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THE IMPACT OF SPATIAL CONFIGURATION ON STREET VENDORS' DISTRIBUTION AT TERMINALS

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ABSTRACT

In terms of the importance of preserving the formality of the main public roads and transportation's terminals in Egypt's cities, this research was initiated with the impartiality of exploring the impact of spatial configuration on the street vendors' distribution in the terminals in order to preserve the accessibility so as connectivity of the streets. The research methodology implemented space syntax analysis, where various measures. Moreover, on-site observations were achieved to pedestrian movement patterns. In addition, a statistical analysis was performed by implementing the Statistical Package for Social Sciences (SPSS). Four different terminal stations in Cairo were selected to be investigated, where a comparison was held between the street vendors' distribution and the spatial configuration of each terminal. This research designated that street vendors are placed at the entrance so as for exit plots and in most integrated streets. This search provided a better understanding of the optimal distribution of the commercial activities in terminal stations. The research suggested that there are two important factors (i.e. accessibility and connectivity). These factors should be implemented as a regeneration tool in terminal stations.

KEYWORDS: Street Vendors, Terminal Stations, space syntax, Spatial Configuration, Pedestrian Movement

1. INTRODUCTION

The informal economy is the economic system's core, so as the developing countries' social systems, where the informal sector's accounts for 20 to 60 % of the urban employment in such countries [1]. The street vending is inserted into the backdrop and the backbone of the urban economies. The street vendors increased, especially in the terminal station areas and in vital spaces in Cairo, where the terminals have spatial opportunities and pedestrian traffic density targeted by the street vendors. They are occupying the main pedestrian paths, waiting areas and some street parts to display their products .The street vendors' concentration in such

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places causes street congestion, conflicts and increased traffic problems. This is evident to occur, as there is a lack of available convenient places for vendors and their customers .

1.1 Research Importance and Questions

In Egypt, terminal stations are located in the cities' central parts, which are used by heaps people. The street vendors' proliferation phenomenon takes place at terminals, which causes lack of the accessibility, the connectivity absence, pedestrians' inconvenience and street obstruction so as constriction. Accordingly, the research attempts to resolve such a problem by answering the following questions :

- Is the distribution of street vendors in terminal stations influenced by its spatial configuration or by pedestrian movement patterns ?
- What are the other variables that affect vendors' distribution?

2. LITERATURE REVIEW

The informal economy sector has an economic role. In addition, it has several social roles (i.e. inclusion, association, dialogue with the local authorities) [1]. The land used by the small-scale enterprise (i.e. street vendors) is rarely mapped, especially in the developing countries due to its rate of urban growth, the scale of informal settlement and the reality of urban livelihoods [2]. Accordingly, many researchers were involved in the fields of understanding the economic activities' location so as the relation between configuration, movement pattern and land use and Space Syntax Theory.

Through understanding the location of the economic activities, various approaches and theories aimed to understand the agents' behavior in allocating the urban activities. The geographers focused on the geographical location of the human activities based on Thünen's theory, which identified the "agriculture product" and "the distance to the market" as the main variables affecting the profit, regardless of other variables [3]. Whereas economists demonstrated the impact of the "market mechanism" on the optimal allocation of the activities, according to the microeconomic theory. Which suggested that the "travel expense" and "accessibility" are the key factors that could increase the land value [4]. These traditional economic theories focused on the "spatial distance" and "movement expense" in order to provide insights into the impact of the spatial conditions on land use spreading [5, 6]. So, the

flexibility of location changing is the main identity of the street markets, as these markets follow the closer demand of their consumers [7, 8]. The street markets are positioned in an intermediate layer in the urban hierarchy, which is between main city structure and local roads. In addition, it allows people to effectively access the most important street systems (i.e. known as the super grid). Consequently, the street vendors' location is often critically important to their success, so understanding the spatial distribution and characteristics of informal jobs in urban locations are one of the starting points for the economic inclusion [2].

The relationship between the commercial activities' pattern and spatial parameters of the built environments was investigated by implementing space syntax method, the significant correlation was proved between the degree of the street spatial integration and the economic activities' numbers [9-13, 5]. So, the network of streets is a powerful tool to arrange movements. These movement patterns affect the urban function from localized to globalized scale [14-16]. On the other hand, the "nesting layers" of different movement scale are correlated to function distribution, where Jakarta city was selected to apply a spatial model. The model consisted of two supergrid-spaces layers, these layers correspond to movement patterns and public economic activities distribution. As well as, the smaller functions be oriented to local scale networks, around the so-called second layers of "supergrid" [17]. While, at a lower scale, the street vending as example of economic functions. So, the diversity of movement distribution results from spatial configuration of the urban grid, which created topological inequalities that influentially affect the land-use patterns [18]. This induces multiplier effects on the movement to attract a greater variety of land uses movement-dependent [19].

Micro scale businesses owned and run by low income individuals are highly sensitive to spatial accessibility to attract consumers. This spatial privilege is missing in planned areas whereas in unplanned areas it is not that chaotic in terms of the types of commercial activity [20]. Meanwhile, the density of the activity increases around central terminals in the city which are located in the most accessible street segments where syntactical properties play a role in the efficacy of the business system [21].

Through concentrating on the Space Syntax theory: the space syntax theory is a useful technique to investigate pedestrian movements and other aspects of built

environments (i.e. land use patterns, social and economic performance, or crime patterns in the urban area) [22, 23].

3. METHODOLOGY

3.1 Research Objectives

Most of the previous studies did not take into consideration the influence of the spatial street grid structure and movement pattern on the street vendors, so this research was commenced with the objective of exploring the impact of the terminal stations' location, spatial configuration and movement patterns on the street vendors' distribution. Moreover, the research aims to predict the economic activities distribution at terminals. In addition, the research investigated how to promote inclusion of the informal vendors as economic activities in the urban context.

