Journal of World Architecture

Review Article

Privacy Regulation, Spatial Culture, and Communities in a Communally Diverse City: Ghadames, Libya

Farag A. El-Agouri[1], Vail Karakale[2]

[1]Department of Architecture and City Planning , Benghazi University, Benghazi, Libya, [2]Department of Civil Engineering, Faculty of Engineering ,Marmara University, Goztepe Kampusu, Kadikoy, Istanbul 34722, Turkey

Abstract: Space syntax, the analytical tool of this study, is a set of techniques for representation and quantification of spatial patterns of buildings. In this paper, quantitative analysis is performed to observe the relationship between privacy as cultural specific and the spatial configuration of the settlement in the city of Ghadames. The analysis is conducted on two levels of detail. Level of the whole Ghadames including three unconventional axial maps representing ground floor (male domain), upper floor (female domain), and the whole spatial system with entrances of buildings embedded. The second level of analysis covers nine sites representing three different cultural communities within Ghadames (Arab, Barbar, and Tuarg). These community areas are analyzed as embedded within the city (embedded model) and as separated (cut out model). Analysis results indicate that ground floor (male domain) seems to be more locally and globally integrated than that of upper floor (female domain). Moreover, spaces of the ground floor are more visually connected than the upper floor, which reveals that greater possibility in route choice for the users of ground floor. Their movement from one place to another is less restricted than that of the female in the upper floor. Furthermore, the results show that mechanisms are the physical elements that facilitate or impede privacy regulation in the city and/or enable users themselves to regulate privacy through their own locales.

Keywords: *space syntax; privacy regulation; visibility analysis; traditional cities; spatial configuration; isovist analysis*

Published date: January 2018

Published online: 31st January 2018

Corresponding Author: Vail Karakale, vail.karakale@marmara.edu.tr

0 Introduction

The perception of privacy is dependent on the accepted social practices, mores, and rules governing the behavior setting[1,2]. Behavioral and social scientists have advanced several definitions for privacy. Concepts of privacy have emphasized one of three central themes: Retreat from people; control over information; and regulation of interaction[3,4]. Altman[5] defined privacy as a state associated with the regulation of interaction between the self and others and/or environmental stimuli. Altman described privacy as a boundary-regulating process that is dialectic in nature. Privacy is, for Altman, an interpersonal process, whose object is optimization West in John[3] theorizes that there are four psychological functions of privacy: The need for; the need for self-evaluation; the need for emotional release; and the need to allow for protected and limited communication with others. Altman argued that these functions are all in the service of the main function of privacy, which is to maintain self-identity. Poor boundary definitions, according to Altman, can lead to psychological problems. Spatiality of privacy has been a neglected field at both academic and practical levels in the Libyan cities. However, the house and city are seldom treated by researchers, architects, planners, and decision-makers, as the sociocultural artifact of their users. The prime of this paper is that a city is a cultural phenomenon. Its form and organization are greatly influenced by the cultural (and subcultural) milieu to which it belongs. Although a small number of Libyan research projects concerning cities have been done, a few of them dealt with space as a sociocultural artifact and none of them has comprehensively studied the city in urban traditional built environment. The objective of this paper is not only to refine privacy regulation mechanisms and study the traditional city but also to study the city in traditional environment where different ethnic communities live in distinct localities. The intention is to analyze a number of ethnic, located in a specific climatic and geographical context, having different cultural frameworks, at a specific point in time.

1 Theoretical construct

The construct for privacy regulation holds that social, behavioral, and environmental mechanisms operating within the context of culture are employed to regulate privacy within built environments. These three mechanisms operate within the overall context of culture and are mediated by three cultural domains: Psychological processes, social legacy, and adaptation to other groups.

1. Environmental mechanisms are the physical elements that facilitate or impede privacy regulation in the designed environment. These mechanisms are devised or deployed by designers and enable users to regulate privacy through their own locales. The elements are composed of field and barriers. Field characteristics regulate privacy by perceptually altering the physical context, through shape, size, orientation, and environmental conditions. Barriers regulate privacy physically and symbolically through walls, screens, objects, and symbols.
2. Behavioral mechanisms are the cognitive, and overt behaviors of the people that used to "modify" themselves to conform to the environment. These behaviors regulate privacy through environmental screening, cognitive behavior, overt behavior, nonverbal/verbal behavior, territorial behavior, and use of personal space.
3. Social mechanisms are policy and social supports governed by the cultural institution through accepted practices, morals, rules, and roles in the behavior setting. Settlement environment builds up the organizational climate within which privacy regulation takes place. They represent cultural communities as spatial organized systems. Policy and social supports facilitate or impede privacy regulation through structuring of activities in space and time.

