Pedestrian Movements in Commercially Transformed Residential Areas: Levent Bazaar, Istanbul

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Abstract

Urban spaces undergo numerous transformations depending on growth and development dynamics of cities. This process can occur within both physical and socio-economic contexts. Besides, built environment can be conserved while socio-economic transformation is obtained. With growth and development of the central business districts (CBD) of cities, commercial transformation of residential areas and change of their spatial identity have become a common occurrence. This spatial change affects the users of such spaces and therefore, accessibility and intensity of pedestrians increase accordingly with the new transportation policies.

This study examines the impact of morphological and functional layouts of built environments on pedestrian movement. The case area of Levent which has been built as a single-family housing area on the peripheral zones of Istanbul and has later become an important commercial centre with the growth and the development of the CBD. Today, much of the district has been functionally transformed. However, the built environment has been largely protected through the laws that do not permit new folds on the buildings. Levent Bazaar has also become the main backbone of the sub-centre, which was a "local trade" nucleus of the residential area in 1950s with only commercial units on the ground level. In this context, the users of the bazaar have become urban and the number of pedestrians has consequently increased. The study contributes to literature in terms of questioning the relationship between morphological and functional layout and pedestrian movement in a commercially transformed urban space. The negative and positive aspects which demonstrate the stated relationship have been identified with the results of natural environment, built environment and pedestrian movement analysis. In the context of these findings, urban design proposals that aim to improve pedestrian comfort and spatial quality have been determined conceptually.

Keywords: *Transformation, urban growth and sprawl, built environment, functional networks, pedestrian movement, Istanbul.*

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Introduction

Aim and Focus of the Study

The purpose of this study is to examine the impact of morphological and functional layers of built environment on pedestrian movements in a functionally transformed urban space. Levent District, which has been originally built as a single-family housing area in 1950 but later became a commercial sub-centre with the growth and development of the CBD of Istanbul, was selected for the case study. During a 60-years period, the morphologic structure of Levent District had been largely protected but nearly half of the buildings have been converted to commercial functions from residences. In this context, the study is to analyse the behaviours and movements of the pedestrians within the space-function interaction in Levent Bazaar, the local and commercial core of Levent District. The focus of the study is to investigate how the morphologic structure and functional networks affect the movements of pedestrians, jointly or separately.

The study is constructed with four intentions:

1) To examine the spatial development and transformation process of Levent District throughout the history,
2) To analyze the morphologic structure and commercial network of Levent Bazaar,
3) To analyze the pedestrian movements in Levent Bazaar,
4) To interpret the spatial structure in accordance with all analyses and design proposals.

Research Methodology

In parallel with these intentions, various research methods were used. Historical texts, former studies, original plans, projects and old photos have been reviewed to understand the transformation and development process of the area. The morphologic structure and functional networks have been analysed on-site and visualized as different layers by processing on the current map. Again as on-site analysis, the routes and directions of pedestrians have been detected by observation and the amounts and densities have been determined by pedestrian counts which were carried out during peak hours on weekdays and weekend. In addition to amounts and densities, data such as pedestrian flows, areas per capita, average speed and level of services have also been obtained in relation to spatial dimensions. All the data have been converted into the tables and diagrams, comparatively evaluated with morphologic and functional layers and the positive or negative aspects of the use of the space and design have been determined. Finally in accordance with the results, design proposals have been made to enhance the quality and comfort of the space; particularly for pedestrians. There is no other specific study about pedestrian movements in early periods of Levent region in the literature, so the historical comparative study was carried out only with the morphological structure.

Theoretical Framework

The increase of urban population and socio-economic changes bring about the facts like urban growth, urban sprawl, urban development and urban transformation. The quantitative expansion of physical and morphological structure is defined as “urban growth”, whereas the positive evolution of economic, social and cultural structure with the physical structure is characterized by “urban development”. In parallel with the two descriptions above, “urban transformation” can be defined as physical, functional or socio-economic differentiation or urban space depending on the dynamics of urban growth and development. Especially in the context of “urban sprawl”, transformation is related with the growth of urban centres, the

expansion of the boundaries towards the peripheral areas and the intertwining of land use and functions (Cheng, 2003). This process has a dynamic, non-linear and complex structure due to the physical and socio-economic factors of urban areas (Clarke et al., 1997; Cheng, 2003).

Urban growth and sprawl occur towards periphery from the historical centres in accordance with various dynamics. The ratio of the growth differs at specific time intervals through these dynamics of the urban areas. At this point, the economic and socio-cultural factors of the related time interval are extremely important. There are many land use models and theories in literature developed within urban growth and sprawl. The term “sprawl” first used by the American urban planner Earle Draper in 1937 (Nechyba and Walsh, 2004). “The Central Place Theory” of Christaller, “Monocentric City Model” of Alonso, Mills and Muth and “Sector Theory” of Hoyt are some of the others. One of the most known and used theories is the Concentric Zone Theory of Burges, which divides the urban space into five regions from city centre to periphery: (1) Central Business District, (2) Industrial areas and the transition zone of the lower income group, (3) Workers’ housing areas, (4) Middle income group housing areas and (5) High income group housing areas (Park, Burges and McKenzie, 1925; Candau, 2002). The rhetoric “All the business opportunities take place in the central business district” which is stated in many of these models and theories has lost its validity in today’s multi-centred complex urban systems and functions are distributed to many locations in the cities as a result of urban sprawl.

