

HIDDEN IN THE MOST VISIBLE PLACE:
Measuring visual accessibility and social performance of urban kiosks

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ABSTRACT

How street kiosks, a prominent example of "human-scale urban form," generate new public space and encourage social encounters? To answer this question, this study applies an integrative methodology combining (1) quantitative visibility analysis with (2) qualitative ethnographic fieldwork. Analysing kiosks' visibility enables to distinguish between the effect of search in familiar and in novel environments. Then the modes in which kiosks are used are traced, revealing that both commercial and noncommercial modes are maximized in places with higher visual integration. Further, the study unexpectedly discovers frequent illegitimate uses in places with higher degree of visibility, despite higher surveillance and supervision.

KEYWORDS

Urban structure and form, spatial cognition, environmental familiarity, social encounter, visibility graphs, kiosks.

1. INTRODUCTION

1.1 Emergence of urban activities

The heart of the city beats with daily retail activities, such as street food and convenience stores, stalls and kiosks. Warm weather and the outdoor lifestyle of Tel Aviv – the largest city on Israel’s Mediterranean coast – fuel a booming street commerce with ample choices on each and every corner (Figure 1).

Figure 1 Typical kiosks in Tel Aviv.

Typically, the geographical location of these places is not prescribed by planning authorities, but is the result of a bottom-up process, intrinsic to the way cities grow and evolve. The intersection of social and spatial dimensions contribute to the creation of this micro-architecture, satisfying the needs of the city dwellers for both legitimate and “shadow” activities and for various modes of sharing of common space.

Economic performances of stalls and kiosks rely on spatial accessibility and wide exposure to pedestrians. They primarily sell everyday items such as food, snacks, confectionery, toiletries, soft drinks, tobacco and alcohol products, magazines and newspapers. However, sometimes these small businesses provide illegal, “shadow” services, such as drug dealing and gambling.

1.2 Relation between customers’ visits and location

The choice of a specific place and particular activity depends on a degree of visitors’ familiarity with the environment. Navigational decisions in unfamiliar or rarely visited urban locations are guided by transformation of visual information; while travelling to familiar destinations, people rely on the previous spatial knowledge (Piccardi, 2011; Wiener et. al, 2009). The cognitive and perceptual apparatus required for these actions differ considerably, both with respect to the format and content of spatial knowledge and with respect to navigational strategies (Jafarpour and Spiers, 2016). To the date, cognitive characteristics specifically related to visibility of urban environment and interaction with micro-architecture have not been studied.

Furthermore, the manner people make use of urban sites and integrate them into their daily routines is of major significance. What is it that people *do* when visiting a particular site, and how does its degree of familiarity and visibility correspond with actual needs and activities of the urban dwellers? In order to fully comprehend the interaction between human cognition, behaviour and the urban form, the social dimensions of this interaction are to be taken into consideration.

This paper aims to address the knowledge gap on the role of spatial cognition (that is, acquisition and memorization of knowledge about spatial environments) in urban design. It studies spatial distribution of one particular urban activity, the kiosks, and explores how the distribution is related to their performance. Detailed analysis of various kiosk locations allows distinguishing between the effect of search in familiar environments and in novel environments. Linking familiarity with urban environment to performance of human-scale urban morphology provides insights into how people interact with particular human-scale urban form, and what social needs are being met through this interaction. We trace various modes in which kiosks are used, both commercial and noncommercial, legitimate and illegitimate. Then, these uses are discussed by categorizing the visitors into six groups and relating their spatial choice to the parameter of familiarity. The posed questions are as follows: (1) Are kiosks located in the least visually integrated venues more likely to be less socially attractive and host more illegitimate activities? (2) And vice versa, are kiosks located in the more integrated venues more likely to be socially attractive and host less illegitimate activities? The study tests a hypothesis that both commercial and noncommercial modes of use are maximized in places with higher visual integration in the city. However, it surmises that illegitimate uses will be found more frequently in places with less visibility, characterized by lesser surveillance and supervision by the authorities.

While there is research done on various aspects of spatial navigation, as well as studies focusing on social urban functions, this paper offers an integrative view allowing to comprehend the dynamics behind spatial distribution, cognitive performance, and social functioning of a specific type of urban space. Why is it at all important to synthesize spatial analysis with cognitive and social examinations? Bringing these factors together allows us to offer a comprehensive narrative of urban space use. Such narrative, once established, can be extrapolated to other types of urban places and populations, highlighting similarities and differences between patterns of city

activities. It is also capable of bringing academic research back to planning practice. The results of this research can lead to knowledge transfer from the human-focused case study to design tools that forecast the impacts of planning directly transferred to socioeconomic impact on spatial environment.

2. METHODS AND DATASETS

The paper brings together two bodies of knowledge - urban sociology and spatial cognition, and integrates theories from both. It applies an innovative mixed methodology that combines (1) quantitative spatial analysis with (2) qualitative empirical fieldwork.

2.1 Describing the field and mapping: Tel Aviv kiosks

Tel Aviv kiosks started emerging prior to the foundation of the state in 1948; the first kiosk dates back to 1910. By mid-1920s, the number of kiosks multiplied, earning the immigration wave of that period the nickname of “kiosk immigration.” In the 1940s, kiosks became a part of the city landscape, serving as gathering sites of the local youth. The licenses for their establishment were granted mainly to socio-economically weak entrepreneurs. Simultaneously, numerous unlicensed kiosks mushroomed, enhancing competition and pushing down prices.

Today, kiosks in Tel Aviv are characterized by a high measure of diversity in terms of physical parameters, assortment of goods for sale, and format of operation. The physical parameters range from “classic” kiosks, located in separate small cabin-like buildings, to small stores inside larger, often semi-residential, buildings. While all of them sell basic items such as cold beverages, sweets and snacks, only those who have a special permit are allowed to sell cigarettes and alcohol, freshly made food (sandwiches and pastries), and lottery tickets. Some kiosks we surveyed had their own seating arrangement (i.e. tables and chairs), while others “adopted” benches located on the streets or, in case of city boulevards, lawns. The kiosks’ opening hours vary according to municipal regulations based on exact location (residential or commercial building, the type of street). None of the surveyed kiosks had restrooms available to the customers, a fact that inevitably limited the time spent

at a kiosk.

Most of the “classic” kiosks in Tel Aviv are municipally owned and rented out for several year contracts via official tenders. Several among the contractors are local coffee and food chains, others are individual private operators. Yet, a bigger portion of the Tel Aviv kiosks were not founded as kiosks, but rather emerged sporadically from stalls and small shops, acquiring the function of a kiosk and, sometimes, an appropriate business license. Tel Aviv municipality offers a number of license categories for kiosks, varying mainly according to a type of products available for sale. However, many kiosks function under different formal categories of a small business.

The definition of what constitutes a “kiosk” is therefore rather vague: the owners or staff often mentioned more than one word to describe their business, such as “store,” “*pitsutsiya*” (a common word for a small store/ kiosk open throughout the week), or even “café.” What made the chosen sites eligible for this study was their self-definition (as reported by the operators) and image (as reported by the interviewed patrons), rather than the type of municipal business license. As the purpose was not tracing the municipal planning and licensing policies, but, rather, the modes of public use and spatial function, we were less preoccupied with the formal recognition of the target sites.

Figure 2a shows a map of the existing kiosks (48 in total) in the case study, the historical district of Tel Aviv, Israel, called Lev Hair (“Heart of the City” in Hebrew). Figure 2b shows its location in the city.

