Sustainable urban design of historical city centers

FEZZAI Soufiane\textsuperscript{a}, MAZOUZ Said\textsuperscript{b}, AHRIZ Atef\textsuperscript{c}

\textsuperscript{a}Senior lecturer, Department of Architecture, University of Tebessa; Doctoral student, University of Biskra, Algeria
\textsuperscript{b}Professor, university of oum bouaghi 04000, Algeria
\textsuperscript{c}Senior lecturer, Department of Architecture, University of Tebessa, Algeria

Abstract

In the last few decades, sustainability has been introduced as one of the major concepts of design. It is the key to preserve a safe future for our communities. This concept introduces many techniques that change the way to read the urban configuration of urban heritage to search for the main parameters in urban space that manage the relation between designers think; it changes also the configuration of urban and architectural environment.

First we try to space configuration and urban behavior. This study has as aim to create a model of analyzing urban space as a support of urban behavior and a generator of social sustainability through preserving heritage and traditional values.

The analysis model is drawn theoretically then tested on a set of case studies of historical city centers to prove its efficiency; the main case tested in this work is the historical center of Constantine (Casbah).

The analysis model is based on space syntax methods and parameters, using applied analysis based on plans of different historical phases of urban growth and on site investigation.

As a conclusion, we try by this work to show parameters of sustainability in urban space and the influence of urban changes on these parameters. The analysis model can be used to show how to use these parameters in future design operations to ensure urban sustainability.

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Keywords: urban heritage, sustainability, space configuration;

1. Introduction

The traditional analysis of urban space is usually focused on a morphological or historical approach trying to determine the architectural and urban character or justify the historical development of the urban fabric. The main objective of such approaches is to analyze configurations, techniques and architectural style. Urban fabric is always studied as a result of other disciplines. However many researches approved that social behavior or transformation
depends heavily on spatial configuration, which means that it must be analyzed as an influent factor in social structure [1].

The paper’s main aim is to study how the configuration of traditional urban space contributes in preserving social values especially in Specific societies, to understand how spatial transformation can contribute in social behavior transformation in order to build a new strategy for urban development of traditional sites.

The paper starts with a brief introduction of methods and tools used to analyze urban space and to evaluate social behavior by decoding urban characteristics in traditional space then in its extension. First as a theoretical support, we try to show relations between urban layout and social behavior by introducing space syntax parameters for analyzing space socially. Then we proceed with a historical presentation of the case study mentioning the different historical phases and the main characteristics.

The case study is supported on the hypothesis shown in the first part, a space syntax analysis through a historical approach (chronological development of the urban fabric) to show differences between different urban typologies, so their influence on social behavior.

As a consequence we try to synthesize the differences in urban layout that influence social behavior and to propose a different strategy of development oriented to preserve social values and behavior.

2. Research framework:

The research adopts space syntax methods to analyze spatial configuration as interaction between spatial and social activities factors, as well as their interrelation with the built environment. Hillier argued their mutual interaction through history [2]. Space syntax is used to analyze different urban configurations of the case study, starting with the old urban core (Casbah) the old Ottoman city considering two main factors, spatial and social. Urban layout is the spatial component, analyzed using space syntax, mainly gates, cross section and urban space structure. Social component is analyzed through activities such as the land use, urban functions, and movements. The same study will be done to evaluate transformations in urban layout and social component by comparing the results of analyzing the different stages of development or extension of the old urban core.

The research is based on a set of theories linking behavior as a choice to spatial configuration; Carmona proposed six dimensions of investigation to understand historical urban spaces: Morphological dimension, perceptual dimension, social dimension, visual dimension, functional (economic) dimension and the temporal dimension [3]. Morphological dimensions are analyzed through axial maps, perceptual and visual dimensions are analyzed through visual graph analysis, social dimension through land use and functions.

3. A brief history of Constantine:

On the rock in the form of Acropolis, the defensive site encouraged the old to install. These different populations through time developed the architectural heritage of the site. Historians tell us that the site was formed by the men of the Neolithic age, out of caves to live in a village. During its past, this site was submitted to the Libyans, Phoenicians, Romans, vandals, Byzantine, Arab Muslims, the Ottomans and the French finally [4].

3.1. Foundation of Constantine:

Constantine was built approximately 3000 years BC, the Numides were original people.

The name "Cirta" appeared in the beginning of the third century BC, was assigned to the city in 308, when a terrible war which caused the total destruction of the city. Constantine the great Emperor rebuilt it, and this is how it took its name in the year 311 [5].

Constantine and the Muslim conquests: Conquered by the Muslim Arabs in 674, it was governed by several Walis dependent on Baghdad, Damascus, and by a number of notable locals. At the beginning of the 9th century during the reign of Fatimid and could enjoy particular splinter under Hafsid it was the largest city after Tunis and Bejaia, in three centuries.
3.2. **Constantine under the Ottomans:**

With the arrival of the Ottomans in 1517, Constantine was going to play a more significant role. It became the capital in the Eastern Beylik or region in the throne a quarantine of beys, some of them retained on power just for a few days. The new mode of life, the urban organization of the old town and friendly space will be reflecting on the urban behaviors. This era finished in 1837 with the French invasion [6].

3.3. **Constantine under the French:**

After a heroic resistance against two successive expeditions, the city was taken by the French who remained until 1962, the date the independence of Algeria.