Central Business Districts (CBD) which are the commercial backbone of the cities usually tend to grow from centre to the periphery depending on the economic conditions. With the decentralization of the industrial areas from city centres, the CBDs enter into the second ring of growth and progress towards residential areas. Mix-uses commonly occur with this progress and commercial functions take place mostly on the ground floors of residential buildings. In this regard, the profile of the users also changes and new “pure” residential areas reappear at the periphery as a “suburb” or “satellite city” with the extent permitted by the physical boundaries of the city.

The first examples of suburbs and satellite cities at the peripheries have emerged with the Garden City Movement at the beginning of 20th Century (Howard, 1946). After industrialization and concentration of the city centres; upper-middle and high income groups moved to the residential areas at the periphery which intertwined with the green areas and became isolated from centre. These areas with a low density but high land values were only affordable for those income groups and access facilities were expensive in terms of distance. Thus transportation has only been performed between home and the offices located often in the city centre. However, small-scale pedestrian-oriented transportation was also available in the neighbourhoods. Today as an extension of this approach, suburban residential areas are being built often as “gated communities” with their own facilities, close to the agricultural and forest areas and far from the city centres and their concentrated and complex structures. The suburban areas are moving further away from the city centres as far as possible within the physical boundaries of cities. Former suburban areas are used by different user groups with other functions (or again as a residence) depending on the functional and economic values of the space.

The most striking and interesting cross-section of urban growth and sprawl process is undoubtedly engulfment of the suburban settlements at the periphery by the CBDs and areincluded in the city centres. In some settlements, these suburbs transform both physically and functionally and have a new physical / social structure independent from the original morphologic and pattern features. In some others, the morphological features of the suburban pattern can be largely protected and the transformation can be actualized only with functional and socio-economic scales. The case area Levent is an original example in this respect. The

change of functional networks that maintain the morphological structure has brought with its changes in transportation networks. Indeed, transportation from home to office and neighbourhoods has been altered to more complex network system. Metropolitan-scale access and concentrated functional relationships are dominated in the region which is a “part” of the CBD.

A large part of the urban transport activities are carried out for business purposes. This situation is decisive for places of business firms, residential location decisions of individuals, determining trip lengths, choices of transportation vehicles, road capacities and etc. (Marın and Altıntaş, 2004). The intensive use of vehicles in commercial areas has always been an important factor which adversely affects pedestrians comfort. In this context, pedestrianization policies are carried out to improve the quality of urban life, especially in central areas. In pedestrianization plans or pedestrian priority designs; multi-dimensional analyses are performed to examine natural, built and social environment to determine the existing and potential problems. These analyses are comparatively examined with the densities of pedestrian uses to realize space and human interaction (Ocakçı, 2010).

In accordance with the conceptual framework outlined above; Levent district, which was built as a suburban settlement at the peripheral zones of Istanbul, but later became a part of the CBD, will be examined as a case study. Within the scope of change in the dynamics of transport and accessibility; the current status of pedestrian movements will be analyzed and recommendations made in order to improve the quality of urban space and life.

Levent District through Urban Development Process

Levent is a concentrated and intensively used sub-centre in the CBD of Istanbul which contains shopping centres, cultural centres, hotels, business centres, offices and high-level services such as banking and insurance. The district is originally composed of three quarters: Phase 1, Phase 2 and Phase 3. Due to the concentration of business and commercial functions, Phase 1 is the focus of the three quarters and the name “Levent” is commonly used for this quarter. Another quarter; Phase 4 is spatially separated from these three quarters with a different planning scheme and a small centre in itself. The district is located between the routes of the two bridges of Bosphorus and very close to Bebek and Ortaköy, two of the historical Bosphorus villages. Some of the “plazas” (skyscraper business centres - which is the part of new CBD) are also located in Levent District (Figure 1).

Levent was originally planned in 1950 by Emlak Credit Bank as a residential area, which was appropriate to the middle-income group including its own local facilities, pedestrian routes and public transport stations. It emerged as a mark of urban growth due to the increase of population after 1950 (Figure 1). The most significant breaking point through the historical process was the period after 1980, and in this period, the region has been spatially, functionally and socially transformed. Functional and social transformation has been more effective; despite the radical changes around the region, spatial pattern has been largely managed and protected.

Levent Bazaar is the main backbone of the sub-centre, which also existed in Levent Phase 1 plan dated 1947. The bazaar was originally planned as a “local trade core” of the quarter and commercial functions were only allowed on the ground levels of the row houses. Single detached houses were all used for housing (Karabey, 2008) (Figure 2). Thus, functional differentiation was supported by the use of different building typologies.