Figure 2 Case study: (a): Map of the kiosks in the area; (b) location of the case study in the city of Tel Aviv. (Background: Maps.Google. com)

The area chosen for the analysis is sized by 1400 ×1800 meters, enabling easy navigation and exploration by foot. Lev Hair is the one of the most vibrant areas of the city, attractive both to local residents and tourists. It offers many things to do and see – shady boulevards with cycling paths and playgrounds; trendy cafés and restaurants open until late at night; hidden piazzas and quiet benches. Combining residential buildings, office areas, and entertainment, Lev Hair is awake 24 hours a day. The moderate Israeli climate, the dynamic character of the

neighbourhood, and street oriented historical buildings facades make the district an ideal location for kiosks. These are among the most probable navigational goals for various categories of pedestrians who venture into the area.

2.2 Visibility graphs

The studied urban environment, as any other urban environment, has a particular street morphology that defines open urban space. Buildings and building activities are distributed within that space in a way that allows movement and interactions between urban dwellers. Therefore the city represents a set of structural relationships between space, urban activities, and movement. To study these relationships, the language of graph theory and network analysis have been used for a long time (Barthelemy, 2011). Graphs are derived by the categorization process, whereby we abstract the system of city elements by eliminating all but one of its features. Then connections between selected features are established by a common attribute or characteristic. This kind of categorization allows to understand the spatial organization of the urban space and to draw insights on how graph characteristics reflect the use of space from the cognitive and social point of view.

To study the principles of kiosks' spatial distribution and to explore how these principles are related to their performance, we used a visibility graph. Graph visibility based analysis allows us to distinguish between an effect of search in familiar and novel environments, since novel environments are mostly explored based on visual perception.

Graphs are shown diagrammatically (Figure 3) and represented by an adjacency matrix A , where:

$$A_{ij} = \begin{cases} 1, & \text{the vertices } v_i \text{ and } v_j \text{ are connected,} \\ 0, & \text{otherwise.} \end{cases} \quad (1)$$

Figure 3 Visibility graph construction: (a) open urban space; (b) intersections-navigation decision points within the street network; (c) SNVG; (d) urban activity locations in red; (e) IVG with two types of points where navigation decision is taken. Black nodes are intersections and red are activity locations.

Two visibility graphs were created. First is the street network visibility graph (SNVG) that considers only street network. The second is the integrative visibility graph (IVG) that incorporates both street structure and activity aspects of city life. It consists of two types of nodes. First are the street intersections and turning points (marked in blue in Figure 3). These are decision points where people make a navigation choice within a street network. Second are navigational targets, i.e. locations of urban kiosks, the subject of our study (marked in red in Figure 3). The nodes are linked if visible. The graph is undirected, i.e. the visibility is mutual. Therefore, our graph represents mathematically a chain of navigational decisions of a person looking for a kiosk in an unknown environment.

2.3 Measuring centrality of visual access

After constructing the graphs, a structural analysis was carried, based on the centrality model. This model was first developed in the field of social network studies (Freeman, 1979). It presents various measures for the node position in the graph. We examined three different centrality measures - degree centrality, closeness centrality and betweenness centrality.

The Degree centrality measures the number of nodes that interconnect a given node. In case of the visibility graph it captures how many destinations can be seen from each node within given urban conditions. The degree $C_D(v_i)$ of the node v_i is defined by:

$$C_D(v_i) = \#\{j \in V : \text{vertices } v_i \text{ and } v_j \text{ are connected}\} \quad (2)$$

Closeness centrality measures how many steps are required to access every other node from a given node. The normalized closeness centrality is defined by the inverse of the average length of the shortest paths to all the other nodes in the graph:

$$C_c(v_i) = \frac{n-1}{\sum_{k=1}^n d(v_i, v_k)} \quad (3)$$

Where $d(v_i, v_k)$ is the topological distance between v_i, v_k .

This measure demonstrates the relative importance of a node within the graph. The more

integrated nodes with short distances to others have bigger closeness centrality. If degree centrality indicates how much one can directly see from one point location, the closeness centrality shows how much one can see both directly and indirectly from one point location. For example, one location may not be directly visible from another, but it may be visible via a third location; then we say that they are indirectly visible through an intermediate location.

Betweenness centrality captures how often, on average, a location may be used in journeys from all places to all others. Locations that occur on many of the shortest paths between others have higher betweenness than those that do not. Betweenness centrality is estimated as follows:

$$C_B(v_k) = \sum_i \sum_j \frac{P_{ikj}}{P_{ij}} \quad (4)$$

Where $P_{ij=\#}$ of shortest paths from v_i to v_j , $P_{ikj=\#}$ of shortest paths from v_i to v_j through v_k . Betweenness centrality measures the influence a node has over the flow through the network. A node with a high degree centrality does not guarantee that it is well connected to all other nodes. Sometimes a node with a few direct connections is more important, since it can act as a bridge, meaning that without it a network may be broken into two or more sub-graphs.

2.4 Relation of street centralities and kiosk distribution

As mentioned above, each navigational decision point within the street network has three attributes of visual accessibility. We investigate how the distribution of kiosks depends on these structural characteristics of the streets. To do so, street centralities were calculated and then compared to the number of visible kiosks. Using the connectivity matrix of the IVG, for each node in the SNVG we derived the number of adjusted (seen from a given point) kiosks (Figure 4). This number is referred to as the “kiosk index” of the intersection.

Figure 4 Intersection with the kiosk index 5.

To compare between intersection centralities and “kiosk index,” the Pearson correlation coefficient (PCC) is used. PCC measures the linear dependence between two variables, in our

case visual centrality of street intersections and number of kiosks located in the visible distance from them. It has a value between +1 and -1 inclusive, where 1 is total positive linear correlation, 0 is no linear correlation, and -1 is total negative linear correlation. If such correlation exists, it assures that there is a link between street configuration and kiosk distribution, and determines that visibility of urban layout is a predictor of urban retail location.

2.5 Ethnography: the social performance of the kiosks

The ethnographic field work aimed to collect evidence of kiosks' use, users' social profile, and their familiarity with the environment. First, observations were conducted, mapping the scope of activities taking place at the kiosks and systemized them into several categories (Table 4). We then attempted to determine the social categories of the visitors (Table 5), complementing the observations with first-hand data: Short unstructured interviews were conducted with a sample of 50 individual customers of the kiosks, who were questioned on the purpose of their visit and the manner they incorporate it into their daily routine. Related information was also obtained from five informants – three customers and two kiosk owners, with whom we conducted several unstructured in-depth interviews.

Second, a broader survey of 200 individual customers (20 for each kiosk of 10 selected kiosks) was conducted in order to determine their familiarity with the particular kiosk and the mode of its use (Appendix 1 and Table 6). We observed the customers from the moment of arrival to the moment of departure, recorded their activities, and inquired on their familiarity with the location and frequency of visits. We also attempted to verify the categories formulated at our mapping via a multiple choice questionnaire listing the customers' activities and social profiles.

People's activity at particular urban sites is a function of their movement routines within a city. As people move differently at different times of the day, we performed observations at different day parts according to peak and peak-off periods (Balcan et al., 2009). The times of daily observations were divided into 6 periods: morning peak hours (8:00am-9:30am), morning peak-off (9:30am-12am), lunch time (12am-3pm), afternoon (3pm-5pm), evening peak hours (5pm-7pm), and evening peak-off (7pm-9pm). For each day part, 10 hours of observations were conducted.

