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UNDERSTANDING URBAN NAVIGATION : WAYFINDING IN THE CITY

CASE STUDY – THE CENTER OF TRIPOLI - LIBYA

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CASE STUDY – THE CENTER OF TRIPOLI - LIBYA

A THESIS

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by

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DECLARATION

I hereby declare that this thesis no work ever presented to obtain an academic degree at a college, and my knowledge. Also there is no work or opinion ever written or published by others, except in writing referred to in the text and mentioned in the bibliography.

Ahlam Abduallah Bridan

October 2018

ABSTRACT

UNDERSTANDING URBAN NAVIGATION : WAYFINDING IN THE CITY

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Wayfinding is an essential activity by individuals throughout their lives during their exploration or navigation from one place to another. This study discusses the urban navigation: wayfinding in the city, through the analysis of visual formation of the city and spatial configuration. The study was focusing on the concept of intelligibility. The analysis of the visual formation through the image of the city by Kevin Lynch (1960) to study the elements of the city. The analysis of spatial configuration by space syntax theory by Bill Hillier. Also, this study contributes to the comparison between mental image and space syntax for the center of Tripoli. Tripoli is the capital of Libya, one of the most important cities. The center of Tripoli was chosen as a case study. One of the main reasons for this research, having problems of wayfinding in case study, especially for first-time visitors to the city. The process of analyzing the visual formation of the case study, all individuals were asked to draw an abstract map of the center of Tripoli. Moreover, the spatial configuration analysis was to study the values of integration (global - local), connectivity, choice and synergy, using UCL DepthmapX software. This study supports a certain relationship between visual formation and spatial configuration.

Keywords: Wayfinding, Mental Image, Space Syntax, Tripoli, Intelligibility.

ÖZET

Yol bulma, tüm bireylerin hayatları boyunca gezinmek veya bir yerden diğerine gitmek için yaptıkları çok önemli bir eylemdir. Bu çalışma, kentsel mekanda yol bulma odağında kent içinde navigasyon konusunu ele almakta ve kentin görsel ve mekansal biçimlenme özelliklerini incelemektedir. Çalışmada, kentteki okunabilirlik kavramını analiz etmek üzere iki teknik bir arada kullanılmıştır. Kentin görsel biçimlenme özelliklerini incelemek için Kevin Lynch'in (1960) ortaya atmış olduğu imaj analizi ile kentin elemanları değerlendirilmiştir. Kentin mekansal biçimlenme özelliklerini incelemek için ise Bill Hillier tarafından geliştirilmiş olan Mekan Dizim tekniği uygulanmıştır. Yürütülen çalışma, bu iki tekniği bir arada kullanarak karşılaştırmalı bir bakış açısı geliştirmiştir. Trablus, Libya'nın başkenti ve en önemli kentlerinden biridir. Çalışmada, Trablus'un kent merkezi incelenmek üzere seçilmiştir. Bu araştırmanın temel nedenlerinden biri, Trablus kent merkezinde, özellikle ilk defa gelen ziyaretçiler için, yol bulma sorunları olmasıdır. Çalışma kapsamında görsel biçimlenme özelliklerini incelemek için kentsel elemanların analizinde, insanlarla birebir görüşmeler yapılarak zihin haritaları çizdirilmiştir. Mekansal biçimlenme analizleri için UCL DepthmapX yazılımı kullanılarak, mekan dizim tekniğinin bütünleşme (lokal ve global), bağlantısallık, tercih ve sinerji ölçümlerinden faydalanılmıştır. Çalışmanın sonuçları, görsel ve mekansal biçimlenmenin, okunabilirlik ile ilişkisini desteklemektedir.

Anahtar Kelimeler: Yol bulma, zihin haritaları, Space Syntax, Trablus, okunabilirlik.

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ABBREVIATION

C	Connectivity
Rn	Globle Integration
R3	Local Integration

1. INTRODUCTION

People learn the process of wayfinding as a natural process since childhood and gradually increase their ability in various stages of growth. Urban navigation is based on experience and understanding of the environment around us. People acquire knowledge of the road network through walking and driving in the city. They do not need wayfinding to keep all their knowledge of the surrounding environment on their minds. People represent their knowledge of the environment in three phases: first on their mind, second in the surrounding environment and third in the surrounding environmental obstacles. The effects of the difficulty of wayfinding may be limited to personal problems, loss of time, anxiety and frustration, fail or confusion on the wayfinding.

1.1. Research problem

Many people have difficulty in finding their way through a particular environment as well as forecasting of the movement through it. In spite of the presence of some environments with character and strong identity, people are unable to locate themselves within the surrounding areas and to direct themselves through the space.

This research focuses on the wayfinding problem in urban environments and tries to determine the relation between the built environment and the wayfinding behaviours.

1.1.1. Research questions

Research questions of this study has been defined as follows:

- Is wayfinding related to spatial configuration and visual formation?
- How would people describe the way for others from their memory and through the items in the city?
- How do various paths of alternative ways to get to somewhere can be evaluated?

1.1.2. Hypothesis of the Research

The hypothesis of this research states that, the ability to wayfinding within the city has a strong relationship with the association between spatial configuration and mental image of the city.

1.2. Aim of the Research

The research aims to explore the relationship between wayfinding, the spatial configuration and visual formation in urban layouts. The research focuses on North African cities in particular, which would contribute to understanding their differences with western cities. The research also aims to assess the usability of techniques, which were developed for western cities, in North African cities. This way it is believed that the outcomes of this study would shed light on future research that focuses on similar case areas.

1.3. Methodology

This research depends on assessment of urban clarity in the study area, the center of Tripoli, using two different methods which are:

1. Analysis of visual formation of the city by mental image mapping.
2. Analysis of spatial configuration using space syntax.

Mental maps are produced by means of interviews with people. All individuals were asked to draw an abstract map of the study area and their maps were analysed in order to obtain the number of urban elements that were drawn in their maps. For this step of the study, the interviews were done with three groups of people, those are locals, visitors and tourists. This classification of people were used to ensure a balanced distribution of the profile of interviewed people.

The second step of the analysis is based on analysing spatial configuration of urban layouts using space syntax technique. In this part, axial maps of the center of Tripoli were drawn and analysed through UCL DepthmapX software to obtain spatial values for integration, connectivity, choice as well as intelligibility and synergy.

2. WAYFINDING IN THE CITY

Wayfinding is the means towards deciding the way in a specific environment, through utilization and possession of spatial knowledge. Wayfinding (discovering one's direction) depicts how a person orientates themselves and explores through a region or space. It is related with knowing (Mohammed Ibrahim, 2002):

- Where you are
- Where you need to go to
- How you go there from where you are

Alternate navigation framework models can be produced by utilizing the ideas of "Wayfinding" and "Exploration" as a notional structure. While the possibility of wayfinding clarifies the way individuals situate and move themselves through space to achieve their goal with no predefined course, investigation infers an essential level of arbitrary route without having a target destination. Wayfinding is characterized as the steady utilization and association of positive tangible signals from the external environment (Andrade and Schieck, 2015).

Wayfinding includes guiding yourself in space, deciding a path to your destination, ensuring you that you are going the correct way and ensuring that you have arrived (Apelt, Crawford and Hogan, 2007).

Numerous components contribute wayfinding in the city, from landmarks to maps, to hand held GPS frameworks, to describe from a stranger. Good wayfinding is a combination of arts and science. It's built onto principles of consistency, exactness and clearness. It helps people to make their own specific mental maps of their environments (City of Victoria, 2016).

The option of a wayfinding framework adds lucidity to our physical environment. When executed well, wayfinding frameworks give walkers the certainty to explore without fear while empowering interest and exploration. The walkers arrive at their destinations with no feeling of tension, no feeling of worry and feeling more informed about the journey (City of Victoria, 2016).

2.1. Urban Clarity

Urban Clarity is a conspicuous and comprehensive connotation that incorporates numerous processes and stages including direction and wayfinding. In the process of wayfinding, we need equipment to help reach our destination. These equipment represent unobserved and visual features of the urban environment that are reference points or significant locations. Environmental profile representations are used to confirm the validity of the environmental acquaintance that defines identity to the place. There are hidden features in the space and they are frequently utilized by people without noticing, and it causes individuals and vehicles spread through the city. Both hidden and visual features influence the clarity of the urban environment. (Jaleel, 2013).

Urban clarity has several names. In his book "The Image of The City", Lynch refers to urban clarity as "Legibility" (also called imageability). Legibility means the extent to which the cityscape can be "read". People who move through the city engage in wayfinding (Lynch, 1960).

The concept of urban clarity is also drawn by Hillier in his theory Space Syntax as "intelligibility". It is defined as the degree of correlation between two measures of the technique, which are the connectivity and global integration (Hillier, 1996).

2.2. Measuring Intelligibility through Mental Maps

Identifying the manner that the general individuals can read a specific environment, in his book “The image of the city” Kevin Lynch explains legibility as the ease to distinguish the parts of the city and to position it into a homogeneous frame". Lynch points to the arrangement of a mental map inside the minds of the individuals, which is around an inner portrayal of a specific environment utilized by the inhabitants as a kind of perspective when they were guiding to a particular place inside it (Lynch, 1960).

2.2.1. Mental Image of the City

Mental images are perceptions and impressions, and furthermore the senses of the motion that are inferred by the inhabitants and users of the city. Arrangement of open urban areas and visual complexities play a vital part in the creation of an

integrated image of the city, regardless of whether this picture is positive or negative (Al-Meghary, 2015). Concept of image of the city states that, mental images are the mental perceptions of the city by the majority of its people, which is shaped by open spaces and visual variation. Likewise, feeling of motion inside its ways is a critical part in the association of an integrated image of the city (Youssef, 1983).

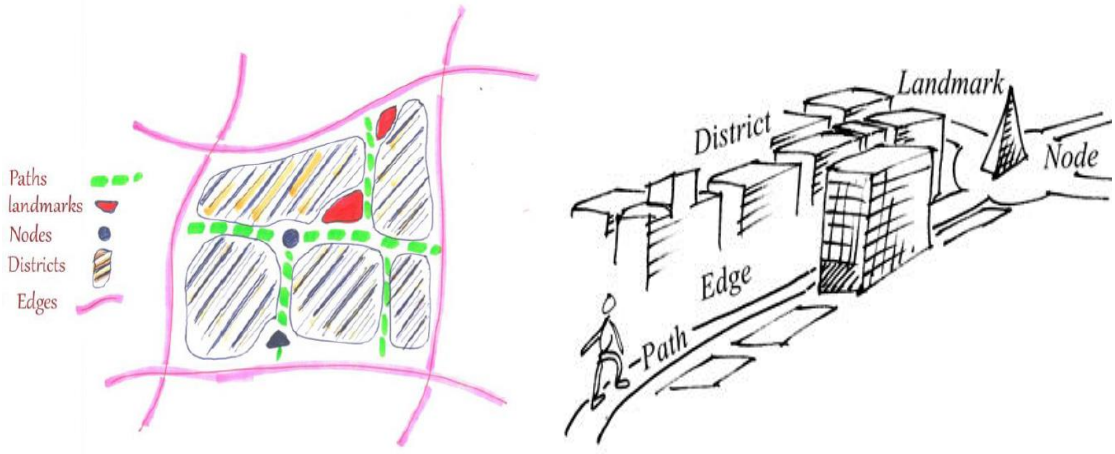
Legible or Intelligible City is a city whose districts, landmarks, edges, paths and nodes can be recognized, clearly and simply. A legible city is where these elements are associated with each other and integrated into one legible arrangement. A legible city has a high ability in terms of clarity and intelligibility. "Imageability" is the concept Lynch used to explain his theory (Youssef, 1983).

2.2.2. Elements of the Mental Image of the City

Lynch argues that individuals in urban areas direct themselves through mental maps. He compares three American urban areas (Boston, Jersey, and Los Angeles) and explores how individuals orient themselves in these urban layouts. A focal idea in this book is intelligibility of cities, which is also called imageability. Legibility indicates the extent to which the urban layout can be "read". People who move through the city engage in wayfinding. People moving through the city are expected to have the capacity to perceive and classify urban elements into a cohesive pattern.

> *"In the process of wayfinding, the strategic connect is the environmental image, the summed up mental image of the exterior physical world that is held by a person. This image is the produce both of the quick sensation and of the memory of past experience, it is utilized to interpret data and to directory action".*
>
> *Kevin Lynch, Image of the City, 1960*

Lynch proposes that these mental maps comprise of five elements which are paths, edges, districts, nodes and landmarks (Lynch, 1960).



(a) (b)

Figure 2-1 An image map (a) and an illustration of the elements of image mapping (b) (Al-Meghary, 2015; Url-1).

2.2.2.1. Paths

Paths are the roads that the observer occasionally or possibly moves. These paths might be streets, transit lines, walkways, trenches, railways and other channels in which people can travel through. For some individuals, these are the transcendent components in their image of the city. Individuals perceive the city by moving in its paths, and along these ways, where the other environmental components are organized and related (Lynch, 1960; Damla, Hatice, Esin, 2009).

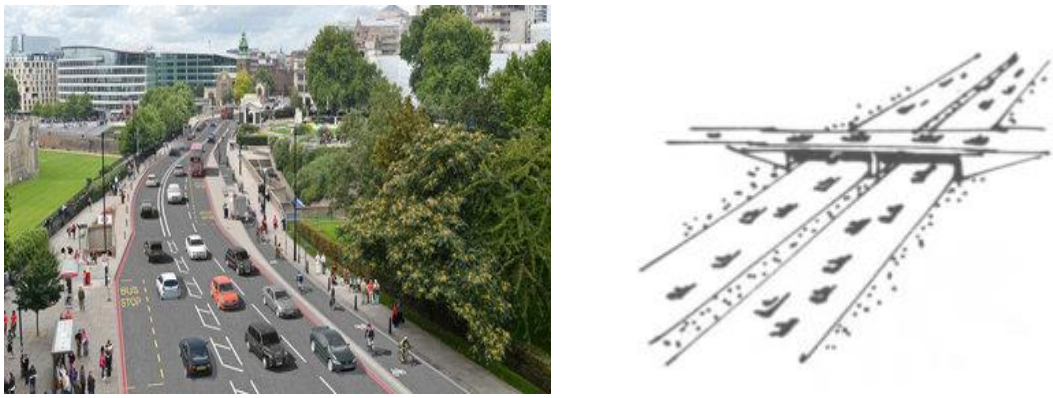


Figure 2-2 Examples for paths (Url-2; Lynch, 1960)

2.2.2.2. Edges

Edges are the linear components that are not always utilized or considered as roads by the observer, but rather considered as boundaries. They are the separators between two different areas which breaks the continuity of those regions such as beaches, railways, the borders of the urban development and fences. Such edges might be boundaries, which close one district off from another; or they might be lines along which two areas are connected and consolidated. Edges can be characterized as two sorts as natural or artificial edges (Lynch, 1960; Damla et. al., 2009).

Figure 2-3 Examples of edges (Url-3; Lynch, 1960)

2.2.2.3. Districts

Lynch defines districts as sections of the city that vary in size and that have similar characteristics within. It is both possible for an observer to enter these districts and an observer to identify them from outside. Districts have a strong effect in people's understanding of the urban structure (Lynch, 1960).

Figure 2-4 Examples for districts (Url-4; Lynch, 1960)

2.2.2.4. Nodes

Nodes are the focal points and strategic axes of the city's urban environments, They might be fundamental intersections, spots of a break in transportation, an intersection or gathering of ways, moments of movement starting with one structure then onto the next. On the other hand, nodes might be essential points of concentration of some uses, shaped by the effect of urban layout, such as a street corner or an urban square. Similar to districts, it is both possible to identify these nodes from outside and also to enter inside (Lynch, 1960).

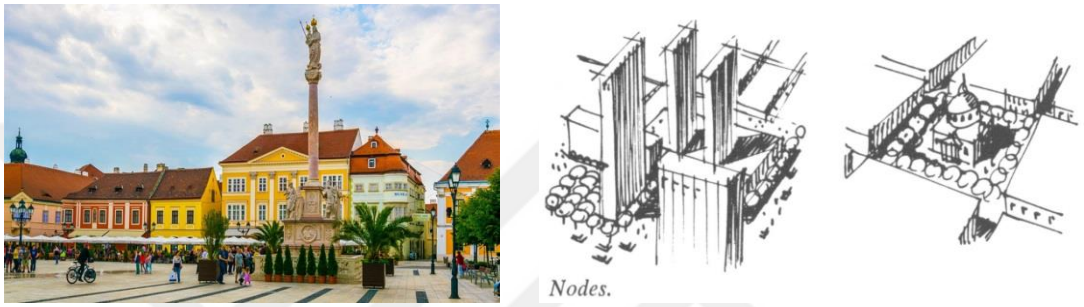


Figure 2-5 Examples for nodes (Url-5; Lynch; 1960)

2.2.2.5. Landmarks

Landmarks are usually a physical object that has simple characteristics but strong effects on city image. They can be a building, a sign, a store, or a mountain. Unlike districts or nodes, the observer cannot enter inside this element, but uses it as a reference point. Size of the landmarks may vary, whereas some landmarks can be towers that can only be observed from a distance, or sculptures, signs and trees that are noticed from closer distances (Lynch, 1960).

Physical characteristics of landmarks such as their scale, pattern, form and material are the main features that establish their importance. Apart from their physical attributes, their historical significance and their use can also affect their rank as a reference element. Different observers may perceive different number of landmarks in the city (Damla et. al., 2009).

Figure 2-6 Examples for landmarks (Url-6; Lynch; 1960)

A reasonable mental map of the urban environment is expected to counter the continually approaching apprehension of confusion. A legible mental map gives individuals an essential feeling of emotional security. It is the structure of communication and conceptual organization, and it increases the profundity and intensity of regular human experience. Lynch argues the city itself is therefore a capable symbol of a complex society. An environmental image has three elements: 1- Identity: the acknowledgment of urban components as isolated entities, 2- Structure: the connection of urban components to different objects and to the observer, and 3- Meaning: its reasonable and emotional incentive to the observer. It is essential that these urban components are not hermetically designed into exact and last detail but rather exhibit an open-finished request. Urban occupants ought to have the capacity to effectively shape their own stories and make new activities. Lynch presents his work as a motivation for urban designers. They should plan the city such that it gives space for three related (movements): mapping, learning, forming (Lynch, 1960).

2.3. Measuring Intelligibility through Space Syntax

Hillier et al (1987) propose a syntactic meaning of intelligibility to depict this qualitative part of spatial form scientifically and quantitatively. The intelligibility of the frame can be estimated by breaking for the connection between how spatial configuration can be seen from its parts and what it resembles as an inclusive pattern, that is, as a dissemination of integration (Kim, 2001). Hillier improves a metric for intelligibility by connecting a local measure of spatial configuration with a global measure. It is characterized as the level of correlation between the connectivity and integration values of the axial lines in spatial configuration (Kim,

2001; Zhang, Chiradia and Zhuang, 2013). Hillier guessed that the high correlation between connectivity and global integration ensures that the spatial configuration is notional and predictable for the pedestrian or vehicular motion (Zhang et. al., 2013). The intelligibility property of the deformed grid refers to the degree to which parts of the system can be perceived. The ease of perceiving other spaces of the system is good evidence to what we cannot see, that is the notion of all space in the system as a whole (Hiller, 1996). The intelligibility property evokes aspects of spatial cognition that relate to navigation, motion, wayfinding, spatial reference, memory, spatial relations, and spatial inferences (Zhang et. al., 2013).

2.3.1. Space Syntax Technique

Space Syntax is consistently thought of as an arrangement of techniques for architectural and urban space and envisioning useful outcomes. It is a theoretical model of human space: how it is sorted out, how it capacities, how it is understood, and how it is a part of the thing we call society. It is likewise predicting functional results at the design arrange that relies upon having a theory that associates the two: a structure-function theory, or form-function theory. The thought is that utilizing objective and particular depiction strategy, we can investigate the degree to which a region is interconnected and measure its accessibility starting with one place and then go to the next are inside the spatial association. The creators of this theory trust that cultural and social data exists in the physical shape and structure, and that through the spatial association of urban communities we can be the nature of social verities (Hillier, 2014).

2.3.1.1. Spatial Configuration

Spatial configuration is important on individual spatial decision-making. It is especially intriguing that it demonstrates the design of the environment itself influences the choices that people make. The definition of spatial configuration alludes to the pattern by which each space in the built environment correlates to relatively every other (Emo. 2014).

There is an expected relevance between space and how to utilize it, connection between configuration of individuals and configuration of space. Configuration as determined in Hillier's book space is the machine is "a set of interdependent

relationships in which each is determined by its relationship to all the others" (Hillier, 1996). The organizing of spaces in a way influences the use of them according to how related these spaces to each other (Emo. 2014).

2.3.2. The Role of Intelligibility on Wayfinding

Wayfinding is not simply a chance, however it takes psychic modalities in view of visual observation. It can be characterized as the decision-making process phase of steering, wherever navigation is consisting of wayfinding and mobility, wayfinding is related to choices made by the individual fundamentally (Hillier, 1996).