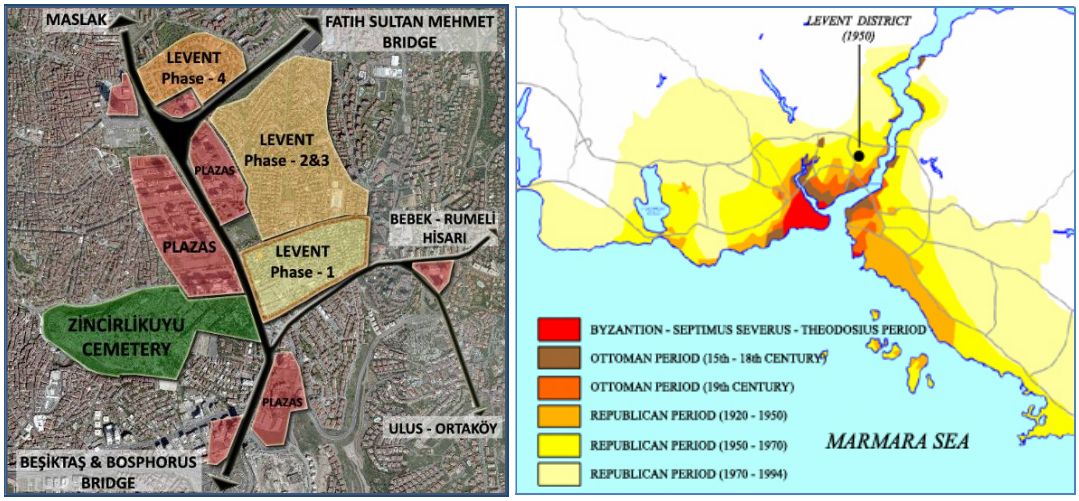

Fig. 1**:** Levent district, surrounding regions and its place in historical development process of Istanbul
Source: (a) Developed from Google Earth aerial image, (b) 1/100000 Environmental Plan of Istanbul

In the early 1950s, Levent was located entirely outside of Istanbul, there was no another residential area around the district. The western side of the bazaar was a rural region in 1940's. In this context, the route which connects Zincirlikuyu and Beşiktaş was an important step forward for the development of the region. Other indicators of the transformation process have occurred with the establishment of slums around the region in the mid-1950s. With the development of other quarters and transportation networks in 1970s, Levent had become a sub-region wedged between high concrete buildings (Danışman, 2002).

Fig. 2 **:** Levent District in 1950's
Source: Arkitekt Journal, 1952

This transformation process has gained a new dimension with the announcement of the second degree centre "Mecidiyeköy – Zincirlikuyu" in 1974 master plan. Shifting the CBD towards Maslak direction engulfed Levent Region in the following years and the district became an important sub-centre. Also, the region has been declared as an "administration centre" in the following plan for Bosphorus Front View and Impact Areas. 1988 - Büyükdere Route Commercial Areas Implementation Plan has also played an important role on the commercial transformation of the region. With the multi-storey shopping and business buildings, the region became a major centre (Gülen, 2006). Thus, both vehicular and pedestrian traffic have highly increased.

After 1980, the region began to lose its residential function with the shift of the CBD and the effect of commercial functions. Illegal floors constructed on buildings and some of the housing

units were converted into the administrative centres, cafes, restaurants, entertainment places, galleries and boutiques. Through the laws which do not allow new floors on the buildings, the built environment has been largely protected, especially in Levent Bazaar. Street patterns, building distances and typologies are very close to the original spatial organization; but the district has been functionally transformed approximately 50% up to the present (Akı, 2008) (Figure 3) and the functions of Levent Bazaar has shifted to the metropolitan scale from the local scale. In addition, upper floors of the buildings totally lost their residential functions too. Today, Levent Bazaar is a pure commercial centre with high density and complex vehicular and pedestrian usage. The day and night population of the region is variable; especially the bazaar is very crowded during the day, but at night, it is occasionally forsaken and insecure.

In the next chapter, the morphologic structure, the functional networks and the spatial dynamics of Levent Bazaar will be discussed in detail.

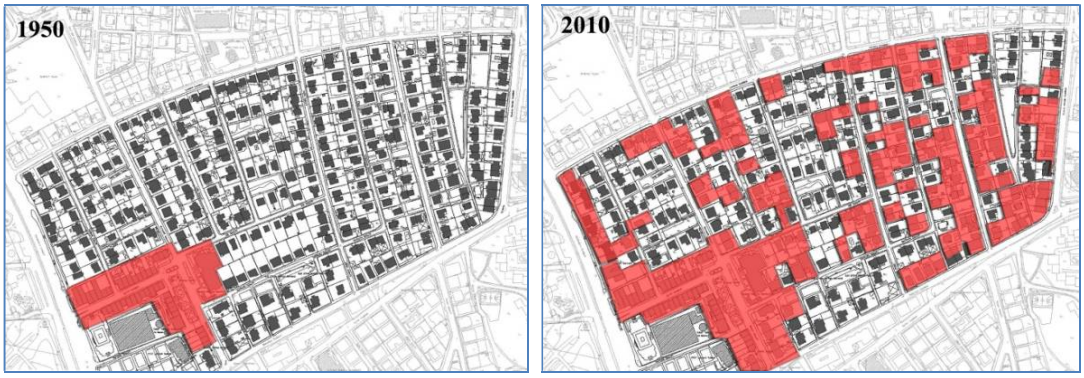

Fig. 3: Levent District, the spread of commercial functions from 1950 to 2010
Source: Akı, 2008

Morphologic Structure of Levent Bazaar

Urban Pattern and Transportation Networks

Levent Bazaar, which has a grid street pattern, can be divided into 4 sub-regions in terms of urban pattern typologies (Figure 4):

1) Original bazaar of the region (row houses)
2) Subsequently changed single houses
3) Single detached houses
4) Subsequently added apartments and skyscrapers

The original bazaar constitutes a large single pattern with its attached structure, although the building dimensions are smaller than others. Likewise; the arcaded building, hotel and water tank building which were built later and not included in the original plan, dissociate from the overall pattern because of their larger scale. Single detached buildings which enclose these two types of pattern regions have a homogeneous structure throughout the district, although their functions have changed. The main square has been located at the centre and intersection of the grid pattern is the most important space of the whole region. In other sub-regions, small open spaces (mostly private gardens) show the same homogeneous characteristic as in buildings. In this context, the original bazaar and the main square integrate and generate a special sub-region in terms of full and empty balance of the entire pattern.