This way, we traced the circumstances that determine the customers’ individual needs in a particular service or activity. Finally, the findings of the field ethnography were linked back to spatial attributes, and a correlation between visual accessibility of the location and characteristics of its performance was established.

3. RESULTS

3.1 Visibility graphs and centrality measures

Figure 5 and Table 1 show two constructed graphs and their details.

Figure 5 (a) and (b) SNVG, street intersections are marked in blue, (a) geo-coordinated layout; (b) non-geo-referenced layout, when the connected nodes are placed close; (c) and (d) IVG, street intersections are marked in blue and kiosks are in red, (b) non-geo-referenced layout, when the connected nodes are placed close.

Nodes		Visibility connections	
Intersections	309	Between intersections	2669
Kiosks	48	Between kiosks	162
Total	357	Between intersections and kiosks	2831

Table 1. Details of the visibility graphs.

In Figure 6 distribution of three centrality measures; degree, closeness and betweenness centralities in the case study is calculated on the two graphs; SNVG and IVG. The measures were computed in graph visualization and manipulation software Gephi Network Analysis (Jacomy et al., 2009) based on “Faster Algorithm for Betweenness Centrality” (Brandes, 1994). The measures were normalized by the software’s built-in function (Jacomy et al., 2009). The normalisation is needed because these graphs follow exponential distribution rather than normal as shown in Jiang 2005 and Natapov et al (2018).

Figure 6 (a) Distribution of degree, closeness and betweenness centralities in SNVG; (b)

Distribution of degree, closeness and betweenness centralities in IVG. The color intensity and the size of each dot represent the magnitude of the measure.

3.2 Relation of street centralities and number of visually accessible kiosks

Table 2 presents correlation values between the kiosk index of the intersection nodes and the three centrality measures.

Measures	R
Degree	0.38
Closeness	0.57
Betweenness	0.36

Table 2 Correlation between the centrality measures and kiosk locations.

The correlation coefficients for degree, closeness and betweenness centrality are 0.38, 0.57 and 0.36 respectively. Thus, all three centrality measures of the street network are positively correlated with the kiosk index. The correlation between the closeness centrality and kiosks is the highest. Closeness centrality indicates the typical distance (in terms of visual connectivity) from a given intersection to all other intersections in the case study area. Namely, it demonstrates the visual accessibility of the intersection in the street network.

This finding shows that kiosks “happened” to be located close to the intersections with maximum visual accessibility in the area. Such correlation means that there is a quantitative linkage between street configuration and distribution of the kiosks in the city. Moreover, given the limited sample, the closeness centrality has been found to be the best predictor for kiosk location among the discussed measures.

3.3 Ethnography of the sample

To carry an efficient ethnographic field study, we limited ourselves to a sample of 10 most representative kiosks where we conducted field observations supplemented by interviews with customers and informants, and a survey. There are 48 kiosks in the case study and their visibility measures are ranged as follows: degree centrality from 1 to 33; closeness centrality from 0.15 to 0.36; and betweenness centrality from 0 to 0.13. In order to reveal the role of visibility and familiarity and relate it to the social performance of urban kiosks, we differentiated two categories of centrality measures – locations with high and low visibility (Fig. 7 and Table 3).

Figure 7 Map of the case study illustrating selected kiosk in two groups - high visibility (HV) and low visibility (LV) measures.

Kiosk ID	Degree centrality	Closeness centrality	Betweenness centrality
High visual centrality			
H1	33	0.33	0.073
H2	15	0.31	0.067
H3	23	0.33	0.011
H4	17	0.29	0.003
H5	21	0.32	0.006
Low visual centrality			
L1	3	0.25	0
L2	4	0.21	0
L3	5	0.22	0
L4	5	0.23	0
L5	5	0.23	0

Table 3 Selected sample of 10 kiosks, 5 with the highest visibility values and 5 with the lowest visibility values.

3.4 Observed activities

Our observations at five kiosks with high visibility and five kiosks with low visibility,

supplemented by information collected from short and long interviews and a questionnaire, revealed a number of activities occurring at different day parts and by different categories of users. These activities were divided according to their general character into commercial and noncommercial, as well as into legitimate and illegitimate activities (Table 4). These categories may overlap, as both commercial and noncommercial activities can be either legitimate (e.g. purchasing goods and interacting with staff), or illegitimate (e.g. gambling and smoking marijuana). In order to systematize the activities, we coded them accordingly as commercial (C) and non-commercial (N); we further divided each category into legitimate (L) and illegitimate (I) activities, creating four main categories (CL, CI; NL; NI).

The most frequent observed activities included purchasing and consuming beverages and snacks on the spot, taking beverages and snacks out, communicating with the staff and/ or other customers, smoking, browsing mobile phones, and people-watching. In this sense, there was a clear distinction observable between high-visibility and low-visibility types: while at kiosks with high visibility there was a noticeable differentiation between activities according to day parts, in kiosks with low visibility this differentiation was rather blurred.

3.4.1 Kiosks with high visibility

The type of activities observed at kiosks with high visibility had a strong correlation with the patterns of movement occurring within the surveyed area. In the morning peak hours, white-collar employees from the nearby offices came for a coffee take-out and a quick bite; during morning peak-off period, passers-by and tourists were the main customers, along with area residents coming for a coffee and newspaper, and, sometimes, a chat. During lunch-time, the kiosks served mainly employees coming for a hot drink and a sweet snack on their way back to the office. In the afternoon, there was a peak of random visitors – tourists strolling the city and stopping for information and an ice cream, shoppers at nearby markets purchasing a pack of cigarettes, beggars asking for a coin, random city wanderers, mainly male, browsing their phones and trying to strike a conversation with female passers-by. In the evening, local residents used the kiosks as meeting points before heading to bars. At kiosks selling alcohol, customers often

stayed longer, having their first drink at a cheaper price than that of a bar or a club. Some of them returned for a nightcap on their way back home.

The late evening was also the time for transactions of the less observable nature, including sales of drugs and related merchandise (mainly smoking devices). Although it was impossible, due to the illegal nature of the transaction, to determine from mere observation what exactly passed hands, several respondents and informants mentioned purchases of light and semi-legal drugs (such as dieting pills, stimulating herbal mixes, and more). Our informants notified us on illegal gambling activities taking place at certain kiosks; however, due to the sensitivity of the issue we were unable to deduce the specific locations in which these activities took place. Same is true about cases of violence – although we learned about several such cases that took place during night time and typically involved drug addicts shoplifting from the kiosk shelves, we did not have the chance to observe them directly. Based on informants' reports, however, it can be ascertained that such cases took place at kiosks with high visibility more often than at kiosks with low visibility.

3.4.2 Kiosks with low visibility

At the kiosks characterized by low visibility, the differentiation of activities and their correlation with day parts and categories of customers was much less apparent. The circulation of people was much less intensive, and the clientele less heterogeneous than in HV kiosks. The customers made fewer purchases and stayed for a longer time (at least at places with available seating); most of them were employed or resided in the area, or both.

It is important to note, however, that kiosks with lower visibility did not offer fewer services than those with high visibility. In fact, some of them offered services unavailable at HV kiosks, such as payphones and lottery, and these services were considerably cheaper. Despite the wider range of services (usually indicated by exterior boards), the kiosks with low visibility are less familiar to people outside the scope of their clientele. For example, when we approached several people who twice a week operate a stall at a local artists' fair, asking them about the closest kiosk, they were unable to point at a kiosk located within a 100 meter distance.