A few elements are recognized to influence wayfinding behaviour, the environmental factors are particularly enjoyable, on the environment that they are gotten of the environment itself not of the individual or efficacies. Structural data is a sort of environmental factors that insinuates to how structure is situated in relation with the road. The data is particularly essential when individual is exploring some place they have not been previously (Wadah Hani, 2014).

Lynch was the first theory that included the relation of structural data to human navigation, where he determined five elements of the built environment that were accessible in mental maps (Lynch. 1960). Spatial configuration is described as the way the connection between any two spaces are balanced by their relationship with a third space. Space syntax techniques suggest a method of measuring spatial configuration, they have been utilized to explicate how the structure of a space characterizes how it is utilized. It was the first significant study to test the role of spatial configuration on individual behaviour in various factual environments. And it demonstrated that styles of behaviour are related to the properties of the environment (Hillier, 1996).

2.3.3. Measuring Spatial Configuration through Space Syntax Analysis

Space syntax is a series of techniques and theories that examines how we relate to the environment. As an instrument, it submits a method of measuring spatial configuration that has proven useful for urban planners and architects. Space syntax analyses of urban environments through the road network by established on axial lines. Axial lines are realized as the longest and fewest observable visible lines with the ability to move to complete the grid. The ensuing grid is analysed a graph, with the roads as nodes and the connections as lines among nodes. Starting space syntax

techniques methodologies relied upon axial lines, which incited diagram measures worked about the topological characteristic of the grid (axial map) (Wadah Hani, 2014).

The main direct utilization of Space Syntax procedures in wayfinding research was performed by Peponis, Zimring and Choi (1990). This exploration is critical for various different reasons. They considered both accessible investigation and coordinated quests as two sorts of wayfinding and also proposed the methodological construct of redundant node use. In Space Syntax terms, they only considered about max of integration and reported that both exploration in novel settings and errors in studies were biased towards spaces with greater max of integration (r = -.757 and r = -.754 respectively). In a later study Haq (1999a) supported those findings.

Kim (2001) scrupulous the part of intelligibility on the correlation between spatial configuration as an overall guideline and its cognitive depiction. Two move towards areas in Hampstead Garden Suburban area, in North London, additional intelligible than the other (r = 0. 284 and 0. 680), were examined. Connectional research drawn that there is strengthened correlation between space configuration and spatial perception for the residents of the intelligible area. He concluded that inhabitants living in the more intelligible areas do indeed produce maps that are better related to Space Syntax variables.

Penn (2001) indicates to Kim's doctoral study which discusses the partnership between urban configuration, cognition and behaviour of its inhabitants. Kim and Penn (2004) found that "space syntax of spatial configuration in genuine environments and spatial cognitive of intellectual maps in spatial cognition are firmly related". In Baskaya et. al. (2004), the unfamiliarity value to the configuration is impressed. In Haq and Girotto (2003), the connection amongst intelligibility and wayfinding is sought.

Kevin Lynch (1960), one of the precursors in the study regarding the acquisition of spatial cognition, hypothesized that individuals have in their brains an image of the environment in which they live and so, he used sketch maps as a significant tool in his study. Space syntax theory interfaces the notion of connectivity and global integration to depict the configurational quality of a whole layout named "intelligibility". It is perceived that as individuals move around in an urban space at

ground level, they cannot see it and experience it at once, but develop an image of each piece. Hillier (1996) argues that the concept of intelligibility identifies with "the way in which a photo of the entire urban framework can be developed from its parts, and all the more particularly, moving around one section then to the other". This definition resembles Lynch's (1960) concept of intelligibility, which he characterized as the simple as a framework that parts can be perceived and organized into a coherent pattern. Despite the resemblance, there is an essential contrast to these two methodologies; Lynch's notion of intelligibility represents the mental image held by numerous people, Hillier's thought of intelligibility depicts these portions of spatial form analytically and quantitatively.

Lynch (1960) determines "intelligibility" as the simplicity with which a structural parts can be recognized and can be sorted out into a cohesive model. He expresses that if a city is intelligible it can be visually recognized as a related model of obvious symbols, so, an intelligible city would be one whose landmarks or zones or paths are frequently effortlessly identifiable and are effectively gathered into a general style. He further disputes that during of determination the wayfinding, the strategic relationship is the environmental image. This sums up the mental image of the outside physical world, which benefits from design intelligibility as sophisticated through an individual. In light of these, he proposes that the intelligibility may presume a conclusive part in procuring a feeling of spatial control in spatial experience. Kaplan and Kaplan (1983) additionally affirm that intelligibility is a standout amongst the most prominent perspectives in a people effective functioning, since it permits one to explore broadly without getting to be lost. In (1986) in the same vein Garling et al offer a model of more powerful spatial structures that may affect spatial navigation and direction.

The study of Garling is unparalleled in that the consideration for intelligibility is moved to a methodical portrayal of spatial configuration. In any case, the three cases of studies have a consolidated procedure that affirms more essence and influential characteristics of spatial frame as opposed to a topical and logical portrayal of it.

3. MEASURING INTELLIGIBILITY IN TRIPOLI

In this section the case study is introduced and data gathering and analysis are explained. The study is based on two stages of analysis The first stage depends on the image of the city by Kevin Lynch. Analysis of visual formation of the case study, mental maps are produced by means of interviews with people, they were asked to draw an abstract map of the case study. The second stage of the analysis, which is mainly concerning the analysis of spatial configuration in accordance to Space Syntax technique, including: analysis of the values of integration, connectivity, choice as well as intelligibility and synergy. This study also contributes comparison between mental image and space syntax for the center of Tripoli.

3.1. The Center of Tripoli

Libya located in the north of Africa and has boundaries on east with Egypt, southeast with Sudan from west with Algeria, northwest with Tunisia and from south with Chad and Niger, Libya has a region of around 1,759,540 sq km. The religion of the general population in Libya is Islam and the official language is Arabic, some Berber language, English and Italian, for the most part rendered useful on business purposes. Libya has a coast on the Mediterranean Sea of 1,770 km. Ruled by the Sahara desert, most of the land is infertile and generally level (Amiruddin and Elmloshi, 2011). The number of population in Libya, built up on the statistics of 2016 is 6,541,948 individuals, (Census, Tripoli Libya). The capital of Libya is Tripoli city.

Figure 3-1 Location of Libya

Tripoli is the capital city of Libya and has the biggest harbour in Libya. There are two primary airport to be specific Tripoli international and Umm Aitiqah. Tripoli is situated on the south seacoast of the Mediterranean sea in a focal position encompassed by numerous agrarian territories, for example, Tajura and Suk Eljomha in the east, Zawia in the west, and Benghashir and Swani Ben Adam in the south. Tripoli has a strategic geographical situation and a broad history. It frames an essential connection between the eastern and western urban communities of the Arab world, and between European urban areas and African urban areas. Tripoli lies at a scope of 32◦ 56 north, and a longitude of 13◦ 10 east. The significance of its area is recommended in Tripoli as a standout amongst economic and commercial focuses in North Africa (Amiruddin et. al., 2011).

Figure 3-2 Location of Tripoli City (Url-7)

Tripoli is the first city in the country to be densely populated and functional when measured in terms of the level and scope of services provided to urban communities (Saad,1995).

3.2. History and Urban Morphology of Tripoli Center

Tripoli has a strategic geographical location and a broad history. Tripoli's history reflects the history of the Libya (Elbendak, 2008). Etropolis or (Al-Medina), is viewed as one of the most established urban areas in the Middle East. It was surrounded by historical walls of Tripoli. Tripoli was held under the support of progressive people groups and civilisations. The Phoenicians (7th -8th centuries BCE) (El-allous, 2016). It has known ups and downs, however its historical architectural landmarks is a prove to the considerable Libyan civilisation. Tripoli has numerous historical buildings, for example, the Red Saraya Castle (Saraya Al-Hamra), (Figure 3-3).

Figure 3-3 Saraya Al-Hamra (Url-8)

They were pursued by the Karthaginians who came to them from Karthag through the 6th century BC until 161 BC and were followed by the Numidians until 42 BC. (Barghouthi, 1967). The Romans (first century BCE-5 the century CE), the Vandals (439-534 CE), the Byzantines (534-643). The Muslim Arabs (who remade the city from 643-16th century), the Spanish and the Knights 59 of St. John of Malta (1510-1551) (El- allous, 2016), (figure 3-4).

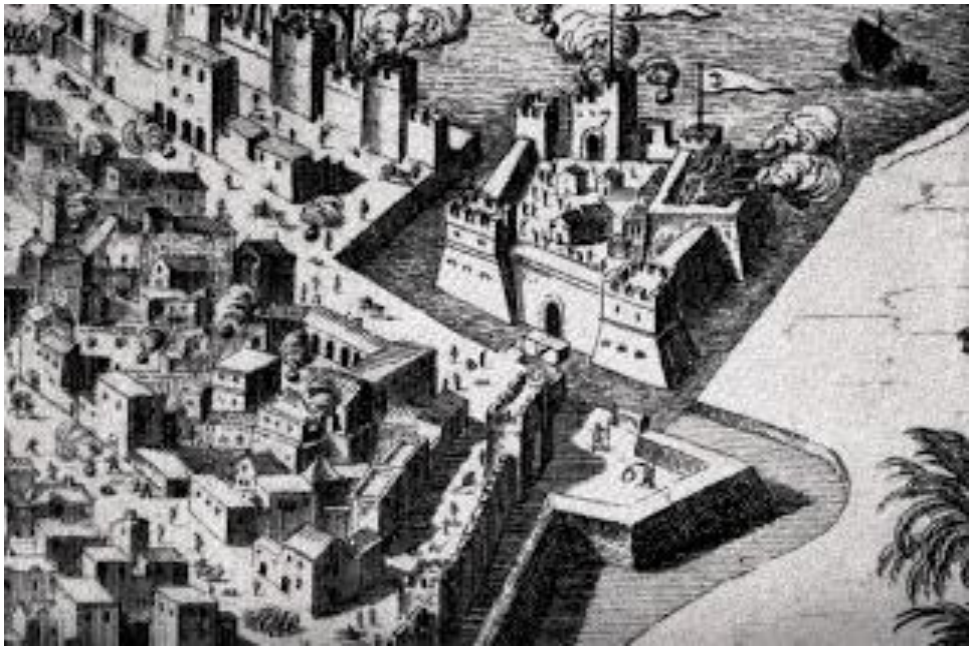


Figure 3-4 Old city in period the Spanish and the Knights in 1510 (Url-9)

The Turks of the First Ottoman Era (1551-1711), the true administers of the inherited Qarahmanli Dynasty (1711-1835), and the Second Ottoman Era (1835-1911) (figure

3-5). These organizations lived in Tripoli, administered from within urban area the specific of Al-Medina (El- allous, 2016).

Figure 3-5 Old city in period Ottoman Era in 1771 (Url-10)

After that Italians came to Tripoli city, it was the Italians' new European city surrounded Old City (Al-Medina), it was broadly and rapidly developed until the early 1940s. After WWII, Tripoli was administered by the British Administration (1943-1951), which managed to maintain the urban conditions of the time until the independence of Libya in 1951, the main transnationally recognized Libyan government in power under the monarchy. The Libyan Kingdom continued (1951-1969). Tripoli City under the Gaddafi Regime (1969-2011) (El- allous, 2016).

There were many names for the city of Tripoli, where it was named Marca Uiat by Phoenicians, then Oea City and changed its name to Tripolis. The Roman governor called it (Tripolis) a word composed of two parts "Tri" it means three and "Polis" is the meaning of the word city, the meaning of the three cities "Lepits Magna, Oea, Sabrata" (Barghouthi, 1967).

The Germans called it "Tripolitanos". The Arabic name of Tripoltanos is Tarablus or Atrablis or Tarabals, and it received this name after the arrival of Arabs. Some historians gave Tripoli the name (The White City), due to the fact that all buildings in the city centre were painted white (Elbendak, 2008).

The old city (Al-Medina) is one of the oldest cities on the Mediterranean Sea, Its urban plan was designed in the Roman period, with Phoenician and Greek monuments. Al-Medina surrounded by high walls, with the aim of protecting them from attacks, there were three gates which built, such as: Bab Zanata west, Bab Hawara south and Bab Bahar north. One of the most important features of the Al-Medina is the Saraya Al-Hamra, which represents the bulk of its eastern location alongside the commercial area containing several shops, and the largest gold and jewellery stores, traditional clothes and the copper shops...etc. Most buildings are one floor or two floors. Its streets are narrow ways with closed ends, most of its streets are for pedestrians where vehicles are not allowed. It has a number of historical mosques. The modern Tripoli city located on the borders of Al-Medina with a clear separation between them, Which there is directly Maidan Al-Shuhada, which is east of Al-Medina, located in front of the Red Saraya Museum in the city centre. The main streets branch out of Maidan Al-Shuhada, they are of great importance to the city, these streets form radiographic planning with Maidan Al-Shuhada. This area is considered one of the most important commercial and administrative areas in the city. This area is followed by a commercial residential area, represent grid layout. The buildings of this area consist of three floors to twelve floors. There is also a main long road beside the sea, known as Fatih Street, at the end this street is the harbour, and Al-Kurnish road, there is a sandy beach suitable for swimming, this area is an administrative area and hotels, with modern tower buildings, and there are buildings under construction (Awadh, 2004).

Figure 3-6 Tripoli Centre (Url-11)

The climate of the Tripoli city is the climate of the Mediterranean Sea. The weather in coastal region is characterised as hot, humid in the summer season and mild, rainy in the winter season. The average humidity in this region is 8% to 65%, which in some years may increase in the summer until to the end of August. The average temperature in Tripoli ranges from 30°C in summer to 8°C in winter (Atmansuri, Curwell and Dowdle, 2009).

The pedestrians movements and vehicles in the city is extremely crowded, especially during peak hours, In all of the months except August and January, because August is the warmest highest temperatures and humidity, even though the people's movement is significantly reduced, especially during the first hours of the day. The traffic increases at 6th pm, especially on the sea, the main streets and Maidan Al-Shuhada, which is utilized as a social space. January is the coldest and most rainy months, the traffic becomes low, especially at night (by author).

Public transports in Libya simply is shared between taxis and buses. Taxis are available in large urban areas, and are frequently used to share work under the supervision of a private association, the cost of taxis is cheap, the fixed lines are specific costs. Private vehicles are the most common of transport in Tripoli- Libya. About 66% of Tripoli's residents prefer to use their own vehicles and later 34% resort to rely upon public transport particularly taxi and microbuses for their transportation activities in the metropolis centre area (Amiruddin et. al., 2011).

Population of Tripoli city according to preliminary figures of Census 2006, total number of Libyan population in Tripoli region amounts to 1,519,000 people, this appears to 27 percent of the number of population in Libya. The Tripoli region is the central urban region in Libya. The 1973 census put the total population in the city at 615,161. This number grows to 994,136 in 1984. The population of 1,059,000 in 1995 (Osama, 2008), (Table 3.1) and (figure 3-7).

Table 3. 1. Population change in the region of Tripoli 1973-2006 (Source: Censuses, 2006)

Year	1973	1984	1995	2006
Population	615161	994136	1059000	1519000

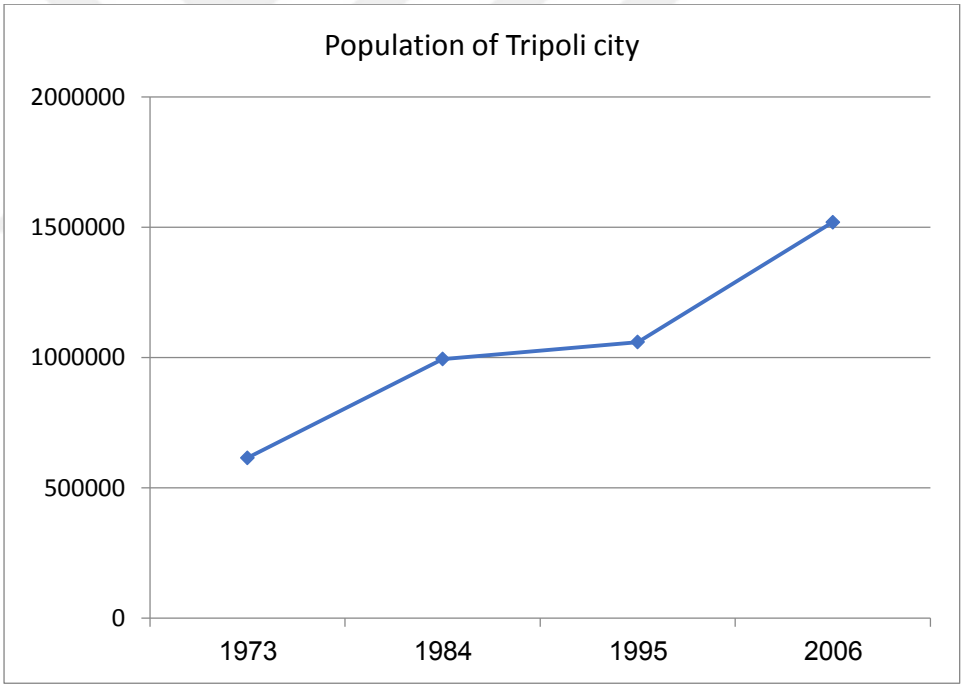


Figure 3 -7 Population change in the region of Tripoli (1973-2006)

Table 3. 2. Population Change in Tripoli districts during 1973-2006 (Census, Tripoli, Libya: 2006)

Population				
Districts	1973	1984	1995	2006
Tripoli center	120701	120542	131245	143040
Soqaljuma	117008	206580	211507	310020
Tajura	34521	47985	73503	84254
Ainzara	58698	145568	149224	246002
Bosleam	103509	156543	189964	272553
Andalus	150522	156543	251353	391142
Janzur	30202	45246	52204	71989
Total	615161	994136	1059000	1519000

According to preliminary figures of Census 2016, total number of Libyan population in Tripoli region amounts of 2,127,000 people. The population of the study area (The center of Tripoli) is 154,060. By studying the population, it needs to identify the sample size, through which people can be interviewed, to study the image of the city on the approach of Kevin Lynch.

3.3. Measuring Intelligibility through Mental Maps in Tripoli Center

3.3.1. Mapping Case Study According to Image of The City

In this chapter the study is based on two stages of analysis. The first stage that depends on the image of the city by Kevin Lynch is the analysis of visual formation of the case area, through mental image of the city, its components and how it is formed. In this regard, 1: individuals were asked to draw an approximate map of the study area, 2: the maps were analysed to reveal the number of urban elements.

Wayfinding requires to depend on understanding of the environment and it is a vital process in which individuals perceive and organize their environment. Lynch argues that people in urban layouts orient themselves by means of mental maps, and to

compares three American cities to search how do people orient themselves in these areas. People who move through the city engage in wayfinding, as they need to have the ability to organize urban elements into a coherent style (Lynch,1960).

3.3.2. Data Gathering and Analysis

Kevin Lynch (1960) theory of the image of the city, defined five elements that make the city intelligible. The city's mental map was traditionally derived from certain qualitative processes, by requesting to recall city elements from their minds. This method was applied in case study to the center of Tripoli as for analysis of mental image, the visual formation and participants were asked to draw sketches for the center of Tripoli. The study was conducted in July 2017. Five locations within the case area that were observed and analysed are shown in (figure 3-8):

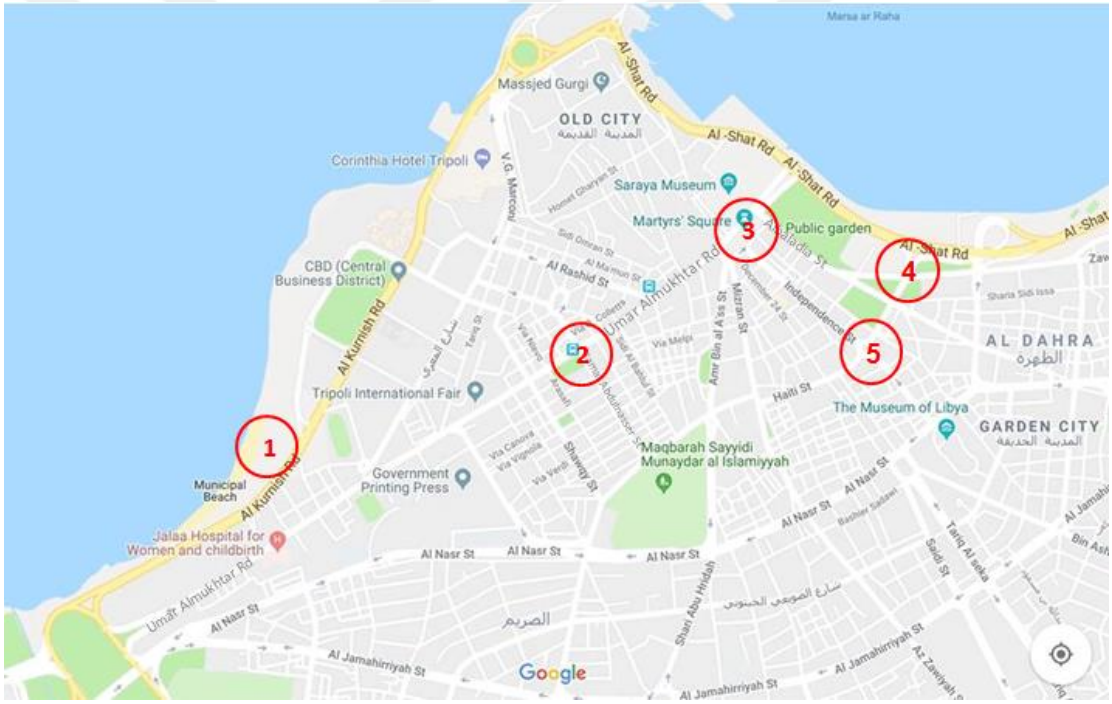


Figure 3-8 Illustrates selected location in the case area: 1. The Sindbad Resort, 2. Umar Al-Mukhtar Street, 3. Maidan Al-Shuhada, 4. Maidan Ghazali, 5. Maidan Al-Jazair

1. The Sindbad Resort, This sand beach is suited for swimming, also it is a business area and an administrative area. The place is a modern area consisting of tower buildings and buildings under construction. While pedestrian movements and crowd congestion in the summer is significant, the

rest of the year there are few pedestrians, and the movements of vehicles increase at peak hours.