Büyükdere Main Street is the most important artery connecting the region to the CBD and also forms a boundary. The bazaar has only one entry from Büyükdere artery (one-way) for vehicular circulation and it directly connects with the main square. In order to access Büyükdere artery from the bazaar, there are two exit routes located in the southern part, again planned as one-way for vehicles. As same as these routes, the entire transportation network has been planned with both one-way and double-way options (Figure 4). The most intense traffic flows occur on Çarşı Street (the main artery of the bazaar), Karanfil Street, Gonca Street and the main square which are located at the intersection of these arteries.

Taksim – Levent Phase 4 Subway Line was one of the most important investments /strategies implemented in terms of transportation for the region, in 2000. One of the entrances of the station is located at the intersection of Büyükdere artery and Çarşı Street; in other words, at the main entry of the bazaar. Furthermore, some spatial organisations have been made for pedestrians in Levent Bazaar in 2008: Sidewalks have been extended, vehicular transportation network has been organised and number of the parking areas has been increased. Considering them together, it is remarkable that the weight of pedestrian-oriented applications is more than others, especially after 2000. The most important reasons can be listed as; the significant number of business centres, people's preferences for alternative transportation systems (rail and public transport) and short walking distances between transfer points and offices.

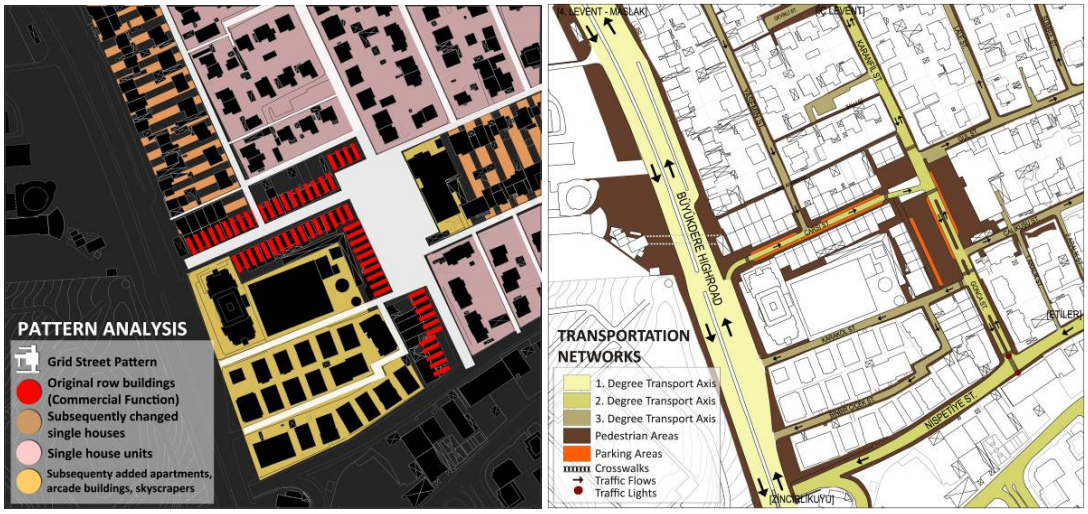

Fig. 4: Levent Bazaar, pattern analysis and transportation networks

Natural & Environmental Factors

Levent Bazaar has an almost flat topography with 4 m. altitude from west to the east. Streets, especially the main arteries surrounded with arcaded buildings, are also the wind corridors of the region. Due to the low-rise buildings, the bazaar's rate of sunlight is high and varies during the daytime. Especially the main square is the most sun-exposed area of the bazaar and gets both morning and afternoon sun. Also the square and the entry/exit points are the noisiest parts of the bazaar as the traffic nodes (Figure 5).

Building Functions

The buildings in the Levent Bazaar have been originally constructed with two floors in accordance with the 1950 residential plan. With the addition of the attics to some buildings, the unique pattern of the bazaar has been changed partially. The skyscraper (former bank, currently hotel function) at the entrance of the bazaar constitutes a contradiction with its high-rise structure.

Today, Levent Bazaar has only commercial functions while it had them only on ground floors in the past. The most common commercial units are banks, butchers, greengrocers, patisseries, tobacco shops, nuts shops, delicatessens, cafes and restaurants. Upper floors are often used for offices or storages of commercial units and seating parts of cafes and restaurants (Figure 6). Levent Bazaar is generally used for daily shopping, banking and lunch activities, depending on the lunch hour breaks of offices. In terms of human-space interaction, pedestrians mostly concentrate on the facilities at the ground floors in short periods of time. Briefly, the majority of pedestrian usages are short-term but intensive, depending on functions.

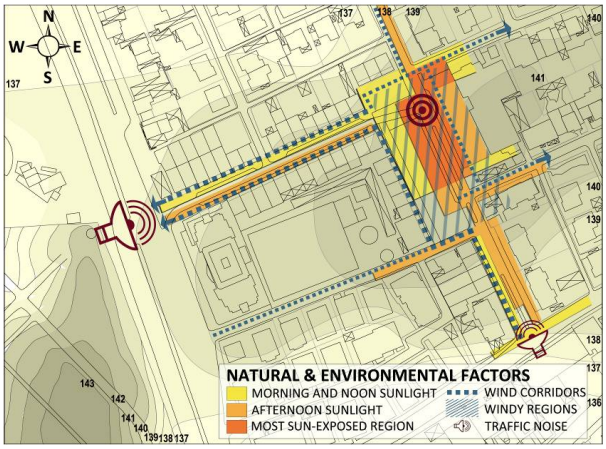

Fig. 5: Natural and environmental factor

Building Functions (%)	Ground Floors	Upper Floors
1st Degree Service Units	20	2
2nd Degree Service Units	4	-
Bank	29	33
Other Financial Services	3	-
Cafe & Restaurants	21	23
Technology & White Goods	6	2
Health Facilities	4	3
Clothing	6	-
Studio (Photography)	1	-
Reeve's Office	1	-
Police	1	-
Arcade	1	2
Club	-	3
Storage	-	25
Empty	3	7

