Traditional Market Design towards Cohesion between Social Sustainability and Bioclimatic Approach

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Abstract. Traditional markets have its significant cultural, functional, and socio-economic values, which reflect the main pillars for an effective sustainable development. Traditional markets are places which show the community lifestyle, culture and heritage that’s why it has a strong rootedness to its local people. By relating space to culture, a relationship between historic and contemporary design decisions can be achieved. Most of the Arabian Cities are undergoing continuous development through different qualities of expression in terms of economy, culture, and global outlook in the old cities’ centres. Nowadays sustainable development has become an essential intervention in the capital cities. However, sustainable solutions should not concern themselves only with utilizing technology, but also with respecting a community’s social, cultural, historical, and environmental aspects. Traditional souqs (market places) are centralized as an iconic inherits in the historic old quarter of the city. The research problem arises from that some of the current traditional markets in the Arab region do not promote social cohesion as they have been developed without consideration for local identity and lifestyle. The question then becomes how to maintain the relationship between the spatial, social and environmental aspects in renovating traditional markets. The importance of the research is derived from the need of applying a critical study for traditional markets’ architecture with pre-existing cultural values. The aim is to reach appropriate sustainable solutions that facilitate the integration of socio-bioclimatic requirements, qualities of the spaces, and culture identity in developing sustainable traditional markets. This study examines and employs a descriptive qualitative and quantitative research strategies for one of the oldest traditional markets in Riyadh’s city old center “Al-zall souq”, to explore the impact of change in the old center, through deriving a typological formation analytical framework which assess; morphological language, socio-cultural and bioclimatic aspects. This study comes out with a complete vision tracing the lifestyle and the cultural values of the society, to end up with a group of suggestions and recommendations that helps in the design decisions taken to create an integrated cultural sustainable market.

1. Introduction
Nowadays, most of the traditional markets are redeveloped to encourage tourism in the cites’ old center. On the other hand, some of these traditional markets’ renovation process led to the loss of its socio-cultural values, so there is a need to discuss and re-evaluate its concepts and results. The process of
regenerating markets should consider the components that make them special and give each market its sense of place. The market’s sense of place is important to be considered in urban regeneration as they make and form the exclusive culture of the market [1]. In the process of urban regeneration, some markets with tourism potentials have been redeveloped in Arabian city in order to upkeep with the city’s modernization. The attempts to redevelop markets can either be successful or not, which consequently influence changes in the sense of place [1]. The concept of integrative strategies for social sustainability and bioclimatic is still new in traditional markets redevelopment in Arabian Region.

In spite of modernization attempts, many users still prefer the random informality of the souq, which has a venerable value in the region. From this perspective, the research answers a group of questions to meet the community needs; how do we define quality in traditional souq? What are users looking for? What attract users to enjoy time in traditional souq?

The traditional souq may be at risk if changes are introduced without sufficient and effective respect to the whole context [2]. Linking the physical form of souqs with all environmental, social and cultural aspects could be a useful way to achieve sustainable designs that respond to local context, community, and climate, [3]. The vision of the planning authorities should reach global standards leading to further utilization of contextual juxtaposition, compromising the old centre’s uniqueness [2].

2. Traditional markets in Arabian region
Old Arabian and Islamic cities have known traditional markets such as craft markets, commercial streets, or wholesale vernacular markets; each type of them has a special character and outstanding identity [4]. Many of these markets in the developing countries maintain their original urban character with the aim of conserving and developing the valuable heritage areas and its economic identity, its urban tissue reflects the social, cultural, and environmental dimensions of the urban context and presents a homogeneous visual character within the crafts and commercial spaces [4]. Arabian souqs are always located near or around the Friday mosque. Thus, if the Friday mosque is considered as the heart of the Islamic city, the souq is necessarily its backbone spine. In general, this well-developed institution forms a unique urban design element found only in Islamic cities, a feature which distinguishes them from other cities throughout the world [5]. Nowadays, the emergence of commercial centers competing with the traditional souqs and the disappearance of local handicrafts, leads to the neglecting of the Arabian souqs, and disorder of commercial activities, although some parts of souqs still bear the name of goods or products that used to be sold there.