Figure 3-9 The Sindbad Resort (Url-12)

2. Umar Al-Mukhtar Street is the main street of the city, it includes the main apartment complexes, management and economical area....etc. The buildings are composed of 4 to 5 floors. It is noticeable that the movement of vehicles and pedestrians are heavy.

Figure 3-10 Umar Al-Mukhtar Street (by author)

3. Maidan Al-Shuhada (Martyrs Square) is one of the main squares in the city, it is used as a social space, which is positioned in the historical area ahead of

the Saraya Al-Hamra and Al-Medina, the main streets branch out from the Maidan, including the historical area, governmental, administrative buildings and the historic fountain in the square. The buildings are all equal in height, ranging from 4 to 5 floors (figure 3-11).

Figure 3-11 Maidan Al-Shuhada (Url-13)

4. Maidan Ghazali (Gazelle Square) is a small square with a fountain, it is one of the main historical landmarks in this city. This Maidan dates back to the Italian period in the early thirties, it represents a lady holding a jug in one hand and a gazelle in the other. It is one of the earliest squares in the Tripoli, as being a crossroad. Near it, there is the historic Oudan Hotel, the Grand Hotel and some modern buildings under construction "The Intercontinental Hotel" (figure 3-12).

Figure 3-12 Maidan Ghazali (Url-14)

5. Maidan Al-Jazair (Algeria Square) is one of the famous squares in the centre of Tripoli. It was established in 1928, and the model used in the construction is the Romanesque architecture. One of the most important buildings nearby, is the Gamal Abdu Al-Nasser Mosque, which was the Catholic Cathedral that was established in the 1920s, but in 1928, it was changed to a large mosque known as the Islamic Dawa "Gamal Abdu Al-Nasser Mosque". The Maidan is located along Al-Istiqlal Street, which is a branch from Hayti Street, that connects it to the main streets of the city, The heights of the buildings ranges from 4 to 5 floors, including shops for commercial activities in the ground floor which is separated from the street by shaded corridors, while the upper floors used as apartments or administrative offices (figure 3-13).

Figure 3-13 Maidan Al-Jazair (Url-15)

These locations have a substantial people's movement (locals, visitors and tourists), whether people's movement or the vehicles' movement. People were interviewed and asked to draw sketch maps for the center of Tripoli. The interviews were of different times of the day. The interview procedure in the morning was low because in the morning people were in a rush to go to their work, which in turn indicates non-response, and people's replies were negative. While in the afternoon it was noticeable there is an increase in the people's movement on the main streets, particularly the commercial areas and Maidan, and there was also a possibility to interview people most of which are visitors to the city centre. One of the best times to interview people was in the evening, because the weather was nice and moderate, with the significant and obvious increase in the people's movement. So most of the people were interviewed at evening period. The work was done on three groups the leading researcher, an urban planner and an engineer.

3.3.3. Interviews and Mental Mapping Procedures

The aim of this procedure is to get mental maps and to explore the degree of intelligibility through degrees of accuracy and completeness of the sketch maps, to achieve a visible and comfortable city. Which gives easy identification of the city's parts to assist practical tasks for wayfinding. In general, the mental image of the city consists of composition, harmony and intelligibility of the following:

1- Paths.

2- Edges.

3- Districts.
4- Nodes.
5- Landmarks.

At the beginning, the sample size of the study area (The center of Tripoli) was determined by using Slovin Formula to define how many sketches are required. Which was:

Computed as: n = N / (1+Ne2).

Whereas,

n = the sample size.

N = total population.

e = error margin / margin of error.

For Tripoli Centre, by 0.05 margin of error.

n = 154060 / (1+154060*0.0025)

n = 398 sketches: 382 sketches were collected.

The sample size was distributed according to gender (Table 3.3) and according to group (Table 3.4) and (figure 3-14).

Table 3. 3. Distribution of the study sample by gender

Gender	
Male	188
Female	194

Table 3. 4. Distribution of the study sample by group

Group	
Tourists	5
Visitors	95
Locales	282

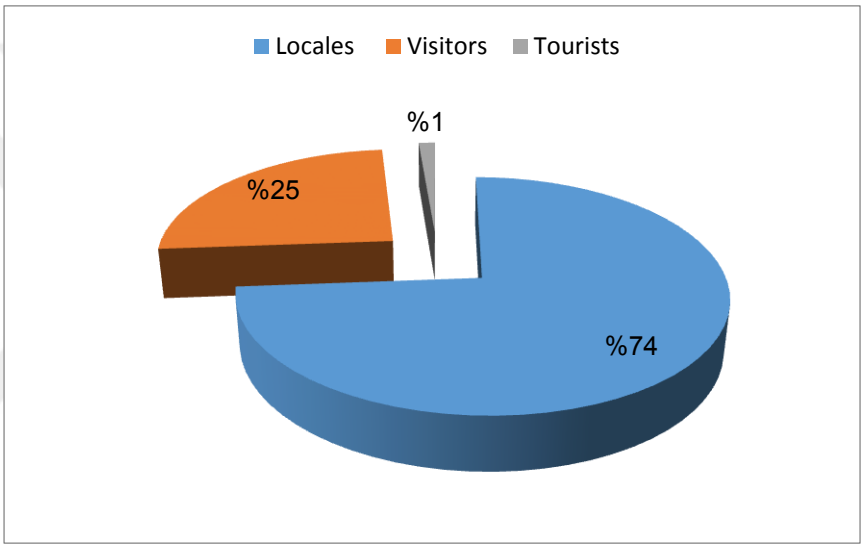


Figure 3- 14 The study sample by Group

382 people with interviews in the center of Tripoli to draw mantel maps sketch for the city. Number of each elements represented in the mental maps (Table 3.5), (figure 3-15) :

Table 3. 5. Mental maps elements

Tripoli Centre	Paths	Edges	Districts	Nodes	Landmarks
	29	2	6	11	85

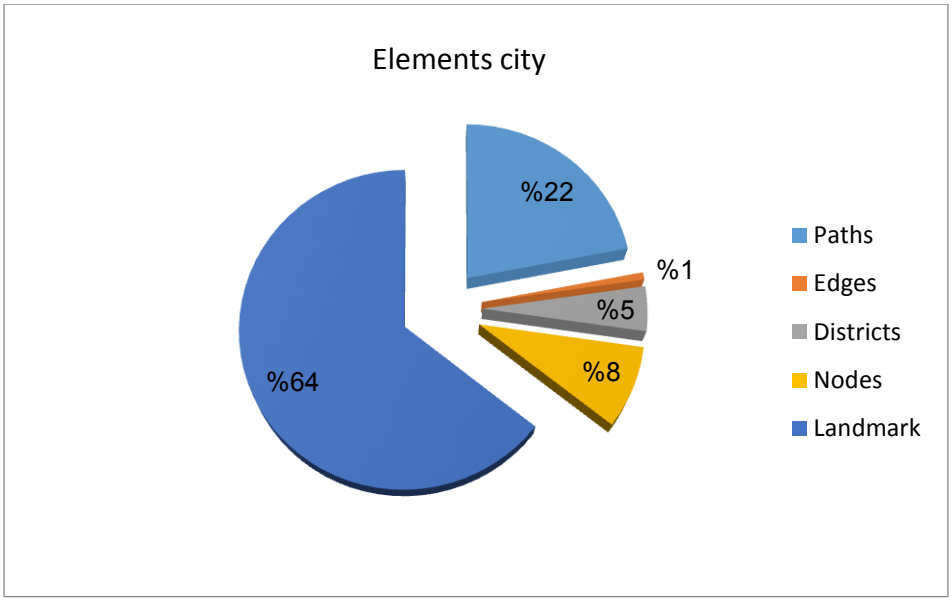


Figure 3-15 Mental maps elements

Table 3. 6. Mental maps elements repetition

Tripoli Centre	Paths	Edges	Districts	Nodes	Landmarks
	2028	210	80	793	2297

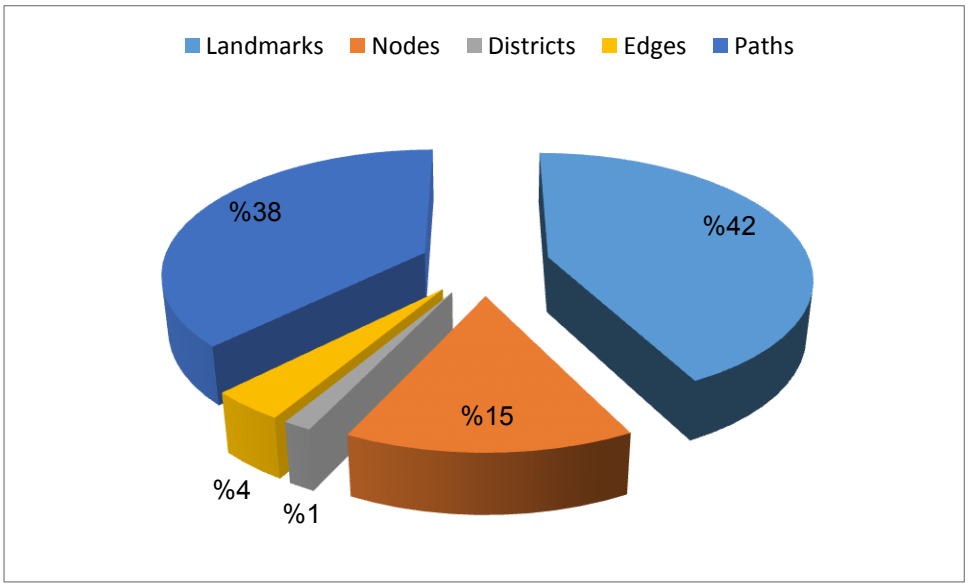


Figure 3-16 Mental maps elements repetition

3.3.4. Elements of the city defined by Lynch in the center of Tripoli

According to the data gathering of the elements of the mental image of the center of Tripoli as following:

3.3.4.1. Paths:

The most drawn paths in the center of Tripoli were Umar Al-Mukhtar Street with 263 times of 2028 times of paths which corresponds to 12.96%, Al-Fatih Street with 206 times of 2028 times of paths which corresponds to 10.15%, Mizran Street with 190 times of 2028 times of paths which corresponds to 9.36%.

The least drawn paths in the center of Tripoli were Al-Kanadi Street with 2 times of 2028 times of paths which corresponds to 0.09%, Al-Ssaeidia Street with 2 times of 2028 times of paths which corresponds to 0.09%, Via Melpi Street with 1 time of 2028 times of paths which corresponds to 0.04. As shown all the paths of Table 3.7 and Figure 3-17.

Table 3. 7. Paths of the center of Tripoli

No	Paths	Drawn	Percentages
1.	Umar Al-Mukhtar Street	263	12.96%
2.	Al-Fatih Street	206	10.15%
3.	Mizran Street	190	9.36%
4.	Al-Nasr Street	186	9.17%
5.	24 December Street	180	8.87%
6.	Al-Tisiqlal Street	156	7.69%
7.	Rashid Street	134	6.60%
8.	Amar Bin Al-A'ss Street	121	6.01%
9.	Baghdad Street	81	3.99%

10.	Al-Harat Al-Kabira Street	81	3.99%
11.	Al-kurnish road	72	3.55%
12.	Hayti Street	70	3.45%
13.	Ma'ari Street	67	3.30%
14.	Ma'moun Street	60	2.95%
15.	Ahmed Al-Shrif Street	33	1.62%
16.	Baladiya Street	31	1.52%
17.	Gamal Abdu Al-Nasser Street	21	1.03%
18.	Ibn Sina Street	14	0.69%
19.	Al-Masirah Al-Kubra Street	13	0.64%
20.	Al-Rasafi Street	13	0.64%
21.	Shawqi Street	7	0.34%
22.	Sarim Street	7	0.34%
23.	Bandung Street	5	0.24%
24.	Al-Tijani Street	4	0.19%
25.	Electron Street	4	0.19%
26.	Abu Mashmasha Street	3	0.14%
27.	Al-Kanadi Street	2	0.09%
28.	Al-Ssaeidia Street	2	0.09%
29.	Via Melpi Street	1	0.04%
Total	All Paths	2028	

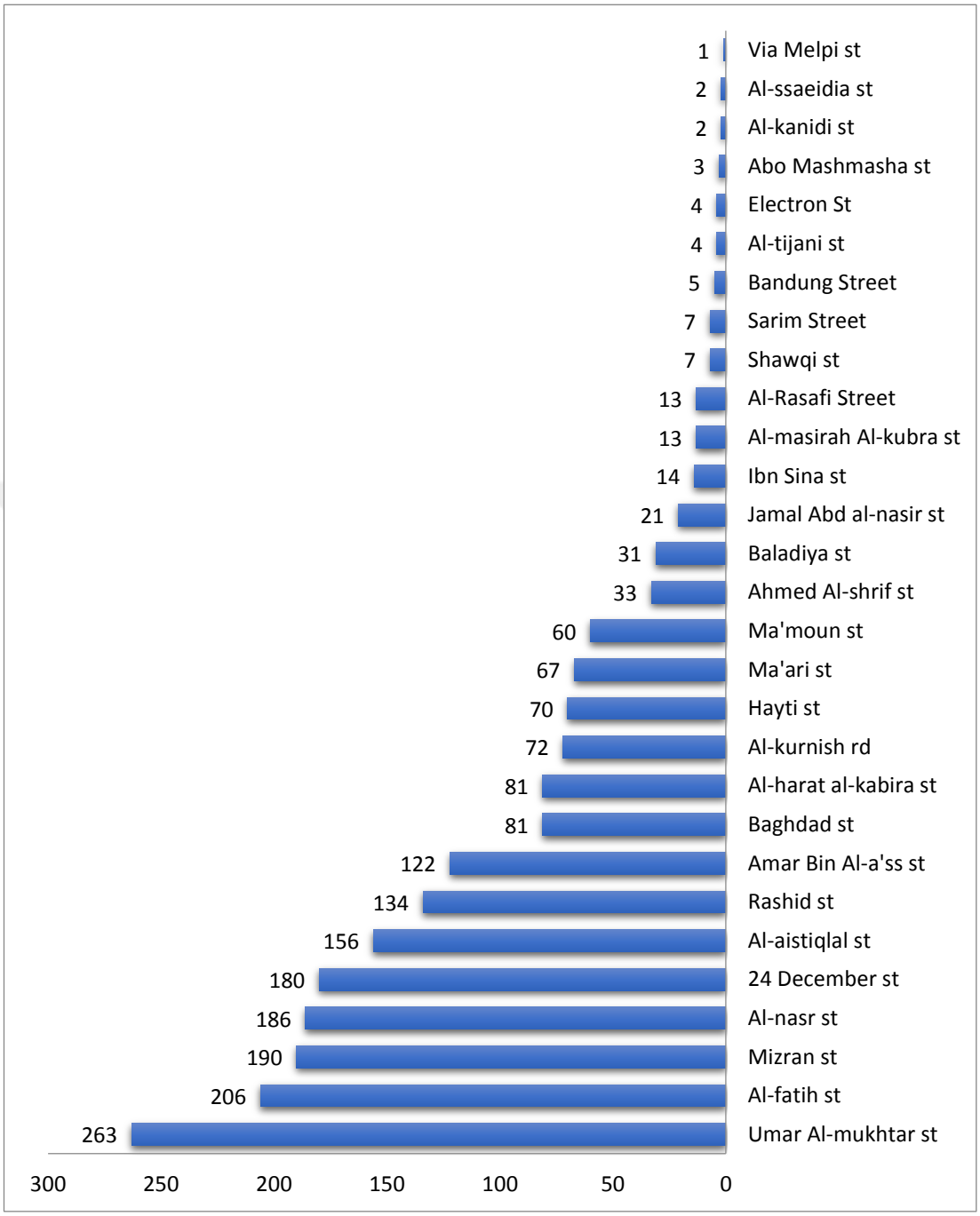


Figure 3-17 Paths in the center of Tripoli

3.3.4.2. Edges:

The center of Tripoli has two edges were the sea with 116 times of 210 times which corresponds to 55.23%, Tripoli harbour with 94 times of 210 times which corresponds to 44.76%.

Table 3. 8. Edges of the center of Tripoli

No	Edges	Drawn	Percentages
1.	The sea	116	55.23%
2.	Tripoli harbour	94	44.76%
Total	All Edges	210	

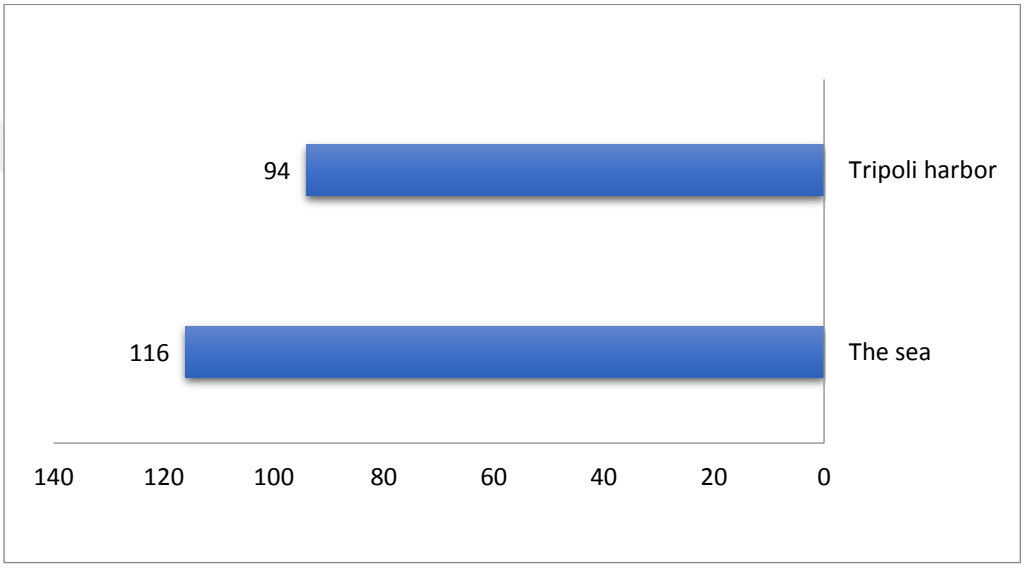


Figure 3-18 Edges in the center of Tripoli

3.3.4.3. Districts:

The most drawn districts in the center of Tripoli were Jalaa neighbourhood buildings (Jalaa district) with 24 times of 80 times which corresponds to 30%, Al-Medina district with 21 times of 80 times which corresponds to 26.25%, Dahara district with 20 times of 80 times which corresponds to 25%, Then comes Al-Nasr district with 8 times of 80 times which corresponds to 10%, Abu Mashmasha district with 5 times of 80 times which corresponds to 6.25%, Sarim district with 2 times of 80 times which corresponds to 2.5%.