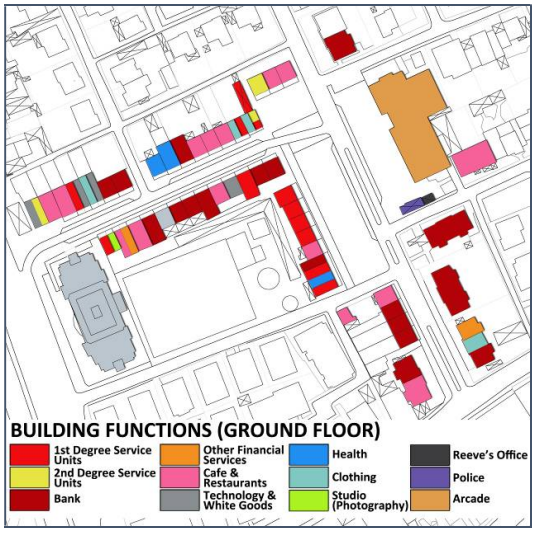

Fig. **6:** Building functions (ground floor) and percentage distributions (ground and upper floors)

Pedestrian Areas and Street Furniture

There are three types of pedestrian areas in Levent Bazaar: sidewalks, interior paths of arcaded buildings and the main square. Sidewalks are located all around the roads with a variety of widths and pavement types. Interior paths of arcaded buildings are roofed, 1.7 meters wide pedestrian roads with a single open facade that exist only in the ground floors of all original row buildings. These interior roads also provide protection against sunlight and rain. The main square is divided into three parts with the intersection of two main streets and every single part has at least one facade from bazaar. The transitions between the parts are provided with crosswalks and traffic lights.

All of the pedestrian areas are paved with hard floor coverings; other green open spaces (like parks and playgrounds) are located between the residential areas outside of the bazaar. The intensive and complex pattern of the region and the high density usages are the most significant reasons for this. However, there was not any green open space for common use in 1950s; the general reason may be the presence of the private gardens.

Street furniture that are used in the pedestrian areas can be listed as trees, flowerpots, street lamps, benches, trash cans, billboards, sculptures, bus stops, kiosks and recycling bins. There is no unique feature of these street furniture; they are placed randomly and more rarely on sidewalks, more often in the square. There are six crosswalks in total, four around the main square and two on the main roads (Figure 7).

Fig. 7: Pedestrian areas and street furnitures (Source of the photographs: Authors)

Pedestrian Movements – Flows, Directions and Densities

In accordance with the morphologic structure and functional features; pedestrian movements do not happen homogenously within the pedestrian areas mentioned in the previous section. Some focal points can be noted which affect the movements as “pedestrian attracting zones”. The primary pedestrian attracting zones in Levent Bazaar can be listed as follows:

1) Service units for first degree requirements (cafe, bank, patisserie, delicatessen, etc.).
2) Sitting and resting places in the square, especially in shady areas.

3) Subway entrance[9] and bus stops.
4) Shopping centres and arcades around the bazaar.

Generally, directions of pedestrian movements have a linear characteristic depending on the grid urban pattern. But this occasionally varies with the presence of pedestrian attracting zones, as in the main square, where movements are converted into a complex network structure. Crosswalks orient the movements around the square, but the same effect is not observed in other parts of the bazaar. Second degree service units and other functions are not attractive for the users. Therewithal, some usages independent from the components of the space (like passing through to Akatlar, Etiler and other sub-regions) have also been determined in the region.

In order to identify pedestrian uses, densities and levels of services; pedestrian counts have been carried out at 10 locations[10] on weekdays and weekend with considering pedestrian attracting zones. The locations, routes and densities are shown in Figure 8 and the results of the counts are elaborated in Table 1 and Table 2. Counts were made during peak hours[11] of most intense use of pedestrians.

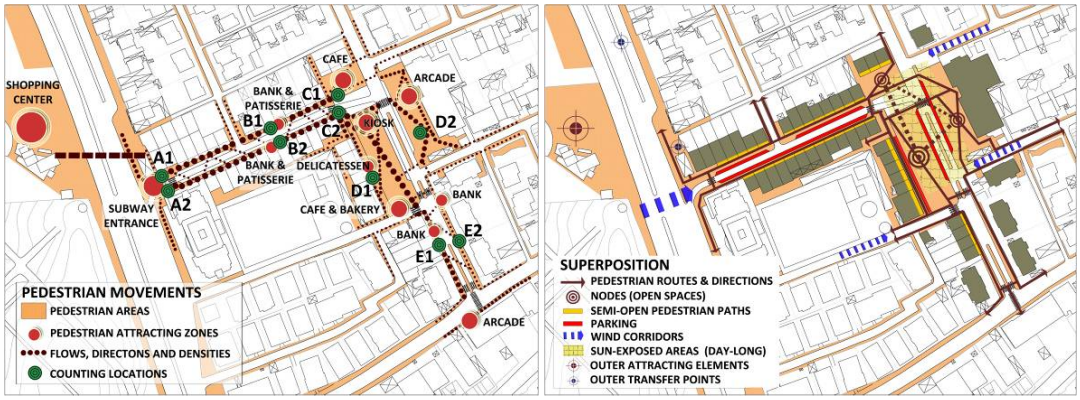

Fig. 8: Pedestrian movements, flows and directions, counting points and superposition with morphologic analyses

