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Design to Thrive



Impact of Technology and innovation on adaptation of architectonic tradition for a sustainable future in the Middle East

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Abstract: The proposed study seeks to establish whether the community is in favour of environmental traditional architecture despite the increase of modern architecture and its subsequent benefits such as indoor thermal comfort. Globally, traditional architecture has a lot of values. In the Middle East (ME), it shows the way people lived in an area and translate their requirements in a distinctive character.

The old architecture carries in it very rich design features which if learned and adopted could immensely help in bringing change to current architectural designs. Thomas (2002) maintains that it is important for the Arab world to revisit all their traditional typologies. Sustainability is expected to remain high with the revealing of old identify architecture to current one. The current study is based on the fact that there is an increase in international-based engineers, who are not able to construct building in line with the cultural aspects of the local users in the ME. However, the question remains on whether and how technology and innovation can be utilized to preserve the architectonic traditions intertwined with modern architecture for a sustainable future in the ME.

This research attempts to contribute to the environmental design for an improved human well-being in the ME.

Keywords: Environmental traditional architecture, Thermal comfort, Transitional architecture

Introduction

There has been a wide range of studies on the intersection between traditional architecture and modern approaches to building and construction. The debate has always been how to balance between the benefits of traditional and modern and often western architectural approaches. Ideally, the choice of architectural approach should be driven by factors such as social environment, religious practices, cultural factors and economic aspects. In this regard, architecture is expected to be authentic and sustainable to the local environment. At the same time, adopted architectural approaches should be adequately progressive in terms of adoption of latest construction technologies.

Rationale of the study

The proposed study seeks to establish whether the community is in favour of environmental traditional architecture despite the increase of modern architecture and its subsequent benefits such as indoor thermal comfort. Globally, traditional architecture has a lot of values. In the Middle East, it shows the way people lived in an area and translate their requirements in a distinctive character. Bukhash (2001) argues that these architectonic traditions need to

be learned, handled, conserved and improved in modern building practice and planning policies.

Statement of problem

Since 1970's there has been high growth in the Middle East population. This growth has led to increased demand of housing and the local builders and architects have not responded due to various limitations. Such limitations include shortage in number of local engineers, construction needed in shortest time possible among others. The shortage of the engineers was filled by international expertise who could not respond to cultural aspects of local users. This has caused the decline of traditional architecture in the Middle East. The researcher wants to look at how innovation and technology can help in adapting architectonic tradition for a sustainable future in the Middle East.

Research Aims and Objectives

Aim

The research aims to assess environmental traditional architecture in its modern context to understand people's physical (thermal heat) and psychological needs and preferences. People preferences in term of which trend will give the occupants indoor and outdoor comfort on the level of sustainability and climate change which also affect the policies of the city. The research also aims to demonstrate the legitimate use of traditional domestic environmental architectonic features in the Middle East. A third aim is to measure building performance with focus on what is appropriate for housing application based on climate control/ thermal comfort as an indicator and other psychological components to a limit to validate psychological and physical inputs; space with different typology/ scheme will be the unit of analysis.

Research Objectives

- To recognize the importance of the presence of environmental traditional architecture in the indoor environment, and their importance to their thermal comfort.
- To study the environmental traditional techniques and modern technology applications, which can enhance buildings designed and in-use performance based in the Middle East
- To explore the impact of the balance between traditional architecture within a contemporary context on the occupants and the building performance; quantifying measurements for the study results.

Literature Review

Collaboration of Modern architecture and traditional value/designs

In the Arab World, a re-evaluation traditional system would assist policy makers to reclaim their identity and pride as well as restore them with their people and prepare them to be or better service. Traditional architect has boundless potential in the Middle East as a source of informing modern architecture. According to Al-Mansouri and Al-Naim (2005), traditional architecture provides endless practices that modern architecture can draw inspiration from. Therefore, collaboration between modern architecture and architectonic traditional designs should be encouraged.

With regard to sustainability, it is important that countries in the Middle East have re-examined traditional models to expose identity to modern architecture. Rashid (2004) argues that this rising concern towards traditional architecture is among a more general concern to preserve historic buildings since they are antique documents and traces of historical forms of art. In view of this, it is vital for their integrity to be conserved and refurbished object be of authenticity.

Sustainability and traditional architecture

In the early century people living in the Middle East heavily depended on the natural world to learn some very common guiding principles that encouraged sustainability. Architects believe that current human population can also learn a lot using the same principles which can encourage environmental sustainability (Asfour, 1998). In the past people used to live in very comfortable environments, they had no problem with social, cultural or climatic condition. This is one thing current humans needs to learn. There three major features which predominantly dominated any decorative and design feature in the early human life, these were privacy, security and temperature control.

