Chapter Six
DISCUSSION, RECOMMENDATIONS AND CONCLUSION

6.1. INTRODUCTION
This chapter discusses the correlation between spatial configuration and visual form according to the results obtained in chapters four and five. Here, the research tries to answer many questions like: Is there a conflict between the results obtained by sketch mapping and those obtained by space syntax technique or they are closely related? Is using space syntax technique efficient to give accurate prediction about wayfinding ability or it needs to work with other techniques like sketch mapping? In other words, are space syntax and sketch mapping need to work with each other to give accurate interpretation for wayfinding problems? Why can not people find their way in Maadi, although it has a high degree of intelligibility? etc. After that, the research will give overall recommendations for improving wayfinding ability.

6.2. HELIOPOLIS > MAADI> Cairo CBD
6.2.1. The Juxtaposition Between Legibility And Intelligibility
Evaluating the legibility of case studies has showed that Heliopolis is the most legible. After it, comes Cairo CBD, while Maadi has showed the lowest scores. On the contrary, measuring intelligibility showed that Maadi is the most intelligible at 0.42, while Heliopolis and Cairo CBD are approximately have the same degree of intelligibility (0.30). Definitely, intelligibility and synergy values for Maadi are away from reality, as they are unmatched with the legibility inferred by mental maps. So, the question is how to solve this conflict between legibility and intelligibility? In other words, how can we
interpret people's wayfinding problems in Maadi: space syntax analysis confirmed that it has higher intelligibility, while sketch mapping and interviews confirmed that it has wayfinding problems and one can not find his destination.

In Fact, the three cases differ from each other in character, and the pattern of pathway configuration. Although Maadi has showed high degree of intelligibility, it actually has low legibility of city elements caused by visual, structural, and semantic reasons:

1. All streets have the same width\(^1\); and they are similar in character like a beautiful maze, the problem increases with grid pattern.
2. All streets vistas ends with nothing; there is a paucity of landmarks\(^2\) specially in squares; and low number of signs specially English ones.
3. The branching of roads with constant width make spatial decision making impossible.
4. underutilized nodal points lead to lifeless and contribute negatively to the social interaction and therefore the negative perception of the suburb.
5. The semantic reasons are names and numbers of roads which cause confusion. The streets sometimes have numbers and other times have names, so a particular intersection may converge various streets with various types of names. Furthermore, there are several names to one street.

\(^1\) This encourages us to make an inference that road hierarchy is an important clue for enhancing wayfinding ability. Especially, when we notice how hierarchy of Heliopolis’s roads increased its legibility comparing to Maadi and Cairo CBD.

\(^2\) Most of Maadi landmarks are limited and visually not accessible, so many indistinct buildings, due to their function, may act as landmarks for those familiar with the suburb, but can not orient visitors perfectly.
6. The need to the security measures increased, so the use of suburb's public spaces is confined to the use of inhabitants. In fact, the few numbers of peoples in the streets make it difficult to find someone to ask about directions (we are supported by people).

We suspected that there may also be a problem of understanding global orientation as the various angles at which the main grid and the diagonals run seem not to be related to very much in the wider world. We tested this by questioning people on the street, asking them First if they are local and know the area well or just visitors, then: a) to point in the direction of some global landmarks that cannot be seen directly but are well known and quite explicit b) we asked people to suggest which road they would take to get there from where they are; c) we asked them to point to the North. We noted the actual directions people point for these on the real map which we have lined up with a compass (but we didn't show them this). We made this for a number of people in each area and have got a good idea of how disoriented people are, and how much they are influenced by the orientation of the street grid they happen to be standing in.

For Heliopolis and Cairo CBD, although the value of intelligibility scored for Cairo CBD nearly equals that for Heliopolis, people have wayfinding problems in Cairo CBD more than Heliopolis. So, the problem is related to the visual form more than spatial configuration. We elicited the reasons of low legibility in Cairo CBD in the following:

1. Bad sense of enclosure comparing with Heliopolis, as there is a bad relation between buildings’ heights and streets width in Cairo CBD. Furthermore, the skyline form is dramatically bad.
Figure 6.1. Enclosure in Heliopolis: width to height ratio of 1:1 (source: researcher)

Figure 6.2. Enclosure in Cairo CBD: width to height ratio of 1:2 (source: researcher)

2. The existence of too many landmarks in Cairo CBD with concentration and haphazard distribution for some of them caused confusion for wayfinder. On the contrary, most of Heliopolis landmarks are well-located, as they are at focal points enhancing the ability of spatial decision making. Furthermore, Heliopolis plan identifies a simple sequence and hierarchy of spaces by which the visitors would move through it easily. Fortunately, each space (square) at this sequence contained a landmark to guide wayfinders to
the next point within the overall sequence of space until they reach their destination.