According to the pedestrian counts on weekdays and weekend, the top pedestrian usage and flow occur on the directions which passing through A1, B1-B2, C1-C2 and E1. It has been observed that A1 and C2 are used more than the other top locations. The density of A1 can be explained with the bazaar's entrance, existence of subway station and proximity to the circumjacent shopping centres (Figure 9). The majorities of the pedestrians who pass through A1 enter or leave the subway with Büyükdere Main Street as a threshold. This high-rated usage has not been found at E1 and E2, which are located in another entrance of the bazaar. Similarly, A2 is not used intensively although it is located on the opposite side of A1, because of its poor

[9] Subway station is also fits in "pedestrian-producing space" category for being located at the entrance of the bazaar.

[10] Pedestrian movements differ in opposed sidewalks, therefore, 5 distinct locations and their opposite side (in total 10 locations) have been selected for the counts.

[11] Peak hours for weekdays: 08.30-09.30, 12.00-13.00 and 17.30-18.30; for weekend: 13.00-14.00 and 17.00-18.00

environmental quality and non-continuant for pedestrians. In this context, large number of the pedestrians disperses into or leaves the region from A1 point.

Table 1: Pedestrian count results for weekdays

STREET NAMES	COUNTING POINTS		PEAK HOURS	Amount of Pedestrians	PAVEMENT WIDTH (m)	PEDESTRIAN FLOW (1 Hour) person/ minute	PEDESTRIAN FLOW (1 Hour) person/minute/ meter	AREA PER CAPITA (m^2/person)	AVERAGE SPEED (meter/minute)	LEVEL of SERVICE
ÇARŞI STREET	A1		08.30 - 09.30	1716	7,5	28.6	3.81	3.5	77	C
			12.00 - 13.00	2028		33.8	4.5	5	80	
			17.30 - 18.30	2544		42.4	5.65	2.5	75	
	A2		08.30 - 09.30	234	5	3.9	0.78	5	80.5	D
			12.00 - 13.00	318		5.3	1.06	5	80	
			17.30 - 18.30	492		8.2	1.64	5	80	
	B1	Inner Path	08.30 - 09.30	546	1,7	9.1	5.35	3	76	A
			12.00 - 13.00	600		10	5.88	3	76	
			17.30 - 18.30	660		11	6.47	2.5	75.5	
		Outer Path	08.30 - 09.30	558	2,5	9.3	3.72	3.5	77	
			12.00 - 13.00	762		12.7	5.08	3	76	
			17.30 - 18.30	612		10.2	4.08	3	76.5	
	B2	Inner Path	08.30 - 09.30	912	1,75	15.2	8.69	1.5	73	A
			12.00 - 13.00	846		14.1	8.06	2	74	
			17.30 - 18.30	906		15.1	8.63	1.5	73	
		Outer Path	08.30 - 09.30	852	2,7	14.2	5.26	3	76	
			12.00 - 13.00	1020		17	6.3	2.5	75.5	
			17.30 - 18.30	630		10.5	3.89	3.5	77	
	C1		08.30 - 09.30	690	17,9	11.5	0.64	5	80.5	B
			12.00 - 13.00	1620		27	1.5	5	80	
			17.30 - 18.30	738		12.3	0.69	5	80.5	
	C2		08.30 - 09.30	2136	7,85	35.65	4.54	3	76.5	C
			12.00 - 13.00	2544		42.4	5.4	3	76	
			17.30 - 18.30	1926		32.1	4.09	3	76.5	
GONCA STREET	D1	Inner Path	08.30 - 09.30	378	3	6.3	2.1	4.5	79.5	A
			12.00 - 13.00	582		9.7	3.23	4	78	
			17.30 - 18.30	378		6.3	2.1	4.5	79.5	
		Outer Path	08.30 - 09.30	276	4,2	4.6	1.1	5	80	
			12.00 - 13.00	372		6.2	1.48	5	80	
			17.30 - 18.30	126		2.1	0.5	5.5	81	
	D2		08.30 - 09.30	552	18,3	9.2	0.5	5.5	81	B
			12.00 - 13.00	786		13.1	0.72	5	80.5	
			17.30 - 18.30	528		8.8	0.48	5.5	81	
	E1		08.30 - 09.30	696	3,8	11.6	3.05	4	78	C
			12.00 - 13.00	1098		18.3	4.82	3	76	
			17.30 - 18.30	1200		20	5.26	3	76	
	E2		08.30 - 09.30	252	4	4.2	1.05	5	80	D
			12.00 - 13.00	534		8.9	2.23	4.5	79.5	
			17.30 - 18.30	564		9.4	2.35	4.5	79.5	