These mechanisms operate within the overall context of culture and are mediated by three cultural domains: Psychological processes, social legacy, and adaptation to other groups. Behavioral mechanisms regulate privacy through psychological processes. Social mechanisms regulate privacy through accepted practices and social norms culturally patterned after social legacy and through adaptation to other groups. (adaptation of neighboring groups to accepted social practices, mores, rules, and roles in a behavior setting is patterned by how groups relate, adapting to different positions).

Behavioral, social, and environmental mechanisms are further mediated by a subsystem of cultural and environmental elements, emic values and beliefs, patterns of language, and material culture, in particular, the transformed physical environment. These elements evolve from and are simultaneously influenced by all the three cultural domains. Emic values and beliefs constitute the common core of consensus that a culture shares to "meaning." Cultural contexting pattern that communicates contextual cues for privacy regulation is predicated on emic values and beliefs. Patterns of language, as ways of communicating, condition verbal/non-verbal behavior for privacy regulation through formal and informal education. Material culture is an environmental outcome or reification of culture that appears in the transformed physical environment and in objects people interact with the silent messages communicated by physical environment, a major resource of material culture.

The physical environment communicates the cultural meaning of environmental mechanisms as privacy regulators through mnemonic cues embedded within or encoded into environment. These cues are interpreted by the user. If the code is not decoded by the user, it is neither shared nor understood and the environment fails to communicate. Built environments that do not communicate lack compatibility in environmental meaning and can be perceived as disorienting and stressful[6].

2 Space syntax: Its elementary theory and method

Space syntax, the analytical tool of this study, is a set of techniques for representation and quantification of spatial patterns of buildings. The main proposition of the theory is that social relations and events express themselves through spatial configuration. Configuration is the relationship between two spaces taking into account all other spaces in the complex (building or settlement). Hillier and Hanson[9] explained: "*Spatial configuration is thus a morecomplex idea than a pair of related spaces.*" The interface between the premises and its surroundings is essential for space syntax theory. In The Social Logic of Space and as Prelude to the Theory, Hillier and Hanson defined the premises (building) as an elementary sociaspatial element (cell), which consists of certain spatial elements that compound to certain social components. These properties are depth and ringness, which is a choice that is the existence of alternative routes. Depth indicates how many steps one must pass through to arrive at certain space from any other space in the complex. We say that a space is at depth 1 from another space if directly accessible to it and at depth 2 if it is necessary to pass through one intervening space. From the depth (relative depth), we are able to calculate integration value for each space in the complex using a special formula. The justified graph represents the permeability of the system, whereas integration value extends these descriptions by expressing how the graph looks quantitatively[1,6]. Other syntactic values are connectivity, control, and ringness. Since space syntax is based on the concept that social relations and events express themselves through spatial configuration, it will be interesting and fundamental to see if it is possible to interpret, syntactically, the sociospatial codes of the interface between inside and outside concerning the traditional settlement of Ghadames in Libya. My ambition, here, is to develop an adequate quantitative analysis in observing the relationship between privacy as cultural specific and the spatial configuration of the settlement under the study. I will test if space syntax techniques are relevant to traditional settlement in the Arab culture, hereby avoiding and misleading results when interpreting syntactically the underlying spatial structure of the whole settlement to introduce the calculation principles of depth and connectivity, let us assume some variables in the connectivity graph [Figure 1b]. The connectivity graph is the dual graph of an axial map, and it is derived by representing axial lines and line intersections from an axial map as nodes and links, respectively [Figure 1c].

For any particular node in the connectivity graph, the shortest distance (or steps) far from the node is denoted by *s (s* is an integer), the number of nodes with the shortest distance *s* is denoted by *Ns,* and the maximum shortest distance is denoted by *I*. Using the expression, space syntax parameters are calculated as follows:

$$\sum_{s=1}^{m} S\times N_s = \begin{cases} connectivity\, if\ m=1 \\ Localedepth\, if\ m=k \\ golobaldepth\, if\ m=1 \end{cases} \qquad (1)$$

Where *n* is the number of axial lines of an urban system. The value *i RA* is then relativized by dividing by the *i RA* of the "diamond shaped" graph with the same number of vertices (axial lines) in

$$RA_i = \frac{2(MD-1)}{(n-2)} \text{ and } RRA_i = \frac{RA_i}{D_n} \qquad (2)$$

Where *n* is the number of axial lines of an urban system. The value *i RA* is then relativized by dividing by the *i RA* which the vertices are ordered so that there are m(>1) vertices whose distance from the root space is the mean depth (MD) of the system, m/2 vertices at the distance minus 1, and so on [Figure 1].

