - e.g. stations, metro stops or parking garages.
2. **The city-scale movement network** - a set of spaces in the grid, which are suited by their geometry for carrying/conveying traffic/movement over the medium and longer distance. The city scale is mostly linear and continuous, and is differentiated and 'formed' by its level of integration into the local scale.
3. **The local-scale network** - the grid at the neighborhood or local scale. It is analyzed and measured by an area integration map[2].

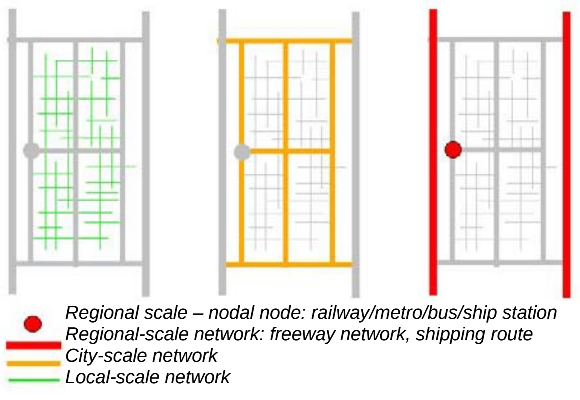

Figure 1. Movement layer network

A large number of people movements are one of the conditions for a livable environment, mix-use function and retail activities in a central urban place. Therefore it is suggested that a 'place', where those movement networks 'criss-cross' with each other, is a place where one can expect an emergence of an urban centre life. This means that real urban centrality depends not only on the contribution of a regional context, but also on a context at a 'city' scale as well as at a local scale.

The density of the network is also an important factor. The denser the movement network (especially at the city-scale), it becomes favorable for the city centre activity, such as retail. Another important aspects that influence the intensity of pedestrian movement are transparency and high grid connectivity (e.g. a relatively simple orthogonal grid with a high average local integration value) at the local-scale. Thus the neighborhood/area with high grid connectivity (up to 3 step away topological distance) will tend to be well used by people.

From these considerations it follows, that a place with a dense city-scale network superimposed by a high integration of local-scale network is the place where centrality activities emerge. The correlation of this spatial centrality factor and distribution pattern of retail has been confirmed in the empirical study of several cities, such as Amsterdam and Haarlem. Figure 2a and 2b show that the retail shops (white patches) located themselves mostly on a place where the city-scale (represented by continuous orange line) and high integration of local-scale structure (represented by area integration map) layered together.

Legend:

- *railway stations (regional-scale movement)*
- *highway network (regional-scale movement)*
- *city-scale movement network*
- *local-scale movement (area integration map: the redder the lines, the more integrated is the space)*
- *retail location*

Figure 2. Spatial centrality and distribution of retail shop in Amsterdam and Haarlem

The Block size

Another important spatial character of a live centre is a small block size[4]. Hess, Moudon, Snyder and Stanilov[5] investigated the effects of neighborhood site design on pedestrian travel in mixed-use, medium density environments. They suggest that neighborhood site design plays a determinant role in supporting walking as means of transportation. Controlling for population density, income and land use mix and intensity, the volume of pedestrian trips is 3 times higher in urban sites with small street blocks and continuous sidewalks than in suburban sites with large blocks and discontinuous sidewalks.

An Australian researcher, Arnis Siksna[6], did comparative studies of block size and form in 12 North American and Australian city centers. He found that some block forms and sizes were better than others in making a city centre layout more amenable to adoption, or more robust in meeting varied development needs over time. He demonstrated that small or medium blocks, in the range 3,600m^2 to 20,000m^2, are more suitable for the general functioning of city centers than larger blocks. Layouts with small blocks produce finer-meshed circulation networks than layouts with large blocks. The number of intersections, affording change in travel direction, is a good indicator of the level of circulation convenience. Finer-mesh pedestrian networks, of 50-70m, are appropriate in areas of intense pedestrian activity, particularly in the retail core blocks. He also found that large building blocks in the city centre has been considerably evolute incrementally over the time. This evolution is intensified by inserting alleys and subdividing the block interior, creating smaller blocks and sub-blocks (e.g. Adelaide, Perth and Toronto). Meanwhile the city centers with smaller initial blocks and a fine circulation mesh (e.g. Portland, Savannah and Seattle) have remained intact and can be regarded as having an optimum block size. Thus, he argued further, if certain block forms have worked well, or have produced particular effects in the past, there is a reasonable expectation that they will perform similarly in other cases in the future.

This in spite of different type of sites, one study was performed for a residential, more suburban area and the second for a city centre area. Both research works found that the spatial aspect, namely the small block size (of 3,600 m^2) and the finer-mesh street network (of 50-70m), plays a role in increasing the pedestrian volume and the mix land use pattern in an urban area, a precondition for creating a city centre environment.