3.4. **History of urban evolution of Constantine:**

After taking the town by the French, the town thrived on the suburbs of “Bellevue” and crosses the “Koudiat Rhumel” to settle also “Sidi Mebrouk”, an extension that was made on an easily urbanized site, see Fig. 1-3.

Starting in 1920 and especially during the war of liberation, spontaneous habitat developed around of Constantine, and of the Valley of “Rhumel”. The rural exodus causes a strong urban development; new districts appear as ZHUN, subdivisions and precarious habitat. In 1970, an extension named on the initiative of the State which will develop on the periphery, the city has substantially completed its site and has had to the beyond its growth in 3 cities satellites with both ZHUN and industrial areas at El Kheroub Didouche Mourad and Ain Smara. Constantine realizes since 1995 a new city on the plateau of Ain el Bey, 18 km from Constantine, beyond the airport, the city must accommodate 300,000 inhabitants, fig. 4 [7].
4. Comparative analysis of the old city center:

4.1. The morphologic analysis:

Using axial maps of Casbah before 1830 and after 1848, which means the original configuration created by local inhabitants then after changes made by French colonialism, Evaluating integration and degree of choice in each one. By using Depthmap we measured local and global measures, focusing on the analysis of step depth and connectivity graphs. Using “la breche” which means the gate as the central point, we produced step depth graphs for all points as well as calculating the number of visibility steps needed to reach different points in the Casbah from the gate.

This analysis of original Casbah (before 1830) showed that traditional urban space is totally segregated. There was only one gate “la breche” which means opening with the spatial configuration of routes: hierarchy of streets, narrow alleys with curved shapes. Axial map analysis showed a very high degree of choice with a very low global integration, the main roads connecting the only gate that exists in the city to other alleys presents the same characters, highest degree of choice and low local integration; it means that the only one historical gate permitted difficult access to the Casbah, A good grasp of space for local inhabitants and especially from inside to the outside and more difficult for strangers or from outside to inside. This verifies the desire of the local people to ensure control of visitors fig. 5.
On the other side, the same analysis of the Casbah after the intervention of French by rehabilitating the second gate through the bridge (bab el kantara) and creating straight routes connecting the two gates and the four sides of the Casbah, these measures changed totally the results of axial map analysis: more connectivity and less choice especially in the center of the map which means that the urban space is more integrated and accessible from the gates. The locals lose control of space and it becomes open on the outside so strangers can access and control space easily.

The last intervention of colonizers was the creation of a third gate with a control point and this was the same strategy in order to open the center of the Casbah on the outside by facilitating accessibility and visibility.

As a consequence, the actual Casbah is the result of the superposition of local architecture and the colonial solutions but this transformation influences the social behavior since the practice of urban space has changed fig. 6.
4.2. **Visual graph analysis:**

Visual graph analysis is integrated to our research to verify the degree of control and privacy in three cases: outer space, between local houses, between colonial and local houses.

In the first case we generated visual graphs in the main road of the original Casbah. We constructed a step depth graph of all points from the location of the gate considering the step depth, Turner (2004) explained that the step depth represents the shortest path with the fewest number of turns through the visibility graph and it is calculated to each node within the graph [8].

In original Casbah, it takes 8 visibility steps to reach the center from the first gate and 12 visibility steps to reach the other gate position (it doesn’t exist in that period), after the intervention of colonizezers, the visibility steps are no more than two steps to reach the center of the Casbah from any gate.
The colonizezers built their houses with several floors on the facades of colonial streets for safety, allowing them to see the terraces of houses of Algerians. Analyzing the visual possibilities between the cells of the local housing and between cells of colonial housing we notice the lack of privacy in last one.

5. Conclusion:

Traditional architecture in Arab traditional world represents a potential heritage, it’s an image of the local identity, and it’s also the support of social interactions and values. Local architecture is an architecture that expresses social identity through practices and values, it’s an architecture that offers to a specific society the best environmental situations to practice and preserve its values. One of the main concepts of this architecture is the control of accessibility and visibility in exterior space (urban space), from exterior to interior and from interior to interior spaces. That means liberty of practice, safety and privacy.

The change of spatial structure in traditional architecture must be studied as a cause of change in social behavior, we showed in this paper that the intervention of colonizezers on the traditional Casbah caused multiple changes in the practice of space through accessibility and visual control, so in the perception of space and in social values encouraging people to change their behavior because they do not control the accessibility and visibility in outer space, and even in interior spaces which means less freedom and privacy, more confrontational with strangers.

Notes

1. Integration: Refers to how many other lines are up to n steps away from each line [9]. In another definition; it is a static global measure describing the average depth of a space to all other spaces in the system, the space of the system can be ranked from the most integrated (red axial lines) to the most segregated one(Blue axial lines) [10]. In a more recent definition, it calculates the closeness of each element to all others, and that is the accessibility for to-movement [11].

2. Choice: The degree of choice each space represents or how likely it is to be passed through on all shortest routes from all spaces to all other spaces in the system [12], the recent explanation is the degree to which each element lies on path between elements, and that is its potential for through-movement [13].

3. Visual graph analysis VGA examines relationships of co-visibility between all points within a spatial system, as it divides the space into a uniform grid, and examines which cells are visible to which other cells [14].

References