2.1. The significance of traditional markets

2.1.1 functional diversity. The mix of uses in the traditional market's urban context results in functional diversity value. Thus there may be a synergy between different functional uses in historic markets resulting from the nature of compatibility and harmony inside the market and synergistic relationship with the nearby uses of city centre [4]. Therefore, social and economic functions must be correlated with humans called physical enclosures, well-defined public spaces, as well as visually and culturally animated built forms, [6].

2.1.2 Social sustainability. It can be defined as “A process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places they live and work. Social sustainability combines design of the physical realm with design of the social world – infrastructure to support social and cultural life, social amenities, systems for citizen engagement and space for people and places to evolve” [7]. It is difficult to design a space that will not attract people. What is remarkable is how often this has been accomplished [8]. Priority has been given to economic and environmental sustainability in particular in the context of redevelopment communities, where policy and investment is focusing on renewable resources, low carbon communities and encouraging pro-environmental behaviour [7]. As a result, there are few practical resources that directly address the question of how to create places that are socially sustainable, as well as physical infrastructure that is environmentally
sustainable [7]. The traditional public squares allow for a high degree of social interaction between people, therefore traditional markets’ redeveloping strategies should aim to create a community spaces that are socially, along with economically and environmentally, sustainable. Evidence shows that traditional markets without adequate local facilities, services and community support suffer from a wide range of social problems.

2.2. Enhancing identity in Traditional markets
Enhancing identity leads design to respond to specific context and create a balance between two views: the ‘traditional’ perspective, where designers see the loss of traditional ways and values, and the ‘modern’ perspective, where designers declare the inevitability of change in the age of globalization [9]. Markets play a significant role as a ‘place for commercial and cultural interchange’ [10]. The market thrives in the first place because it serves the local community and has been a significant part of the local traditions that is rich with arts and cultural practice, [11, 12]. It is important to increase concerns for the continuity of identity that compatible with the community needs, in the historic markets of artisanship, there is a strong cultural identity but also a full reflection to the present needs that increases the cultural memory value and highlights the heritage significance [4]. In the field of architectural design, in the case of infill design for new development in historic context, it is important to understand the design principles that gave rise to the existing conditions [13].

3. Analytical framework
It is important to understand the objectives of rehabilitation, especially the old urban centres, and that this is a theme of growing and current interest and a global concern, to lessen the abandonment of these areas and make them attractive and that each existing building has intrinsic characteristics that may enable different sustainable solutions [14]. From this concern, the study will follow the triangulation method through possible correlations between the observation analysis and results of the survey (Questionnaire & interviews), as a descriptive qualitative and quantitative research strategies. These strategies are applied for one of the oldest traditional markets in Riyadh’s city old centre “Al-Zall Souq”, to explore the impact of development and renovation in the traditional market, through: first, deriving a typological formation analytical framework and second, measuring the users' experience and satisfaction level. These two strategies assess; morphological language, socio-cultural and bioclimatic aspects.

- Case study description
This research studies one of Riyadh traditional markets (souqs) morphology and examines its role as a domain of both functional and symbolic importance. Al-Zall Souq is the oldest part of the main traditional market place in Riyadh old centre. Its significance comes from the number of citizens and tourists that visit it frequently to buy some old traditional products; handmade carpets, incense, gifts, antiques, jewellery and handicrafts especially traditional Saudi clothes. The recent development of Al-Zall souq is an additional stage for the previous projects of the Qasr Al-Hokm (ruling palace) area development, which aims to raise the urbanism quality of the area that enhances the architectural identity of Riyadh city. The expansion of cities and relevant construction activities are inevitable for the development and livability of these cities. During this development, historic cores and historic urban sites also need to develop as an integral part of those cities [13]. Most of the current developments are constructed as iconic buildings that ignore the specifics of the cultural context, lifestyle and living patterns. The improvement strategy of the souq aimed to facilitate the attraction factors for users and pedestrians, such as the pedestrian roots, car parking’s, service facilities, and enhancement of the visual environment at the site. The traditional architectural style and existing business activities was the main objective of the improvement of Al-Zall souq to encourage landlords to develop their properties. The renovation strategy included the removal of the mud buildings around the market, the reorganization of the infrastructure and the tiling, and the improvement of the lighting system in the inner corridors of the market. Also the inner corridors’ improvement of the interiors and ceilings.
3.1. Typological formation analysis model
This part of the study applies observation and analysis strategies, which aims to measure and examine the three aspects of design; morphological language, socio-cultural and bioclimatic. This is reached through deriving an evaluating model (Typological formation analysis model) see ‘Figure1’ which helps in analysing such cases to set parametric rules for generating different solutions.