3.2 Hypothesis

The spatial configuration of the terminal station and movement patterns are important variables in the street vendors' distribution as an economic activity.

3.3 Case Studies and Criteria of its Selection

Four different terminal stations in Cairo were selected to be investigated, these are El-Attaba, Ramsis, El -Sayeda Aisha and El-Asher- El Salam station. The criteria of selecting these cases are:

1. The biggest terminals located in the capital.
2. The researcher's repeated visits to some of these terminals and the observation of the ethnographical distribution of street vendors inside and around them.
3. The diversification of their location inside the capital, whereas El-Attaba, Ramsis, and El-Sayeda Aisha are in the heart of the capital, which includes densely walked street segments with the city. El-Asher- El Salam Station: located out of the heart of the capital on the Ring road.
4. The different potentials of selected diverse areas (i.e. historical, commercial, administrative and rail station and Metro). El-Attaba Station: It is located near the major gathering of retail trade areas such as El-Mosky, Abd elAziz Street and El-Roaee. Whereas Ramsis Station is close to main train station (Egypt rail Station)

and many of other bus stations and metro- gathering more than one metro line in the capital, and some of the big administrative building. El-Sayeda Aisha Station: It is in the historical area in Cairo, this neighborhood featuring the popular residential areas.

3.4 Materials/Stimuli

- The Space syntax analysis by using Depthmapx (Multi-platform Spatial Network Analysis Software version.30. To analyze the spatial configuration of the four cases at different scales and compared results with street vendors' distribution.
- The observation methods [24] (Static Snapshots and Gate counts) to track the people and street vendors to reveal their behavior.
- The statistical analysis using the Statistical Package for Social Sciences (SPSS) Version 22 to investigate the relationship between different variables and distribution of vendors.

3.5 Variables/Design

Table 1 shows a set of variables that have been inferred through: First: observation; these are variables of the location properties as follow: Areas types, the proximity to metro and rail stations, proximity to the terminal entrance and traffic density, in addition to the number of the pedestrians and number of the street vendors in 1 meter Second: through space syntax analysis; these are spatial variables, normalized local angular choice and integration as an output of Depthmapx program, a numerical value. The type and value of each variance has been determined to facilitate input to SPSS programs as digital inputs to be recognized by changing the qualitative variables into quantitative variables. Where there are three variables as follow: 1. Nominal: it is categories but there is no natural order; 2. Ordinal: categories which have a natural order, but it does not make sense to do algebra; 3. Scale: the number is meaningful and can be used for calculations.

A template that contains the numbers of streets in which street vendors disseminate which have been determined on the map through observation as well as all inferred variables. Then the template was filled in by giving a value to each variable in

each street in the four cases subject of the study to facilitate their input in the SPSS program to conduct the various statistical analyses.

Table 1. The various variables that have an impact on the distribution of street vendors at terminals.

Deduction from	Variables	Classification of variables as SPSS Inputs		
		Type		Values
Observation	1.Areas types	Categorical (Qualitative) variables	Nominal	1=El Asher, 2=Elattaba, 3= Elsaida Aisha , 4=Ramsis
	2.Proximity to metro and rail stations		Ordinal	1=very closed, 2= closed, 3= moderate, 4= far, 5= very far
	3.Proximity to terminal entrance		Ordinal	1=very closed, 2= closed, 3= moderate, 4= far, 5= very far
	4.Traffic Density		Ordinal	1=very high, 2= high, 3= moderate, 4=low, 5=very low
	5.Street length in meters	Continuous (quantitative) variables	Scale	Numerical values
	6.Number of pedestrians		Scale	Numerical values
	7.Number of street vendors in 1 meter		Scale	Numerical values
Space syntax analysis	8.NAIN, INRn, INR400		Scale	Numerical values
	9.NACH, CHRn, CHR400		Scale	Numerical values

3.6 Procedures

3.6.1 Syntactic analysis

The space syntax method is used to measure the spatial configuration of the case study areas. An urban layout was reduced to an axial map and topological configurations were analyzed using depthmapx software. The spatial model focused on two main measurements, Normalized Angular Choice (abbreviated as NACH) and Normalized Angular Integration (abbreviated as NAIN). The Normalized measurements are used to compare the different areas of a city. The choice calculates the potentials for each segment selected by the pedestrians as the shortest path, so the “choice” denotes movement potential of a segment in a spatial system (through-movement). On the other hand, “Integration” forecasts the “to-movement” potential for each segment when measuring on all the shortest angular path in the system for all origins to all destinations.

3.6.2 On-Site observation and interviews

The on-site observations were used to support the spatial analysis. It focused on the movement pattern and the street vendors' location in and surroundings the terminal stations. The observations implemented standard techniques:

- A static Snapshot method was conducted to capture the use pattern of spaces from people and vendors once in the morning and once in the afternoon.
- The Gate Counts method was implemented for observing pedestrian movement patterns. The gates were selected to cover the stations' entrance and exit with street vendors, so it was diverse from busy to lightly routes surrounding the terminals' area to count people. The observations were achieved for two hours distributed over two periods in the day (morning and afternoon). Six to ten gates were considered for each case study. The pedestrians were classified into three main categories: children, teenagers, and adults.
- The semi-structured interviews -by an open-ended question- were conducted with the street vendors to identify the social background of their presence in these areas, as well as to identify their awareness of the places choice where they spread.