Table 2: Pedestrian count results for weekend

STREET NAMES	COUNTING POINTS		PEAK HOURS	Amount of Pedestrians	Pavement Width (m)	PEDESTRIAN FLOW (1 Hour) person/ minute	PEDESTRIAN FLOW (1 Hour) person/minute/ meter	AREA PER CAPITA (m^2/person)	AVERAGE SPEED (meter/minute)	LEVEL of SERVICE
ÇARŞI STREET	A1		13.00 - 14.00	1434	7,5	23.9	3.19	4	78	C
			17.00 - 18.00	1530		25.5	3.4	3.5	77.5	
	A2		13.00 - 14.00	330	5	5.5	1.1	5	80	D
			17.00 - 18.00	144		2.4	0.48	5.5	81	
	B1	Inner Path	13.00 - 14.00	552	1,7	9.2	5.41	3	76	A
			17.00 - 18.00	390		6.5	3.82	3.5	77	
		Outer Path	13.00 - 14.00	654	2,5	10.9	4.36	3	76.5	
			17.00 - 18.00	390		6.5	2.6	4.5	79	
	B2	Inner Path	13.00 - 14.00	576	1,75	9.6	5.49	3	76	A
			17.00 - 18.00	582		9.7	5.54	3	76	
		Outer Path	13.00 - 14.00	456	2,7	7.6	2.82	4	78.5	
			17.00 - 18.00	492		8.2	3.04	3.5	77.5	
	C1		13.00 - 14.00	606	17,9	10.1	0.56	5.5	81	B
			17.00 - 18.00	582		9.7	0.54	5.5	81	
	C2		13.00 - 14.00	1560	7,85	26	3.31	3.5	77.5	C
			17.00 - 18.00	1260		21	2.68	4.5	79	
GONCA STREET	D1	Inner Path	13.00 - 14.00	372	3	6.2	2.07	4.5	79.5	A
			17.00 - 18.00	240		4	1.3	5	80	
		Outer Path	13.00 - 14.00	108	4,2	1.8	0.43	5.5	81.5	
			17.00 - 18.00	222		3.7	0.88	5	80.5	
	D2		13.00 - 14.00	312	18,3	5.2	0.28	5.5	81.5	B
			17.00 - 18.00	288		4.8	0.26	5.5	81.5	
	E1		13.00 - 14.00	654	3,8	10.9	2.87	4	78.5	C
			17.00 - 18.00	618		10.3	2.71	4	78.5	
	E2		13.00 - 14.00	240	4	4	1	5	80	D
			17.00 - 18.00	246		4.1	1.03	5	80	

C2 is the concave intersection point of L-shaped bazaar region and also it is the main distribution area of intensive pedestrian flow throughout Çarşı Street (Figure 9). It is one of the entrances of

the main square and a focal point close to the banks, delicatessens, cafes and other places. Likewise, C1 is the other entrance of the square, but it does not have the same functional domain. B1 and B2 are located on the central axis of Çarşı Street and pedestrian usage is over the average in both interior and exterior paths of arcaded buildings. Besides, some of the important commercial functions are located on this route.

The most important reason for the usage of D1 and D2 less than the other points is their distance from the centre of the main square. Most of the pedestrians prefer to use the main square, especially for passing through. Only the pedestrians who use the commercial units on these directions pass from D1 and D2. The reason for using E1 more than E2 is E1's suitability for the natural factors and the continuity of the first degree commercial units (Figure 9).

In consideration with the sidewalk widths, all sidewalks including the arcaded paths are convenient for pedestrian comfort. However, pedestrian flows at some locations cause pedestrian traffic and occlusion, even if the width of the sidewalk is sufficient. Especially the intensive usage of interior arcaded paths on rainy and sunny days generate negative conditions for pedestrians. There is an inverse ratio between the pedestrian flow and the area per capita / average speed. As usual, the walking speed of pedestrians decreases where the amount of pedestrians is high. At this point, the variety of commercial functions and morphologic features are extremely effective. It has been detected that the most intense areas (A1 and C2) are medium-level and secondary intense areas (B1-B2 and C1) are high-level in terms of levels of services[12] and service conditions. Levels of the least used areas are the lowest. In this context, locations and their importance through the spatial organisation of the most intense areas are more in the foreground than the levels of the services.

As mentioned before, the main square is mostly used for transitions (Figure 8-9). There is a particular route for every part of the square. Other regions of the square are rarely used for other activities (like sitting and resting) depending on climatic conditions. The most important reasons for this rare usage are the excessive sun-exposure and the traffic noise. The parking areas around the square also generate important disadvantages for efficient use of the space.

The analysis of pedestrian movements for 1950's Levent Bazaar is not possible, but to speculate about the movements, densities and directions is possible according to the morphologic pattern which is the same and the functions are so limited. At that period, Levent was a peripheral settlement with a low population; this brings to mind a circular pedestrian movement within its boundaries. The movements probably occurred between homes, offices and local traditional units; according to the written texts and interviews made with the users who lived in Levent during those periods. Pedestrian movements have a much more complex structure today. Non-regional dynamics have also important roles on pedestrian movements such as intra-regional dynamics. Because of the continuity of the commercial functions, the movements from bazaar to the residential areas are also diversified. In summary, commercial networks are more effective than morphologic structure for pedestrian movements. Despite the protection of built environment, commercial transformation can radically change the movements in some specific places.

[12] **The level of services** is used to define the spatial attributes of street facades depending on some parameters. From A (highest level) to E (lowest level), the parameters are: (1) Amount of buildings in every 100 meters, (2) A wide variety of functions, (3) Amount of doors and windows in every 100 meters, (4) Blank facade ratio, (5) Passive facade ratio on ground floors and (6) the variety and richness of building facades (Ocakçı, 2010).