Integration is a reciprocal of this value, which is given by the following formula:

$$Intergration = \frac{D_n}{RA} \begin{bmatrix} global(Rn) = \dfrac{D_n}{RA} \\ Local(R3) = \dfrac{D_3}{RA} \end{bmatrix} \qquad (3)$$

Where *Rn* is global integration and calculated based on unrestricted radius (from all spaces to all others within the system), and *R*3 is considered as local integration calculated based on radius 3 (three steps of depth away from all spaces) this radius could be 4,5,6…to n depending on local and global correlation and the purpose wanted.

$$D_n = \frac{2\left\{n\left(\log_2\left(\left(n+2\right)/3\right)-1\right)+1\right\}}{\left(n-1\right)\left(n-2\right)} \qquad (4)$$

Moreover, this D-value gives the standardized value for the integration value from MD John[7]. The MD is given by the global depth (Equation 1) divided by *n* - 1. This relationship means that the bigger the integration value, the more integrated the axial line is.

The concept of isovists was introduced into spatial analysis by Tandy for the analysis of landscape; however, it was Benedikt[8] who first treated isovists fully as a method for the analysis of architectural space. Benedikt's main contribution was to develop various measures of the properties of isovists, such as area, perimeter, occlusivity (the proportion of the perimeter lying on the solid boundary of the environment), and various measures of the distribution of the distance from the viewpoint to the perimeter. Benedikt calculated the properties of point isovists at a grid of locations in the open space of a

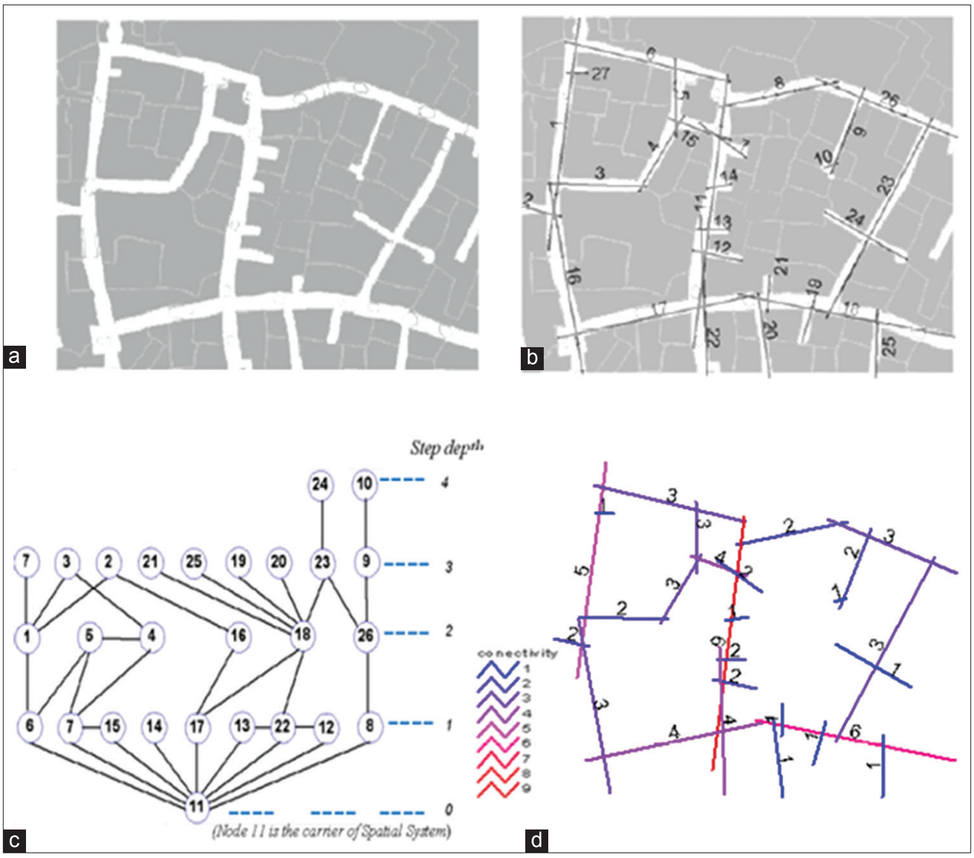

Figure 1. Axial map, justified graph from carrier of space to the root, and connectivity. (a) Open and closed spaces, (b) axial map of the area, (c) Justified graph of the spaces, (d) connectivity of the spatial

configuration and then interpolated to give "isovist fields."