3.6.3 Statistical analysis

Based on the listed data, the following was achieved by using SPSS: 1. The Mway (ANOVA) test was conducted to verify the influence of the categorical variables on the street vendors spread, 2. Correlation analysis was achieved to find correlative relationships between variables, and 3. Regression analysis was carried out to establish a model to predict the street vendors spread and the most suitable places for their presence within the urban circumstances without causing any urban problems.

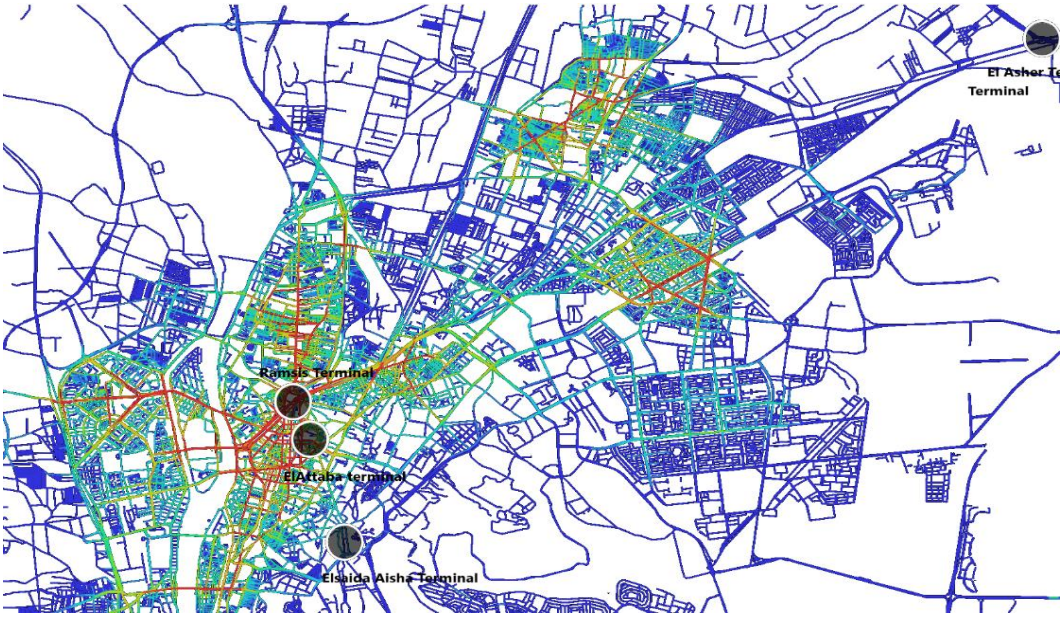
4. RESULTS

4.1 Terminal Morphological Analysis

The configuration identity of the terminal morphologic analysis was designated in Fig. 1.a, where it refers the Normalized Angular Choice (NACH) of the four stations within the Cairo metropolitan context. The red lines indicate the highest values, while the blue streets are the lowest. The four cases are located along high global choice routes. The Normalized Angular Choice (NACH) indicated that the

locations of the terminal stations are places-through-movement to attract people and vehicles.

The Normalized Angular Integration (NAIN) indicated that “Ramsis” and “E Attaba” stations are red patches, while, “El Asher” and “El Sayeda” are orange and blue patches. This analysis indicated that “Ramsis” and “ElAttaba” are integrated with urban context, whereas “Elasher” and “ElSayeda Aisha” are segregated from the whole urban context; Fig. 1b.



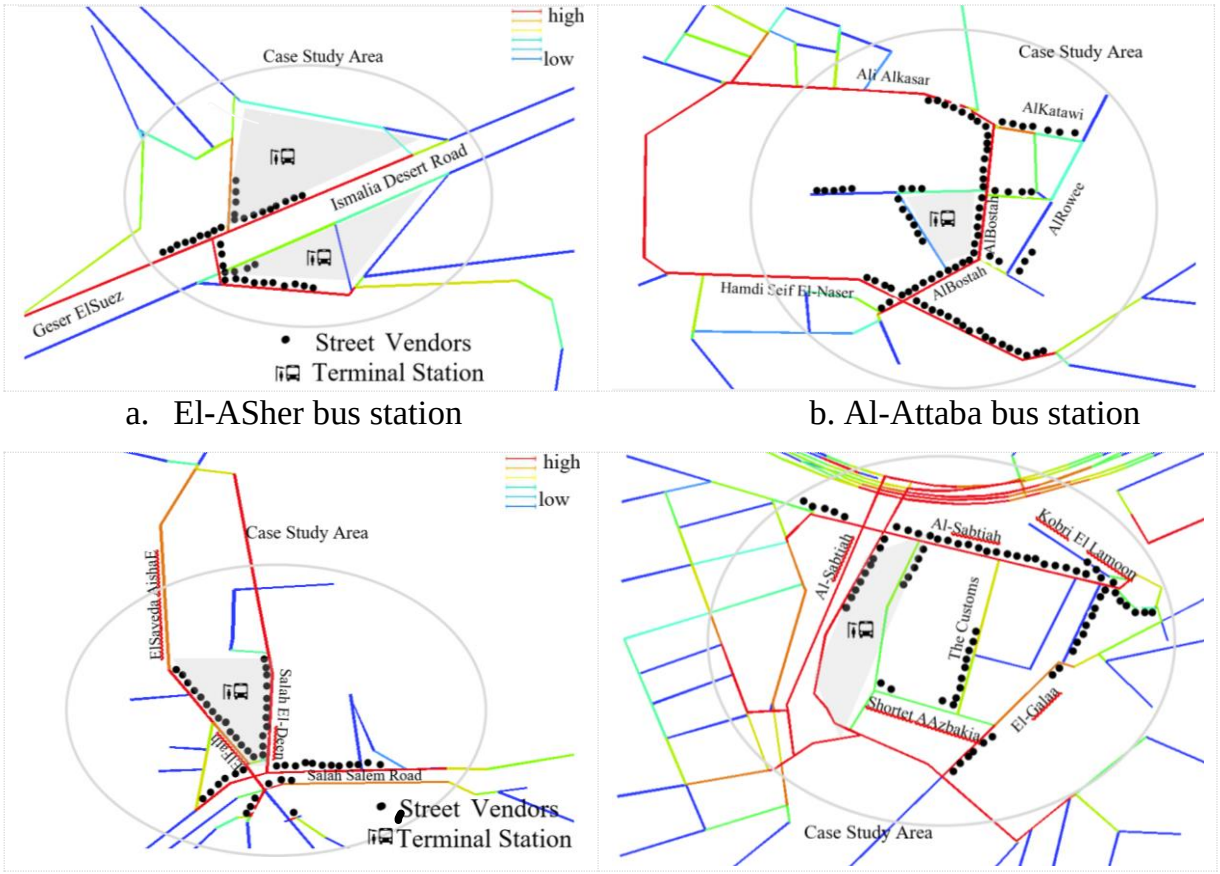
(a) normalized angular choice NACH.