List of observed activities

	Commercial				Non-commercial			
	Legitimate		Illegitimate		Legitimate		Illegitimate	
1	Buying food/ beverages/ other goods	CL1	Buying drugs and/ or related merchandise	CI1	Consuming food/ beverage purchased elsewhere	NL1	Drug use	NI1
2	Consuming purchased food/ beverages	CL2	Underage alcohol purchase	CI2	Smoking	NL2	Underage alcohol consumption	NI2
3	Legal gambling (lottery)	CL3	Single cigarette purchases	CI3	Mobile phone use	NL3	Illegal gambling*	NI3
4	Using secondary services (ex. payphone)	CL4	Buying goods sold without permit	CI4	Communicating with customers	NL4	Quarrels and fights*, harassment	NI4
5					Communicating with kiosk staff	NL5	Begging	NI5
6					People- watching	NL6	Littering	NI6
7					Reading newspapers	NL7	Squatting	NI7
8					Obtaining information	NL8	Drinking alcohol after 11pm*	NI8

*Activities we did not observe but learned about from informants.

Table 4 Observed activities and their abbreviations.

3.5 Social categories of visitors

Based on observations and customer and informant responses, the visitors were categorized into six major groups defined by the repertoire of their trajectories/ activities in the city:

1. *Hi-tech/ white-collar employees*: with their offices located in the high-rise buildings in

the area, employees represent one of the most prominent local consumer groups. Their activities correlate strongly with their work routine and related day parts (namely, before work, during lunch break, and after work); most of them become returning clients with more or less stable repertoire of activities.

2. *Blue-collar employees / small business owners*: compared to their white-collar counterparts, these workers have less resources to spend on consumption and leisure. They make fewer purchases and rarely dine out; however, they often spend longer time over a single purchase, such as a cup of coffee or a snack.

3. *Local residents* are another prominent group in Lev Hair. Working elsewhere or at the home, they make use of the area mainly in the mornings and in the evenings, with their trajectories based on the factor of familiarity, both with the staff/ owners and with other clients. For the residents, the kiosk serves as a familiarized landmark in their daily trajectories and a convenient spot to come in contact with others.

4. *Tourists*, both foreign and local, comprise a rather heterogeneous group defined solely by its temporary presence at the spot. In contrast with the first three groups, tourists build their trajectory basing primarily on the visibility of the kiosks, stopping on their way to or from their sightseeing destinations. They rarely come in contact with the staff, unless when seeking information, which is usually readily provided.

5. *Random visitors*: like tourists, random visitors are a heterogeneous category consisting of those who just “happen to be” on the spot without having a permanent aim linked to that particular area – people coming for a business meeting, random shopping, or simply pass by. Their choice of a kiosk relies heavily on the parameter of visibility, as well as on previous experience of similar places elsewhere.

6. The last group, which we termed “*marginals*,” consists of people who visit the kiosk for purposes incompatible with its formal and informal normative uses, namely, consumption and communication: beggars approaching customers and staff for money, homeless occupying benches and adjacent sidewalks for sleeping, or idlers seeking to strike a conversation with passers-by. This group has not been indicated by our survey respondents and was created based on observations and informants' evidence.

It is necessary to note that we did not succeed to interview any of the “marginals” – when

approached, they preferred to leave the spot; also in kiosks with lower visibility, the customers were more reluctant to talk with us.

Table 5 below summarizes the uses of the kiosks by the social categories received from the observations, the interviews and the survey.

Marginal’ visits to the kiosks strongly correlates with the tolerant attitude of the owners and a convenient setting – mainly the availability of benches and shade. At times, the presence of such marginal customers results in socially tense situations involving either verbal or physical confrontation. For this group, the correlation with the parameter of visibility has dual implications: beggars, for example, prefer to approach sites with more lively circulation of people; at the same time, centrality and visibility may result in official sanctions aimed at illegal or not normative activities. Nevertheless, there appears to be strong preference for HV locations among the “marginal” visitors.

It is important to note in this context that illegitimate (or, in certain cases, illegal) activities were not reserved to the members of this last group. Activities such as smoking marijuana – illegal, but widely popular and informally tolerated activity – were performed by other categories of customers, mostly the local residents. Moreover, it was nearly always accompanied by normative social activities such as communicating and mingling, by and large with a small circle of regulars or friends. This observation suggests that these are not only the types of activities that should be taken into consideration when trying to characterize the mix uses of the kiosks, but also the connotations of social stratification found in the city.

In general terms it appears that the target audience of the LV kiosks belongs to a lower socioeconomic strata than that of HV kiosks that cater to a more heterogeneous clientele.

Social group	Observed activities			
	Legitimate	Illegitimate	Legitimate	Illegitimate

1. Hi-tech/ white-collar employees	CL1; CL2; NL2; NL3; NL5; NL7	CI1; NI1; CI3; CI4	CL1	
2. Blue-collar employees / small business owners	CL1; CL2; CL3; NL1; NL2; NL3; NL4; NL5; NL6; NL7	CI1; CI3; CI4; NI1; NI3	CL1; CL2; CL3; CL4; NL2; NL3; NL5; NL6; NL7	CI3; NI3
3. Local residents	CL1; CL2; NL1; NL2; NL3; NL4; NL5; NL6; NL7	CI1; CI2; CI3; CI4; NI1; NI2; NI3; NI8	CL1; CL2; CL3; CL4; NL1; NL2; NL3; NL4; NL5; NL6; NL7	CI1; CI2; CI3; NI2; NI3
4. Tourists	CL1; CL2; NL1; NL2; NL3; NL5; NL6; NL8			
5. Random visitors	CL1; CL2; CL3; NL2; NL3; NL5; NL7; NL8	CI3; NI2; NI6	CL1	
6. “Marginals”	NL1; NL2; NL6	NI1; NI4; NI5; NI6; NI7; NI8	NL1	NI4; NI6; NI7
	Kiosks with high visual centrality		Kiosks with low visual centrality	

Table 5 Activities documented during fieldwork according to visitors’ categories.

3.6 Familiarity, activities and visibility

In order to determine the parameter of familiarity vs. novelty, we conducted a survey that included tracking and a short questionnaire of 100 people approached at different day parts at each spatial category (high/ low visibility kiosks) – twenty persons for each of the selected kiosks (Three were excluded due to uncompleted data). The surveyors recorded all performed activities, while the respondents were asked to identify a social group with which they associate themselves and answer two short questions, related to the frequency of the visits (“Are you a first-timer or a returning customer?”) and travel trajectory (“Is your visit is a stop on the way elsewhere, or a destination in its own right?”) (see Appendix 1).

Among our respondents in the survey at the HV kiosks, there were 29 white-collar employees and 19 blue-collar employees working in the area, 28 local residents and 21 random visitors, 8 of which were tourists. For the LV kiosks, 9 white-collar and 47 blue-collar employees from the area, 39 local residents, and 5 random visitors were interviewed.

While at the HV kiosks there was a more or less balanced ratio between “regulars” and new customers (50 and 47, out of 97), the LV kiosks were characterized by much higher rate of returning customers (86 and 14, out of 100). Indeed, as was observed, a HV kiosk caters both to those who have incorporated it in the daily routine (such as white-collar employees and local residents) and those who happen to pass by (such as tourists or random shoppers). An LV kiosk caters mainly to those who are already familiar with its location and services, remaining rather “invisible” to random passers-by. Both the high and low visibility kiosks were described by our respondents as “stations” on their daily routes; only 16 out of 197 customers stated that the kiosk was their sole intended destination, twelve of them were interviewed at kiosks with low visibility.