Table 3. 9. Districts of the center of Tripoli

No	Districts	Drawn	Percentages
1.	Jalaa district	24	30%
2.	Al-medina district	21	26.25%
3.	Dahara district	20	25%
4.	Al-Nasr district	8	10%
5.	Abu Mashmasha district	5	6.25%
6.	Sarim district	2	2.5%
Total	All Districts	80	

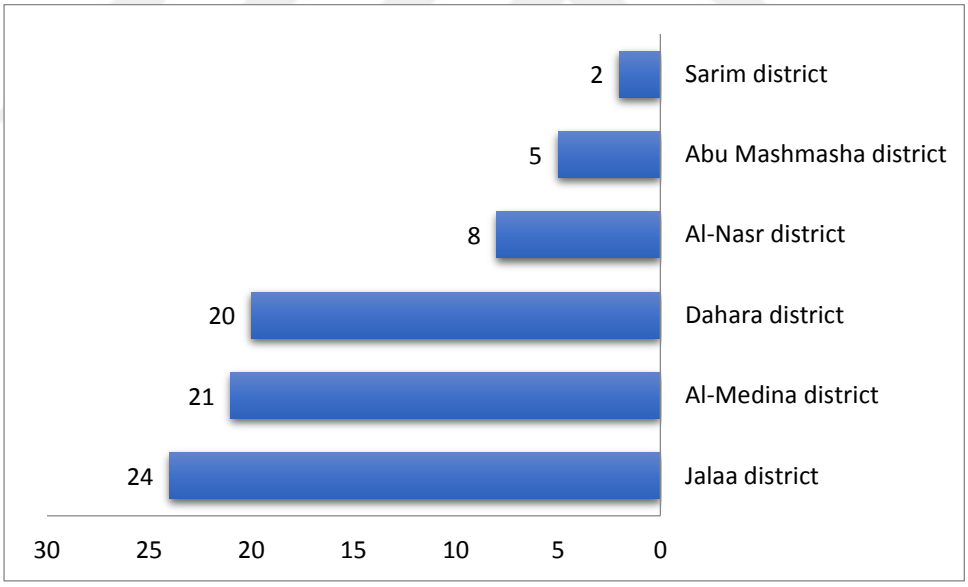


Figure 3-19 Districts in the center of Tripoli

3.3.4.4. Nodes:

The most drawn nodes in the center of Tripoli is Maidan Al-Shuhada with 305 times of 793 times which corresponds to 38.46%, which corresponds to Public Park with 119 times of 793 times which corresponds to 15.00%, Which corresponds to comes

after them gradually Maidan Ghazali with 56 times of 793 times which corresponds to 7.06%, Roundabout Suq Al-tulata with 55 times of 793 times which corresponds to 6.93%, Maidan Al-Jazair with 48 times of 793 times which corresponds to 6.05%, Roundabout Port with 46 times of 793 times which corresponds to 5.80%, Oudan Bridge with 43 times of 793 times which corresponds to 5.42%, Fish Market with 42 times of 793 times which corresponds to 5.29%, Roundabout Dahara with 30 times of 793 times which corresponds to 3.78%, Jnat aarief Square with 28 times of 793 times which corresponds to 3.53%, Maidan Al-Sweileh with 21 times of 793 times which corresponds to 2.64%.

Table 3. 10. Nodes of the center of Tripoli

No	Nodes	Drawn	Percentages
1.	Maidan Al-Shuhada	305	38.46%
2.	Public Park	119	15.00%
3.	Maidan Ghazali	56	7.06%
4.	Roundabout Suq Al-tulata	55	6.93%
5.	Maidan Al-Jazair	48	6.05%
6.	Roundabout Port	46	5.80%
7.	Oudan Bridge	43	5.42%
8.	Fish Market	42	5.29%
9.	Roundabout Dahara	30	3.78%
10.	Jnat aarief Square	28	3.53%
11.	Maidan Al-Sweileh	21	2.64%
Total	All Nodes	793	

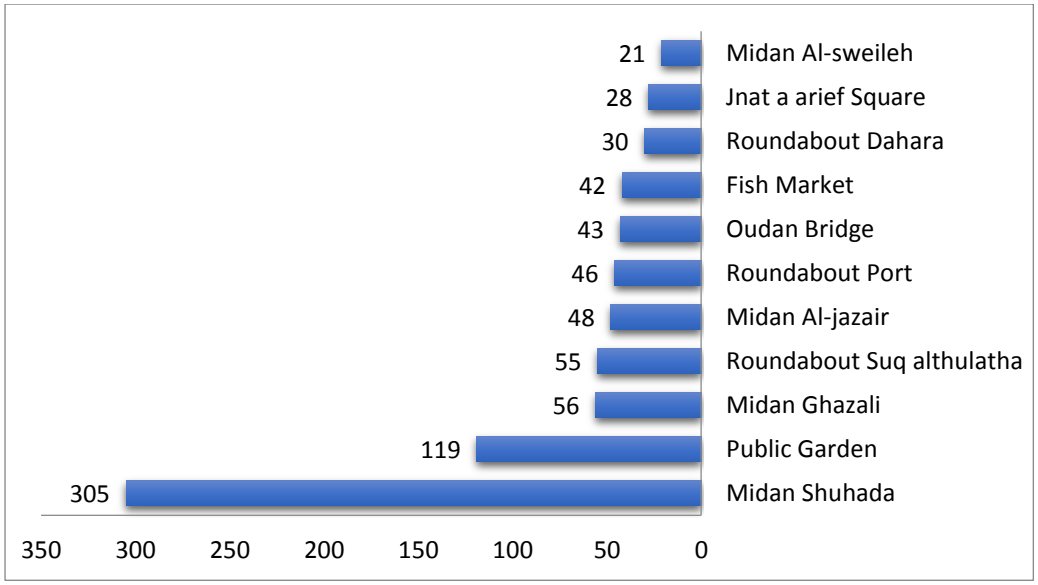


Figure 3-20 Nodes in the center of Tripoli

3.3.4.5. Landmarks:

The center of Tripoli is one of the most important areas in the city. Where most of the administrative, commercial which corresponds to tourist areas of Tripoli City are concentrated, as well as a residential area. The most drawn landmark is the Maidan Al-Shuhada with 305 times of 2297 times which corresponds to 13.27%, which corresponds to Saraya Al-Hamra (Red Saraya) with 230 times of 2297 times which corresponds to 10.01%, Which corresponds to comes after them gradually Al-Medina (Old City) with 183 times of 2297 times which corresponds to 7.96%.

The least drawn paths in the center of Tripoli were Kudu Fast Food Restaurant with 1 time of 2297 times which corresponds to 0.04%, Al-Diyafa Restaurant with 1 time of 2297 times which corresponds to 0.04%, Abu Mashmasha Mosque with 1 time of 2297 times which corresponds to 0.04%. As shown all the landmarks of Table 3.11 and Figure 3-21.

Table 3. 11. Landmarks of the center of Tripoli

No	Landmarks	Drawn	Percentages
1.	Maidan Al-Shuhada	305	13.27%
2.	Saraya Al-hamra	230	10.01%
3.	Al-Medina	183	7.96%
4.	Corithai Hotel	134	5.83%
5.	Public Park	119	5.18%
6.	Tripoli International Fair	107	4.65%
7.	Tripoli harbour	94	4.09%
8.	Sayyidi Munaydar Cemetery	86	3.74%
9.	Drghout Pasha Mosque	78	3.39%
10.	Grand Hotel	73	3.17%
11.	Jalaa Hospital	61	2.65%
12.	Saraya Lake	59	2.56%
13.	Maidan Ghazali	56	2.43%
14.	Jumhoruia Bank	49	2.13%
15.	Maidan Al-Jazair	48	2.08%
16.	Libya Central Bank	47	2.04%
17.	That Emad Towers	44	1.91%
18.	Fish Market	42	1.82%
19.	Tripoli Tower	41	1.78%

20.	National Commercial Bank	35	1.52%
21.	Oudan Hotel	34	1.48%
22.	The Museum of Libya	31	1.34%
23.	Abo Laila Tower	28	1.21%
24.	Bourgeiba Mosque	25	1.08%
25.	Public Station	24	1.04%
26.	Bab Al-Bahr Hotel	22	0.95%
27.	College of Military Girls	20	0.87%
28.	Gamal Abdu Al-Nasser Mosque	20	0.87%
29.	Ministry of defence	10	0.43%
30.	Libyan passport Authority	9	0.39%
31.	Saharai Bank	9	0.39%
32.	Al-Badeel Electronic	9	0.39%
33.	Clock Tower	8	0.34%
34.	Nadi Al-Medina	8	0.34%
35.	Zueitina Oil Company	7	0.30%
36.	Gas Station	7	0.30%
37.	Al-Wahda Bank	6	0.26%
38.	Aman Bank	6	0.26%
39.	commerce and Development Bank	6	0.26%
40.	Marcus Aurelius Arch	6	0.26%

41.	Ali Wirth School	5	0.21%
42.	Arts and Crafts School	5	0.21%
43.	Saraya Restaurant	4	0.17%
44.	National Security of Tripoli	4	0.17%
45.	Scouts Theatre	4	0.17%
46.	Philadelphia Restaurant	4	0.17%
47.	Libya Airlines	4	0.17%
48.	Tourism Ministry	4	0.17%
49.	Financial Supervision	4	0.17%
50.	Red Al-Hilal Clinic	4	0.17%
51.	Maruti Tower	4	0.17%
52.	Radio which corresponds to television buildings	3	0.13%
53.	Audit Bureau	3	0.13%
54.	Social Security	3	0.13%
55.	Al-Eidikhar Bank	3	0.13%
56.	Mizran Mosque	3	0.13%
57.	Ahmed Pasha Mosque	3	0.13%
58.	Al-Wifaq Stationery	3	0.13%
59.	Senous Mosque	3	0.13%
60.	Al-Wahah Hotel	3	0.13%
61.	Abu menjel Mosque	2	0.08%

62.	Rwaq Al-Jazair Cafe	2	0.08%
63.	Sunrise School	2	0.08%
64.	Tripoli School	2	0.08%
65.	Garden Play	2	0.08%
66.	Jamila Institute	2	0.08%
67.	Post Office	2	0.08%
68.	Basma Clinic	2	0.08%
69.	Flowers Square	2	0.08%
70.	Cinema	2	0.08%
71.	Fathi Café	2	0.08%
72.	Iceland Cafe	2	0.08%
73.	Al-Tahrir School	1	0.04%
74.	Saida Hafsa School	1	0.04%
75.	The Flowers School	1	0.04%
76.	Sidi Soliman Mosque	1	0.04%
77.	Gas Al-Medina	1	0.04%
78.	Office of Al-Qulae for Travel	1	0.04%
79.	Amber Nabil Café	1	0.04%
80.	Dinar building	1	0.04%
81.	Hayti Café	1	0.04%
82.	Haidar Al-Souati School	1	0.04%

83.	Kudu Fast Food Restaurant	1	0.04%
84.	Al-Diyafa Restaurant	1	0.04%
85.	Abu Mashmasha Mosque	1	0.04%
Total	All Landmarks	2297	

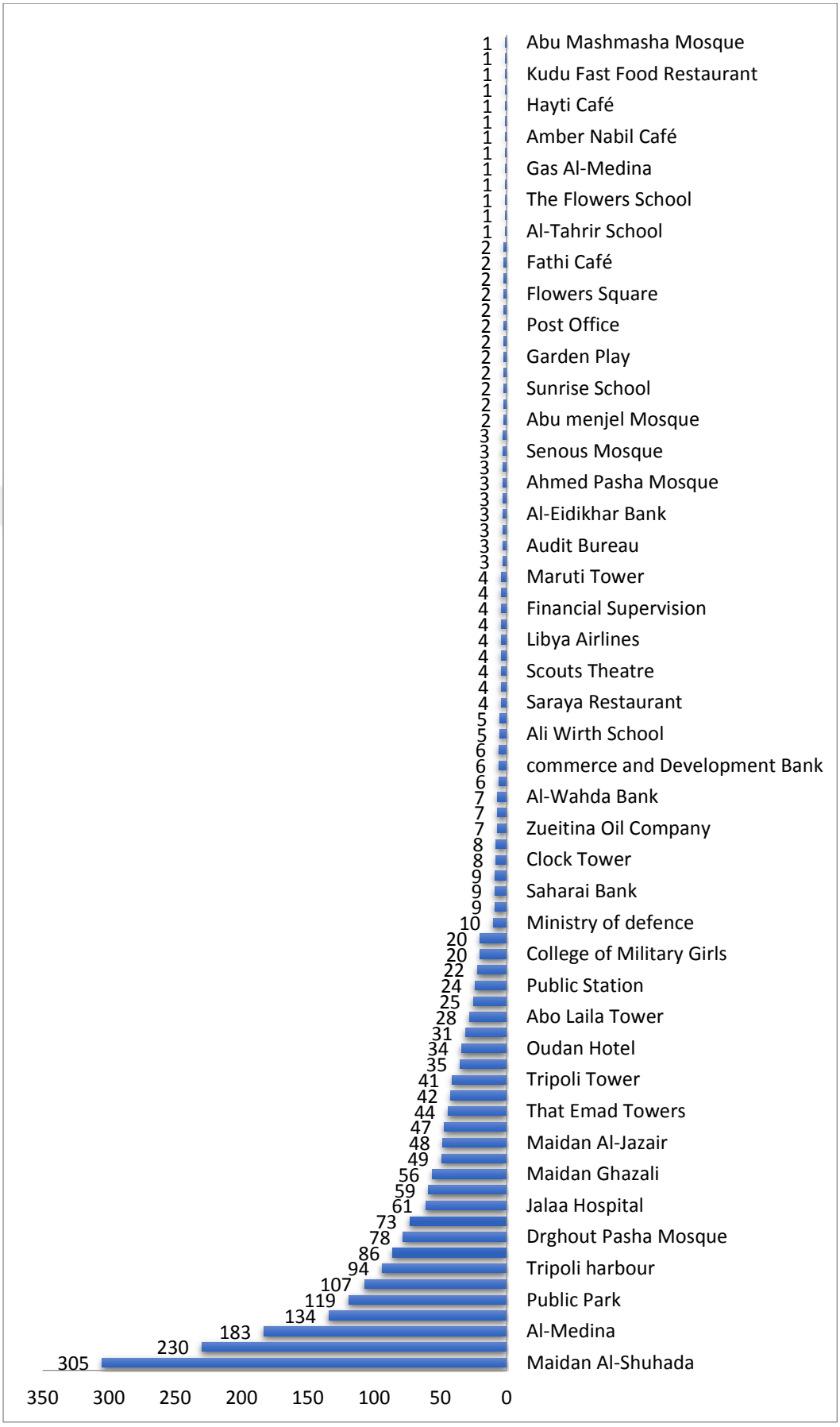


Figure 3-21 Landmark in the center of Tripoli

The highest drawn for the different city elements in the case area (Table 3.12) and (Figure 3-22).

Table 3.12. The highest drawn for the center of Tripoli

Elements City	The center of Tripoli	
Paths	Umar Al-Mukhtar street	263
Edges	The sea	116
Districts	Jalaa neighbourhood	24
Nodes	Maidan Al-Shuhada	305
Landmarks	Al-Shuhada	305

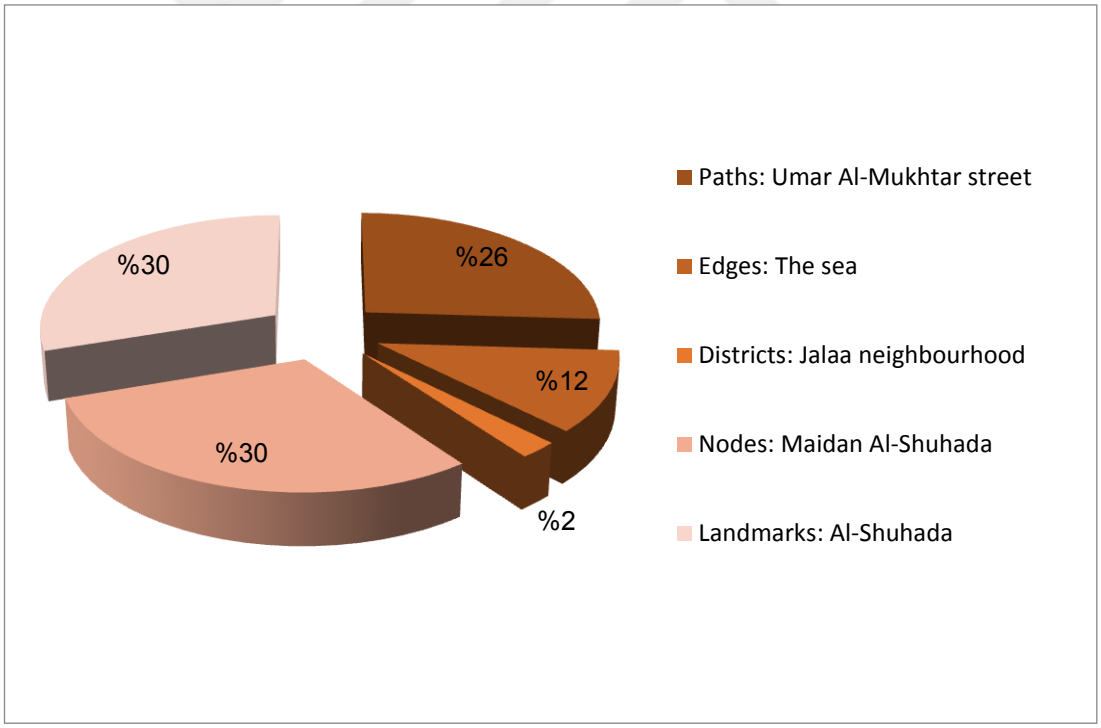


Figure 3-22 The highest drawn for the center of Tripoli

The visual form of case area as seen in the field (Figure 3-23).

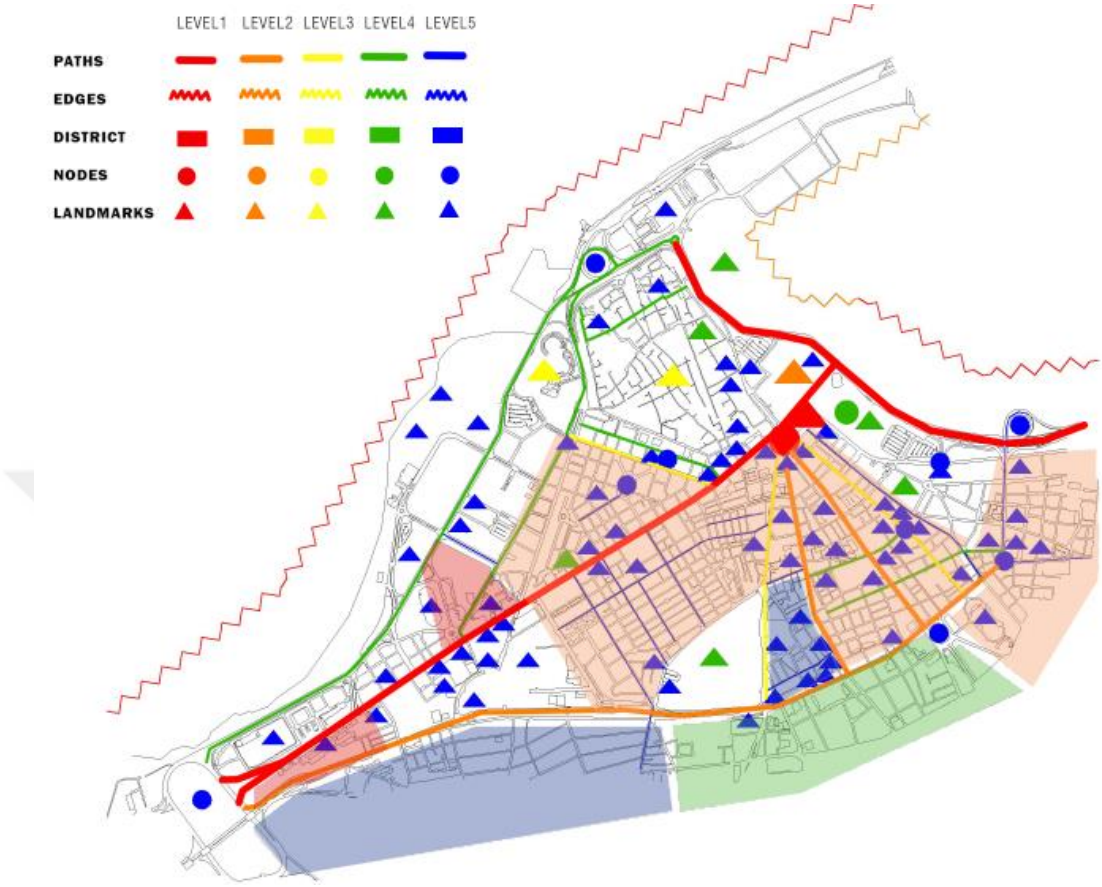


Figure 3-23 The image of the center of Tripoli

Paths : The red line from 263 to 209, the orange line from 209 to 157, the yellow line from 157 to 105, the green line from 105 to 53 and the blue line from 53 to 1.

Edges : The red line from 116 to 99, the orange line from 99 to 94.

Districts : The red line from 30 to 24, the orange line from 24 to 18, the yellow line from 18 to 12, the green line from 12 to 6 and the blue line from 6 to 2.

Nodes : The red line from 305 to 249, the orange line from 249 to 192, the yellow line from 192 to 135, the green line from 135 to 78 and the blue line from 78 to 21.

Landmarks : The red line from 305 to 254, the orange line from 254 to 184, the yellow line from 184 to 123, the green line from 123 to 62 and the blue line from 62 to 1.

Umar Al-Mukhtar Street is the most intelligible paths with 263 times in the minds of people. The name of this street refers to the name of Libyan hero Umar Al-Mukhtar, he is the leader of the resistance against the Italian occupation at that time. It is considered to be one of the largest and the most important streets in the center of Tripoli, it branches out of Maidan Al-Shuhada and it includes shops, governmental, administrative buildings, hotels, restaurants, cafes, Tripoli International Fair....etc. It also, includes residential neighbourhoods. The buildings in this street have the Italian-style of construction, they consist of 4 to 5 floors. The buildings are equal in height, the distribution of these buildings are in this way as the shops are used for commercial activities in the ground floor, which is separated from the street by shaded alleys and the upper floors are used as residential apartments or administrative offices and most of the buildings are painted with white.