**Figure 6.3.** Bad correlation between landmarks and spaces at Al-Tahrir square, Cairo CBD.

**Figure 6.4.** Good correlation between landmarks and focal points at Heliopolis.

3. Traffic jams; scattered and poorly designed gathering points in Cairo CBD make it difficult to find your way smoothly, as chaotic environment overwhelm our ability to discern which information is relevant. Definitely, Cairo CBD is not welcoming, as you have to negotiate dangerous intersections to get to green spaces, and if you've got kids you have to risk dodging the traffic. Likewise, you may get fed up of waiting for a bus.

4. Lower permeability in Cairo CBD comparing with Heliopolis. Furthermore, the absence of road hierarchy and branching of paths made legibility in Cairo CBD dramatically low. On the contrary, hierarchy of roads in Heliopolis improved the process of wayfinding.
5. The disjointed organization between the elements required for orientation decreases their legibility to wayfinders\(^3\).

### 6.2.2. Road Width And Wayfinding

As mentioned before, the results of Maadi's spatial configuration analysis has showed that the suburb is highly intelligible, although it is actually not. This deviation from reality lies in the constant and narrow width of most of Maadi roads. Although narrower width and absence of road hierarchy discourage traffic flow and pedestrian movement; and decrease familiarity and wayfinding ability, but the error here is related to axial map itself. Someone may claim that space syntax has nothing to say about road width especially the issue of road hierarchy. But this is definitely not right, as the axial map does not neglect this, the way that an axial map is drawn means that longer and more connected lines get through wider streets\(^4\). In narrower streets, slight deviations from being straight lead to more lines. In other words, road width does in fact get represented in the axial graph. We can add road width (or hierarchy) as an attribute of the line and then look at it statistically in our analysis of the results. We use multiple regression to see what independent effect road width and the various syntax measures have in explaining traffic flows. This interprets the error in results of Maadi’s spatial configuration analysis.

### 6.3. FINDINGS

- It is noticed from the comparison between spatial syntax of configuration and imageability of every environment that:

\(^3\) Despite huge number of landmarks and signs, studies show that most of Cairo CBD visitors have trouble in finding their way around and worry about getting lost.

\(^4\) This principle does not apply to Maadi, as both of longer lines and shorter ones have the same width. This is absolutely abnormal, so Maadi and the like are odd/ special cases.
- Heliopolis has showed moderate legibility in cognitive maps of volunteers, and somewhat intelligible environment in spatial syntax of configuration. This means that there is a juxtaposition between legibility and intelligibility; and there is a positive relation between them.

- Maadi has showed low legibility in cognitive maps - paucity in landmarks and bad correlation between Lynchian city elements- and high intelligible environment in spatial syntax of configuration. These opposite results are actually caused by a flaw in Maadi’s axial map analysis, as it is common that longer lines get through wider streets and shorter lines get through narrower ones. But in Maadi, the case is different and abnormal, as both of axial map’s longer and shorter lines have the same narrow width. So, the problem lies in space syntax methodology of analyzing spatial configuration for this type of axial maps. To conclude, we like to say that space syntax can not predict degree of intelligibility and wayfinding ability in special cases such as Maadi and the like which definitely need methods other than space syntax to interpret and predict wayfinding difficulties within them.

- Cairo CBD has showed moderate legibility in cognitive maps. Likewise, the settlement showed somewhat intelligible environment in spatial syntax of configuration. This confirms that there is a positive relation between legibility and intelligibility.