3.1.1. Morphological language Aspect. This aspect reflects the physical cohesion of traditional market form language that includes vocabularies, parameters and rules, through analysing the geometric characteristics of spaces; Spatial typology (shapes, areas, and proportions), Spatial hierarchy, Accessibility, Connectivity, Land use and formation.

- **Spatial typology**: The pattern of Al-Zall souq layout is a compact tissue of network pattern consisting of main and secondary alleys, which are intersecting at right angles. Shops are clustered back to back along a common party wall, the proportion between solid and void ratio is emphasizing the souq typology.

- **Spatial hierarchy**: There is a harmony and a partial hierarchy in the spaces of the souq. The shops clusters form a pattern of three main plazas, four main pedestrian's roots, two secondary lanes and network of narrow alleys. The three main plaza are either covered with a shading element higher than the surrounding ones or open to the sky. The hierarchy in scale of these clusters appears in the composition of main public plazas leading to the main pedestrian roots, which branches into the alleys see ‘figure2’. The absence of the nodes between the pedestrians and alleys affected the spatial hierarchy, therefore the transition and cross-points between the main routes and alleys are not clear.

![Figure1. Typological formation analysis model (By authors)](image-url)
• **Accessibility:** The cars accessibility to the souq parking is through one main eastern traffic street (Al sheikh Muhammed ibn Ibrahim street) and the main exit from the parking area is through the southern traffic street (Al Madinah Al Monawarah street). The pedestrians’ entrances are not emphasized due to the absence of the gates see ‘figure3’.

![Figure 2. Souq’s spatial hierarchy map (By authors)](image)

![Figure 3. De-emphasized pedestrians’ entrance (By authors)](image)

• **Connectivity:** Achieving responsive cohesion between the souq and its context is as important as achieving responsive cohesion among the souq internal spaces (Abowardah and Elsayed, 2017). Al-Zall Souq is considered as a transition space between Qasr Al-Hokm palace, Al Thumairi Street, Imam Turki Ben Abdullah grand mosque and Dahw historical neighbourhood see ‘figure4’. In spite of that the main transitional spaces between these four traditional poles does not act as a connecting node due to its de-emphasis. This is clear in the weak and unsuccessful urban treatment for the northern transition plaza see ‘figure5’, also the southern transition plaza, which is used as parking now, doesn’t reflect the important connectivity between the souq, Sheikh Mohammed b. I. mosque, and Qasr Al Hokm. The pedestrian root which connecting Qasr Al-Hokm with the souq is not emphasized, although it is considered main spine and should act as main activity root.

![Figure 4. Souq’s surrounding context. (By authors)](image)

![Figure 5. Souq’s northern external plaza. (By authors)](image)
• **Land use:** The roof is three to two stories high. Shops occupy the lower levels categorized in; handmade carpets, incense, gifts, antiques, jewellery and handicrafts especially traditional Saudi clothes. While the upper levels belong to adjacent houses at the outer border of the souq, or even to the shops beneath as a storage area or as crafts workshop, which have openings to the shopping, alleys see ‘figure6’.

• **Formation:** The simple treatments of elevations strengthen the connection of the souq with the surrounding context. This contrasts the organic nature of the surrounding context and helps in the compliment of the forms. The variation of the souq heights and its surroundings enhanced the harmony with the historical context see ‘figure 11’. The usage of the tents as a vernacular element in the roof acted as successful local reference to other adjacent buildings in the surrounding historical area see ‘figure7’.

![Figure 6. Souq’s land use stories. (By authors)](image)

![Figure 7. Souq’s vernacular tented roof. (By authors)](image)

3.1.2. **Socio-cultural Aspect.** This studies the traditional market as a complex cultural product that results from many ambitions which traces the social and locality environmental dimensions, through analysing; Social interaction, Movement/walkability pattern, Liveability, and Integration value.