For example, colonnades and courtyard remained two very important aspects. The former provided ventilation and indirect light to living areas while the latter provided shelter from both sun and wind. Regional architectures heavily considered doors, columns, capitals, roof parapets, shutters, windows, screens and wind-towers as their common motifs. Asfour (1998) believes that literature lacks sufficient traditional architecture on the Middle East world. Coming up with eloquent architectural design similar to those used in the past would literally mean a complete overhaul of current architectural designs. One perfect way of making this a reality dream is by encouraging current architectural students to adopt a traditional learning mind. This will help the students to compare and contrast old historical settings with the current ones to come up with very perfect solutions.

Method and Research Approach

The researcher will emphasize in this paper on the quantitative data collected from one of the selected spaces for the experiment, in relation to cultural existence and change in Riyadh, Saudi Arabia.

The data presented in this paper was collected from Landform House; a private house for Dada architecture firm. The data loggers were placed in three different spaces or themes; indoor modern scheme living house; indoor transitional scheme tea room space and outdoor space created similar to the traditional Petra path "Al-Seeq". A second set of data was collected from Historical Addiriyah from three data loggers as well; indoor traditional living, traditional court and the outdoor area, however, this set of data is not covered in this paper. The initial data analysis is translated in this paper in terms of psychological comfort looking for public acceptance and resistance, to ensure findings are compatible with environmental housing application in Hot-Arid climate of the Arab region.

According to Bryman & Bell (2011) a theme comes into place when one tries to capture the fundamental importance or meaning of a select component of the narrative text. For this study, the researcher will rely on the themes as the main backbone on what the study is trying to bring out.

Instruments

Three data loggers were located in three areas, the first is a living room that is constructed in a modern architectural design involving big glass facades.



Figure 1. Landform House, Living Room

The second area is a tearoom built in a transitional scheme merging the modern structure with one of the traditional architectonic features; a cooling tower as shown below.



Figure 2. Landform House, Tea Room

The third logger is placed outdoors to compare indoor and outdoor temperatures.

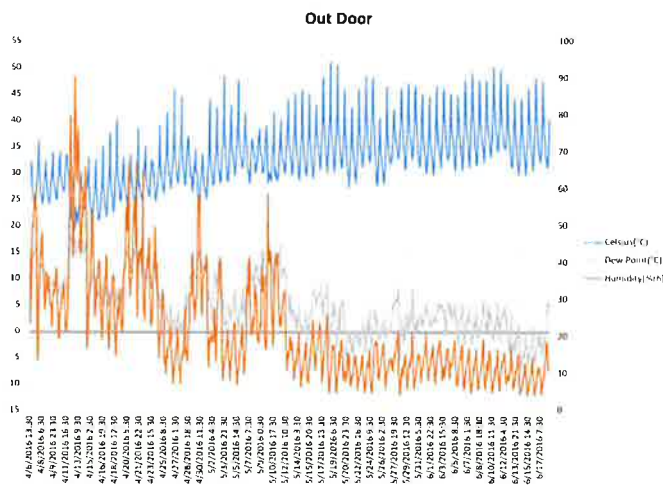


Figure 3. Landform House, Outdoor

Discussion

Three data loggers were situated in three different spaces; outdoor; living room and tea room. The data displayed in figures 1, 2, and 3 are collected over a three months period from April until June, 2016. As stated by Records of annual temperature (1996) in Riyadh, Saudi Arabia; between March and April is spring with heavy short rain falls; from mid-April till October moderate to hot summer. Therefore, its Hot-Arid architectural zone relative to being close to equator. According to Riyadh code standards human level of comfort in the outdoor in the central region of Riyadh is between 20 °C to 30 °C.

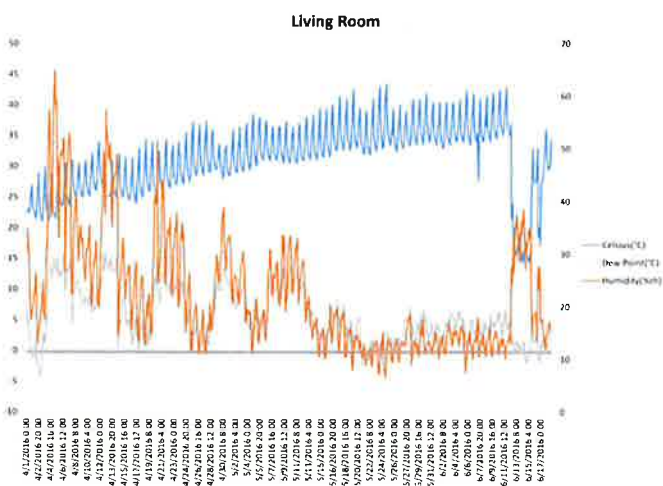
The line graph representing the temperature outdoors shows an average temperature of 28 °C during April with the least temperature of 19 °C and a peak temperature of 46 °C. In comparison to the temperature in the living room, the average is 27.9 °C with almost same degree with the outdoors during the same month. However, the coolest area during April was the tea room with an average of 27 °C which is almost 2 degrees less than the living room and the outdoors, that represents the effect of the windcatcher architectural feature.