It is evident that in designing the urban centrality, that is suitable for mix use activities: living, working and shopping, of a railway station area, the spatial aspect is a crucial factor. It needs the same characteristics, which prevails in traditional city centers, namely:
1. the interweaving of movement layer of local to largest scale;
2. high concentration of city scale network superimposed on transparent local scale network with high grid connectivity;
3. small block size (approximately 3,600 m^2) and fine circulation mesh (50-70m).

The existing distribution pattern of retail in Delft

There are five important shopping centre areas in Delft[7]. Three of them are located in the historical inner city, and have a fun-tourist shopping character. The fourth one, “In de Hoven”, is an urban indoor shopping centre, located in a post-war urban area where buildings are mostly high-rise and densely populated. The newest shopping area (built 1995) is “Leeuwenstein”, a regional car-based shopping centre where one can get furniture, carpets, beds and kitchen appliances. It is easily accessible from highway A13 and its parking place is directly connected to the entrance doors. Due to its outstanding accessibility via the highway, this shopping centre serves not only the city of Delft, but also the other smaller cities around it.

Legend:

Shopping area

I.	De Klis	: 4,8 ha
II.	In de Stede	: 11,9 ha
III.	In de Veste	: 8,3 ha
IV.	In de Hoven	: 12,9 ha
V.	Leeuwenstein	: 4,2 ha

Figure 3. Shopping area in Delft, source: Gemeente Delft

In spite of the fact that this study focussed mainly on the spatial configuration around the railway station, it was necessary to include the whole urban grid in the analysis, to ensure that each line in the station area is embedded in the whole urban structure. Figure 6 gives an axial representation of the city of Delft, covering the area approximately between the highway A13 in the east and the natural city boundaries in the north, south and west, such as the farming lands and green houses.

Figure 4. a) City scale movement network, represented by the thick orange lines; b) Local scale movement network. It is measured by, so called, area integration analysis (one of Space Syntax measurements)

Figure 4a is the city scale movement structure and as such shows the most global structure of Delft, with a pattern centred on main street line axes. As we can see, the location of the railway station is near the crossing of the street 'Westlandseweg-Zuidwal' and 'Westvest-Phoenixstraat', one of the most central locations in Delft.

Figure 4b shows the area integration analysis, one of the Space Syntax measurements. In general one could say that local concentrations of high local integration (the redder patches) reflects high pedestrian movement and social interactivity. As can be seen in Figure 4b, the market square area in the old city centre is highlighted (the redder patches in the area integration map) and it is the location where the most street-edge shops in Delft are clustered, with 192 retail shops of a total 612 in all of Delft.

Let us focus on the spatial configuration around Delft Central Station. Since we deal mainly with street configuration, the *walkable radius* is chosen as the research boundary. It means that the railway station area is identified as a circular area radiating from the railway station that is considered 'walkable' distance. In this case we adopt a walkable radius of 1 km (more or less equal to ten minutes walking time).

Figure 5 selects a one-kilometre area around Delft Central Station and assigns numbers of retail shops on each line segment on area integration map. It shows that retail shops mostly located themselves along the most integrated spaces (red lines) and only a small number of shops are located in the vicinity of the station. This suggests that the effect of the spatial configuration, in this case the 'area integration' measurement, is more determining than the effect of the station.

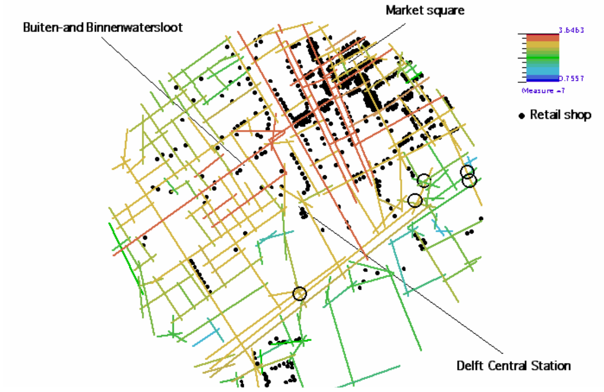

Figure 5. Area integration map plotted with the distribution of retail shops, within 1 kilometre radius of Delft Central Station

The analyses show that in the city scale structure, the existing station is located in a rather well integrated position, by being centrally located in the city of Delft. But its integration with the local scale urban fabric is rather poor, as we can see from the area integration analysis. The urban fabric around the station doesn't have a simple orthogonal transparent grid and the block sizes are rather big (in average of 21,000m^2 /block), which means that this area is rather un-intelligible and inconvenience for pedestrian movement and not suitable for city centre activities.

In spite of the fact that the station has been there for more than 100 years, this rather poor spatial condition explains why the station, with almost 40,000 people daily passing by (20,000 train passengers, plus passengers using other modes of public transport) doesn't attract much of economic activities (especially retail) around it.