(b) The normalized angular integration NAINRn.

Fig.1. Angular segment analysis for the 4 case studies within a wider context.

4.2 Interpreting Segment Maps

As for the interpretation of the segment maps, Fig. 2. is provided to denote the Normalized Choice NACHRn analyses for the case studies at global scales (Rn). This figure refers to the visual correlation between the spatial parameters and street vendors' distribution (i.e. as black dots). It gives the impression that street vendors are mainly located along the most accessible segments.



a. El-ASher bus station b. Al-Attaba bus station

c. Alsaida Aisha bus station d. Ramsis bus station

Fig. 2. Normalized Choice Measures (NACHRn) in four stations overlapped by the distribution of street vendors.
(Black color indicate higher accessible values while gray represents lower values)

4.3 Movement Observation

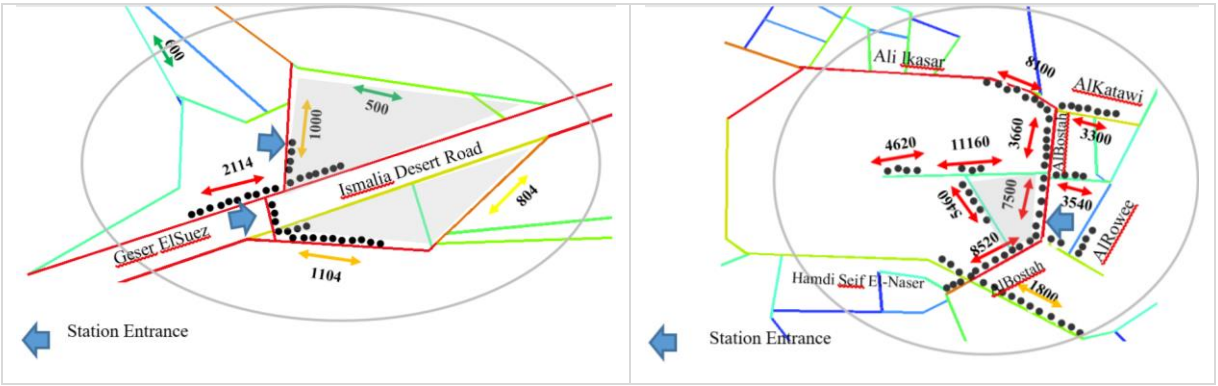
Focusing on movement observation, the Gate counts method was applied to obtain an accurate picture of the relationships between the pedestrian movement flows, spatial configuration and street vendors' distribution. Important locations were chosen that cover the areas under study. The field study was carried out on the same days for the four stations during working days and weekends on September-December of 2017.

In El- Alasher station, movement observation indicated that there are more people in Geser el Suez street than in the rest of the area due to the spread of illegal microbus on the main route and movement from and to the two parts of the bus station; Fig. 3a. Street vendors concentrated on the main street along the most accessible streets and in front of the entrance of the bus station.

Movement observation in El-Atabba identified that movement rates are typically higher in the main streets (Al-Bosta, El- Azbacia) than in the rest of the area due to the existence of (El-Attaba Metro Station). The proliferation of commercial gatherings (El Roaee, El-Moskee, Al-Azbakya) is provided on Fig.3b. The street vendors are concentrated along highly accessible streets and the bus station's entrance to attain the revenue from pedestrians.

The movement observation in El-Sayeda Aisha indicated that movement rates are typically higher in the main streets (Salah El -Dein and El- Fath) at weekday, whereas the movement rates increase dramatically due to the existence of the temporary "market for animals" on Sunday. The street vendors are concentrated along highly accessible streets and the entrance of the bus station Fig. 3c.