Outdoor Temp.	APRIL	MAY	JUNE
Max.	46	51	50
Mean	28	34.6	36.8
Min.	19	25	29.5

Table 1. The max., min. and mean values of the environmental parameter "temperature" measured in the outdoor, (from April to July, 2016) in the central region of Riyadh

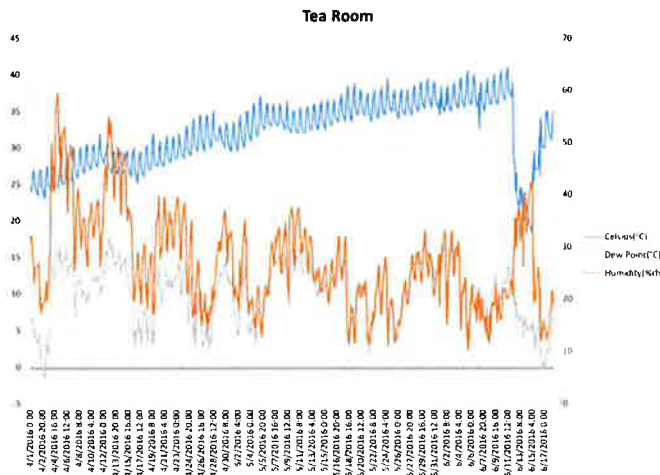
Figure 4. Graph of monthly and hourly record of the environmental parameter "temperature" measured in the outdoor, in summer (from April to July, 2016) in the central region of Riyadh



Living Rm Temp.	APRIL	MAY	JUNE
Max.	37.5	43.5	43
Mean	27.9	34.4	35
Min.	23.5	28.5	14.5

Table 1. The max., min. and mean values of the environmental parameter "temperature" measured in the Living Room, (from April to July, 2016) in the central region of Riyadh

Figure 5. Graph of monthly and hourly record of the environmental parameter "temperature" measured in the indoor living room, (from April to July, 2016) in the central region of Riyadh



Tea Rm Temp.	APRIL	MAY	JUNE
Max.	35	39.5	41
Mean	26	34	33.5
Min.	23	28.5	18.5

Table 1. The max., min. and mean values of the environmental parameter "temperature" measured in the Tea Room, (from April to July, 2016) in the central region of Riyadh

Figure 6. Graph of monthly and hourly record of the environmental parameter "temperature" measured in the indoor Tea Room, (from April to July, 2016) in the central region of Riyadh

The outdoor area was selected with in the house for the study relevance. The space was designed in a way to create a cross ventilation through the house cooling its spaces, this made the graph readings even cooler than the existing outdoor temperature.

The trend of the Time Series Graph is mostly similar for all three months, reflecting an efficacious reduce of the indoor temperature; of the windcatcher, a traditional environmental feature adapted into modern scheme, along different seasons; spring and summer including moderate and hot weather. Hence the temperature with the use of traditional environmental features are always pleasant to the occupant level of comfort.

Limitations

This study was done in the central region of Riyadh, Saudi Arabia; due to the limited no. of loggers/devices available which makes its finding limited to the climate of the selected area which is Hot-Dry climate. Therefore, more studies are required to generalize the results of the study on the ME. Arab Region. Occasionally temp. in the living room is cooler than the tea room this could be contributed to the air-conditioning factor that could affect the result slightly. It is not enough in hot summer since daytime temperatures frequently exceed 40 °C; but fall at night, and the presence of strong wind carry desert sand with them, to rely only on the fresh air ventilation.

Conclusion

The paper is presenting a study that is part of a PhD. Research and further analysis will be transcribed in detail in the full thesis, where the results will be explored in relation to human psychological and physical comfort.

To understand different approaches of the research shall extend the thermal study in relation to human psychology, and in different climatic architectural zones to include another areas of the Arab Region.

To conclude on hot-dry climate; temperature is reduced with the use of traditional environmental features, from the outdoor and from modern spaces using electrical air-conditioning system in relation to human level of comfort. As they are often supporting occupants' comfort during most of the day time. This sustainable development among traditional and modern themes will allow for long-term benefit for all mankind.

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