This can be understood in terms of kiosks’ measure of visibility, discussed in Section 2.3. As seen from Table 6, kiosks with high visibility accommodate both the activities characterized by high degree of familiarity and those characterized by low degree of familiarity; in fact, their ratio is almost equal. Kiosks with low visibility, on the other hand, tend to accommodate mainly activities with high degree of familiarity. That is, high visual centrality generates both first-time exposure and ensures recurrent experience, while low visual centrality invites familiarity and repetition. It may be argued therefore, that the spatial location not only dictates one’s initial perception of a particular site, but also structures consequent sets of activities that shape people’s routes and routines.

Observed activities

	Legitimate	Illegitimate	Legitimate	Illegitimate	
High degree of familiarity (Social groups # 1-5)	CL1; CL2; NL4; NL5	CI1; CI2; NI1; NI2; NI3; NI5; NI7	CL1; CL2; CL4; NL4; NL5	CI3; CI4; NI2; NI3	
Low degree of familiarity (Social groups # 1-4)	CL3; NL1; NL2; NL3; NL6; NL7; NL8	CI3; CI4; NI4; NI6; NI8	CL3; NL2; NL6; NL7	CI3	
	Kiosks with high visual centrality		Kiosks with low visual centrality		

Table 6 Types of activities by degree of familiarity with a given visibility of the kiosks.

Although it is impossible to make generalizations based on our limited sample, it is safe to claim that certain activities require familiarity more than others - especially those related to interaction and knowledge of covert possibilities. What may come as a surprise is that the ratio of such covert (or illegitimate) activities and behaviours was significantly higher at the HV kiosks. This leads us to the conclusion that visibility is a key factor fostering all modes of use and determining a wide scope of activities including those hidden from the eye.

The kiosks make attempts to increase their visibility via various additional measures. Among these are banners and signs, catchy names, logos, and other visual forms of self-marketing. Trespassing the boundaries of the space allocated to the kiosk is another popular measure (Figure 8).

Figure 8 Additional measures to increase visibility: outside banners, refrigerators and stands.

A kiosk owner informant described how every day he moved the ice cream refrigerator and newspaper stand to the sidewalk outside the kiosk. The outdoor stands attracted not only

customers but also shoplifters and municipal inspectors. Heavily fined every now and then, the owner nevertheless continued to occupy the sidewalk, as the sales brought by the increased visibility surpassed by far the fines.

4. DISCUSSION AND CONCLUSIONS

4.1 Discussion

Concrete geographical locations of urban kiosks are not prearranged by planning authorities, but evolve in the bottom-up self-organising process as part of the city's growth and change. This study looked for the relationship between the spatial organisation of the kiosks and their social performance.

First, it examined how these micro-architectural forms and the street network are mutually dependent. Streets are likely to persist much longer in time than other urban elements, such as buildings, commercial facilities or services (Vernes-Mouton, 1989). Moreover, it is known that pedestrian movement is significantly correlated with the centrality of the streets, i.e. highly connected streets tend to attract more people than the segregated ones (Jiang, 2008; Desyllas and Duxbury, 2001; Hillier, 1996). Using a graph technique we represented movement channels (streets) and kiosks locations as mathematical graphs and characterized their centrality in terms of visibility.

Three centrality metrics pertaining to visual accessibility were used: degree, closeness and betweenness centralities. Each of the measures gives a different interpretation of the urban layout. Degree and closeness centrality demonstrate the set of most visually connected street intersections, while betweenness centrality shows most visually attractive intersections among all the existing opportunities of the network.

We compared centrality values of each street intersection with the number of kiosks visible from it, and found that kiosks are positively related to all three examined measures. The correlation with the closeness centrality, indicating the visual accessibility of the intersection, has been found to be the strongest. That means that urban kiosks tend to be located close to the street intersections with maximum of visual connectivity. This finding reinforces existing knowledge about interrelationships between street network visibility and other urban commercial facilities, such as cafes, restaurants, and stores (Natapov et al, 2013). It also allows us to give a new

explanation on how space and society evolve to satisfy the needs of its individuals in sharing a common space and daily routines.

This study focused only on one type of urban amenities, kiosks; however, in the future the method can be expanded by considering other amenities and locational factors, such as stores, public spaces, parks, playgrounds, pavement conditions, etc.

We complement these findings by relating the parameters of location to the manner in which individuals interact with and make use of these spaces. To that end, we selected a sample of 10 kiosks with high and low visibility and posed questions on the correlation between their spatial properties and hosted activities: Are kiosks located in the least visually integrated venues more likely to be less socially attractive and host more illegitimate activities? Are kiosks located in the more visually integrated venues more likely to be socially attractive and host less illegitimate activities?

Our findings demonstrate that both commercial and non-commercial modes of use are maximized in kiosks with higher visual integration. They also reveal that, surprisingly, the intensity of both legitimate and illegitimate activities was significantly higher at the HV sites. This suggests that visibility is a key factor fostering *all* modes of use, including those happening out of sight.

The prevalent assumption is that anti-social behaviour is tied to marginalized spatial segments of the city, correlating with low socio-economic conditions, deviant group behaviour, and lack of sufficient surveillance and regulation. In recent decades, there has been a growing emphasis on various measures of securing the public space, mainly via surveillance and exclusion of elements deemed problematic. This is particularly true for privatized public spaces such as shopping malls that invite gathering and interaction within more or less strictly defined framework of consumption. Our observations, however, demonstrate a different picture: not only a kiosk in a more visible location will get more patronage than the one less visible, but this patronage also involves illegal uses, undermining the correlation between shadow activities and lower visibility. Spatial behaviour is mostly repetitive and habitual, and is closely related to the body (Seamon 1980, 153). Gaze and visual perception function as cognitive extensions of the body, internalized as a habitual mode of behaviour and reflected in spatial trajectories that comprise individual

daily routines. Sets of these integrated behaviours comprise “time-space routines” that further fuse into a larger whole of a “place-ballet” (Seamon 1980, 157-9). A crucial characteristic of this spatial “ballet” is familiarity arising out from the routines – usually unintentional but capable of producing meaning and attachment. The study of Tel Aviv kiosks illustrates this choreography: it demonstrated how higher visibility facilitates both familiarity and novel exposure, while low visibility generates mainly recurrent behaviour determined by familiarity. This is manifested by the local “place-ballet”: while at HV kiosks there was a noticeable differentiation between activities according to day parts, at LV kiosks this differentiation was rather blurred.

Urban kiosks become integrated in individual spatial trajectories as social spaces that are neither work nor home; as such, they are closely related to the more familiar notion of “third places.” “Third place” is defined as a social environment separated from the home (“first place”) and the office (“second place”), central for informal community-building (Oldenburg, 1989). A “third place” is a site explicitly defined both in spatial and functional terms (as a bar, a café, or a library). Adopted by people as places of informal socializing, “third places” nevertheless have clear boundaries demarcating the territory within which people come to linger. In contrast, kiosks are characterized by vague definition and fluid spatial boundaries between the inside and outside that invite rather non-structured modes of use. For the most part, these uses take place outside the kiosk – on the sidewalk, benches, or lawns. Most importantly, in contrast with “third places,” kiosks are sites of transition, nodes in the constant movement of people.