In Ramsis Station, movement observation designated that there are more people in Al-Sabtia Street, Ramsis Square and El Galaa Street than in the rest of the area due to the existence of Egypt rail station and Ramsis Metro Station (El Shohada); Fig. 3d. Street vendors concentrated on the main street along the most accessible streets and in front of bus station's entrances.



a. El-ASher bus station. b. Al-Attaba bus station

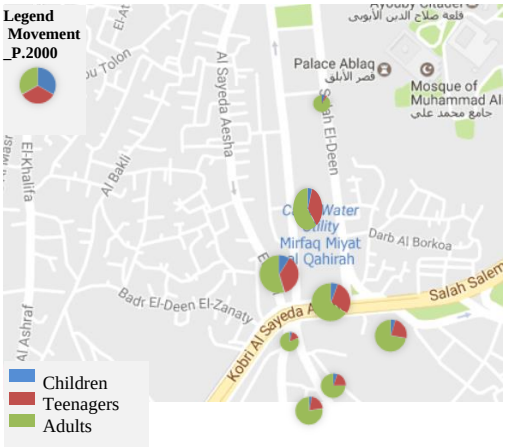
c. Alsaida Aisha bus station d. Ramsis bus station (elsabtia)

Fig. 3. Normalized Integration Measures (NAIN) in four stations overlapped with the distribution of street vendors.
(Black color indicate higher accessible values while gray represents lower values)

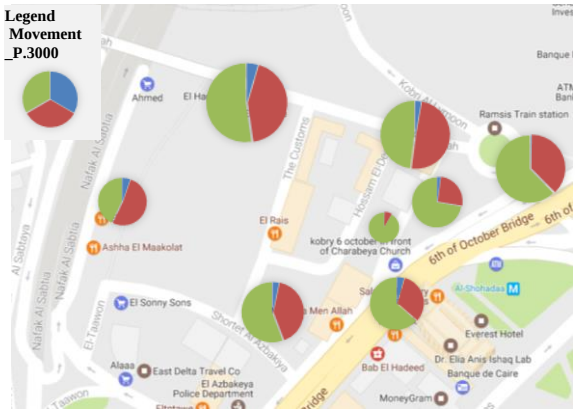
In the four stations, the streets are mostly dominated by the teenagers and adults than children, as most people come to their work or educational institutions, Fig. 4.

a. El-ASher bus station

b. Al-Attaba bus station



c. Alsaida Aisha bus station



d. Ramsis bus station (Elsabtia)

Fig. 4. Pedestrian flows denoted the children, teens, and adults dressed in suits in four stations overlapped with movement pattern.

4.4 Ethnographic Observation

4.4.1 Gathering of people

From daily observation, it was found that people gather in the stations at 3 plots.

- Place 1 is at the waiting zones for the bus both inside and outside the station, where the number of increases at rush hours, in the morning and evening.
- Place 2 is in front of the street vendors who sell food, especially in the morning.
- Place 3 is in the zone for selling the vegetables and fruit in the evening (i.e. during the rush hour for the employees that return from their work; Fig. 5.

4.4.2 Attractive places

The attractive places are at the station entrances and metro gateways are the most attractive places to the distribution of street vendors due to the great movement rates than other areas in the station.

4.4.3 Pedestrian movement pattern

People usually move in groups at the station area, especially at the entrance and exit of the station and in front of the street vendors. The high density of people usually moves in the short path. For example, they broke the fence of the station to shortcut the movement path, so the street vendors stabilize on this path to gain the high-density's revenue.

(a) El Asher Station b) El-Saida Aish Station

(c) El Attaba Station d) El Sabtia Ramsis

Fig.5. Gathering people and distribution of the street vendors in the four terminal stations.

4.5 Semi-Structured Interview

The street vendors were interviewed to recognize the reason for their presence and to recognize their awareness in choosing such places to stand by using open-ended questions to achieve the aims of interview see Table 2.

Table 2. The answers of the street vendors about their location.

Interview Objectives	Questions	Answers
How to determine their locations	Where do you prefer to stand?	-At places such as the tunnel and the metro doors, where pedestrians are intensively there and consequently more trading takes place. (Ramsis) -The main streets as well as the large markets and terminals, metro stations, and railways, where vital places for trading. (Al-Attaba)
Social background of the existence	What is the reason of your presence in these specific places?	- Big families that come from villages and upper Egypt governorates have control over commercial store in the main streets in the area where they rent location before and adjacent to those stores to emigrants of their home villages (Ataba and Moski) -Moreover, we have been raised with the notion that vendors, fathers after grandfathers, are located in the same places to get their living.
Reasons of dissemination in terminals	What are the reasons for your presence at terminal stations?	-Due to the lack of the public services at terminal stations, we offer food and beverages to the passengers and drivers, as they wait for a long time for buses and microbuses, that the length of the period makes pedestrian buy some of their needs. -Meanwhile, most of the customers are labors and student of middle and low income who seek to meet their necessities of food, clothes and others as street vendors are the closest and cheapest alternative.
Dealing strategies and policies (their inclusion inside urban context)	The sellers' opinions of transferring them to other places?	Vendors assure that when they are forced to move to a place far from the station location, lack of pedestrians shall force them to return to their places. Vendors demand designated places on the main streets in vital areas and are insured and licensed. (Ramsis)

4.6 Statistical Analysis

4.6.1 Impact of location characteristics variables on vendors' distribution

In order to identify the impact of categorical variables (i.e. type of area, proximity to the metro or rail station, proximity to the entrances of terminal station and traffic density), As well as the effect of the interaction between these variables on the

number of street vendors. So, Mway ANOVA test was carried out to test significant between variables followed by Bonferroni posthoc analysis in SPSS.

Table 3 shows "Areas types" had a significant effect on vendors distribution (F (2) = 11.049) and also "terminal entrances" had a significant effect (F(4)= 5.669). Namely, there are differences between the various "areas types" and "terminal entrances" in their impact on street vendors in the four cases of the study. Therefore, the impact of the existence of the set of variables alongside has been verified as follow:

Table 3. The Mway ANOVA test results of the qualitative variables.