• **Social interaction:** The souq was designed to reduce the use of cars and to attract locals back to the old centre by providing a public realm, to integrate local identity. Nowadays, the three main plazas are used as a gathering area for visitors and merchants see ‘figure8’, although they lack the feeling of enclosure and this lead to social gaps between the intercultural gathering spaces and the users’ activities. Therefore, the bonding between the buildings, the main poles and the plazas disappeared and affected negatively the social interaction. In a high-density area, the souq is a significant node suitable for public realm.

![Figure 8. Souq’s internal plazas. (By authors)](image)
• **Movement/Walkability pattern:** Pattern of movement inside Al-Zall Souq reflects the indirect narrow alleys in the old Arabian traditional cities and represents a compact tissue and network, which consists of four Main internal wide roots, ends with three main plazas. The journey through the souq is an unpredictable adventure following pathways, secondary network narrower alleys, following long and short axes. The disengagement of spaces with each other affected the space awareness through the disappearance of change in level, proportion, height and direction. This weakened the sense of way finding and users experience in the space that affected how do people approach, enter and move through the souq. The presence of footpaths, sidewalks, land use patterns, shops accessibility, enhance the walkability and how friendly is the area.

• **Livability:** Al-Zall Souq has strategic location between the main attractive poles, which enhances its Livability through promoting the quality of life in public spaces. Along the souq, behind the rows of shops, there are series of public buildings; Qasr Al-Hokm palace, Al thumairi market, Imam Turki Ben Abdullah grand mosque. These buildings supported the livability of the souq and, at the same time, acted as buffer zones between the busy souq and the surrounding residential area, Dahw historical neighbourhood, where the inhabitants had to pass through the souq to get into these buildings. The absence of resting area and places for eating affected the concept of market being part of the public realm, this discouragement of the pedestrian movement through the souq roots and alleys.

• **Integration value:** Al-Zall Souq boundaries are undefined exhibiting high degree of irresponsive cohesion. The rectilinear forms of the edges spaces allowed the Segregation from the coexisting souq preventing its complement of the integration value. The lack of the overlap between the souq and adjacent context have to be treated in a way to make these realms respond to each other by focusing on the transition space in between leading to full integration with the surrounding context, specially the western pedestrian root. While the eastern cars root caused segregation between the souq, Dahw district and Al thumairi market. The internal souq alleys do not respond to the existing surrounding building context and movement roots on both sides.

3.1.3 **Bioclimatic Aspects.** This type of analysis for historical cases is a helpful strategy to understand traditional markets’ techniques and design strategies in hot arid climate, and to translate some interactive environment solutions through; Level of shading and plantation, Ventilation and orientation, Natural day lighting, and materiality.

• **Level of shading & Plantation:** The new projecting tented roof does not dominate the old facade but appears to Hoover gently above the walls. The height of the souq's buildings is twice the width and in proportion to its width; the main souq's roots are wider, longer, and higher than the internal alleys. The secondary lanes and the narrow alleys network are roofed and completely shaded, where as the main pedestrians' roots are tented roof and partially shaded see ‘figure 9’. The southern and northern plazas are not shaded and this affected the thermal comfort and users' interaction with the space during the daytime. The western plaza is completely shaded which helps in its livability. The souq lacks to the plantation and Trees in its main plazas and roots, which play a negative role for shading and relative humidity.

• **Ventilation and Orientation:** The souq represents passive cooling system, which enhances the thermal comfort inside the space. The perpendicular grid for the internal alleys network and roots allowed cross ventilation, the souq's entrances with its orientation helped in the air flow see ‘figure 10 &11’. In addition, the subtracted spaces (plazas) acted as a principle of stack effect that enhances the air circulation. After the air passes through the shops, it heats up and start rising through the upper openings in the alleys and the plazas to escape. The high ceiling with its opening helped in ejecting the undesired hot air.
Natural day lighting: The small sizes of the upper souq’s openings introduce the natural daylight and isolate the thermal heat. The upper openings helped the natural light to partially lighten the souq’s pathways see ‘figure 12’. The variation between higher new tented roof and the existing lower roofs enhanced the natural day light through the redesigned roof by considering gaps in the souq which help in penetrating the strong direct sunlight to the main pathways, that reflects in animating the space and enhance its sensual quality. The low souq form allows sunlight and air into this extremely dense part.

