

Heritage Preservation within public open spaces: the case of Qabel Street (Old Jeddah) Spacious Experience

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Abstract. Building Information Modeling provides a solid ground for historical areas documentation, where a virtual experience of historic buildings is digitally constructed in order to maintain the built environment through its entire lifecycle. Jeddah Old Balad area, especially “Old Hajj Road”, is considered to be the core of heritage preservation. Therefore, this paper elaborates on a platform demonstrating the potential of combining big data for main corridor in Old Balad by using GIS server; In addition to people reflections within outdoor spaces via smart sensors while experiencing the variety of urban features of the area. Therefore, the aim of this paper is to give an overview of people responsiveness, as well as surveying and representation of spacious data in order to support the process of further integration between HBIM and GIS tools to maximize the use of built heritage resources used for creating, conserving, documenting, and managing information which has a great impact on touristic and commercial activities within the case of Qabel Street. The study aims to strengthen the relation between sustainable developments in this area within the explicit constraints of architectural heritage preservation.

Keywords: Historical Paths; Sustainable developments; HBIM; Smart Indicators; Sensors

1 Introduction:

Building Information Modeling provides a solid ground for historical areas documentation, where a virtual experience of historic buildings is digitally constructed in order to maintain the built environment through its entire lifecycle. Models have been constructed to enhance historic building information modeling (HBIM), such systems represent an extremely strong paradigm within architectural heritage that can be used for creating, conserving, documenting, and managing complete engineering drawings as well as adopted information. Therefore, the aim of this paper is to give an overview of people responsiveness in Jeddah heritage areas of Old Balad corridor by using GIS server; as well as surveying and representation of

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spacious data in order to support the process of further integration between Big Data, HBIM and GIS tools to maximize the use of built heritage resources in order to support the process of further integration between variety of factors and demonstrate how the complexity of built heritage resources can be dealt with.

2 Research Methodology:

The structure of the paper starts with elaboration on the importance of big data modeling in heritage conservation and previous models applied. This will be followed by a brief historical overview of the area under discussion. Secondly a detailed demonstration of existing of Qabel Street, the main corridor in old Balad via GIS Data analysis for existing urban fabric. Finally, results are discussed based on people reflections within outdoor spaces via smart sensors while experiencing the variety of urban features of the area, based on these recommendations for future plans for preserving the quality of the spaces will be suggested.

3 Historical Areas Documentation Approaches:

Building Information Modeling provides a solid ground for historical areas documentation, where a virtual experience of historic buildings is digitally constructed. In the context of rapid technology development, the theory of using building information modeling (BIM) has been used in several historic places as presented by N. Megahed, 2013. With BIM technology, several virtual model of a historic building can be digitally constructed in order to maintain the building through its entire lifecycle, including demolition. Specific work has been done by A. Baik et al.2013 and 2015, including documentation for existing architectural historical richness and details have been done under remote sensing techniques and spatial considerations. Such studies present a theoretical framework that has been constructed as a guide for the research done in this paper to enhance the understanding of the different aspects of historic preservation and management through a smart open platform in old Balad Area. The focus of the study will be related to urban features in outdoor spaces affecting people reactions towards the experience they live on a specific route in Old Jeddah.

3.1 Jeddah Old Balad Heritage area:

Saudi Government as well as public awareness do realize the importance of preserving the Saudi culture as well architectural heritage. In 2014, Historic Jeddah was considered as one of UNESCO's World Heritage Sites. Accordingly, the area was divided into subzones regarding to the historical value as can be seen in figure 1, Samir, A., 1986.

Jeddah municipality is concerned with preservation areas within old Jeddah districts as per the development projects conserved with preservation of old Balad

historical sites, further details are available on the websites: <https://www.jeddah.gov.sa/Jeddah/HistoricalPlaces/Districts/index.php>
<https://www.jeddah.gov.sa/Business/LocalPlanning/HistoricalJeddah/index.php>.

The Nominated Property (NP) is the oldest urban area of Jeddah city, which contains a group of urban and archaeological buildings characterized by their historical, architectural and urban value and importance represented on fig.1. Buffer Zone (BZ 1 and 2): Urban areas that surround the Nominated Property and represent the extension of urban areas and includes a range of activities. The biggest section of the street (BZ3 and BZ4) includes denser areas but with urban functions less dense. Representation of the developments done are presented in “Conservation of Jeddah Old Town Project Brief”, Agha Khan Projects award, 2013.