Tests of Between-Subjects Effects Dependent Variable: number of street vendors per meter				
Source	Df	Mean Square	F	Sig.
Corrected Model	25	.180	11.463	.003
Intercept	1	9.039	576.519	.000
Area Types	2	.173	11.049	.010
Metro gateways	1	.080	5.103	.065
Station Entrance	4	.089	5.669	.031
Traffic Density	4	.055	3.499	.084

4.6.1.1 Interactive impact of the existence of a set of variables "area type", "metro gateways" and "entrances of terminals" with each other on the distribution density of street vendors

There was a significant Interaction between "proximity to metro stations" and "terminals entrances", especially in Al-Attaba and Ramsis p <.05. This interaction indicated that the combination of all the following location property variables; i.e., "proximity to the underground or railway station", "proximity to bus terminal entrances" in various areas impact the increasing number of street vendors Table 4 where the increase in the numbers of street vendors in both areas Ramsis and Attaba go back to the density of neighboring commercial streets and permanent markets as in Attaba and the increase in the number of residential and office buildings as in Ramsis, see Fig. 6.

Table 4. The impact of area type and proximity to underground and bus terminals set of variables on the distribution density of street vendors.

Area Types	Metro Gateways	Station Entrance	f	Sig.(P)
Attaba	Very closed	Very closed	19.40	.005
Ramsis	Very closed	Very closed	16.20	0.01

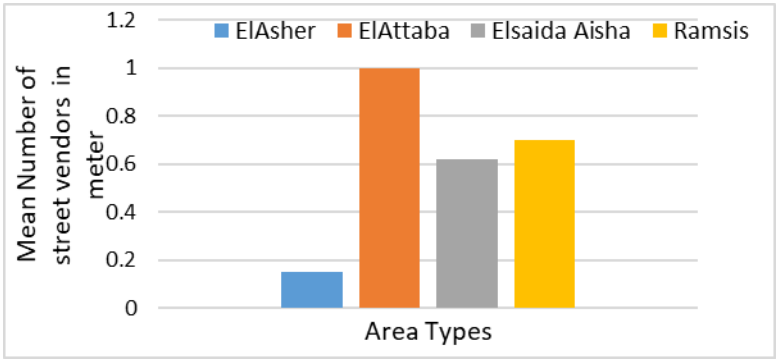


Fig.6. The mean number of street vendors in the four stations.

4.6.1.2 Interactive impact of the existence of the proximity from "metro gateway" "terminal entrances", and "traffic density" set of variables with each other on the distribution density of street vendors:

There was also a significant interaction between "proximity to metro stations", "terminal station" and "traffic density" at $p < 0.05$ Table 5. The interactive impact with the meaning of the combination of the various variable values with each other to impact the distribution density of street vendors. For example, when the values of "close proximity to the metro stations", "proximity to bus terminals" with "low traffic density" combine together in certain streets impacts the increase in the numbers of street vendors whereas we find in other streets that "close proximity to bus terminals" variable though "far away from the metro stations" with "high traffic density", we also find that the density of street vendors increases in those streets. We, therefore, conclude that the variable of "close proximity to terminals" is an effective and impacting element on the distribution and density of the street vendor dissemination.

Table 5. The impact of area type and proximity to metro, bus terminals and traffic density set of variables on the distribution density of street vendors.

Univariate tests, Dependent variable: Number of street vendors in meter				
Gateway (Metro)	Terminal entries	Traffic density	f	Sig.
Very closed	Very closed	Very low	8.611	0.026
Very far	Very closed	High	12.863	0.012

4.6.1.3 The impact of "terminal entries", "metro gateways" and "traffic density" separately

Figure 7 shows the density of street vendors increases the more we approach terminal entrances in all the cases of the study with the existence of other variables

that impacted the existence of a number of street vendors though far away from terminals such “permanent markets and commercial streets” in Attabba area and Ramsis as well as the existence of “unofficial microbus stations” as in AlAsher.

Figure 8 shows the increase in the numbers of street vendors the more we approach the metro stations and the Railway Station as in the Attaba and Ramsis areas. We notice that the dissemination of street vendors in El Sayeda Eisah and the AlAsher does not relate to the underground stations for the two areas are far away for the metro stations, and therefore the underground has no impact on them.

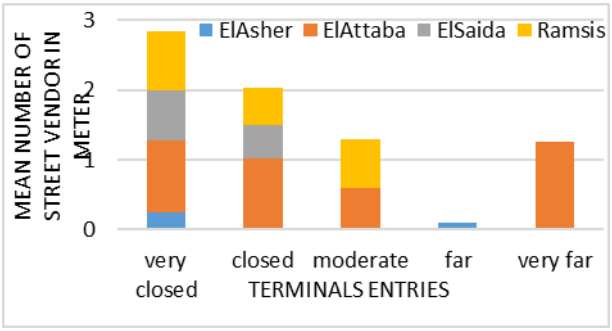


Fig. 7. Impact of “Terminal entries” on a street vendor.

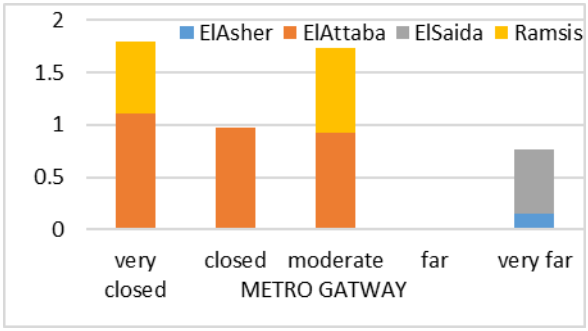


Fig. 8. Impact of “Metro gateway” on a street vendor.

Figure 9 shows that the variable of “traffic density” in itself does not impact the dissemination and distribution of street vendors in the areas of the study as the existence of street vendors whether in high or low traffic density is impacted with the existence of other variables as previously mentioned.