Materiality: Sheer weight of exterior walls was used to reduce the heat and decrease the thermal mass. This was originally reached through mud brick but nowadays mud stone material is used instead.

3.2. The users' experience and satisfaction level
The users' experience and satisfaction level for Al-Zall Souq spaces are measured through questionnaire and interviews for visitors and merchants. The questionnaire sample consists of 50 users from visitors.
The interview sample consists of 10 shopkeepers. The questions are designed to measure the quality of the souq's spaces through the users' spatial experience, comfortability and level of interaction within the spaces. The survey's questions cover three main aspects; morphological language aspect, socio-cultural aspect and bioclimatic aspect.

- **Questionnaire Sample**
  1- Do you come frequently to Al-Zall Souq? If yes, why?
  2- How often do you visit Al-Zall Souq?
  Questions about morphological language aspects were structured to measure the users’ spatial experience towards the souq spaces quality as follows:
  3- Do you find the entrances and the exits for the souq clear to enter easily?
  4- Do you move easily to the adjacent souqs and facilities?
  5- Do you find targeting shop easily?
  6- What kind of shops do you suggest adding to the souq?
  Questions about sociocultural aspects were structured to measure the users’ level of interaction with the souq spaces as follows:
  7- Do you enjoy walking by foot in souq area?
  8- Do you find the souq’s plazas attractive and suitable place for gathering?
  9- Do you find enough activities to spend a family day out?
  10- Do you find enough sitting areas to rest during your shopping?
  Questions about bioclimatic aspects were structured to measure the users’ comfortability within the souq spaces as follows:
  11- Do you find the shading level of roofs enough and comfortable?
  12- Do you find the souqs’ alleys thermally comfortable and satisfying?
  13- How do you evaluate the level of daylight in the souq alleys?
  14- How do you evaluate the level of night artificial lighting in the souq alleys?
  15- How do you evaluate the level of plantation in the souq spaces?

- **Interview questions**
  Questions addressed to the shopkeepers or shop owners were:
  1 - Do you prefer to stay in Al-Zall Souq and why?
  2 - Do you like the idea of gathering all specialized shops in one souq?
  3 - What is the best time or day for sales and why?
  4 - Will you be able to participate to improve the condition of the souq including your shop?
  5 - What do you suggest for Al-Zall Souq improvement plan?

3.2.1 **Questionnaire findings and analysis.** From the answers of the visitors for the first two questions, it is clear that the visiting rate for Al-Zall souq is high. The most crowded time is during the weekends, as they come mainly for shopping rather than walking or gathering.

**First: Morphological language Aspects:** Regarding the users’ spatial experience, the visitors’ answers show a high percentage for disagreement for the clearness for entrances and exits of the souq, easily movement to the adjacent facilities, way finding and the highest percentage of the visitors agreed to add coffee shops as an important missing facility see ‘figure 13’.

**Second: Socio-cultural Aspects:** Regarding the users’ level of interaction with the souq spaces, the visitors’ answers show a high percentage of agreement for enjoying walking by foot in souq area. While the answers show a high percentage of disagreement for the social interaction in the souq’s plazas. Absence of activities to spend a family day out and sitting areas to rest affected the shopping experience see ‘figure 14’.

**Third: Bioclimatic Aspects:** Regarding the users’ comfortability within the souq spaces, the visitors’ answers show a high percentage of agreement for roof shading level, alleys’ thermal comfortability and
level of daylight in souq alleys. Whereas the high percentage of disagreement appears in evaluating level of artificial lighting in souq’s alleys, and the level of plantation in the souq’s spaces see ‘figure 15’.