We therefore suggest to view kiosks as “fourth places” – a term referring to heterogeneous locales characterized by openness, in-betweenness, publicness, and vague spatial definition (Aelbrecht, 2016). “Fourth place” locations are flexible, adaptable, and conducive for encounters with strangers; while Aelbrecht refers to loosely defined (albeit privately owned and managed) spaces such as thresholds, edge spaces, and paths, we believe that this category may be expanded to include more urban sites. By virtue of being spatially open, accessible, transient and allowing for a constant flow of people, kiosks can qualify as “fourth places.”

Transience and “in-betweenness” possessed by “fourth places” is an important precondition to developing informal social uses, comprised mainly of “in-between” activities such as people-watching, waiting, or killing time, performed by a broad spectrum of users (Aelbrecht, 2016).

When social encounters occur in such places, they generate fluid connections based on common

routines rather than strong communal cohesion; however, they allow for constant re-creation of daily activities and the making of urban societal networks.

As may be seen from the collected data, activities related to social encounter occupy an important place in the kiosk visitors' repertoire. Communication with the staff and other customers, although never reported as a formal purpose of one's visit, nevertheless occurred with high frequency, especially at the HV locations. In this sense, it may be argued that part of the activities associated with "fourth places" occurs in a spontaneous manner and not as part of the planned routine, pointing at the non-structured manner of such spaces' appropriation.

Based on our observations and interviews, we can determine that the higher the visibility of a kiosk, the more engagement it generates through multiple activities and multiple categories of people partaking in them. Physical and spatial accessibility characteristic of the HV kiosks translates into social accessibility, enabling a wider range of activities, carried by a wider range of customers, both occasional and regular. In other words, the higher is the parameter of visibility, the more intensive use of the "fourth place" functions can be anticipated. Furthermore, an unpredicted finding that our study illuminated upon is that illegitimate activities were detected with higher frequency in kiosks with higher visibility. This discovery contradicts an assumption that "shade" activities would occur mainly at less visible sites and underlines the chief importance of visibility in urban public space use.

4.2 Conclusions

Urban micro-architecture forms similar to kiosks were acknowledged and theorized before as favourable spaces that support informal social activities (Lofland 1998; Whyte 1980 and Goffman, 1963). This phenomenon is assumed to have arisen primarily from social conditions rather than physical ones. However, the findings of this study reveal that these conditions are strongly spatialized and related to cognitive properties of users: visual perception, previous experience, and familiarity with the environment. Maximization of kiosk uses is found in very specific spatial settings and under particular spatial conditions. With the advancement in visibility analysis techniques, it is possible to measure both spatial distribution and performance of urban form, and further explore the ways in which these new understandings can improve urban practice.

The contemporary role of urban kiosks can be conceptualized in terms of a “fourth place” – a public space with a high measure of in-betweenness and transience, but nevertheless enabling social encounter. In his account of “third places,” Oldenburg (1989) laments their gradual disappearance from the society. However, it appears that “fourth places” are capable of fulfilling, at least partly, the social function of informal encounter, and may be regarded as a post-modern evolution of the “third place.”

HIDDEN IN THE MOST VISIBLE PLACE:

Measuring visual accessibility and social performance of urban kiosks

FIGURES

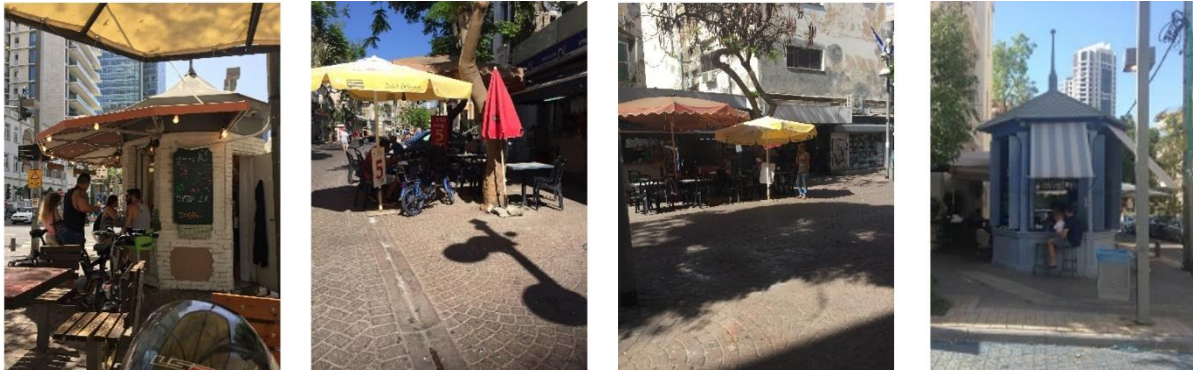
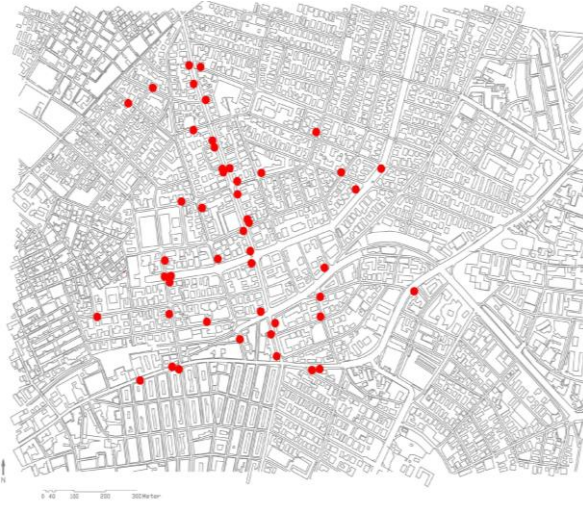
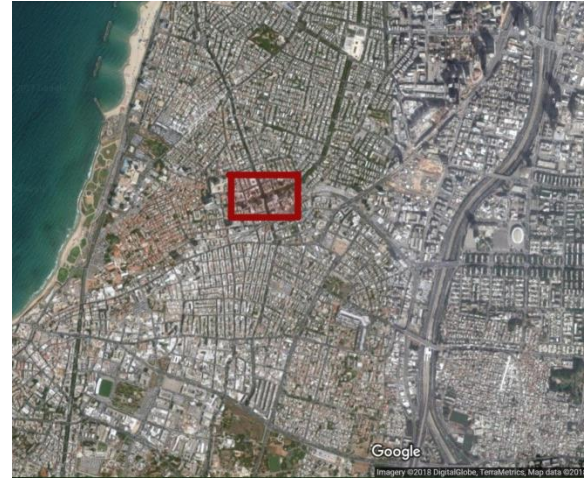


Figure 1 Typical kiosks in Tel Aviv.