The new master plan

By the coming of the "Stedebaan" and the new High Speed Train, it is expected that by 2010-2015, the number of trains will be increased significantly (466 passenger trains, 11 cargo trains and 68 Thalys trains). Therefore the municipality of Delft proposed a new master plan (Figure 6) to upgrade the area around the station. This proposal eliminates the existing barrier effect of the railway by building underground railway tracks, which gives a new opportunity for redevelopment of the urban area around the existing station.

Figure 6. The new master plan of Delft Central Station by Joan Busquets, source: Gemeente Delft, 2003

Figure 7. a) City scale movement network with the new master plan, represented by the thick orange lines; b) Area integration analysis of Delft with the New Master Plan

The start of the tunnel will be at the DSM-Gist factory and continues until it passes Abtswoudseweg. Since the Irene tunnel in Westlandseweg will disappear, the road and the tramline of the Westlandseweg will be on the ground level. The bicycle tunnel of Abtswoudseweg will vanished as well. The station will be located underground, to the north of the existing station. The accessibility will be from the new municipality office and the bus terminal (still in discussion). The bus terminal and the tram stops will remain on the same location. This scenario opens up an opportunity to urbanize the Spoorzone area from the 'Bolwerk' until Abtswoudseweg, in which will provides about 60,851m^2 of overall footprint space and 26,000m^2 built-up space for urban redevelopment[8]

Figure 7a shows the city scale network in Delft after the tunnel is built. Most important is that there will be addition of city scale network on the Coenderstraat, which will improve the density of the city scale network in Delft.

The results of the area integration analysis are presented in Figure 7b. As can be seen, the new master plan provides not only the opportunity to utilize more space for urban redevelopment, but also more possibilities to increase the number of small urban blocks (approximately 3,900m^2/block). In total, 38 blocks will be added. This scenario will also allow a more transparent orthogonal grid in the area. These factors increase the area integration value, since they provide a finer-mesh fabric (60-65m) and therefore more convenience and intelligible for pedestrian movement.

Conclusion

It is evident that in the existing situation the railway infrastructure forms a barrier for the city integration. The infrastructure divides the city and makes the area around the station unintelligible and not favorable for street edge economic activities. A new master plan is proposed to solve this problem. Putting the railway infrastructure underground, the new scenario opens the opportunity to spatially integrate the city area and exploits the urban area around the station. Elimination of the railway tracks and development of a transparent and simple orthogonal urban grid increase significantly the local-scale integration value, of the area around the new station without decreasing the integration value of the historical centre.

The railway station (a node of regional network) is well integrated into the city- and local-scale network, which means it will provide a favourable place for the emergence of urban centre activities. Theoretically there exists a strong correlation between the integration of the street networks in different scales and the small block size on one hand and the centrality of the space in the other hand. Thus the more integrated is the space, the more pedestrian movement potential we can find. The more pedestrian movement, the more potential the space has for economic activities, which is one of the pre-conditions for mix-use and a livable environment. Therefore, we can conclude that the new master plan would stimulate the emergence of liveability and a pleasant atmosphere around the station for living, working and shopping activities. In fact a combination of high quality infrastructure, an intelligible street network (spatial centrality), the presence of university and cultural historical value are the main strengths of this location, which even opens up new opportunities to upgrade the location into a regional centre.

Endnotes

1 Read, S. (2000) *The patchwork landscape and the engendineered web: space and scale in the Dutch city*, retrieved February 1 2004, from http://www.spacelab.tudelft.nl/publications/publications.html

2 One of Space Syntax[3] measurements. In general one could say that local concentrations of high local integration (the redder patches) reflects high pedestrian movement and social interactivity.

3 Space Syntax is a set of techniques for describing and analysing the relationships between spaces of urban areas and buildings. Originally conceived by Bill Hillier at the Bartlett, University College London in the 1980s as a tool to help architects simulate the likely effects of their designs, it has since grown and has been extensively applied in a variety of research and design applications, in the fields of architecture, urban design, planning and interior design (see www.spacesyntax.org).

4 Jacobs J, (1961) *The Death and Life of the Great American Cities*. New York: Random House.

5 Hess, P.M.; Moudon, A.V.; Snyder, M.C.; Stanilov, K. (1999) *Site Design and Pedestrian travel.* In Transportation Research Record 1674 (www.enhancements.org)

6 Siksna, A. (1997) "The Effects of Block Size and Form in North American and Australian City Centres", *Journal of Urban Morphology*, Vol. 1, p. 19-33

7 Gemeente Delft (2003) *Delftse economie in beeld 2003*, retrieved April 21, 2004, from http://www.gemeentedelft.info/

8 Gemeente Delft (2003) *Masterplan spoorzone,* Delft: Gemeente Delft.

Acknowledgements

I would like to acknowledge the support of my supervisors Prof. D.H. Frieling, Prof. J.M. Schrijnen and dr. S.A. Read for their invaluable guidance during my PhD thesis work.