3 Visibility mapping

In urban composition, a process of visualization of space as being potentially occupied by users and sequences of events is essential, though not necessarily conscious.[4,6] *"The architect and user both produce architecture, the former by design, thelatter by inhabitation. As architecture is designed and experienced, the userhas as creative a role as the architect."* In this sense, the visibility graph is a tool with which we can begin consciously.

To explore the visibility and permeability relations in spatial systems, as far as visual privacy is concerned. Having introduced both the basic concepts and methods of the descriptive theory of space, known as space syntax and visibility graph analysis (V.G.A) method, this part attempts to apply these techniques in the Walled City of Ghadames as a selected case study (desert settlement). The aim is to establish a systematic relationship between these and morphological measures of Ghadames' spatial system in one hand and various privacy constructs measured in terms of interaction between inhabitants and visitors, control over space, enclosure, territory, proximity, and other relevant aspects. In this framework, the analysis is conducted on two levels of detail. Level of the whole Ghadames includes three unconventional axial maps representing ground floor (male domain), upper floor (female domain), and the whole spatial system with entrances of buildings embedded. The second level of analysis covers nine sites representing three different cultural communities within Ghadames (Arab, Barbar, and Tuarg). These community areas are analyzed as embedded within the city (embedded model) and as separated (cut out model). Model and analysis results are shown in Figures 2-6.

4 Syntactic and morphological property

To give clear picture of the sociospatial configuration of ground floor as male domain, it is necessary to investigate and interpret the results derived from both the convex and axial maps [Figure 5a and b] which are abstract representation of the space structure. These results, which include morphological and syntactic

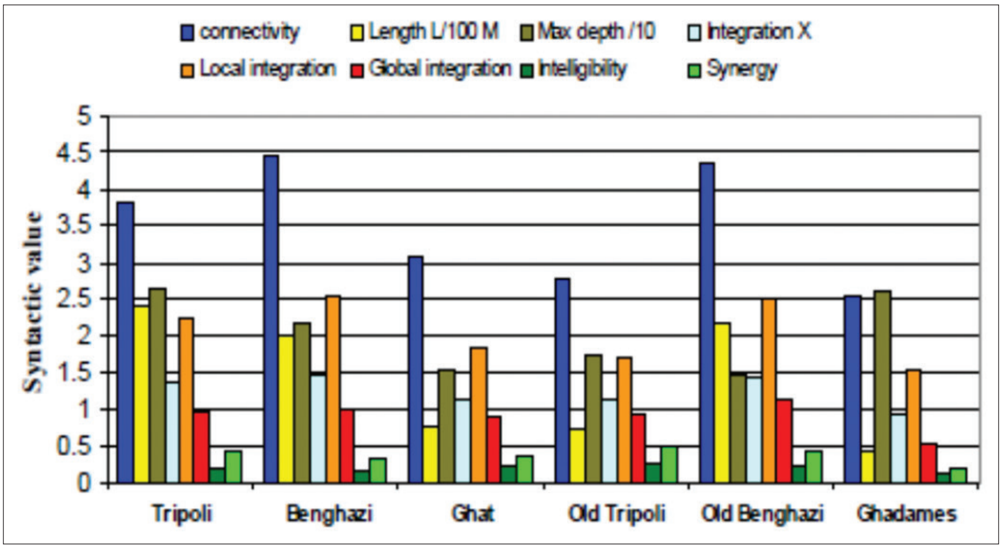

Figure 2. Syntactic comparison of six Libyan cities

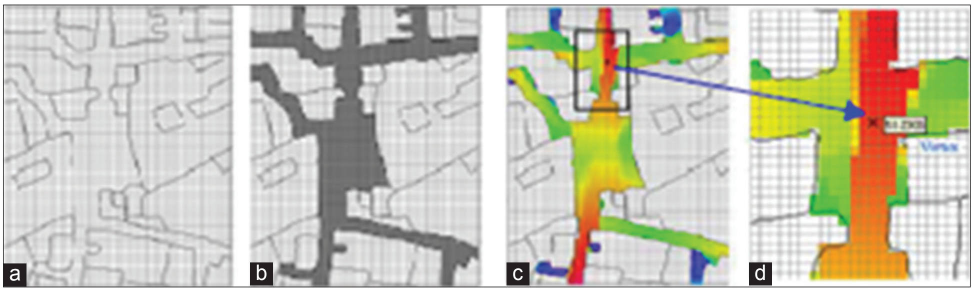

Figure 3. (a) Main square filled with grids 70 by 70 cm, (b) open space in black, (c) graph constructed shows max radial, and (d) a point in isovist max radial