The sea is the most intelligible and drawn edges in the center of Tripoli with 116 times. It is considered as a natural edge that has a direct impact on the minds of the people because it influences on emotion and human behaviour. It is located to the north west side of the city, where the Public Park, fountain and children's playground are situated. There is also the Corniche, which have cafes and small shops. On the north-east side, there is a sandy beach suitable for swimming called Sindbad Resort located next to the tower buildings and hotels in this area.

Jalaa neighbourhood buildings are the most intelligible and drawn districts in the center of Tripoli in the minds of the people. This is due to the heights of buildings that reaches to 18 floors, because it is easy to see it from nearby neighbourhoods. The neighbourhood includes a large number of buildings as well as a lunge population. Moreover, Jalaa Hospital for women and children in this area make it easy for people to keep recalling the name of the area that is originally attributed to the Jalaa Hospital.

Maidan Al-Shuhada is the most intelligible and drawn nodes and landmark with 305 times in the minds of people. It is one of the most famous squares in the city of Tripoli, it was founded in the 1920s. It is located next to the Saraya Al-hamra and Bab Al-Horia is one of the entrances to Al-Medina (figure 3-24). Where it was called the Italian Maidan (Piazza Italia), and after the independence of Libya in 1951, the name was changed to Maidan Al-Shuhada, again the name was changed to Green Square in the era of Gaddafi, after the revolution of 17th of February 2011 it was

rename Maidan Al-Shuhada again. It has the shape of the rectangle and at the end of it, there is a historical fountain that branches out. It is the most important main streets in the center of Tripoli. The Maidan considered to be the most important historical and tourist areas, which is used as a social space and do the concerts, religious events and for demonstrations in the city recently.

a.

b.

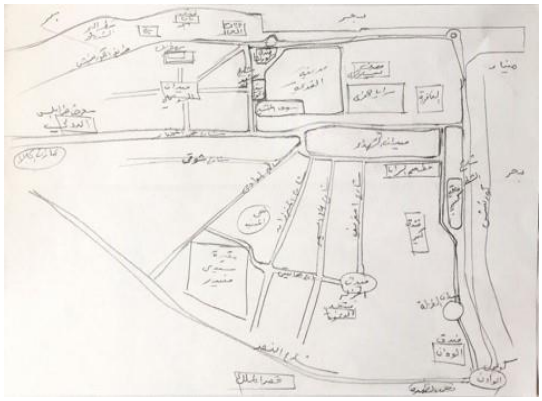
c.

Figure 3-24 a. Maidan Al-Shuhada, b. Historical fountain and c. Al-Shuhada in religious events (Url-15; Url-16; Url-17)

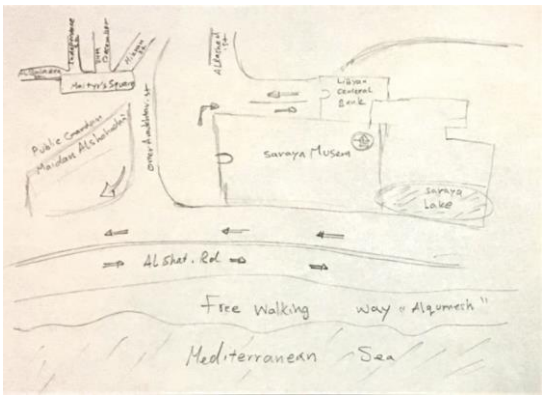
The most important problems that hindered the process of data gathering in the case area are: There were some people who did not want to contribute to the study process, especially when they knew about the process of drawing a sketch map of the center of Tripoli; as they were evading that task. Some said that they were busy. Some others said that they were on a long workday and they feel tired and they cannot draw or think about the contents of the study area, and only few were willing to participate.

3.3.5. Some examples city elements in the center of Tripoli

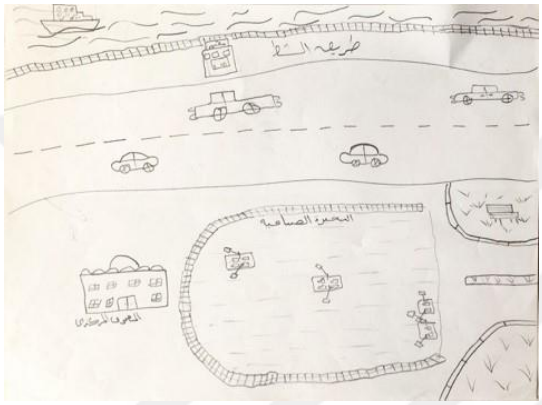
Some example of sketch mental maps of city elements in the center of Tripoli drawn by six different participants (figure 3-25):



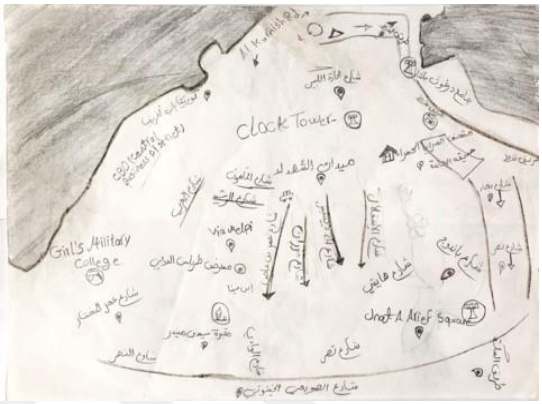
34 years old male (visitor)



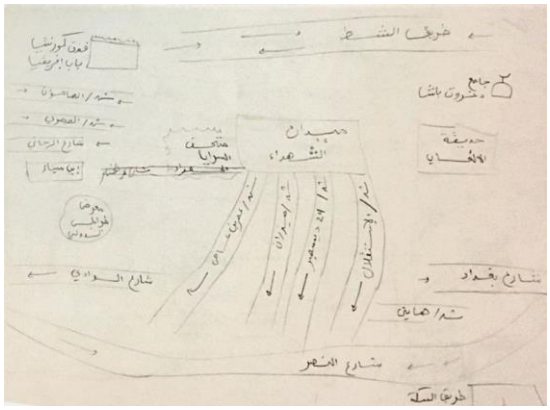
29 years old male (inhabitant)



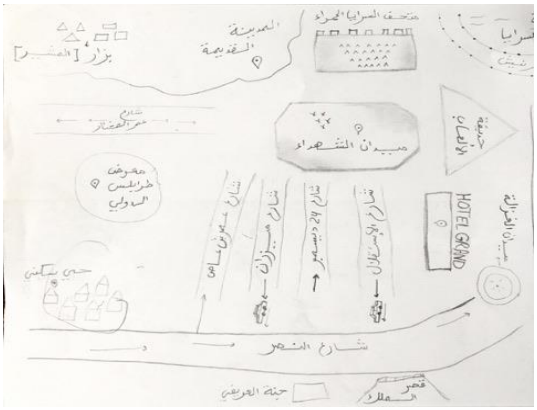
21 years old male (visitor)



32 years old female (inhabitant **)**



36 years old female (inhabitant)



21 years old female (visitor)

Figure 3-25 Some examples city elements – The center of Tripoli

3.4. Measuring Intelligibility Through Space Syntax in the center of Tripoli

3.4.1. Mapping Case Study According to Space Syntax Technique

Also, in this chapter, this study reaches the second stage of the analysis, which is mainly concerning the analysis of spatial configuration through analysis of the values of integration, connectivity, choice as well as intelligibility and synergy by means of space syntax. Before beginning the analysis, the axial map of the study area must be first established.

3.4.2. Processing The Axial Maps

Processing axial maps means to run UCL DepthmapX on them, in order to get values of integration, connectivity, choice, intelligibility and Synergy, as following:

3.4.2.1. Integration

Integration is the means of how deep or shallow each line in the map is from all lines up to n steps away. The type of integration vary according to radius- n, if n includes all levels then the integration obtained is called global integration. It is a static global measure, that describes the average depth of a space to all other spaces in the system. (Hillier, 1984). The spaces of a system can be ranked from the most integrated to the most segregated. Likewise, if n is up to three steps then the integration obtained is radius - 3 integration....etc (Hillier, 1984). Integration is the focus of the axial map analysis. The distribution of movement both vehicle and pedestrian that passes through each line is strongly dependent on its value: Integration values in line maps are of great importance in understanding how urban systems function because it turns out that how much movement passes down each line is very strongly influenced by its integration value (Hillier, 1996). The axial map of the center of Tripoli was drawn using AutoCAD program and exported as dxf. cad file to UCL DepthmapX software. The processing of axial lines helped getting integration value with different radius, the greater the radius, the more global the extent of the measure. The axial lines are represented from red to blue, as red means the highest value of the parameter, while blue means the lowest. In other terms, for the integration value; the red line means the most integrated, and the blue lines mean the most segregated (least integrated).

The global integration maps of the center of Tripoli represent by Umar Al-Mukhtar Street has the most integrated in this area, and it is the longest segments, representing

the local integration maps of the center of Tripoli. Umar Al-Mukhtar Street, Mizran Street, Rashid Street, Ahmed Al-Shrif Street, Shawqi Street and Via Melpi Street have the most integrated in this area. These streets represent red colour and are the highest integration in this area, and the longest segments. These streets encourage movement between parts of the area and they are easy in terms of wayfinding in the center of Tripoli. On the second places, the streets in the center of Tripoli represent orange colour are 24 December Street, Amar Bin Al-A'ss Street, Baghdad Street, Hayti Street, Ma'ari Street, Gamal Abdu Al-Nasser Street, Ibn Sina Street, Al-Masirah Al-Kubra Street, Al-Rasafi Street, Sarim Street and Sayyidi Munaydar Street. Also, these streets are in integration in this area. These streets are the most important and the most vital streets in the city center, they included a commercial area (shops), hotels, restaurants, cafes, an administrative area and a residential area.

On the other hand, Al-Fatih Street, according to global and local integration, represents blue colour, indicating least integrated and most segregated. In the fact that, it is one of the most crowded streets in terms of vehicles or pedestrians, it is located near the coast and it is also known as Al-Shat Street, there are gardens, parks with children's playgrounds, restaurants and cafes. During the period from the evening to the night, the people's movement was greatly observed, especially when the weather was fine. In addition, the people who are living in Tripoli suburbs used this street as an easier access to the city center in short time.

Except of few streets, which are in yellow and green colours, most of the streets of Al-Medina are represented by blue colour, indicating the most segregated (least integrated). Most of the buildings in Al-Medina are unsuitable for housing except some buildings, and most of the residents in this region are of different nationalities other than Libyan. The most visible area of the people's movement is the place of the commercial area, which contains the gold and jewellery shops, the traditional clothing, the copper shops and handicraft shops. (figure 3-26, and figure 3-27). The people's movement and orientation is more different in the part, as the paths are narrow with dead ends and with the nearby buildings, making wayfinding hard in that specific area.

Figure 3-26 Global Integration - The center of Tripoli

Figure 3-27 Local Integration R3 - The center of Tripoli

Figure 3-28 The streets in the center of Tripoli

3.4.2.2. Connectivity Values

Measures the number of immediate neighbours that are directly connected to a space. connectivity is a static local measure (Hillier, 1984).

Connectivity is a specific property of Arab cities at 2.97 (Agael, 2017). In the settlements, where the confrontation of users and foreigners is an unwanted situation. Low value of connectivity is an inevitable circumstance, for example in the residential areas of Islamic, which are the most segregated parts of the cities, because of security and privacy reasons. The center of Tripoli has a low value of connectivity at 3.214 (Table 3.13). In comparison to the value of the correlation between the center of Tripoli and other Libyan cities, the value of the connectivity of the center of Tripoli is close to that of Al-Khums city at 3.745, Ghadames City, Bani Walid City appear to be less connectivity values at 2.7, 2.667 respectively. (Table 3.13).

Figure 3-29 Connectivity Values - The center of Tripoli

The connectivity maps of the center of Tripoli represented by Umar Al-Mukhtar Street and Mizran Street with the highest connectivity values in this area. It is important that the connectivity values varies along Umar Al-Mukhtar Street (figure 3-31). The red colour in the middle of the street represents the highest value in the city, and this part includes commercial activity of shops, cafes, restaurants, hotels and the Tripoli International Fair, which is one of the city's landmarks and an important part of it (Figure 3-30).

a.

b.

c.

Figure 3-30 a. and b. The commercial activity, c. Tripoli International Fair (Url-18; Url-19; Url-20)

At the beginning of the street, the green and blue coloured lines indicate the low value of connectivity, representing the historical area (Al-Medina, Saraya Al-hamra), Maidan Al-Shuhada, public park, government buildings and banks, indicated by the number and short and broken lines intersected with each other in all directions. At the end of the street, the green coloured lines indicate low connectivity values, that this area represents the Jalaa neighbourhood buildings. This street network and connectivity value indicates the unwanted accessibility of strangers to the social

interaction, connection and confrontation of the locals in the system. These residential areas are the most segregated parts of the city, because of security and privacy reasons. Lowest connectivity measures are represented by the blue coloured lines, indicating streets with more privacy, low choice for visitors, limited connection, and difficult wayfinding; especially at the Al-Medina.

Figure 3-31 Connectivity Values - Umar Al-Mukhtar Street

3.4.2.3. Choice

Global choice is a dynamic global measure of the "flow" through a space. A space has a strong choice value when many of the shortest paths, connecting all other spaces to all spaces of a system and passes through it (Hillier, 1984). Axial choice is the measure of choice calculated within an axial map. It measures how often an axial line lies on the shortest topological paths (turnings) between any pair of axial lines (Hillier, 1987). Figure 3-31 shows the Umar Al-Mukhtar Street represented by a red colour in begin this street, it is the highest value in this area, which shows the shortest paths that connect all the spaces in the system. This area is the most known areas in the city of Tripoli, because it is a historical area that reflects the civilization of the city, and at the same time it is a tourist and a vital area. It means that it is easy for the wayfinding in this area, easy to navigate and to have access. Moreover, it is

observed that the middle of the street is represented by a green coloured line, indicating that this area needs more than choice and more paths to access this part. While the end of the street is represented by a blue coloured line, also parts of the most case study are represented by the blue coloured line, except few streets, that are coloured in green. Which shows that the center of Tripoli needs more than one option in identifying the paths, and it is difficult to find the road in that specific area. It is difficult to navigate and to access the parts of the city. In other terms, it needs more experience and several navigation times to understand the city.

Figure 3-32 Choice - The center of Tripoli

3.4.2.4. Intelligibility

The intelligibility of a system is defined as the correlation between the integration and connectivity of the axial lines in that system. Intelligibility can be interpreted in a number of ways. Firstly, Hillier described it as the property of intelligibility of a deformed grid meaning that the degree to which what we can see from the spaces that make up a system is a good guide to what we cannot see, that is the integration

of each space in the system as a whole. The property of intelligibility conjures up aspects of spatial cognition that pertain to motion, wayfinding, navigation and spatial reference, memory, spatial inferences and spatial relations (Hillier, 1996). The measure of intelligibility agrees remarkably well with the intuition of a labyrinthine layout. It would then make sense to consider intelligibility as a neighbourhood property to be intuited from the perspective of the ground. This property requires the inhabitant to move repeatedly through the space to build some kind of mental impression (Dalton, 2007).

The intelligibility indicator for the center of Tripoli is 0.1912 (Table 3.13), which indicates that the center of Tripoli has a low degree of intelligibility. In comparison to the value of the correlation between the center of Tripoli and that of other Libyan cities, the intelligibility value to the center of Tripoli with Al-Khums city at 0.3286, the intelligibility value of the center of Tripoli is less than the value of Al-Khums city. While Ghadames City and Bani Walid City appear to have least the intelligibility values at 0.122 and 0.0624 respectively than that of the center of Tripoli. The center of Tripoli the intelligibility value indicates that there is a high degree of privacy, inward-looking structure, and difficult wayfinding. This implies that users confront difficulty in capturing the whole structure of the city from their experience of the small parts. The center of Tripoli need more steps to understand the whole parts of the city.

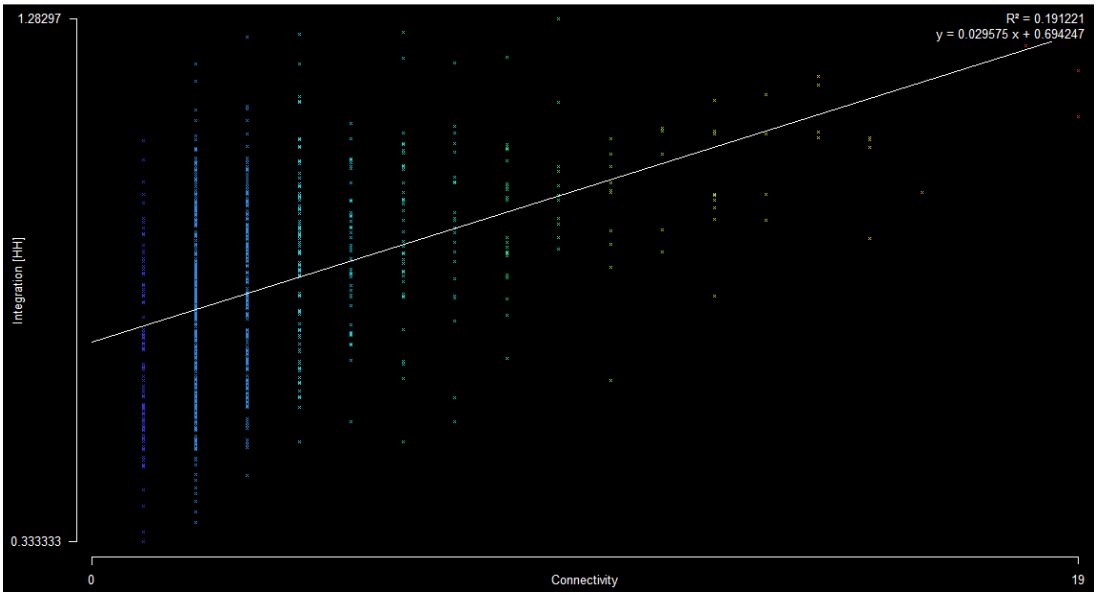


Figure 3-33 Intelligibility - The center of Tripoli

3.4.2.5. Synergy

Synergy is the measure of the correlation between global integration value and local integration value. This measure reflects how the global structure of an entire entity like a city or city region is reflected in the local structure of space (Dalton, 2007). This implies that the spatial structures bolster or hinder the stream of motion between the local level and the global level, between residents and guests. Again, to quote, research has shown that the critical thing about urban sub-areas is how their internal structures relates to the larger scale system in which they are embedded (Hillier, 1996).

The center of Tripoli registered a good value at 0.5225 (Table 3.13), this indicator also shows the support of the city integration and cultural exchange the users of urban space. While AL-Khums city recorded a high value at 0.7128, this value is higher than that of the center of Tripoli. However, the synergy values of Ghadames city and Bani Walid city are lower: 0.227 and 0.2247 respectively. This means that the structures of the space of the city support positive interaction between inhabitants and visitors. It reflected relations between tourists and residents, because the center of Tripoli includes many archaeological, tourist, commercial and administrative areas.

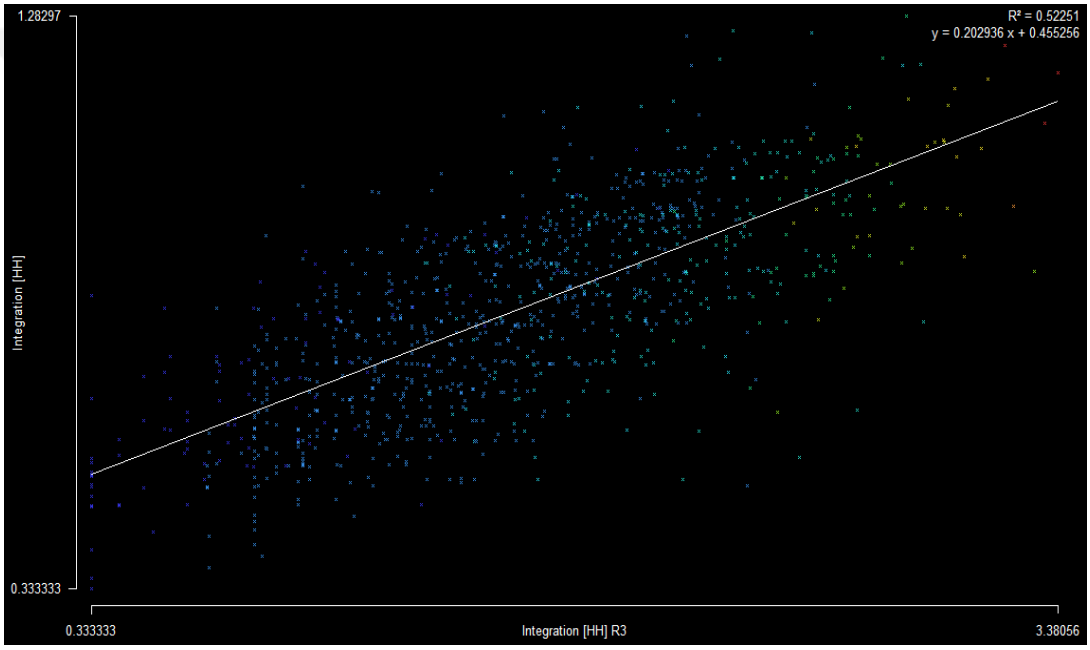


Figure 3-34 Synergy - The center of Tripoli

Table 3. 13 Averages of different Libyan cities

Cities	Connectivity C	Local Integration R3	Global Integration Rn	Intelligibility Rn / c	Synergy Rn/ R3
Libyan Cities	3.53	3.53	0.904	0.192	0.369
Ghadames City	2.7	2.7	0.558	0.122	0.227
Al-Khums City	3.745	1.842	1.293	0.3286	0.7128
Bani Walid City	2.667	1.303	0.348	0.0624	0.2247

Source: Agael, 2017

The center of Tripoli	3.214	1.640	0.786	0.1912	0.5225

prepared by researcher, 2017

3.5. Comparison between Mental image and Space Syntax data for the center of Tripoli

This study discusses the relation between visual formation according to the image of the city and spatial configuration according to the space syntax theory, through the analysis of case area (The center of Tripoli).