- The spatial configuration of an environment and spatial cognition are closely related, as the degree of appearance of streets in the sketch maps is somewhat significantly correlated with their degree of importance in the area regarding to the values of most integrated axes.
Although it can interpret wayfinding problems in special cases that space syntax cannot analyze correctly, Lychian method is subjective in general and not appropriate for estimating the quality of structure comparing with space syntax technique, so it needs to co-operate with an objective method like space syntax which can give us a quantitative result about spatial configuration. This means that combining the two methods will be helpful and powerful in analysis, as Lynchain method will give us a real prediction about the city image; and space syntax will estimate the quality of structure perfectly. So, the two methods should be complementary.

**Figure 6.5.** Schematic figure for combining Legibility and Intelligibility.
• Depending on environmental information through urban navigation increases in unfamiliar environments, whereas frequent visit and strong familiarity make people depend on spatial structure more than visual clues, as wayfinders move from a point to another spontaneously.

• Sequence and hierarchy of spaces with a landmark in each space help to direct people through wayfinding process.

![Figure 6.6. Sequence of spaces: Locating landmarks at focal points increases legibility (Source: the researcher)](image)

6.4. RECOMMENDATIONS
The results obtained suggest a series of recommendations for the further improvement of case studies:

6.4.1. Overall Recommendations
• Landmarks should be located at strategic points, points of pedestrian trip origins and destinations, and places where there is possible ambiguity for effective enhancing of the ability of spatial decision making. In other words, they should be done in very close proximity to the streets or at
nodes and streets corners. They should also not too many, as the huge number of landmarks can undermine their helpfulness.

- Cities should be legible visually and structurally. This confirms that spatial configuration and spatial cognition are closely related.
- There should be a balance between vehicular and pedestrian movement.
- Junctions should clearly indicate the next destination and support the ability of linking one’s current position with all surrounding paths on the network.
- Street furniture should never be obscured, as it is a vibrant tool for using spaces effectively and provides a strong clue for orientation.
- Creation of points of high enclosure should only be allowed in areas where there are wide streets. In other words, the height of buildings should proportionally be related to the width of the spaces between them. Likewise, gaps in the lines of buildings should be avoided.
- There should be a clear distinction between public and private spaces.
- Nodes should be created as catalysts providing the unique character to regions and creating social interaction.
- Primary entrances should be distinct and strong in order to create a strong impression and facilitate orientation for first-time and frequent visitors.

6.4.2. Heliopolis

- Both Osman Ibn Affan and Harun Alrasheed paths require a critical improvement to increase permeability.
The northern part of the suburb should be upgraded in order to complete the character of the suburb and create integration between southern and northern parts. In other words, this area should be softened through increased plants and soft landscaping; and facades of ill-considered constructions should be beautified and redesigned giving them the common sense of old Heliopolis buildings. This will positively change the character of this part of the suburb and make the area more welcoming to the users.

The interference between tramways and vehicular movement should be treated well especially at the nodal points.

**Figure 6.7.** Improvement of Osman Ibn Affan St. permeability.
Figure 6.8. Separating vehicular movement from tramway, Heliopolis.

- The old Heliopolis should be preserved from the encroachment of new construction.
- Streetscape should be protected from deterioration by citizens.

6.4.3. Maadi

- Vistas should end with objects like landmarks or signs in order to improve orientation. Furthermore, these provided landmarks should be visually accessible for assisting users in establishing visual sequences for self-orientation.
- Squares should be decorated by landmarks to improve the ability to differentiate them from each others.
The suburb should be covered by a well-planned system of signage, although signs are not substitute for good design.

Streets’ names system should be reconsidered, reinforced with signage, and tackled in a way congruent with the nature of society who live or visit the suburb. Likewise, applying several names to one street should be avoided.

The area should be well-connected with the adjacent areas in order to increase its global integration and overcome isolation.

The fantastic landscape and old buildings of the suburb should be preserved from deterioration and demolishment by owners.

Points of weak connections should be eliminated through removal of obstacles barring streets from each others and more appropriate security options should be considered.
• The human ability to perceive this beautiful maze should be improved by educating users to order it, and learn more about it.