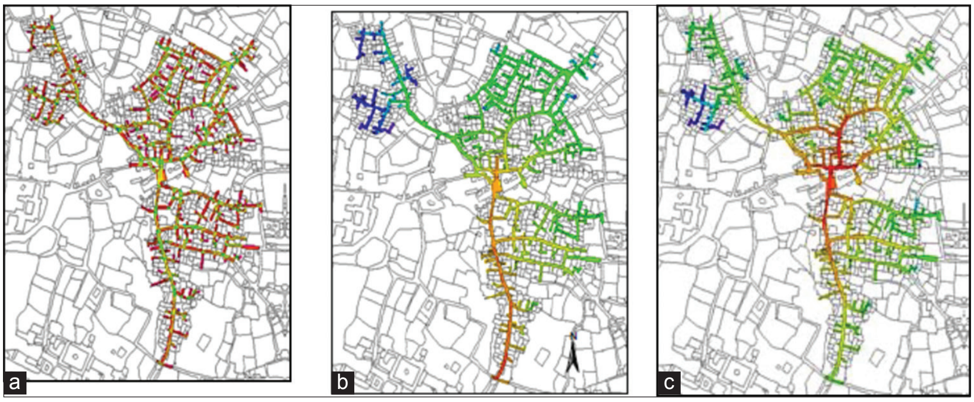

Figure 4. Analysis results. (a) Visibility graph for upper floor shows visual coefficient "embedded model," (b) upper floor "female domain" shows visual global integration in embedded model of space, (c) upper floor "female" shows visual global integration in cutout of space

measures, are summarized in Table 1. In the measure of convexity, the spatial system of the ground floor shows a low value of convex articulation (0.76), which indicates a great break up of open space and therefore less synchrony. The properties of convex spaces Figure 5a reflect a great variety in the length and width of the segments of the settlement. This type of convex space structure is property found in Islamic organic city. In terms of the measure of axiality, looking at axial articulation - the number of axial lines compared with the number of buildings - Ghadames ground floor has non-axial articulation since the value 0.48 is low which indicates that the streets and cul-due-sacs of the Walled City have a great breakup development in their system. An other informative measure is the axial integration of convex spaces. Moreover, interesting feature of Ghadames is that both convex and axial ringiness are too low 0.04 and 0.06, respectively, which confirms