Paths: Paths of the center of Tripoli, the main streets were high drawn by people in the region of integration and connectivity with the Maidan Al-Shuhada, for instance; Umar Al-Mukhtar Street and Al-Fatih Street, and the streets that follow Mizran Street, Al-Nasr Street, 24 December Street, and then Al-Istiqlal Street, Amar Bin Al-A'ss Street and Rashid Street (figure 3-35). Each of these streets are considered to be one of the main streets, which have a great importance for the center of Tripoli. This

area represents the historical, archaeological, commercial (shops, cafes, restaurants and hotels), administrative and governmental area. It is interesting to note that the Al-Fatih Street got high drawn from people in mental mapping, which is in the contrary to the spatial structure of the city in spatial configuration values, as this street is located in a least integrated and least connected area, also it has the lowest choice. This street is very important for people, is because this road links the suburbs of Tripoli to the city center, as people reach the city center quickly in a short time. It is easy for orientation, as well as the effect of the edges (Sea) on it as the road leading to the harbour. Physical features may be more important to identify the road as prominent elements. In other areas, the percentage of integration in the spatial configuration of the city gets high values, as well as in connectivity values, with the exception for some streets, especially Al-Medina. However, this area has got a low drawn from people, except few streets that drawn lowly. This is also on the contrary to the mental image and spatial configuration, where the concentration of people was on the main known streets of the city, also increase the pedestrian's movement. Perhaps the most important reason is that most of the city streets remained on the labels of the Italian period in the city. There is also no local post-office (delivery of goods) in Libya, because of this point the majority of people do not know the names of the streets. Also, the connectivity values is not high in all areas, but there are differences in connectivity from one area to another. Moreover, the choice values are low in the area, except for the beginning of Umar Al-Mukhtar Street, which is in the high value choice ratios, for the importance of this area is historical, archaeological and tourist. Making it easy to identify and easy to access and also there is a high pedestrian's movement in it.

Figure 3-35 The streets in the center of Tripoli

Global Integration - Paths

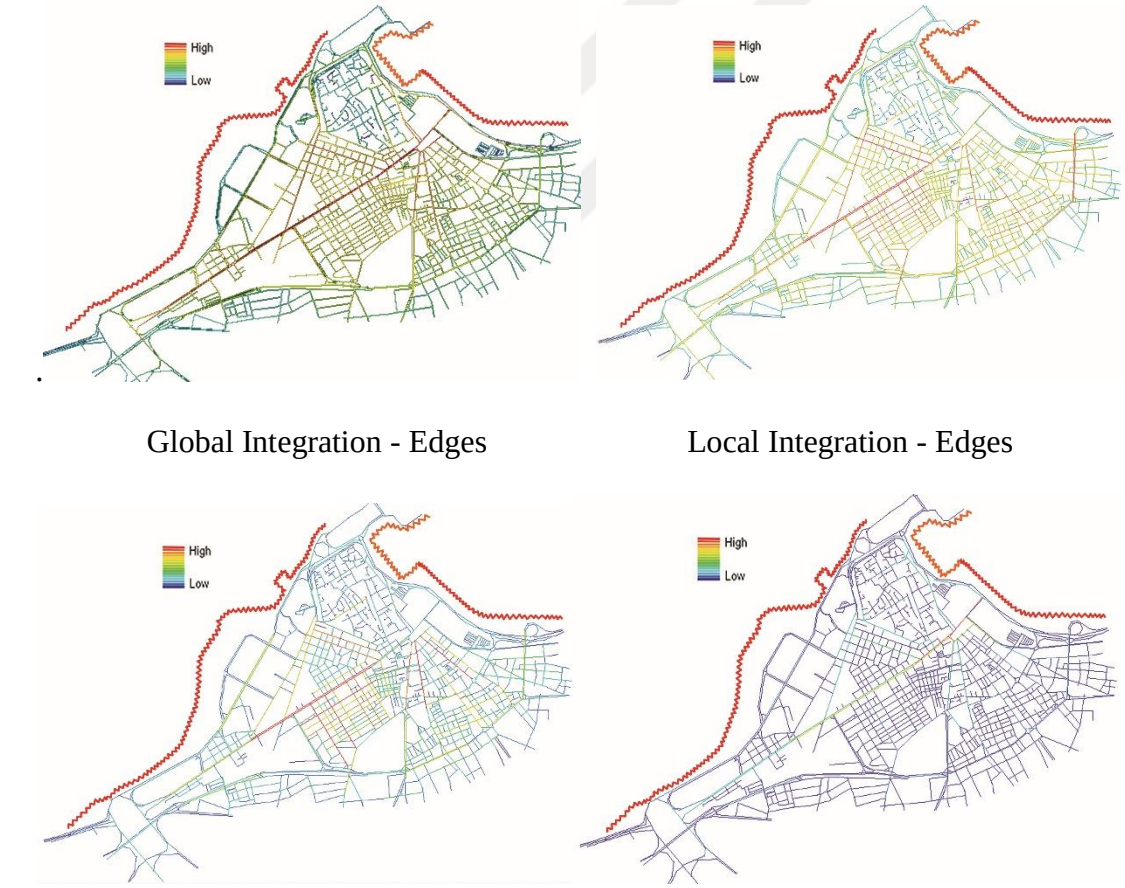
Local Integration - Paths

Connectivity - Paths

Choice - Paths

Figure 3-36 Paths - Mental maps results and DepthmapX results in the center of Tripoli

Edges: The sea can be considered as a strong edge of the city, and the harbour has a significant influence to it. This means that the roads adjacent to the sea are more visible and intelligible for people, and it makes it easier to identify the road (wayfinding). Furthermore, it can greatly affect the suburbs of the city and neighbouring cities. The harbour is also considered to be a strong edge for people, the harbour performs an important economic role in the city and is a vital source for it, also a source of livelihood. These streets are located next to the sea and the harbour, these streets that has been located are low integration and with low connectivity, this shows the difference between the spatial structure and the degree of clarity of people.



Global Integration - Edges

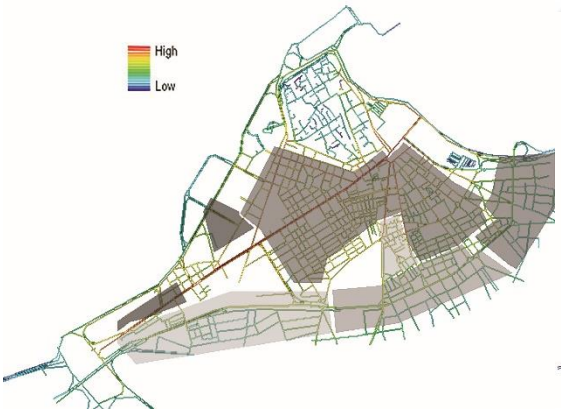
Local Integration - Edges

Connectivity - Edges

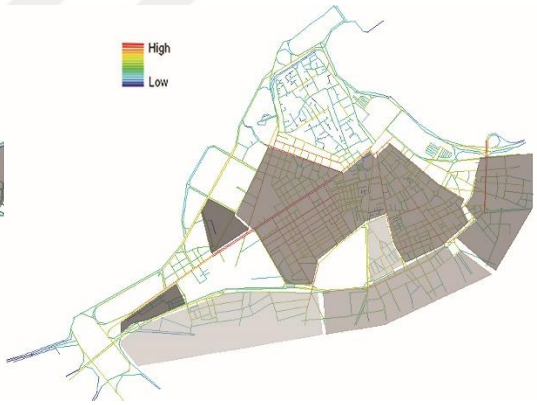
Choice – Edges

Figure 3-37 Edges - Mental maps results and DepthmapX results in the center of Tripoli

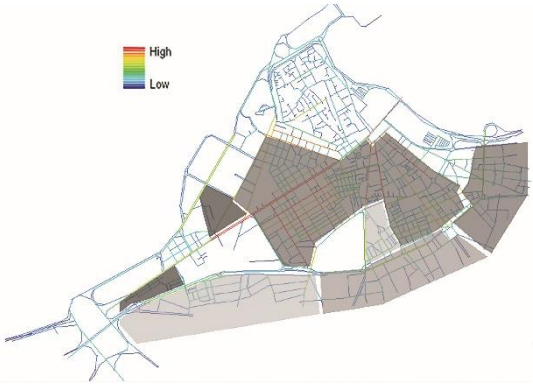
Districts: The Jalaa neighbourhood (Jalaa district) has the highest drawn from people. Many people live in this neighbourhood, because it is composed of buildings with high multi floors, making them easier for people to observe. Also, it is located next to the Jalaa Hospital for women and children, with a high movement of people there. This district is located in a separate area with low integration and connectivity streets, indicating more privacy, low choice, limited connection and difficulty for wayfinding within the neighbourhood. Al-Medina district, which had the higher drawn from people, is located in a connected area with more integrated streets, and most of the streets have medium to high connectivity values. This district is the largest in the city center, located on the main streets of most importance in the city. Other districts located on the borders of the case study had a low drawn from people, where people focus was more in the city center around Maidan Al-Shuhada, because these districts are large they are important to the city and to the people.



Global Integration - District



Local Integration - District

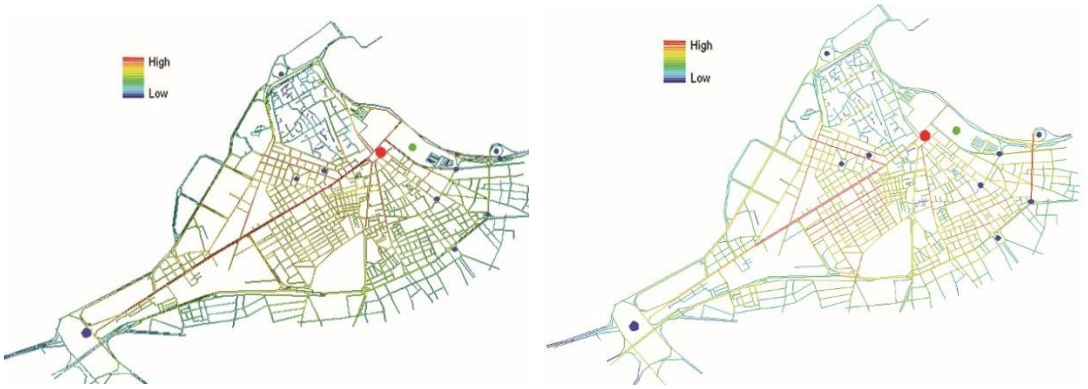


Connectivity - District

Choice – District

Figure 3-38 District - Mental maps results and DepthmapX results in the center of Tripoli

Nodes: The nodes in Tripoli are also of great importance to the city, especially for Maidan Al-Shuhada, it has the highest drawn from people. Which represents a social space, and most celebrations and religious events, are performed in it, because of its strategic location in a special area of the city. Besides, it is in the historic area, archaeological (Saraya Al-Hamra and Al-Medina) as well as the shops that sell traditional clothes for men and women. It branches out from the most important main streets of the city. This node is located in a connected area with more integrated streets, and most of the streets have medium to high connectivity values. This Maidan and these streets are easy to the find, accessibility for people, and easy to direct them through it. This Maidan symbolizes Libya's history, where the most significant events are held. Noticing that, the other nodes in the city are least intelligible and categorized than the people, including the historical Maidans of the city, and are significant in orientation within the city, both of which are historical landmarks (Maidan Ghazali and Maidan Al-Jazair) (figure 3-39). This area has less pedestrian movement, Also these nodes are located in streets with low integration, low connectivity, and low choice.



Global Integration - Nodes | Local Integration - Nodes

Connectivity - Nodes | Choice – Nodes

Figure 3-39 Nodes - Mental maps results and DepthmapX results in the center of Tripoli

Landmarks: The city landmarks is the most obviousness feature for people, because of its significance to the city and especially in the guidance. Maidan Al-Shuhada has received the highest overall drawn from people, as it is one of the most important features of the city of Tripoli, due to its great significance to the city. This node is located in a connected area with more integrated streets, and most of the streets have medium to high connectivity values, also it is easy to wayfinding, easy to navigate and access, with more choice in the city.

Saraya Al-Hamra is a historical and archaeological symbol for Tripoli city, which is a distinctive and a significant feature. It is located adjacent to Maidan Al-Shuhada, and it overlooks Umar Al-Mukhtar Street and Al-Fatih Streets. It is located in the north eastern corner of Al-Medina, overlooking its harbour, and the Saraya lake, part of Saraya Al-Hamra represents the Tripoli Museum. This is one of the oldest and largest Libyan museums, displaying the heritage and history of Libya across

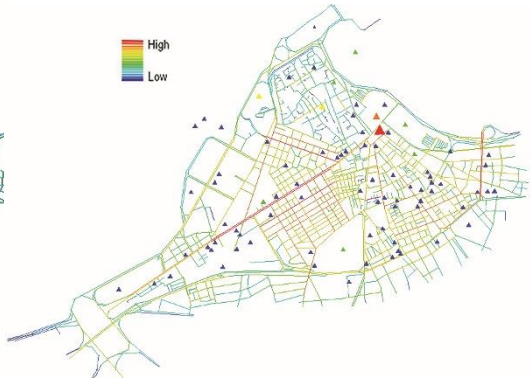
different periods of time, including the civilizations of Libyan tribes, Greeks, Phoenicians, Romans, Byzantines and Arab ages (Figure 3-40).

Figure 3-40 Saraya Al-Hamra (Url-21)

There are other landmarks in Tripoli with the same importance and are very well known. However, it is noted that they had low drawn from people. This is because they are located in the administrative and governmental areas, but with no commercial area in it, and with less people movement (Figure 3-38). Furthermore, there are buildings under construction that are located in an area with low integration and connectivity.

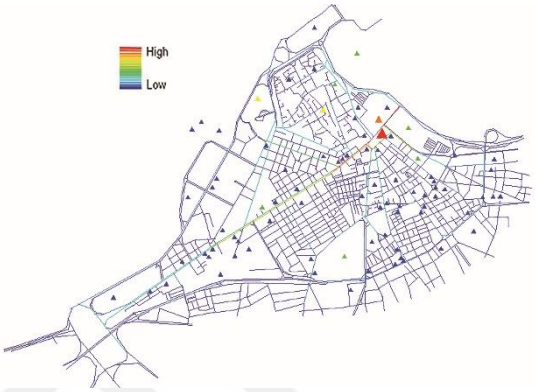
Figure 3-41 Administrative and governmental areas in The center of Tripoli (Url-22)

Global Integration - Landmarks



Local Integration – Landmarks

Connectivity - Landmarks



Choice – Landmarks

Figure 3-42 Landmarks - Mental maps results and DepthmapX results in The center of Tripoli

The comparisons of mental maps and spatial configuration demonstrate that the center of Tripoli has low intelligibility, which causes wayfinding to be difficult. The exceptions in this difficulty are some main paths and landmarks, which have already been mentioned above.

Results of the analysis confirm the necessity of achieving an image of the city with regard to the city elements for an enhanced wayfinding. Spatial analysis have also shown that it is possible to access intelligibility through space syntax theory. There is strong relation between the findings of mental mapping and spatial analysis, both highlighting the historical area and the most important paths of city center.

4. CONCLUSION

Reliance on environmental features through urban navigation increases in unknown or unfamiliar environments. Repeated visits make people move more powerfully and confidently, and makes them depend on spatial structures more as visual evidence. Also, it makes it easy to move from space to space spontaneously, and the sequence between the spaces among the city's landmarks helps in the orientation of people through the area with easy wayfinding and navigation.

This study shows that the centre of Tripoli require knowing the visual formation and the spatial configuration. The two theories, which are Kevin Lynch’s imageability and Space Syntax, are complementary in giving the most accurate details and results, and it appears that there is a strong correlation between these two theories. Although it is objective and it can interpret some problems in wayfinding in special situations, space syntax falls short in explaining the entire wayfinding behaviour. Also Lychian method is subjective in general in interpreting the identification of wayfinding within the city. This means that the combination of the two methods will be powerful and useful in analysis. As Lynchain method provides a forecast about the image of the city, space syntax estimates this image with a qualitative aspect, which makes the two methods complementary of each other.

The centre of Tripoli has low intelligibility. According to mental maps, Maidan Al-Shuhada has the highest drawn from people. The historical area have more intelligibility in the centre of Tripoli and also includes the more integrated and connected areas of the city. This area has a great impact on people whether they are "inhabitants" or "visitors". According to mental maps, Umar Al-Mukhtar Street (being the first) has the highest people drawn with the highest values of integration and connectivity and has the highest choice values. On the second place, 3 streets have high people drawn with medium to high integration and connectivity values, which are Mizran Street, Al-Nasr Street and 24 December Street. On the third place, 3 streets have medium drawn with medium to high integration and connectivity values, which are Al-Tisiqlal Street, Rashid Street, Amar Bin Al-A'ss Street.

According to the mental maps and spatial analysis, Al-Fatih Street has the second highest people drawn, yet has low integration and connectivity values.

This results indicate the spatial structure a good and strong relationship between drawn of inhabitants and visitors, as this area has a great importance to the city.

The edges in the centre of Tripoli (Sea and harbour) have higher people drawn as the sea ranked first, but they are located in a separate area and have low integration and connectivity values.

The most common node is Maidan Al-Shuhada that is located between the streets with high integration and connectivity, and the highest choice values. The second node in intelligibility is the Public Park, as it is located next to the historical area and the sea, linking Umar Al-Mukhtar Street and Al-Fatih Street, the streets that have the highest visibility in the mental maps. The other nodes have low people drawn, and low to medium values in regard to integration and connectivity.

The most important landmark in the center of Tripoli is Maidan Al-Shuhada. On the second landmark, there is the historical area, including the Saraya Al-Hamra with high drawn of people and high integration and choice, but low connectivity values, overlooking the most important streets of the city. Then comes Al-Medina that reflects the Libyan civilization through various periods, making this area an important historical landmark of both Tripoli and other cities.

Of all these results the focuses of intelligibility in the city are, the historical area, including Maidan Al-Shuhada, the Saraya Al-Hamra and old city "Al-Medina", the main streets and Al-Nasr Street which have high results in the intelligibility according to people's drawn with high to low integration and connectivity values. Thus, facilitating mobility and accessibility in these areas are easily recognizable for wayfinding. However, other areas are difficult for wayfinding and navigation. So, the centre of Tripoli, according to the results, is limited in clarity and readability, requiring solutions and ways to help to navigate inside the city and to make it more visible.

4.1. Recommendations

The results obtained from this study puts forth the following recommendations for the improvement of the centre of Tripoli:

- The city should be intelligible, visually and spatially. This confirms that the spatial configuration and visual configuration is strongly correlated.
- Emphasis must be on nodes, especially Maiden "squares" in the centre of Tripoli (Maidan Ghazali and Maidan Al-Jazair), and also more support should be given for these areas, so that there will be incentives to encourage pedestrian movement, providing a unique character in the city and ease for wayfinding.
- The system of street names should be reconsidered, should be enhanced by signage that would be put in places that are easy to observe. The design of the signage should be creative and consistent with the nature of the society for the people who live in the city or for visitors. Also, applying several names to the same street should be avoided.
- In order to become more integrated with the city, the governmental and administrative areas should be merged, especially the area that has the view of the sea in the city centre. This overcomes isolation in this area and it focuses on the establishment of commercial and entertainment centre with the areas where there are tower buildings under construction.
- The northern part of the area should be upgraded in order to complete the character of the centre of Tripoli and to create integration between southern and northern parts. Redesigning the city centre with regard to the old city would positively change the character of this part of the centre of Tripoli and make the area more welcoming to the users.

4.2. Future Research

This thesis proposed a comparative study between the Lychian Method and the Space Syntax. It focused on the process of the wayfinding in the case area. With the results and recommendation provided in this study, a more detailed research on evaluating the effectiveness of roads can be carried out, in order to help planning the movement axes of the city which would give an important and accurate understanding of the city, and would guide the development of the road network promoting pedestrian movement.