6.4.4. Cairo CBD
• The parts of the area should be well-connected with each other by not only the subway lines but also walkways. In other words, the path system should confirm the priority of pedestrian movement.
• The gathering points like Al-Tahrir square should be redesigned providing safety and beauty for visitors.
• Parking areas should be located in a well accessible lots to facilitate wayfinding and parking search. In fact, suitable strategy of movement should be adopted first.
• Skyline should be reconsidered under the umbrella of architectural preservation.
• Signs should be well designed and placed to prevent visual noisy and reduce chaotic environment of irrelevant information.

6.5. FUTURE RESEARCH
• Increasing the number of data collection sites may generate more accurate results.
• Using other techniques to measure degree of legibility / intelligibility may be effective.
• Although this thesis suggested a co-operation between Lynchian method and space syntax technique\(^5\), it was mainly focused on understanding wayfinding process and how to enhance the ability of wayfinding

\(^5\) The hints provided in findings of this thesis about combining the two methods are just suggestions, as the field of evaluating of these two great methodologies needs performing many tests and deep readings about them for accurate criticism which definitely not available on M.Sc. scale.
especially in case studies. This point of view can be changed into how to develop the methods themselves in another research. In other words, how to envisage a combined methodology that would acquire both approaches?. The notion can also be shifted to be more focused on the evaluation of the effectiveness and validity of the methods themselves and this definitely will be opposite to our thesis which mainly concerned with improving the navigation in case studies regardless of the methods evaluation.

6.6. CONCLUSION

This chapter tried to shed light on the correlation between legibility and intelligibility for better understanding of urban navigation. The correlation outlined according to the results obtained from both spatial configuration and sketch mapping analyses in a more realistic trail for linking the two methods. The chapter was divided into four points:

First, we tried to solve the conflict between results of legibility and intelligibility of the three case studies. The argument about representing road width in axial maps has been discussed and showed that road width is already taken into consideration in the construction of the axial map, and the axial map gives rise to both connectivity and integration values which form the intelligibility correlation. Road width is absolutely taken into account in intelligibility. So, the error in measuring Maadi intelligibility is abnormal and confined only to Maadi and the like.

Second, we outlined the main findings of our thesis. Third, we formulated general recommendations and gave recommendations for improving wayfinding process in three case studies. Eventually, we suggested ideas and hints for future research.
APPENDIX 1: Subjects Questionnaire

- Subjects were interviewed in their local work places, cafes, plazas, and in bus and tram stations in order to get the mental representations of their environment. They were told that this questionnaire is a part of a study that concerns with urban environment and that all the collected information will be confined to academic purposes. We paid their attention that we try to find out a way for better understanding of the environment and easy navigation. The questionnaire form was divided into two types:

1- PERSONAL INFORMATION
1.1) The sex of subject
   A Male                      B Female
1.2.) How old are you?
1.3.) What suburb do you live in?
1.4) What is your highest level of your education?
1.5) Where is your work?
1.6) Are you local and know the area well or just a visitor?

2- THE IMAGE OF THE CITY
2.1.) What does the area mean for you?
2.2.) How did you get into here? Walk ( ) bus ( ) car ( )
2.3.) Why do you walk in this area? Health ( ) no parking available ( ) save money ( ) other ……………………………………………
2.4.) Do you enjoy walking in or to this area? Y ( ) N ( )
2.5.) What is the main reason of your visit to the area? Work ( ) Shopping ( ) Services ( ) other…………………………………………
2.6.) How often do you come into_______ ( ) days per week? [write in number]
2.7.) Do you find it easy to find your way in the area?
2.8.) What clues do you depend on to find your way?
2.9.) Please list ten elements of the area you think are most distinctive and explain why if possible?

1. Reason:
2. Reason:
3. Reason:
2.10.) Describe three of the elements listed in question 2.5.?
2.11.) Draw a quick sketch map of the area as if you describe it to a stranger?
2.12.) Describe your trip from your home to work, and describe events and the sequence of things you would see, hear, or smell?
2.13.) Do you have any particular emotional feelings about various parts of your trip?
2.14.) Can you locate the parts of the trip you feel confused and disoriented?
2.15.) Can you specify the direction of north on your map?
2.16.) Arrange the following areas according to their degree of legibility from the highest to the lowest

A Maadi       B Heliopolis       C Cairo CBD

- Subjects were asked indirect questions like:
1.) How do I get to ________?
2.) How will I recognize it when get there?
3.) How long will it take me to walk there?