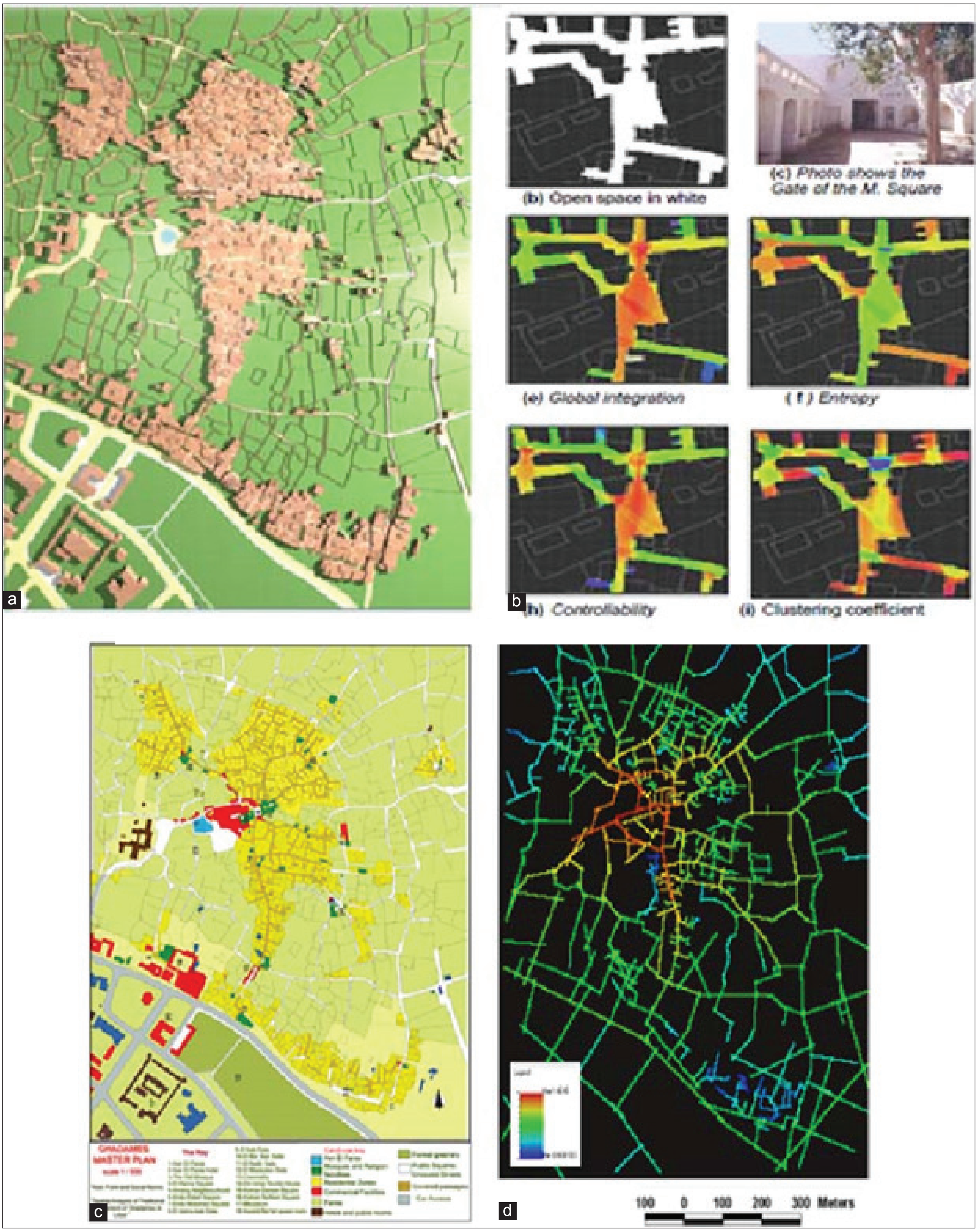

Figure 5. Ghadames layout, (a) built-up in three dimentional, (b) main square in syntactic measures, (c) plan shown land-use distribution, (d) axial map shows global integration

that the walled city has non-distributness system of spaces. In fact, this property is a common phenomenon in almost organic cities.Some Photographs show a gate and a main street in Ghadames is presented in Figures 7,8 8 respectively.

5 Conclusion

In terms of visual and metric analyses of the Walled City of Ghadames and its selected communities, some remarked conclusions could be drawn.

Table 1. Illustrated various syntactic measures of the three maps of Ghadames

Morphological properties	Ground floor "male domain"	Upper floor "female domain"	Ghadames with entrances
Convex spaces	1168	448	2640
Axial lines	744	371	2139
Mean length (m)	39.52	11.41	16.52
Buildings Islands	1535	835	1535
Thoroughfares	94	16	94
Dead ends	434	212	434
Thoroughfares/dead ends ratio	233	154	1705
Area of open space (esq.)	1.8627	1.3766	0.2545
Perimeter (m)	125484	18848	-
	36644	12290	-
Measure of convexity			
Convex articulation	0.7609	0.5365	1.7198
Convex deformation of grid	12.4255	28	28.085
Grid convexity	0.0979	0.0558	0.0433
Measure of axiality			
Axial articulation	0.4847	0.4443	1.3934
Axial integration of convex spaces	0.5711	0.2318	22.7553
Grid axiality	0.0321	0.02695	0.01
Numerical properties			
Convex ringiness	0.0403	0.018	0.0178
Axial ringiness	0.0634	0.0217	0.022
Syntactic measures			
Integration (Rn) global	0.5577	0.5824	0.5917
Integration (R3) local	1.6078	1.4877	1.648
Connectivity	2.7	1.84	2.35
Intelligibility (Rn vs. Con)	0.1221	0.116	0.0423
Synergy (Rn vs. R3)	0.2267	0.211	0.0891
Maximum depth	26	20	34