Fig. 9: Levent Bazaar, pedestrian areas and movements; (A) The entrance of the subway – A1 location, (B) Sidewalks, parking areas and barriers, (C) Row commercial buildings – E1 location, (D) Main square, (E) The entrance of main square - C2 location, (F) Interior and exterior paths of arcaded buildings
Source: Authors

Findings of the Analyses

Within this study, morphologic pattern and functional networks of Levent have been analysed as layers and the relationship between space dynamics and pedestrian movements have been investigated. The main determination of the study is that the pedestrian movements and densities directly vary depending on the functions. As a result of spatial and pedestrian use analyses, the following findings are determined and associated with spatial comfort and quality:

Positive Aspects:

1) The central location and the proximity to the important focal points of the space are positive for pedestrian use.
2) The accessibility of the space is at the maximum level with the proximity to transfer points and public transportation stops.
3) Traffic problems are reduced to the minimum level with the development of one-way and two-way options on roads. Pedestrian oriented policies have become more widespread.
4) Arcaded paths provide an alternative for pedestrian comfort in terms of climatic conditions.
5) The spatial layout is perceptible, legible and in human scale with adhering of building dimensions to the original design principles.
6) There is a harmony between focal points, pedestrian attracting zones and pedestrian movements. The variety of functions provides alternatives for pedestrians.
7) Pedestrian areas are generally defined, sustained and proper for pedestrian comfort.
8) Natural slope is favourable for pedestrian movements.
9) The buildings are in visual integrity and harmony in terms of spatial perception.
10) The landscaping rate of the space is above a certain level.
11) All street furnitures are available for all requirements (Figure 7).
12) Pavements are ergonomic in terms of spatial comfort.
13) Solutions for disabled citizens are considered between roads and sidewalks (like ramps).

Negative Aspects:

1) Single entrance from Büyükdere Main Street to bazaar causes traffic jam.
2) Parking areas along the roadsides restrict the pedestrian areas.

3) Excessive traffic jam and traffic noise occur both at the entrance of the bazaar and at the junction on the square.
4) Wind corridors lead to negative consequences in harsh climatic conditions.
5) Negative effects of the sunlight are excessive in open spaces (especially in square). The shady areas are less.
6) Utilization of daytimes and nights are variable due to the lack of housing function.
7) Transitions with the exception of crosswalks cause negative consequences both in pedestrian and vehicular traffic.
8) The main square is generally used for transitions rather than gathering and other activities.
9) Although the defined parking areas, there are lots of barriers between the roads and sidewalks, which restrict pedestrian movements (Figure 9).

Conclusion

Commercial transformation of residential areas is a common phenomenon in terms of urban development and growth dynamics. With the growth of population and development of economy; CBDs grow from centre to periphery and partially or totally transform the residential areas. The growth process of CBD occurs in accordance with certain axes or as new sub-centres, in the context of urban sprawl. Like CBDs, the boundaries of the cities are also expanding, so the central area and the city itself grow together as two rings intertwined.

In the process of historical development of cities, suburban settlements of a time period which remain at periphery can be engulfed and transformed by CBDs. This transformation can be just as functional and social, or it may result in the complete alteration of a physical structure. Likewise, some of the suburban settlements can articulate CBD with their unchanged and protected morphological structures. Thus, commercial functions are reorganized in the existing built environment.

As a result of growth and development of the CBD of Istanbul, Levent District has been transformed into a commercial area from single-family residential function with a largely protected built environment. The changes in the user's profile and scale of service, spatial usages and densities have also been differentiated. With the spatial growth, the district is located in the centre of the current CBD today, while it was on the periphery in the construction period. This brought new metropolitan-scale usages and the district lost its local identity.

Levent reflects an original typology of 1950's planning applications and keeps it despite all the functional changes, new high-rise constructions and skyscrapers. The district is also affected by the increase in land values depending on the functions. Today, most of the buildings have been rented or purchased by high-income groups or companies.

For being a commercial sub-centre and a transition space; pedestrian uses are extremely important in Levent District. With the built environment analyses and pedestrian detections, the state of the physical space is put forward in terms of pedestrian comfort. The largely protected built environment, the presence of 1st degree of service units, their relations between users and each others, transition axes and the intense use especially on business hours, have been identified through analyses. With the cross-comparison of all obtained data, positive and negative aspects have been determined in terms of pedestrian comfort and spatial identity.

In accordance with the positive and negative findings in the previous section, the following design proposals can be made in order to increase spatial quality, pedestrian comfort and human-space interaction:

1) Additions of the buildings should be removed in accordance with the traditional structure of 1950 plan. Signboards and facade claddings should be standardized with originality.
2) One of the one-way exit arteries located on the south of Çarşı Street should be converted into one-way entrance as an alternative for the present.
3) The parking areas, which interrupt the continuity of the pedestrian movements around the square should be removed. Time limits should be set on the rest of the parking areas.
4) The shady areas should be increased with natural or artificial elements. Noise control should be provided in the square with noise barriers / sound walls.
5) The artificial barriers which restrict the movements of the pedestrians should be reduced.
6) Water elements should be used in the square to balance the microclimate, to direct the organization of the space and to increase the aesthetic value.
7) Street furniture for resting and waiting should be increased near the subway entrance and bus stops.
8) Street lamps should be re-organized and increased where necessary for night usage (especially on the interior paths of arcaded buildings).

Pedestrian priority / pedestrian oriented solutions are extremely necessary in the centres where commercial functions are concentrated. Functional networks should be examined as much as morphologic structure. How pedestrians use these functions and the way they interact with the space should be considered. Especially in transformed regions, spatial investigations should be made retroactively and the solutions should be produced in consideration with traces from history.

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