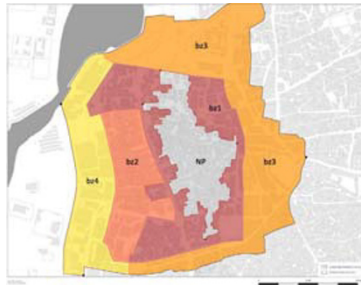


Fig. 1. Old Balad heritage area; zones;
<https://www.jeddah.gov.sa/Business/LocalPlanning/HistoricalJeddah/pdf/English/5.pdf>

3.2 Qabel Street Historical Background:

Qabel Street or "Old Hajj Road" is one of the most important Jeddah's streets both in the past and recently. It locates in Historic Jeddah "Al Balad" districts in the heart of Jeddah city in Kingdom of Saudi Arabia. Because of its location, Old Jeddah was used as a port for the Holy Makkah facilitating regional commerce as well as receiving pilgrims. Qabel Street acted as the main path of pilgrims, as cited in <http://www.sauditourism.sa/en/Explore/Regions/Mecca/Jeddah/Pages/j-9.aspx>. The street locates within two of old Jeddah's neighborhoods which are Harat AlYaman to the south and Harat Almazloun to the north. Qabel Street extends from King Abdulaziz Road to the west till Old Makah Road to the east and bisected by Al Dahab Road, with total length about 700m as can be seen in fig. 2 demonstrated in <https://www.scta.gov.sa/en/Heritage/Pages/HeritageSites.aspx>. The street is divided into 3 sections, the western extension Al Mahmal Plaza, the second section lays between King Abdulaziz Road and Al Dahab Road, the third section from Al Dahab Road till Old Makah Road.



Fig. 2. Qabel Street, Main corridor; "Old Hajj Road" heritage area, Jeddah.

4 Urban and Architectural Analysis for Old Hajj Road, Qabel Street:

The Architectural Features and Urban Details have been cited under different researches done recently by Samaa B., 2015; Hossam B., 2016. Demonstrations for Data gathered along the built environment Qabel Street, Main Corridor in Old Balad, Jeddah is relevant to the spatial characteristics is presented in this paper by integrating GIS server; which will allow the further integration of People responsiveness relevant to specified routes data compilation and analysis for the following features:

4.1 Uses & Activities

Activities densities can be detected in fig. 3 representing the following percentages: 74.4% of the buildings along the street is for commercial activities for clothes, bags and gold. 1.8% is for the religious uses, 22.6% is for residential uses, 0.6% offices and 0.6% is vacant lands. The street encompasses a group of the oldest and most famous souq in Jeddah like Alalawi, Albadw, ALgamee souq.



Fig. 3. Commercial versus residential occupancy along Qabel Street, Main corridor, (by Authors).

4.2 Buildings' Quality

Buildings with good quality concentrated in the western part of the street which considered as the new high rise buildings which represents 22.6% of the buildings, to the east of the street concentrates the bad and moderate buildings with percentage 75.6% of the buildings and some of those buildings are historic ones with especial importance, as per fig. 4.

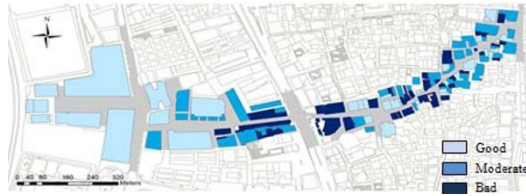


Fig. 4. Building status overlooking along Qabel Street, Main corridor, (by Authors).

4.3 Architecture Characteristics

The analysis of gathered data demonstrates that 26.2% of the buildings along the street are historical almost all of them concentrate in the eastern part of the street fig. 5. Nevertheless, the value of those buildings most of them requires restoration, follows some examples of those historic buildings in fig. 8.



Fig. 5. Historical Buildings Existence on the eastern part of Qabel Street, Main corridor, (by Authors).

A Okasha Mosque old and currently elevated entranc

B. Nassif House



Fig. 6. Some of the existing historical Buidings along Qabel Street, (by Authors).

4.4 Street Network

Qabel street is a pedestrian pathway and intersected with two main streets, King Abdulaziz street by surface intersection and Al Dahab street through a pedestrian tunnel (C) as can be seen from points A, B, C and D as per figure 7. It intersects also with a secondary street Al abdarous street with surface intersection with other streets intersecting with Qabel street are pedestrian alleys, figure 10 shows respective views of selected nodes.

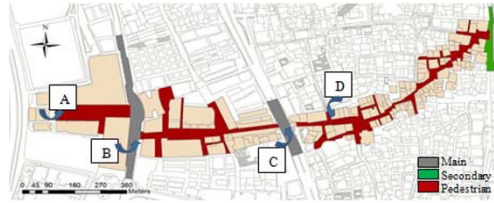


Fig.7. Street Network Intersecting Qabel Street, Main corridor, (by Authors).

A Souq Al Dahab B Gateway for Qabel Street C Pedestrian Tunnel D Typical Pedestrian Souq



Fig. 8. Respective views of selected intersections along Qabel Street, (by Authors).

4.5 Streets' Quality and Paving

Street Paving's status can be seen from fig. 9, the quality of the streets ranges between moderate to bad

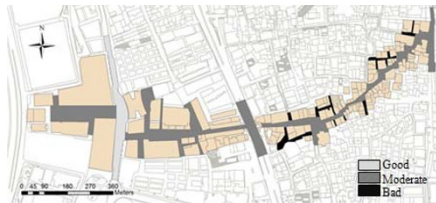


Fig. 9. Streets and Paving's Quality, along Qabel Street, (by Authors).

The finishing of Qabel street and other pedestrian alleys is cobble stone and for the main and secondary streets are Asphalt, Al Mahmal plaza from tiles, as per fig.10.