1. The global integration core for the whole city remains clearly hinged around the center where major activities take place. The outcome of V.G.A substantially confirms the results of axial analysis providing MD value that, in each case (ground floor, upper floor, and entrances embedded), approximates the previously obtained values of axial integration. However, the most globally segregated area is a residence located in Mazigh neighborhood.
2. The distribution of visually local integrated spaces within the Walled City is found to be even and almost uniform across the spaces with a slight more local integrated spaces in both Auld Blel and Giosan and neighborhoods. This implies that local areas are more accessible, and therefore, a greater potential for visual and spatial interaction is likely to be found among neighbors.
3. Ground floor (male domain) seems to be more locally and globally integrated than that of upper floor (female domain). Moreover, spaces of ground floor are more visually connected than the upper floor, which reveals that greater possibility in route choice for the users of ground floor. Their movement from one place to another is less restricted than that of the female in upper floor.
4. Structure of spaces in Ghadames is generally very disorder, and hence, the city lacks geometric order and uniform grids as organic tree-like structure. This fact can be confirmed through observing the very low visual entropy measure for the city. The most disorder areas are found around the edges

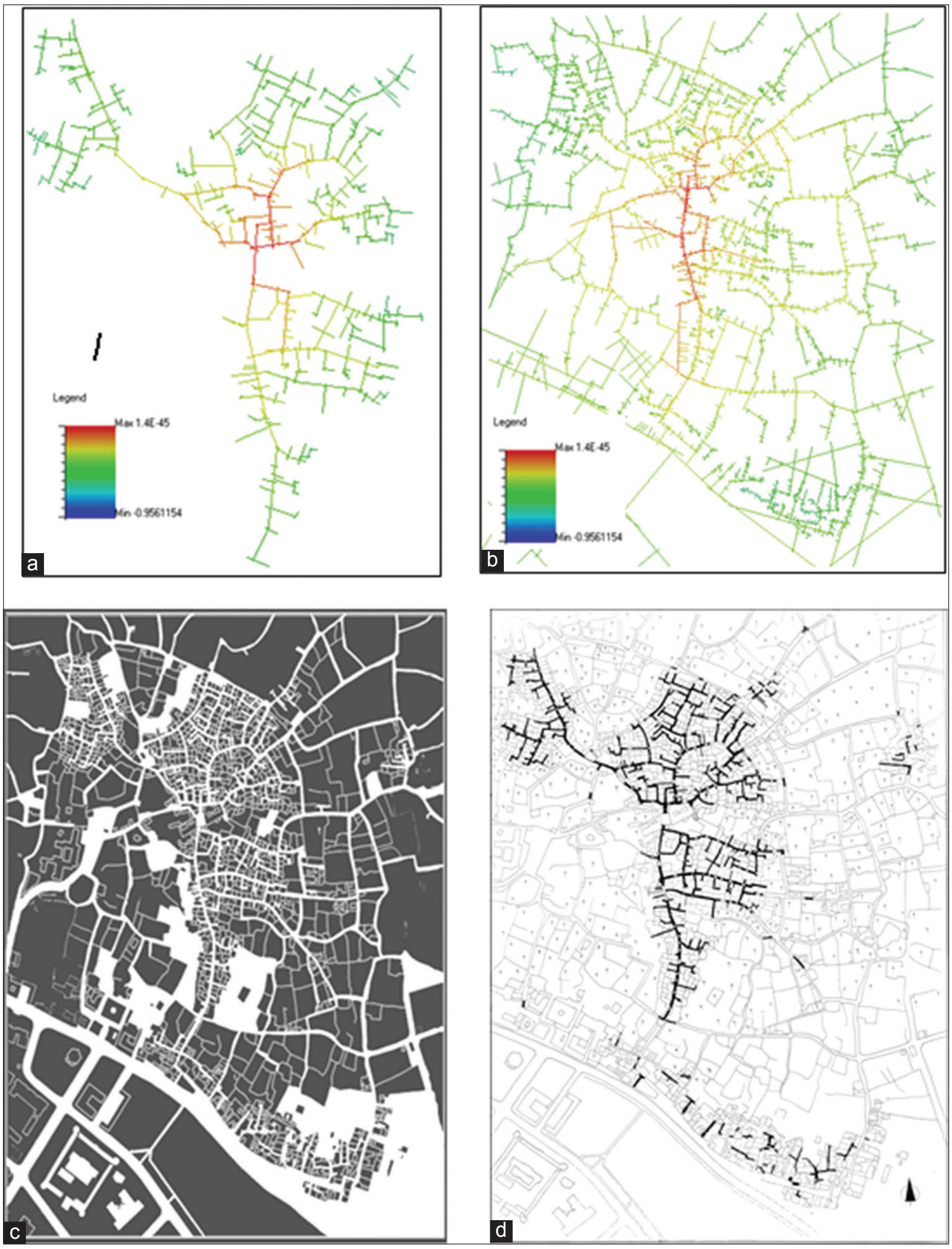

Figure 6. Axial map results. (a) Ghadames axial map ground floor female domain, (b) Ghadames axial map, ground floor building entrances, (c) global integration(Rn), (d) global integration(Rn)