(a)



(b)

Figure 2 Case study: (a): Map of the kiosks in the area; (b) location of the case study in the city of Tel Aviv. (Background: Maps.Google. com)

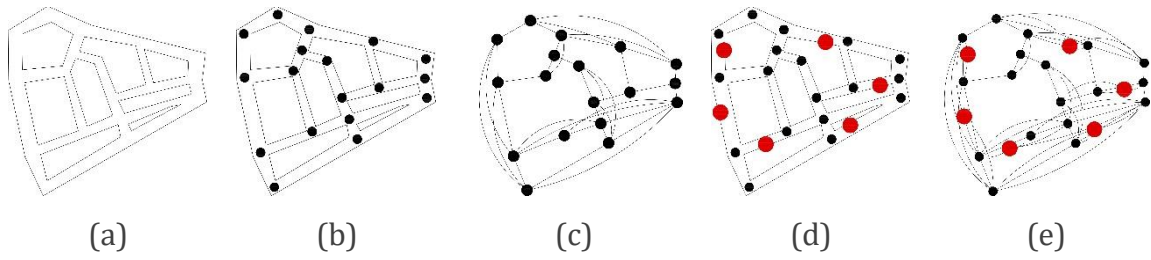


Figure 3 Visibility graph construction: (a) open urban space; (b) intersections-navigation decision points within the street network; (c) SNVG; (d) urban activity locations in red; (e) IVG with two types of points where navigation decision is taken. Black nodes are intersections and red are activity locations.

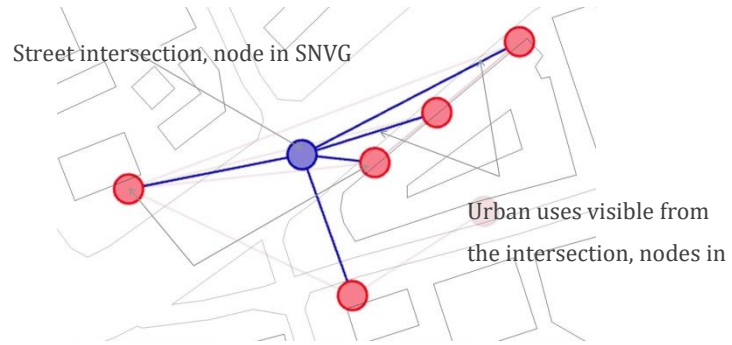


Figure 4 Intersection with the kiosk index 5.

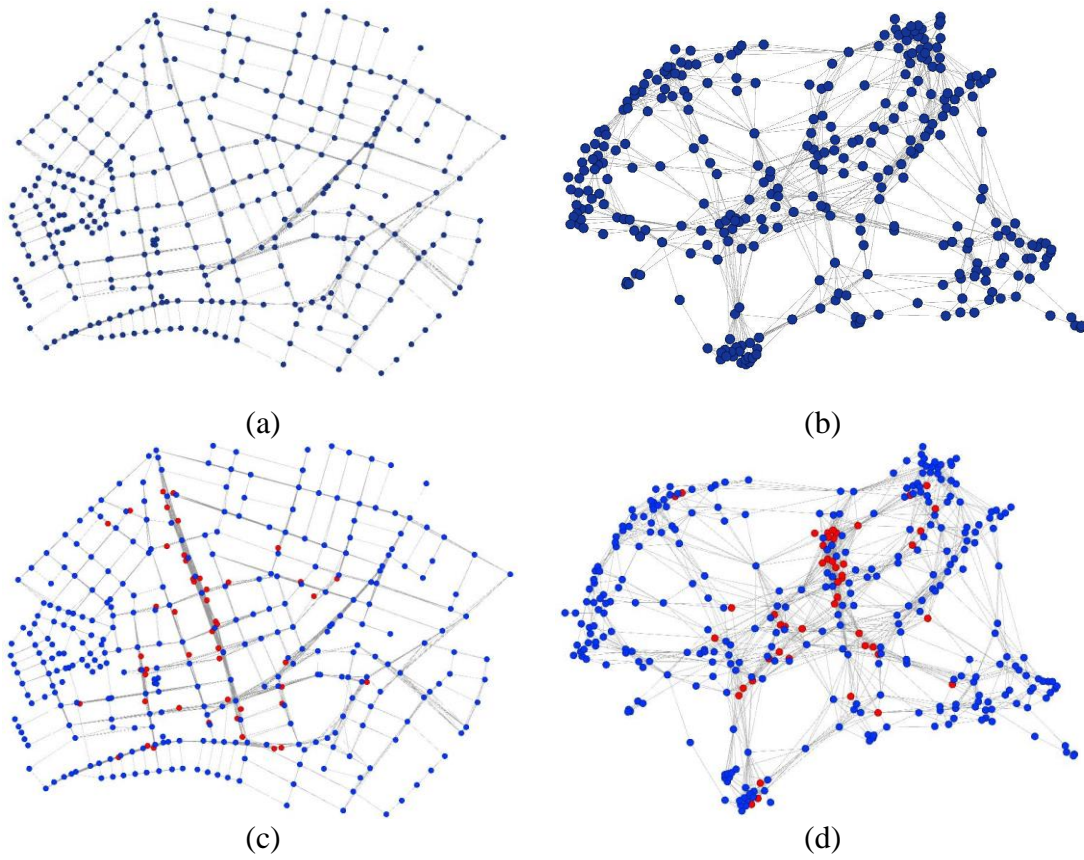


Figure 5 (a) and (b) SNVG, street intersections are marked in blue, (a) geo-coordinated layout; (b) non-geo-referenced layout, when the connected nodes are placed close; (c) and (d) IVG, street intersections are marked in blue and kiosks are in red, (b) non-geo-referenced layout, when the connected nodes are placed close.