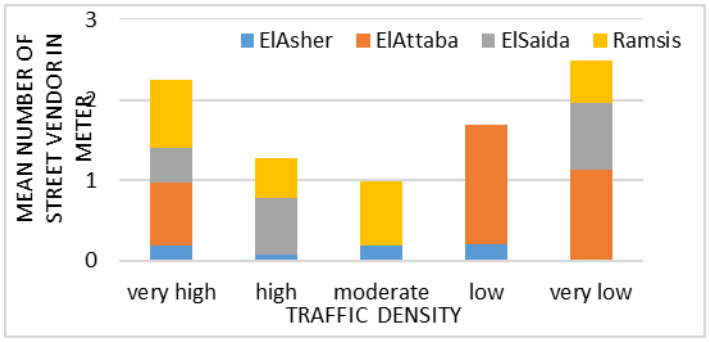


Fig. 9. Impact of “Traffic density” on a street vendor.

4.6.2 Spatial factors, pedestrian’s movement and vendors’ correlation

The correlation network with a strong and moderate, statistically significant relationship between "street vendors’ distribution", “spatial variables”, “pedestrian

movement" and "location characteristics" was observed; Table 6., where a moderate correlation between street vendors distribution and "choice" in two scales Rn and R400, was designated r = 0.402, 0.413, p < 0.05. There was a strong correlation between street vendors and "integration" in all scales NAIN, INRn, INR400 which was statistically significant r = 0.468, 0.523, p < 0.05. A strong linear relation was observed between "street vendors" and "pedestrian movement", "metro station", r = 0.679, 0.485, p < 0.005.

Table 6. Correlation matrix showing Pearson's r for Spatial variables, pedestrian movement, street vendors distribution, and location characteristics variables.

		QUANTITATIVE VARIABLES								QUALITATIVE VARIABLES		
		Spatial variables						Pedestrian pattern	Street vendors	Location characteristics Variables		
		1	2	3	4	5	6	7	8	9	10	11
1	NACH	-										
2	CHRn	**.87** .00**	-									
3	CHR400	**.75** .00**	**.95** .00**	-								
4	NAIN	**.41* .02**	.11 .53	.08 .62	-							
5	INRn	32. .07	**.68** .00**	**.65** .00**	27-. 13.	-						
6	INR400	**.45** .00**	**.73** .00**	**.71** .00**	-.14 43.	**.94** .00**	-					
7	Pedestrian	.31 .07	.41* .02	.41* .02	.38*- .02	.36* .03	.43* .01	-				
8	St. vendors	.24 .17	.40* .02	.41* .01	-.41* .01	**.46** .00**	**.52** .00**	**.67** .00**	-			
9	Areas types	.06 .70	.31 .08	.34 .05	**.48** .00**	**.69** .00**	**.57** .00**	.24 .17	.22 .21	-		
10	Metro Gateways	.10 .57	-.24 .18	-.23 .18	**.52** .00**	**.75** .00**	**.64** .00**	**.38** .02**	**.48** .00**	**.50** .003**	-	
11	Terminal Entrance	-.42* .015	-.41* .01	**.46** .00**	.00 .97	-.18 .30	-.23 .18	- .49**	-.28 .11	-.12 .50	.06 .72	-
12	Traffic Density	**.45** .00**	.27 .13	-.20 .25	.50** .00	-.04 .81	-.09 .61	-.08 .64	.18 .32	.03 .86	-.13 .47	-.01

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

4.6.3 Street Vendors and Economic Activities Regression

A regression analysis was carried out to the street vendors and economic activities. Multiple regression analysis was used to test if the "spatial variables",

“pedestrian movement” and “location characteristics” significantly predicted "street vendors’ distribution. The results of the regression indicated the one predictor explained 40.5% of the variance (R2=0.405, F(1,30)=20.4, p<0.001). It was found that Normalized Integration significantly predicted street vendors distribution was (β = (-0.328, p< 0.001); Table 7. The coefficients table indicated that all coefficients for the model are statistically significant. This indicated that predicted the number of street vendors = 1.13 + (- 0.328) * Normalized integration.

Table 7. Regression analysis of all variables.

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	**.636a**	**.405**	**.385**	**.30169**	**.405**	**20.398**	**1**	**30**	**.000**
2	.688b	.474	.437	.28855	.069	3.793	1	29	.061
3	.708c	.501	.447	.28603	.027	1.513	1	28	.229
4	.715d	.511	.438	.28831	.010	.560	1	27	.461
5	.728e	.530	.439	.28804	.019	1.051	1	26	.315
6	.732f	.536	.424	.29185	.006	.324	1	25	.574
7	.736g	.541	.407	.29614	.005	.281	1	24	.601
8	.736h	.542	.382	.30238	.000	.021	1	23	.886
a. Predictors: (Constant), NAIN									

5. DISCUSSION

One of the main objectives of this research is to verify the impact of the spatial configuration and pedestrian movement rates on the distribution of street vendors at terminal station in Cairo, in addition to attempting a means to forecast the way small economical businesses are distributed in unplanned areas. There are many previous studies conducted on the type of the natural location of commercial businesses in urban areas. These cases are useful in finding out explanations around the way the commercial business determines the location in the urban areas with the inexistence of regulations. In [19] the axial analysis shows compatibility and harmony between commercial business concentration and the pattern of topological integration, as in [11, 20] that shows a clear positive relation between the total distribution of commercial usages and spatial accessibility which confirm the results of our study. Meanwhile, our research added to the “Movement Economy Theory” that the “location” and “type of business” are two basic elements in attracting the greatest number of individuals and consequently the economic

business then come the street vendors in selecting the most accessible streets. In comparing the interpretation of [17] to the spatial model, we found in the results of our study a relation between the first super-grid that is related to city scale movement and the second super-grid at the level of local scale networks where street vending as an a small economic business is related in the cases of the study with public terminals, huge commercial markets and administrative areas, and this has a social and spatial logic.