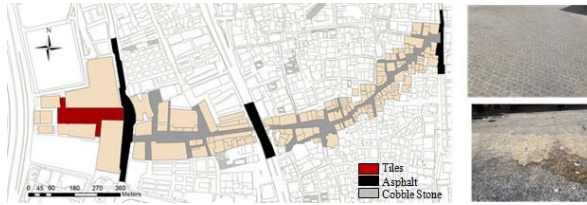


Fig. 10. Street and Paving Status along Qabel Street, (by Authors).

5 Spatial Responsiveness Indicators

While Experiencing the journey by several pedestrians that re really enjoying The main demonstrated responses against stress points indicate the change of normal responses, causes are documented via cam recording and tracking specific site location via GPS location, tools and techniques adopted by Taha et.al. 2012 and 2013; A.Nayer, 2015. The Results detected according to data measured gives indications to people responses, KREIBIG, S.D.2010. GIS Data representations provide for the existing status of urban spaces in the specified location where spatial features are explicitly described according to the above steps of the research produces in the first part under section 4. Data Gathering and compilation is verified according to the adopted methods in respective research done by the author in selected location on Jeddah to meet similar environment, public interest as well as developments targeted by decision makers, A.Nayer, 2016.

Table 1. Participants stress levels experienced along their walk along Qabel Street as indicated on figures

Main Nodes Stress detected	Urban Features	Average fig. 14d	Participant (1) fig. 14a	Participant (2) fig. 14b	Participant (3) fig. 14c
Node (A) , fig. 9	Plaza	1	1	1	2
Node (A') , fig. 7	Mosque	3	3	3	4
Node (B) , fig. 9	Gateway	3	3	3	4
Node (B') , fig. 7	Plaza	3	3	3	4
Node (C) , fig. 9	Tunnel	3	3	3	4
Node (D) , fig. 9	Market	3	3	5	6

Selected Participants are three middle aged females interested in historical environment as well as regularly visiting the mentioned sites; they are all under the same moderate climate conditions and timing on the evening of weekend. Stress levels are interpreted as heat mapping indications on figure 11 a, b, c. Overall representation on fig.11d. Analysis of the findings presented in table 1, is performed through three main steps:

- Data analysis from collected computing wearable devices.
- Benchmarking against actual surveyed case presented on GIS mapping.
- Explicit listing for prospect solution suggested for targeted developments



Fig. 11a. Participant (1) Heat Map detecting Stress Level along Kabel Street, (Sensors data analysis, by Authors).



Fig. 11b. Participant (2) Heat Map detecting Stress Level along Kabel Street, (Sensors data analysis, by Authors)



Fig. 11c. Participant (3) Heat Map detecting Stress Level along Kabel Street, (Sensors data analysis, by Authors).






Fig. 11d. Overall participants 1, 2 & 3; Heat Map compiling Stress Level along Kabel Street, (Sensors data analysis, by Authors).

6 Discussion

The findings indicate the expected impact on touristic and commercial activities within the case of Qabel Street. The study provides a holistic overview that strengthens the relation between future sustainable developments in this area within the explicit constraints of architectural heritage preservation.

6.1 Investigations and Surveys

The analysis of gathered data demonstrates detected points where specific remedies should be attended to in terms of spatial solutions. Parallel investigations for people responses as well as physical surveys provide for a complete image of working for the public best involvement to enhance the experience in open spaces on Qabel Street.

Stress levels (as indicators to participants Comfort levels)	
	High Stress levels (due to unsafe street crossings at Node A, B, C)
	Medium Stress Levels (due to increasing in crowd density and path features Node A', B')
	Minimum Stress level (due to regular shopping and market activities)

6.2 Potential of Developments

Suggestions for resolving major points of stress along the Qabel Street will encourage safe pedestrian accessibility, as well as preserving the built environment in the historical area of Old Balad. Crowd management and Street Crossings should be handled in terms of facilitating the intersections between pedestrian paths as well as providing for required mobility for services while comparing node B and Node C.

Encouraging Public services and enhancing quality of spatial features is also required while checking the plaza sitting areas at node A and D for commercial purposes while the activities on nodes A' B' have purpose of preserving historical and cultural built environment.

7 Conclusion

Throughout Date represented in this research, we notice the importance of integrating the public responses in the process of Decision making, in terms of potential developments within existing urban heritage areas especially in Old Balad, Jeddah. Modeling techniques adopted allow for possible integration of variety of data typology by working under GIS Server. Therefore, the work presented highlights the importance of modelling heritage patterns as well as people responsiveness, by integrating surveyed data along with representation of spacious features under a digital environment, in order to support the process of further integration between HBIM and GIS tools to maximize the use of built heritage resources used for creating, conserving, documenting, and managing information.

Acknowledgements

Considerations is granted for the collaboration of Associate Professor, Dr. D. Taha, Department of Architecture, Faculty of Engineering, Alexandria University; for her advice and contribution for pilot research project assessing potential aspects in reference to human behavioral responsiveness in open spaces along the city of Jeddah.

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