of neighborhoods where various residential areas match each another. This confirms that these neighborhoods are independent and self-contained and evolved according to self-organized local mechanisms dictated by each cultural community. This can also be reconfirmed by examining the local entropy measure, which is very value and therefore less disorder spaces within three steps away of depth. In this context, it is obvious that spaces within these communities seem to reinforce and encourage spatial and visual interaction among residents rather than residents and visitors.

5. Distribution of spaces in Ghadames in terms of their visual depth (visual relativized entropy) reveals that users would expect a large number of spaces (locations) encountered as they move through the system. This fact can be seen in the streamlined street of Giorsan where spaces vary considerably in terms of their visual depth and therefore have the highest values of the visual relativized entropy measure.
6. Locally, the distribution of spaces in terms of visual depth in the range of three steps of visual depth reveals that spaces are almost evenly distributed with only a few spaces that are found in large open

Figure 7. Photo shows one of the gates to the mainsquare “El Katus” from South part

Figure 8. Photo shows the main street “El Jarsan” with main mosque at the end of vista

spaces such as public squares that vary slightly in terms of their visual depths.

7. In general, spaces of the walled city offer to a great multidirectional fields of vision and users of the system confront continuous changing of visual information in their movement. This fact may interpret at their attractiveness to both visitors and residents.
8. Spaces of the walled city are controlled evenly throughout the system with only spaces that found in the dead-end streets that are overcontrolled because they lack visual accessibility and contribute a little to the value of control.
9. Regarding visual controllability property of Ghadames spaces, the most controllable spaces are found in the linear and dead-end streets, whereas the least controllable are mainly found in large spaces such as public squares where multidimensional visual fields are dominant.
10. Visitors and inhabitants of the walled city confront difficulty to capture the while structure of the city from their experience of small parts. In other words, the city lacks intelligibility property as of two main reasons. First reason, the local residential areas are globally segregated even near the most integrated core of the city. Second reason, spaces of the city show very low visual connections among them. Therefore, very weak correlation is found between their integration values and their visual connectivity.
11. The interface between inhabitants and visitors is unlikely to be seen throughout city spaces, as visual synergy measure is too low. This fact reveals that city spaces seem to extrude strangers from almost all parts of the city if the integrated core is excluded. Therefore, inhabitants and visitors confront difficulty to contact one another and visual and spatial interaction is not likely to be found.
12. Ghadames spaces are generally characterized by offering the shorter sight of vision compared with that found in Libyan cities. This property reflects a high degree of enclosure in these spaces and lacks open visual fields for the users. However, the spaces of the upper floor (female domain) are even more clustered and offer far shorter sight of vision for the female users.
13. Another interesting property of Ghadames spaces is that users of the system are easily to span within various parts of the city. The Isovist Moment of Inertia is too low that reconfirms this fact. This is the pattern of street network of the city structured according to the law of shortest links and least effort for pedestrian movement. It is clear from natural connections and streamlined streets throughout the city that users are likely to make the least effort in traversing from one space to another.

References

[1] Fatema E. Architectural Privacy: Hidden dimensions of Urban Forms. Germany: VDM German Publish Press; 2009.

[2] Altman I. Privacy: A conceptual analysis. Environ Behav 1976;8:7-29.

[3] John A. The place of architectural factors in behavioral theories of privacy. J Soc 1977;33:134.

[4] William W. Perceiving Architectural Space: From Opticarrays to Isovists. Persistenceand Change. Connecticut: Lawrence Erlbaum; 1981. p. 103-114.
[5] Altman A. The Environment and Social Behavior. Monterey: CA: Brooks/Cole; 1975.
[6] Patrik S. Top-Down and Bottom-up Characteristics of Shape and Space. Proceedings of the 4th International Symposium on Space Syntax. University College London; 2003.
[7] John A. The place of architectural factors in behavioral theories of privacy. J Soc 1977;3:116-37.
[8] Benedikt ML. To take hold of space: Isovists and isovist fields. Environ Plan 1979;6:47-65.
[9] Hillier, Bill, Hanson J. The social logic of space Cambridge University Press. Cambridge 1984.