5.1 Social Logic of Street Vendors' Distribution

Irregular waiting areas of buses, lack of specific pedestrians' paths and waiting areas and lack of public services within the terminal station, especially basic needs in addition to absence or weakness of censorship in areas of the terminal station are the reason for spreading street vendors. Whereas people stay in the terminal station area a long time due to the shortage of the number of buses, the longer time the people stay, the more density of people are. This phenomenon entrenches social meanings as:

- There is a long waiting time in the bus station, so the public especially the poor and mid-income people invest their time to buy their daily needs.
- The illegal street vendors sell their products cheaper than shops.
- The profession of street vendors is inherited in particular in the areas where families emigrating from the countryside to the cities in search of their living encourages street vendors to exist due to movement density at stations and terminals.
- The well aware of the street vendors of the dissemination areas where they get the opportunity to pick up passersby and in particular in areas close to terminals, the undergrounds stations, great and seasonable commercial markets.

5.2 Spatial Logic of Street Vendors' Distribution

The presence of the final terminals and main transport networks in through-movement locations attract the movement of people and vehicles and consequently the location of economic businesses at those axes to attract the spatial accessibility and high movement rates.

The street vendors' spread in the four case studies overlapped with the most integrated and accessible streets. In all cases, the street vendors are mostly

concentrated along entrances of the stations, which also have a high global angular choice.

6. CONCLUSIONS

The study introduced the relation between the spatial configuration, the location properties and the movement pattern from one side and the way of distributing the street vendors from the other side at terminal stations in Cairo. We clearly found a similarity in all the cases of the study as terminal stations represent a strong motive for the increase of movement rates and consequently the density of street vendors. Moreover, there is a clear similarity in the impact of spatial configuration on the distribution density of street vendors in the various streets of study areas where we find that their location and increased number is in the most accessible streets. This is manifested in the analysis of choice and integration. However, there are some differences among study areas in the way and pattern of street vendors distribution inside each area due the impact of a set of variables that were inferred; i.e., the type and potentials of each area, the presence of the underground station and railway stations and traffic density where we find that there is an interactive impact of the combination of these variables in various forms with each other on the density of street vendors in each street.

What are the reflections and conclusions that could be introduced to urban planners and designers in a city acceleration expansion like Cairo for the distribution of small economic businesses represented in street vendors where the natural conversion of urban to gather small commercial businesses depends at least on the following:

1. Areas that are integrated with a strong general urban context enjoy better capabilities to generate small commercial business opportunities like street vendors more than those areas that are segregated from the urban context. (This appears in the spatial analysis of the four locations subject of this study).
2. The pattern of using lands such as terminals forms a stimulus to gather greater pedestrian movement rates that help generating unintended general economic works

that can be easily reached. Such areas are considered the beginning that generate economic centers closely related to the urban context of a wider scope and create economic opportunities in various areas in the capital.

3. Locally accessible streets allow the establishment of special destinations that street vendors exploit to meet the daily needs of passersby. This has been found in the analysis of streets where the vendors of the four cases of the study are centralized.
4. The presence of big permanent and seasonal markets enhance small commercial businesses such as street vendors that related and disseminated close to them.
5. Railway and the underground stations form the greatest stimulus for the density increase of street vendors and impact their distribution due to the increasing rate of movement there. They are considered generators of commercial businesses close to them.

Therefore, the commercial business should be planned on basis of "spatial accessibility" that reduces the time spent to reach and increases the social interaction and economic profit. The superficial vision that distributes business should be reconsidered on the principle of abstract geometrical distance while observing the various variables that impact the distribution of the economic businesses. Therefore, the results of this study that prove that commercial businesses in unofficial areas are distributed in a social and spatial logic and consequently including street vendors in urban context by determining and designing spaces dedicated to them that enjoy all the inferred capabilities to make the urban vital and provide opportunities to all people whether shoppers or vendors.

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Abbreviations

CH	"Choice (betweenness) it basically calculates the potentials for each segment element to be selected by pedestrians as the shortest path".
IN	"Integration is a normalized measure of distance from any a space of origin to all others in a system".
NACH	"Normalized Angular Choice aims to solve the paradox that segregated designs add more total (and average) choice to the system than integrated ones".
NAIN	"Normalized Angular Integration aims to normalize angular total depth by comparing the system to the urban average".
R	"Radius is the set of spaces selected from the whole system to be analyzed round a root space".
INRn	Integration within global Radius
INR400	Integration within 400m from a root space.
CHRn	Choice within global Radius
CHR400	Choice within 400m from a root space.

أثر التكوين الفراغى على توزيع الباعة الجائلين عند المحطات النهائية

يناقش البحث أثر التكوين الفراغى للمحطات النهائية على ظاهرة انتشار الباعة الجائلين كنشاط اقتصادى غير رسمى فى مصر، بالاعتماد على نظرية تحليل بنية الفراغ حيث قدم فهم أفضل لتوزيع الأنشطة الاقتصادية الصغيرة وعلاقتها بكل من الوظيفة والموقع والتكوين الفراغى، وعن طريق تحليل عامل الاندماج تم التنبؤ بتوزيع الباعة الجائلين بصفة خاصة ومن ثم الأنشطة التجارية بصفة عامة.