It is believed that the study encourages the use of complementary techniques to study the degree of intelligibility and problems of wayfinding.

The results of this study would be a powerful background for a comparison with other Libyan cities to achieve more accurate and exciting results.

The study of the process of the wayfinding in the case area, using Lynch's theory of analysis visual formation, focusing on the gender and different age groups.

REFERENCE

1. Abdelatif. M. O. EL- Allous. (2016). The Historical Transformation of Civic Architecture City Council Buildings and Urban Change in Tripoli, Libya.
2. Ahmed R. A. Al-Meghary. (2015). The role of the Paths and Visual Endings in the formation of the Image of the city (Case Study - Gaza City. Islamic University – Gaza.
3. Agael Fawzi. (2017). Relations between Built Environment and Human Perception (Case Study: two Libyan cities Al-Khums & Bani Walid), Okan University.
4. Aisha A. Atmansuri, Steve Curwell, David Dowdle. (2009). Designing a Dwelling Unit in Tripoli -Libya by Using Sustainable Architectural Principles, University of Salford, UK.
5. Ameera Jaleel, (2013). Legibility Environment Urban of Al-Kifl Historical City.
6. Amiruddin Ismail & Adel Ettaieb Elmloshi. (2011). Existing Transportation Scenario In Tripoli, Libya.
7. Andrade, R., & Schieck, A. F. G. (2015). Wayfinding to support urban exploration: Combining space syntax analysis with social media data for navigation system design. Proceedings of the 10th International Space Syntax Symposium, London, 117:1-117:19.
8. Awadh Ahmed Ali. (2004). The Morphology of Tripoli's City Center.
9. Barghouthi Abdel Latif Mahmoud. (1967). Ancient Libyan History from ancient times until the Islamic conquest.
10. Baskaya, A., Wilson, C., Ozcan, Y., (2004). “Wayfinding in an Unfamiliar Environment Different Spatial Settings of Two Polyclinics”, Environment and Behavior, 36, 6, 840.
11. Beatrix Emo. (2014), Seeing the Axial Line: Evidence from Wayfinding Experiments. Bartlett School of Graduate Studies, University College London.

12. City of Victoria, (2016), Victoria Wayfinding Strategy - Step 1: Analysis Report, Visual Victoria—Re-Imagining our Public Space.
13. Dalton Nick Sheep. (2007). Is Neighbourhood Measurable? . The Bartlett School of Graduate Studies, UCL.
14. Damla Zeybekoğlu Atik, Hatice Kiran Çakir, Esin Benian. (2009). The Importance Of City Image Elements Through Recognizing and Introducing Of Cities: Edirne. Trakya University, Faculty of Engineering and Architecture, Department of Architecture, Edirne / TURKEY.
15. Elbendak Umar Emhamed. (2008). Urban Transformation and Social Change in a Libyan City: An Anthropological Study of Tripoli.
16. Garling, T., Lindberg, E., & Mantyla, T. (1983). Orientation in buildings: Effects of familiarity, visual access, and orientation aids. Journal of Applied Psychology, 68, 177-186.
17. Haq, S. (1999). Expectation of exploration: evaluating the e®ects of environmental variables on wayfinding in: T. Mann(ed), The Power of Imagination, Vol. 1, EDRA, Orlando, FL, p. 84 – 94.
18. Haq, S., Girotto, S. (2003). "Ability and Intelligibility: Wayfinding and Environmental Cognition in the Designed Environment", J. Hanson (Ed.), Proceedings, 4th International Space Syntax Symposium, UCL, London.
19. Hillier, B. (1996). Space is the Machine: a Configurational theory of Architecture. Cambridge: Cambridge University Press.
20. Hillier, B., Burdett, R., Peponis, J., Penn, A. (1987), Creating Life: Or, Does Architecture Determine Anything? Architecture et Comportment/Architecture and Behaviour , 3 (3) 233 – 250. pp. 23.
21. Hillier, Bill. Space Syntax as a Theory as well as a Method. (2014.) ISUF 21st International Seminar on Urban Form.
22. Hillier, Bill & Julienne Hanson. (1984). The Social Logic of Space. Cambridge.
23. Kaplan, S & Kaplan, S. (1983). Cognition and Environment. New York: Praeger.
24. Kevin Lynch, B. (1960). The Image of the City.
25. Kim, Y.O. (2001). "The Role of Spatial Configuration in Spatial Cognition", J. Peponis, J. Wineman, S. Bafna (Eds.), Proceedings, 3rd International Space Syntax Symposium, Atlanta

26. Kim, Y.O., Alan, P. (2004). “Linking the Spatial Syntax of Cognitive Maps to the Spatial Syntax of the Environment”, Environment and Behavior, 36, 4, 483.
27. Lingzhu Zhang, Alain Chiradia, Yu Zhuang. (2013). (In The Intelligibility Maze Of Space Syntax: A space syntax analysis of toy models, mazes and labyrinths). Sejong University.
28. Mohammed Ibrahim. (2002). Environmental considerations into motion axes urban planning, Ain Shams University.
29. Mohsen Salah Eldin Youssef. (1983). Summary book" Image of the city".
30. Osama Kh Ali. (2008). Changes in residential land-use of Tripoli city, Libya: (1969-2005).
31. Penn, A., (2001). “Space Syntax and Spatial Cognition Or, Why The Axial Line?”, J. Peponis, J. Wineman, S. Bafna (Eds.), Proceedings, 3rd International Space Syntax Symposium, Atlanta.
32. Peponis, J., Zimring, C., & Choi, Y. K. (1990). Finding the building in wayfinding. Environment and Behavior.
33. PWL PARTNERSHIP LANDSCAPE ARCHITECTS INC, LANDSCAPE ARCHITECTS + URBAN DESIGNERS. (2016). VICTORIA WAYFINDING STRATEGY, Step 1: Analysis Report, VISUAL VICTORIA—Re-Imagining Our Public Space.
34. Ron Apelt, John Crawford and Dennis Hogan. (2007) Wayfinding design guidelines. Cooperative Research Centre for Construction Innovation.
35. Saad Algziri, (1995). The Libya study in geography. In: Saad Algziri, Alhadi Bolegmah (eds),Urbanization. Dar Libya, Sirt, Libya,.
36. Wadah Hani. (2014), The effect of the visual configuration of the architectural spaces in the interior Wayfinding, Tishreen University Journal for Research and Scientific Studies.
37. Young Ook Kim. (2001). The Role of Spatial Configuration in Spatial Cognition University of Sejong, Korea.
38. Url-1: http://designforwalking.com/are-paths-the-primary component-of landscapes/
39. Url-2: http://www.npr.org/tags/126951797/cycling
40. Url-3: http://www.turkeymoon.com/439
41. Url-4: http://www.okctalk.com/showthread.php?t=40380&styleid=20

42. Url-5: https://takeweek.com/hungary/
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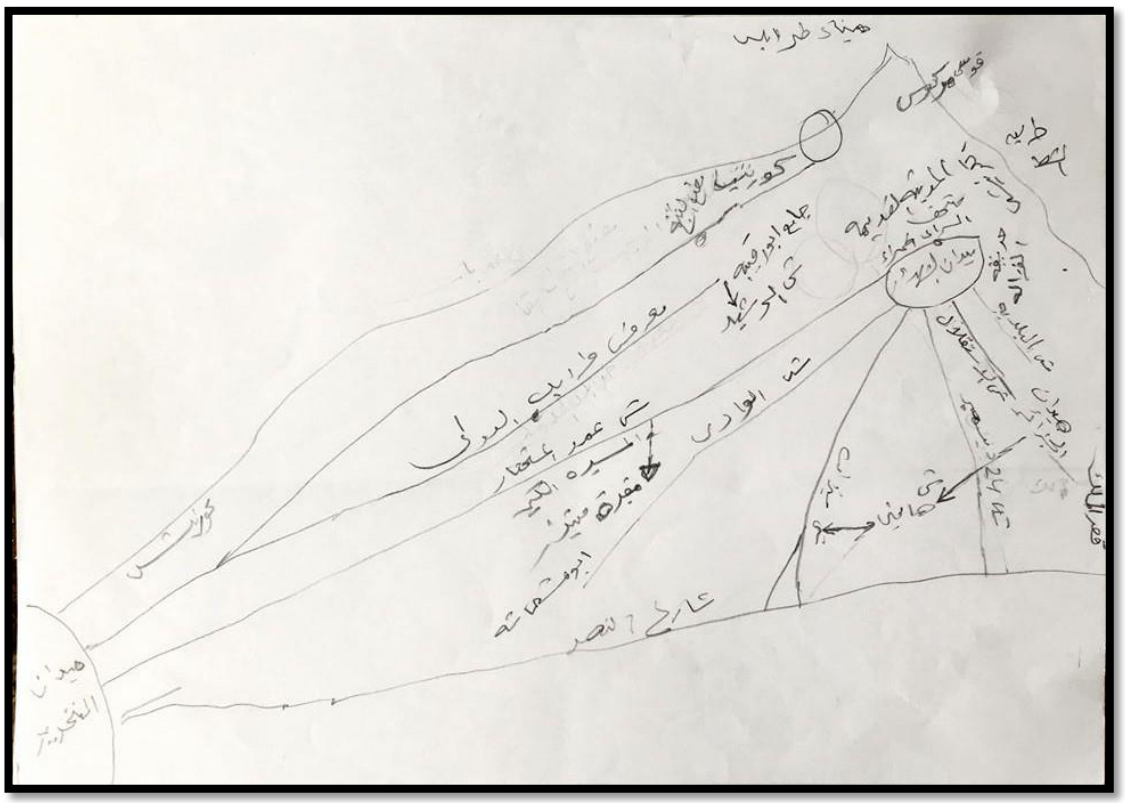
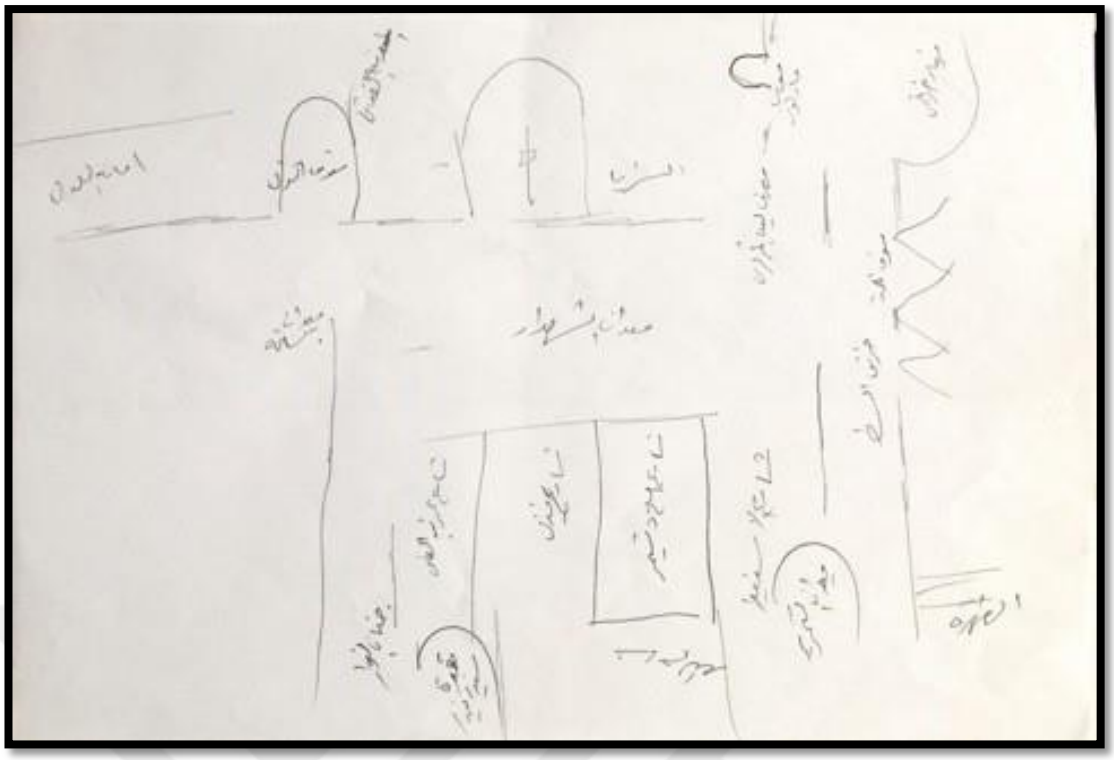
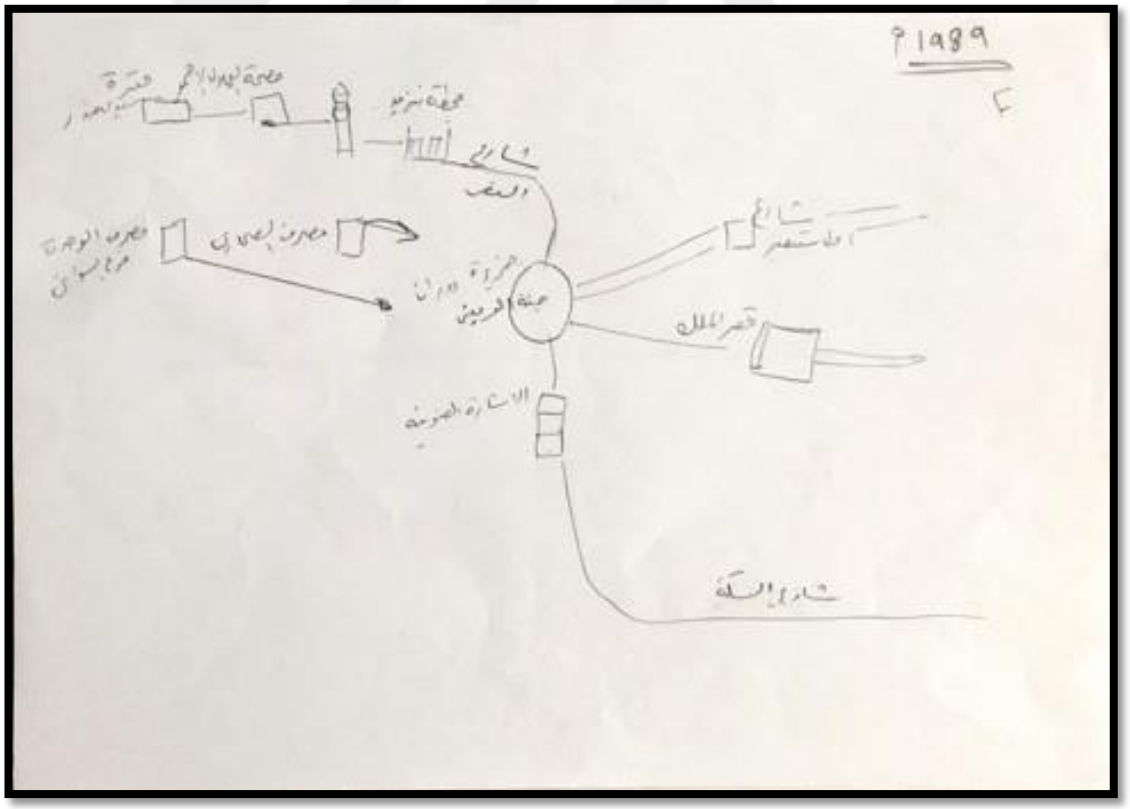
APPENDIX

The different examples to mental image of The center of Tripoli by females:



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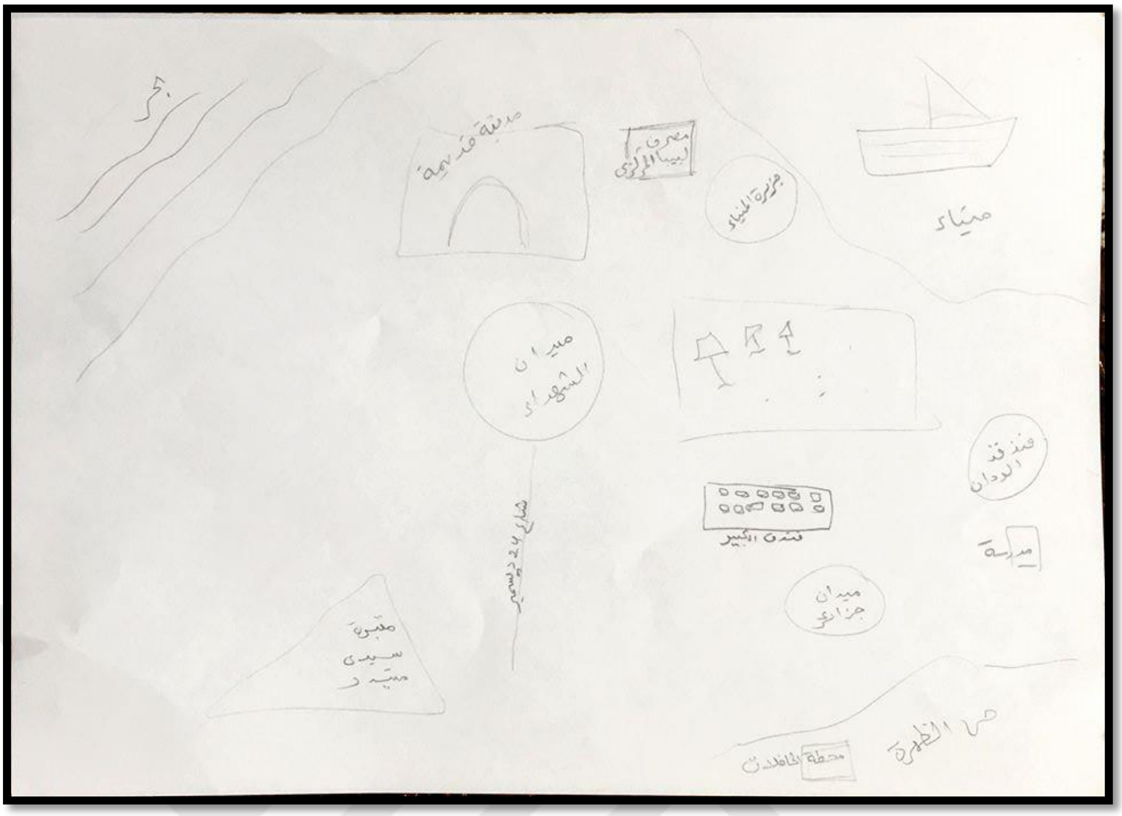
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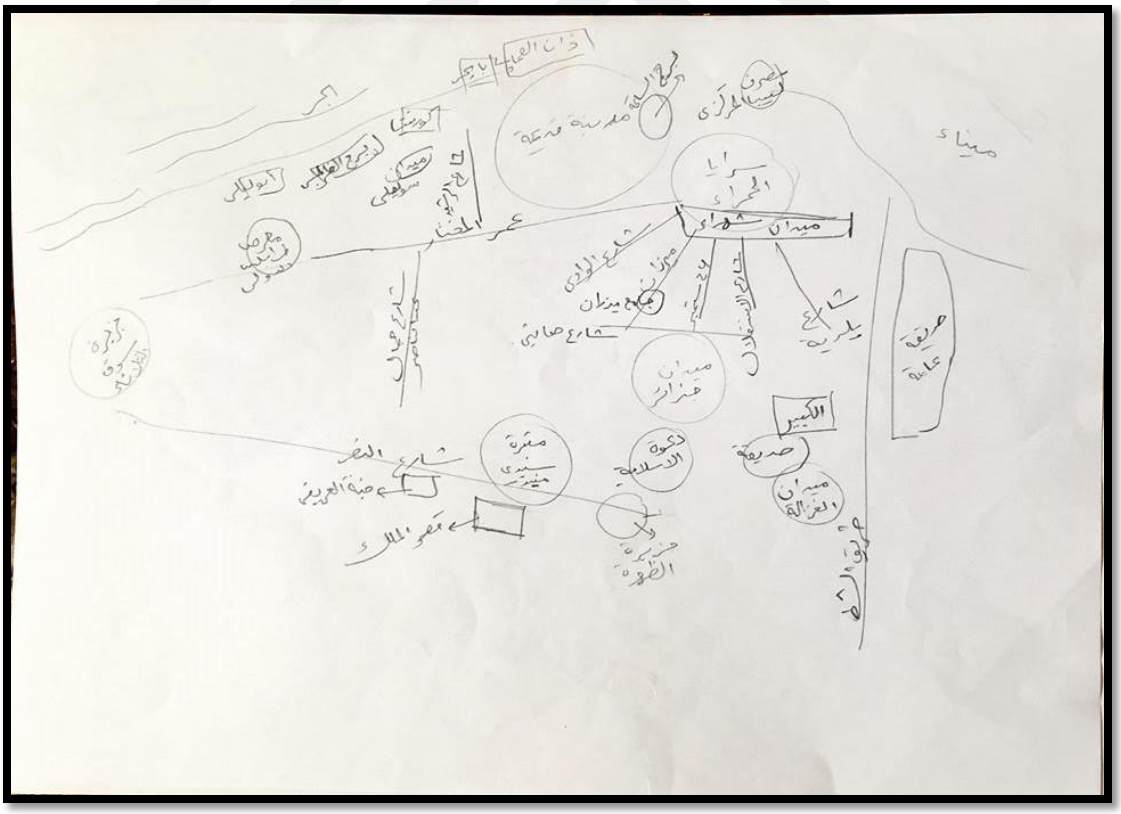
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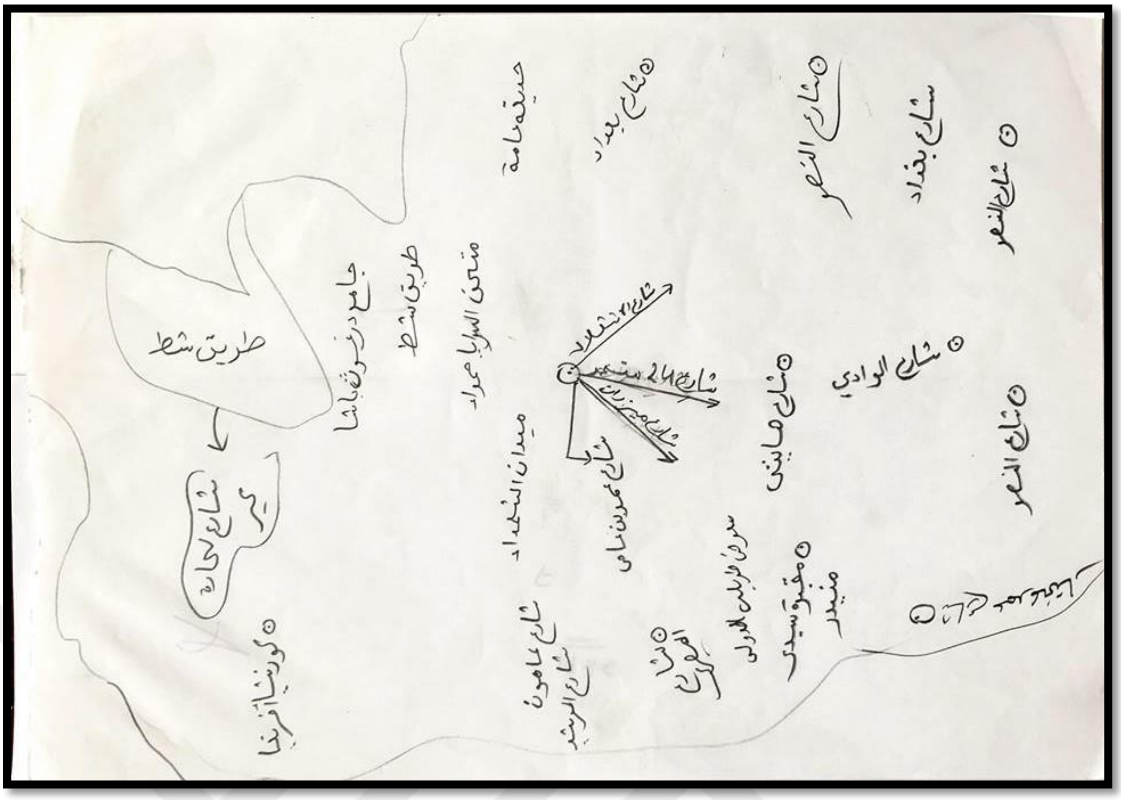
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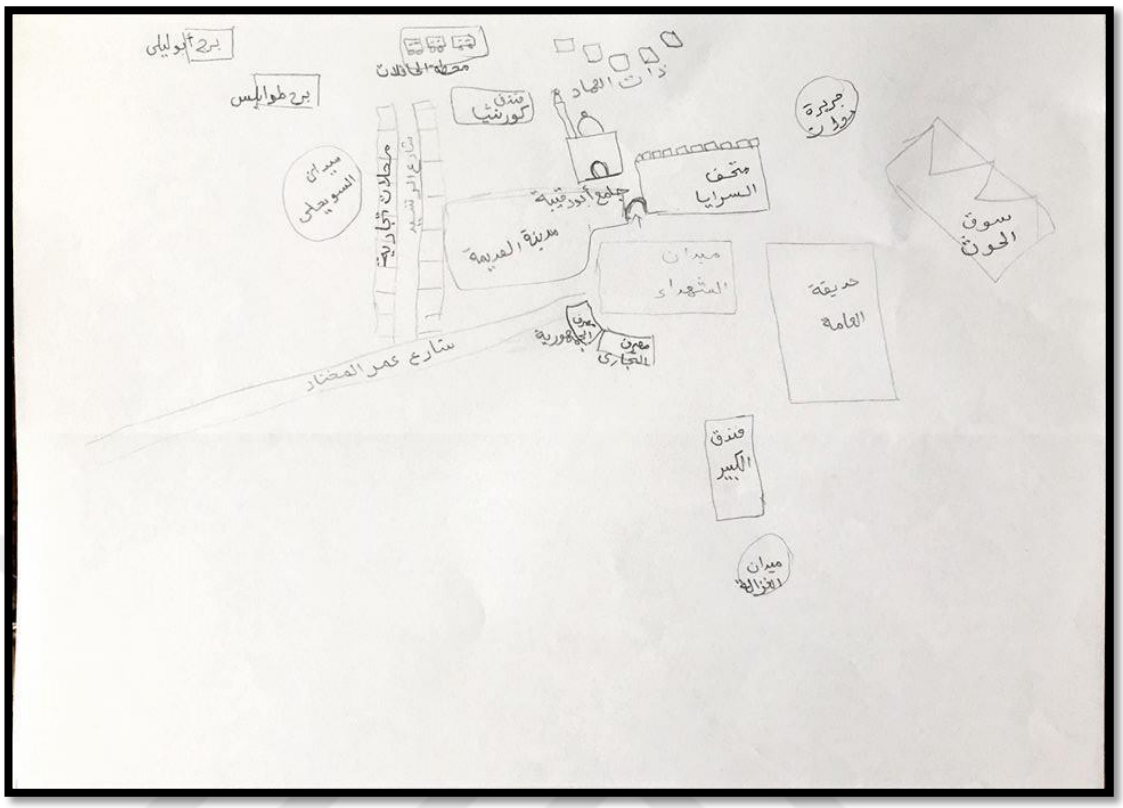
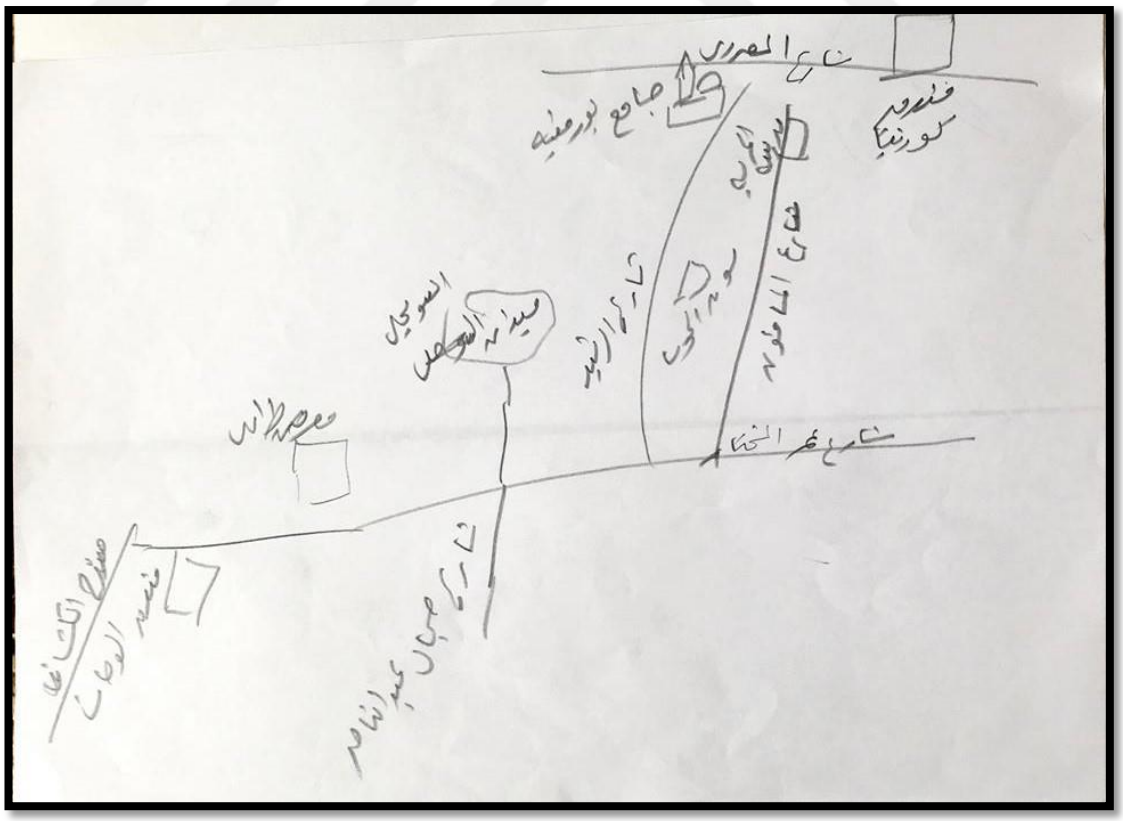
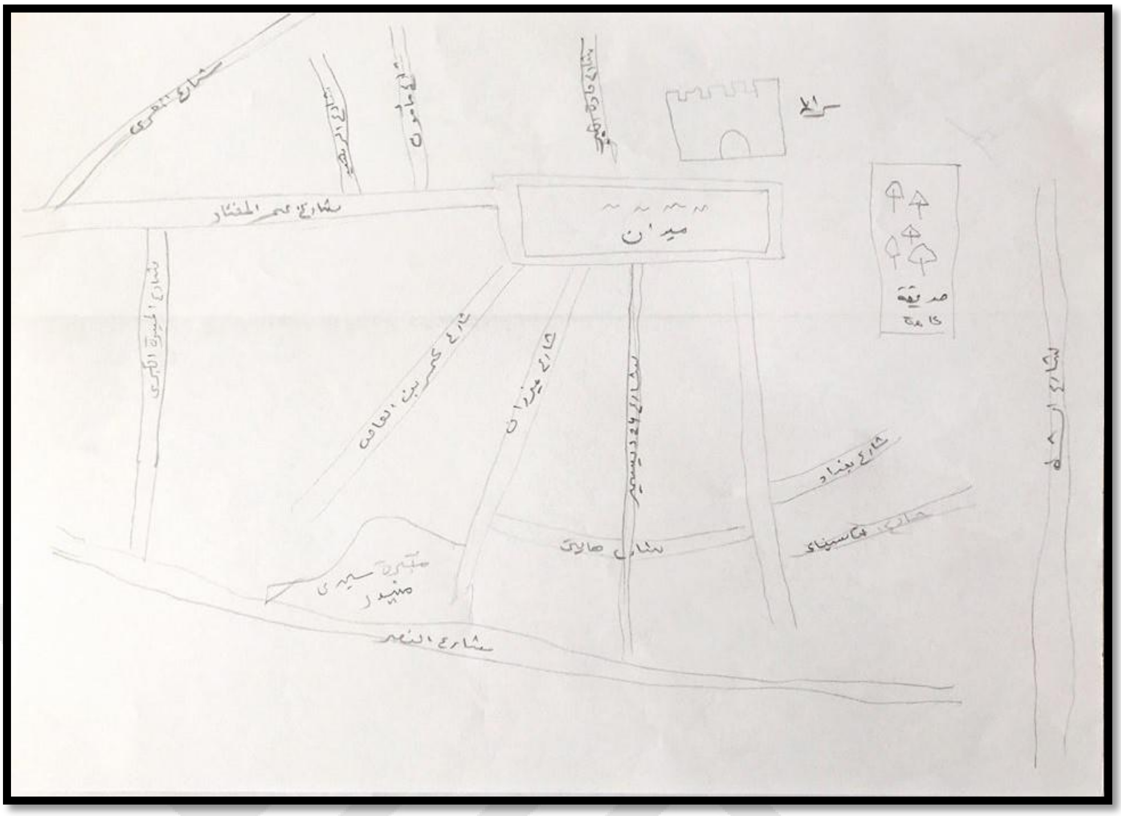
شارع النصر
شارع الوادي

The different examples to mental image of the center of Tripoli by males:



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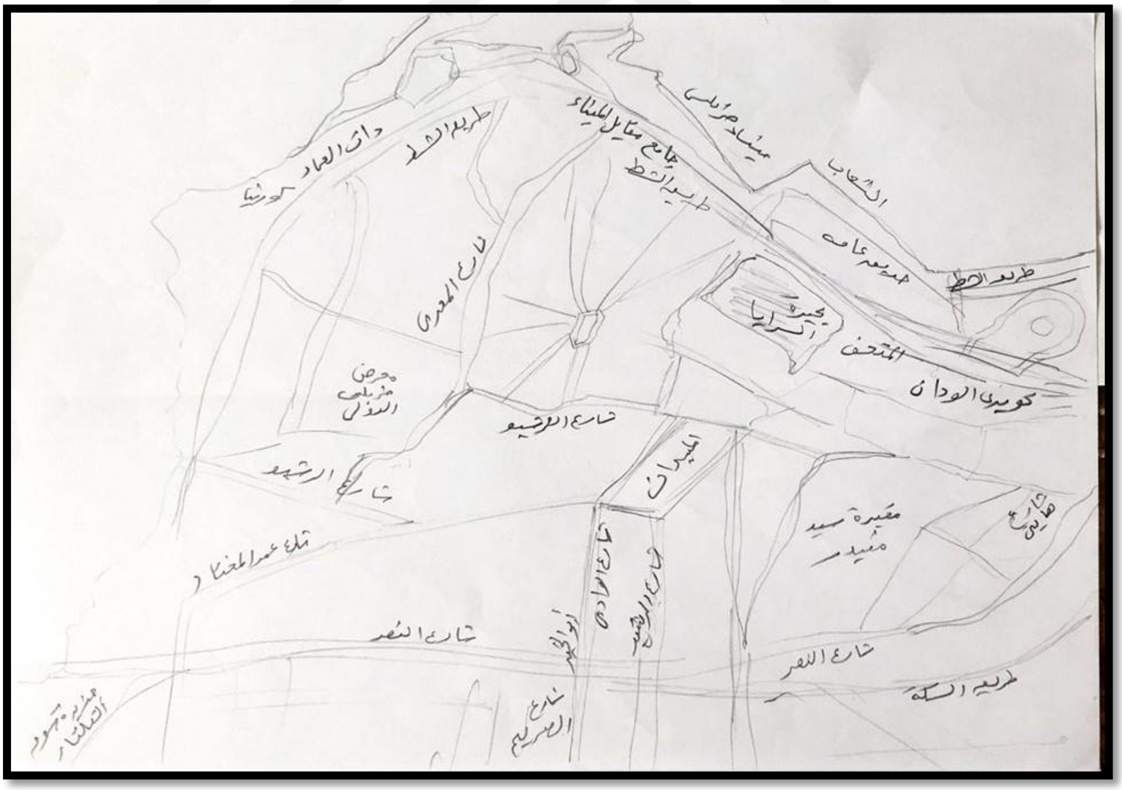
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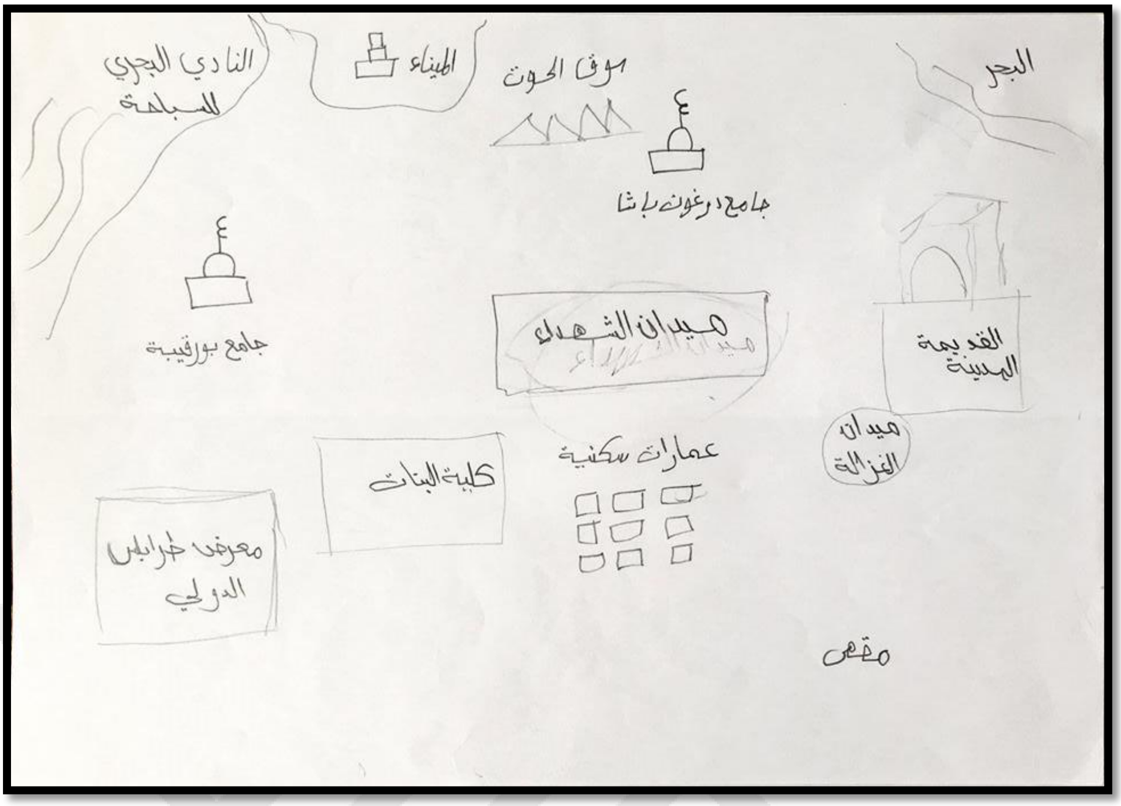
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ميدان الشهداء
القديمة
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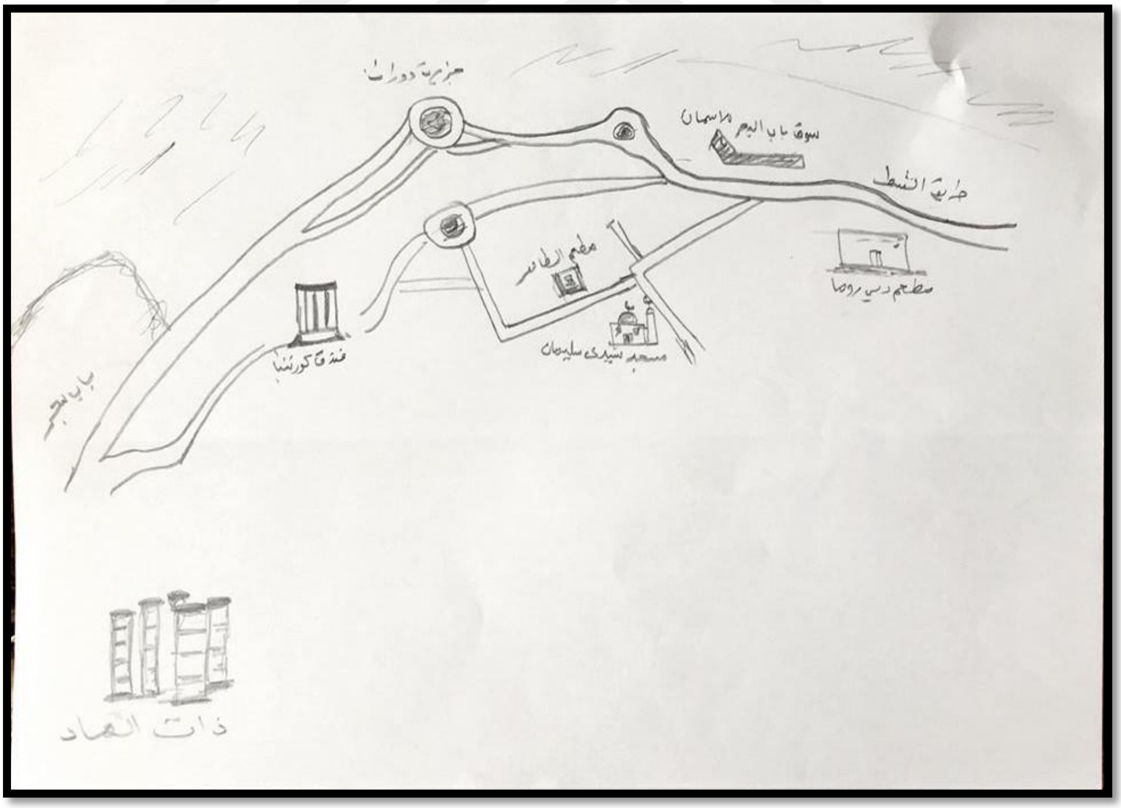
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باب بحر
ذات العماد