Thank you for your assistance

All above questions measure the ability of respondents to understand their environment and give a generic prediction of their degree of familiarity with the area.
BIBLIOGRAPHY

- Appelyard, D., 1976, Planning a pluralist city: Conflicting Realities in Ciudad Guayana, Massachusetts, Cambridge University, MIT Press.


- Batty, M.& Rana, S., 2002, Reformulating space syntax: The automatic definition and generation of axial lines and axial maps, Center for Advanced Spatial Analysis (CASA), University College London, London.


- Beattie, A., 2005, Cairo: a cultural history, Citiscapes Series, Oxford University Press US.


- Conroy Dalton, R.,2003, “The syntactical image of the city : A reciprocal definition of spatial elements and spatial syntaxes” ,Georgia institute of technology, USA.
- Conroy Dalton, R.,2002, Is spatial intelligibility critical to the design of large-scale virtual environments?, Georgia institute of technology, Colleges of Architecture and Computing, USA.
- Crane, D., 1961, Review of the image of the city, J. of Amer. Institute of Planners.
- Gärling, T. & Evans, G. (Eds.), 1991, Environment, cognition, and action: an integrated approach, Oxford University Press US.
- Imanishi, Emi, 2004, Evaluating Legibility of Montreal's Underground City and Toronto's Underground City, unpublished research, School of Urban and Regional Planning, Queen's University, Canada.
- Kosslyn, S., 1975, Information representation in visual images. Cognitive psychology.
- Kruijff, E., 2000, Wayfinding, unpublished research, Bauhaus-Universitaet Weimar, Germany.
- Long, Y., 2007, The relationships between objective and subjective evaluations of the urban environment: space syntax, cognitive maps, and urban legibility, Ph.D. thesis, the Graduate Faculty of North Carolina State University, Raleigh, North Carolina.
- Lynch, K., 1972, What time is this place?, Cambridge, MIT Press.
- Myntti, C., 1999, Paris Along the Nile: Architecture in Cairo from the Belle Epoque, American University in Cairo Press.
- Omer, I., & Jiang, B., 2008, Topological qualities of urban streets and the image the city: A multi-perspective approach, 11th AGILE International Conference on Geographic Information Science, University of Girona, Spain.
- Penn, A., 2001, “Space syntax and spatial cognition or, why the axial line?”, Peponise, J., Wineman, S., Bafna, (Eds.), proceedings, 3rd International space syntax symposium, Atlanta.
- Perdikogianni, I., 2007, From Space to “Place”: The Role of Space and Experience in the Construction of “Place”, Proceedings, 6th International Space Syntax Symposium, Istanbul.
- Raymond, A., 2007, Cairo: City of History, American Univ. in Cairo Press.
- Sakr, T., 1993, Early twentieth-century Islamic architecture in Cairo, The American University in Cairo Press.
- Singerman, D.& Amar, P.(Eds.), 2006, Cairo cosmopolitan: politics, culture, and urban space in the globalized Middle East, American Univ in Cairo Press.
- Steinitz, C., 1968, Meaning and the congruence of urban form and activity, J. of Amer. Institute of Planners.

- المقرن, عبد العزيز, 2000, تصميم المستشفيات العامة : تقويم الحركة الرئيسية ونظام معرفة الطريق من وجهة نظر المرضى والزوار : حالة دراسية لمستشفى الملك خالد الجامعي بالرياض, مجله الامارات للبحوث الهندسية, مجله 7, الدند 1, ص 1 - 12.
- ثابت, أيمن, 2003, العثور على الطريق كمدخل تصمييمي تطبيقا على المستشفيات, رسالة دكتوراة, كلية الهندسة, جامعة القاهرة, الجيزة, مصر.
- سليمان, مروة, 2007, عناصر التصميم العمراني المؤثرة على الإدراك البصري لمداخل المدن, رسالة ماجستير, كلية الهندسة, جامعة القاهرة, الجيزة, مصر.
- معزوز, سعيد, 2007, دراسة تطبيقية لنظرية "صيغة التركيب الفراغي" في رصد العلاقة بين التغييرات العمرانية والسلوكيات الاجتماعية بأحياء السكنية, ندوة الإسكان 3, الرياض, المملكة العربية السعودية.