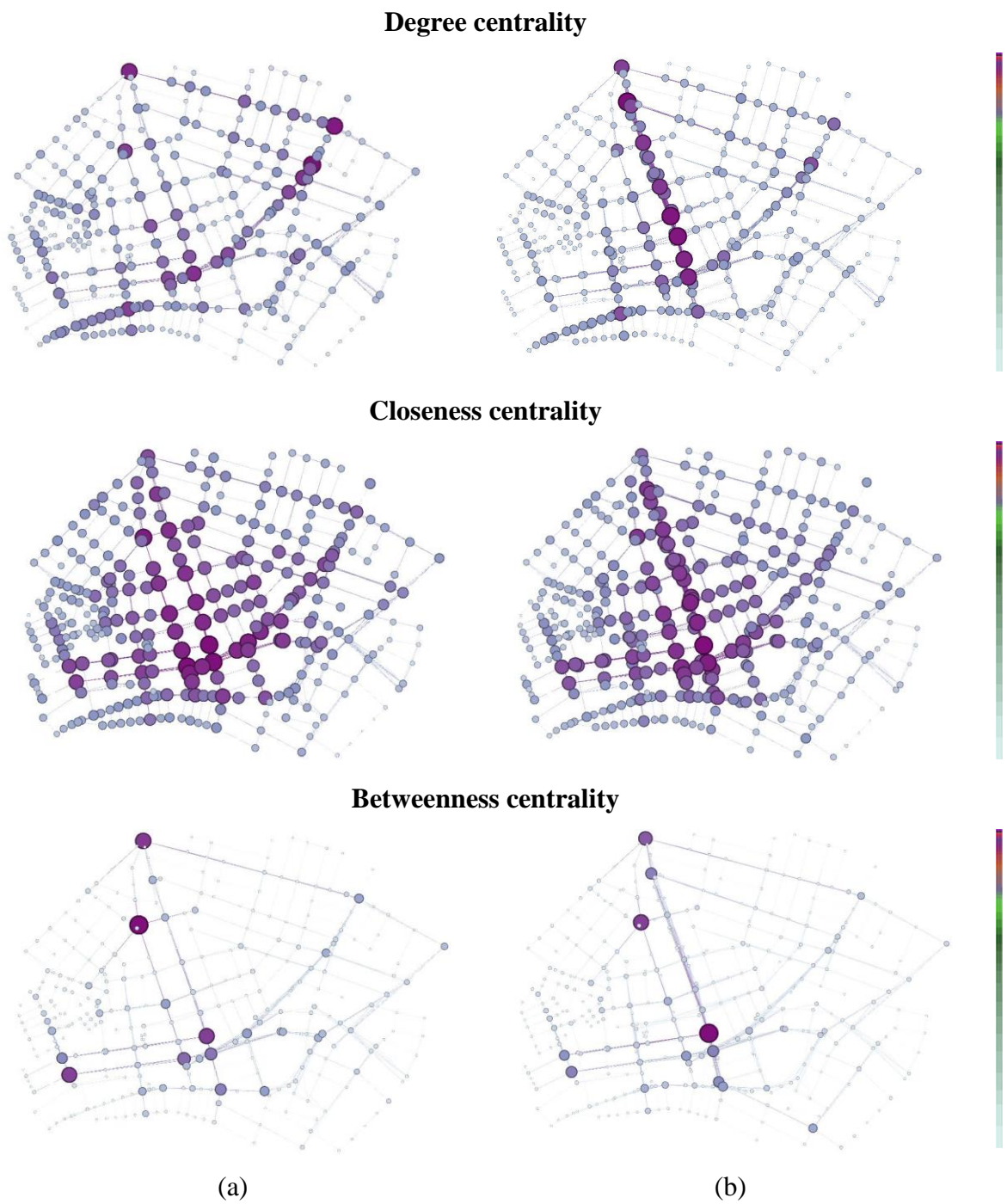


Figure 6 (a) Distribution of degree, closeness and betweenness centralities in SNVG; (b) Distribution of degree, closeness and betweenness centralities in IVG. The color

intensity and the size of each dot represent the magnitude of the measure.

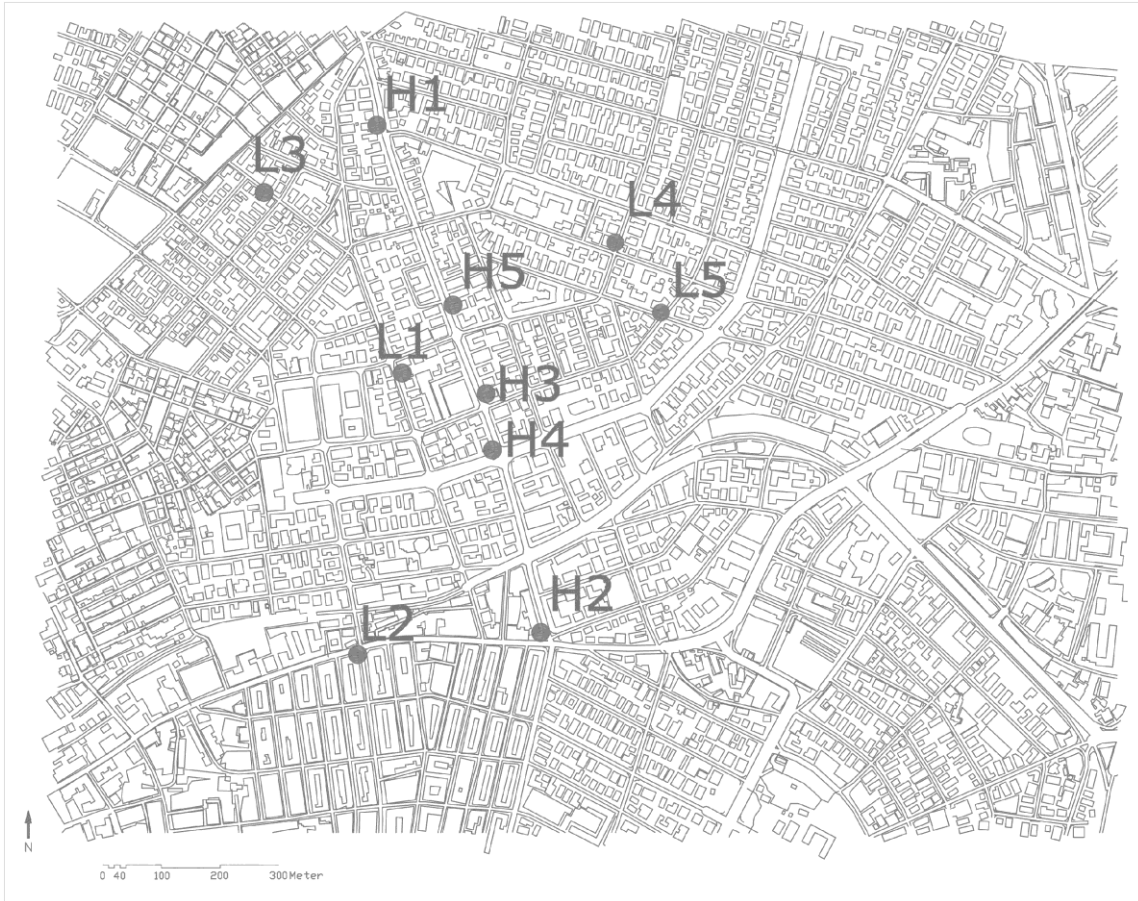


Figure 7 Map of the case study illustrating selected kiosks in two groups - high visibility (HV) and low visibility (LV) measures.



Figure 8 Additional measures to increase visibility: outside banners, refrigerators and stands.

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APPENDIX 1: SURVEY OF INDIVIDUAL CUSTOMERS

Translated from Hebrew; verbal instructions were given prior to the survey

Instructions for surveyors:

- ✓ The survey is supervised by Dr Natapov (UCL CASA) and Dr Grinshpun (Hebrew University).
- ✓ Please note that respondents' participation is entirely **voluntary**.
- ✓ Please indicate to the respondents that the answers will be processed and published **anonymously**.
- ✓ Please fill-out ALL the tasks.
- ✓ Contact person: Dr Grinshpun Helena.grinshpun@mail.huji.ac.il

Surveyor's tasks

1. Please mark the observation site (see attached map)

H1	H2	H3	H4	H5	L1	L2	L3	L4	L5

2. Please mark the relevant time slot

8:00-9:30	9:30-12:00	12:00-15:00	15:00-17:00	17:00-19:00	19:00-21:00

3. Please mark the activities performed by the observed person

	Remarks
Buying food/ beverages/ other goods	
Consuming purchased food/ beverages	
Legal gambling (lottery)	
Using secondary services (ex. payphone)	
Buying drugs and/ or related merchandise	
Underage alcohol purchase	
Single cigarette purchase	
Buying goods sold without permit	
Consuming food/ beverage purchased elsewhere	
Mobile phone use	

Communicating with other customers	
Communicating with kiosk staff	
People-watching	
Reading newspapers	
Obtaining information	
Smoking	
Drug use	
Underage alcohol consumption	
Illegal gambling*	
Quarrels and fights, harassment*	
Begging	
Littering	
Squatting	
Drinking alcohol after 11pm *	

*Activities not likely to be observed (learned from informant interviews)

4. Please ask the respondent to indicate the most relevant category (multiple choice)

Remarks

1. Hi-tech/ white-collar employees	
2. Blue-collar employees / small business owners	
3. Local residents	
4. Tourists	
5. Random visitors	
6. Other	

5. Please ask if the respondent is a first-timer or a returning customer?

Regularly (returning customer)

First time (not a returning customer)

6. Please ask if the kiosk was a destination in its own right or a stop on the way elsewhere

Destination

Stop on the way