![Figure 13. Missing services and users’ spatial experience. (By authors)](image)

![Figure 14. Users’ level of interaction. (By authors)](image)

![Figure 15. Users’ comfortability in souq spaces. (By authors)](image)

3.2.2. Interview findings. From interviewing the shopkeepers and shops’ owners, the research comes up with some findings: most of them prefer to stay in Al-Zall Souq for its strategic location in the old center and the main commercial area in Riyadh. The majority prefer to have their own shop in the same area of the similar shops in spite of the competition because it facilitates showing the variations between the quality and prices of the products. Ramadan month is the most crowded time in Al-Zall Souq due to the area’s spiritual theme, which encourage the social gathering, other than that weekends are the most popular time for shopping in the area. Most of the shopkeepers showed intention to participate in improving the souq’s condition to enhance the shopping experience quality, which will affect their sales. Regarding their suggestions for the souq improvement, they all agreed on adding sitting areas, service facilities, and enhancing the plazas’ design to accommodate formal open bazars instead of the informal one held on Fridays.
4. Design suggestions for Al Zall souq’s redevelopment

4.1. Enhancing Social sustainability

- Applying social interaction in Al-Zall Souq and focus on the importance of providing good quality social and local services, to give the opportunities for visitors to share social spaces and activities in the souq, through offering a new interpretation of local architectural language. This can be done through creating spaces within the visitors can meet and interact aiming to develop socially sustainable spaces by providing the missing services, such as: markets, traditional cafes, restaurants, children playground for activities, and sitting areas for resting and socializing. Consider using traditional authentic materials and skills to foster local belonging and identity.

- Thinking about all users and adding variety of cultural amenities is a main objective through enhancing various activities to happen such as introducing regular traditional bazars, cultural events, and local festivals as new functions, to attract many residents and visitors. Adding art galleries with plazas can act as urban lungs for the development.

- Introduce new interactions with the best contextual harmony to achieve connectivity through redesigning the accesses of the souq to connect strategic points more efficiently, which will attract visitors back to the old traditional markets by providing a public realm, with an attempt to integrate local identity.

- Enhancing livability in Al-Zall Souq can be through providing a range of transitional meeting spaces. The relationship of these meeting spaces with the context requires an overlap between the souq and the adjacent spaces, through providing various restaurants and outdoor cafés.

- The souq needs to be responsive to children, elderly, and people with impaired mobility in order to add value and pleasure for them, through transferring the spaces into attractive, safe, organized and interactive gathering point.

4.2. Enhancing bioclimatic approach

- Adding appropriate shading is one of the most relevant themes that influence most people’s decision to enjoy sitting in souq’s central plaza for a prolonged amount of time, thus there is a need to enhance the shading in the souq’s main plazas.

- Comfortable and shaded seating is one of the most frequent requests of improvement. Thus adding vegetation in the main paths and plazas is essential to cast shadows taking into account the type and size of vegetation in relation to its aim (shading in the summer, wind shelter in the winter).

- More variety in terms of landscapes (slopes, plants, and flowers) can create places that are easier to recognize.

- Usage of sustainable technologies through providing mechanical skylight systems that plays a role in determining the level of exposure to the sun and ventilation.

- Indeed, from the point of view of energy efficiency, installing smart artificial lighting is an essential action to reach the users comfortability during night shopping times.

5. Conclusion

- Aiming for social sustainability should be the main goal for traditional markets’ renovation strategy, through underlying the traditional lived environment and examining the social processes to highlight the life ways and preferences of local people.

- Traditional markets’ renovation philosophy must focus on delivering a sustainable mixed-use intervention that reflects local culture through its spatial environment, by adapting traditional architecture to the modern built environment.

- The traditional market renovation strategy should rethink the relationship between the souq and the adjacent neighbourhoods to create an integrated cultural environment market that response to the social, cultural and economic requirements of the community.
The traditional souq should always add value to its context and this requires much more than simply fitting in. Thus, it should offer sufficient cultural and entertainment activities for visitors that enhance the interaction between local citizens and tourists.

Considering the Bioclimatic dimensions is essential in renovating the traditional markets in hot climate region through studying the traditional environmental techniques and focus on the relationship between the passive design and the local community. Besides considering natural ventilation system, shading types, thermal insulation, and natural lighting.

Renovation of traditional markets can succeed by creating an authentic contemporary architecture informed by critical thinking about sustainability. This is reached through the reinterpretation of old architectural language and the emphasis on creating a traditional sense of community.

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