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The Influence of Sustainable Physical Factors on Hajj Crowd Perception among Internal Pilgrim Group in Mina

Badr M. Alsolami*[,a,b], Mohamed Rashid Embi[b], Wallace Imoudu Enegbuma[c]

[a]Faculty of Islamic Architecture, College of Engineering and Islamic Architecture, Umm Al Qura University, Makkah, Saudi Arabia.
[b]Department of Architecture, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia.
[c]Department of Civil Engineering, faculty of Engineering, Computing and Science, Swinburne University of Technology Sarawak, 93350 Kuching, Sarawak, Malaysia.
badralsolami@gmail.com

Devotional and ritual observance by internal pilgrims to Hajj presents a constant journey towards fulfilling the fifth pillar of Islam. Although, internal pilgrims are within their geographical domain, the large number of pilgrims visiting Mina at a given time stimulates crowding perception. Internal pilgrims perform such rituals in Mina for a minimum of three days. The local authorities are constantly expected to provide adequate amenities which require constant assessment to enable internal pilgrims perform their rituals without the stress of feeling crowded. In the quest for sustainable best practices, this paper examines the effects of sustainable physical factors (coding and signage, disorientation cause, spatial anxiety, orientation strategies and routing strategies) on perceived crowding levels among internal group of pilgrims in Mina. Data was collected via self-administered questionnaire from 473 internal pilgrims to Hajj. The data was analysed using SPSS for descriptive analysis and AMOS for Structural Equation Modeling (SEM). Internal consistency of the developed research instrument, Kaiser-Meyer-Olkin measure of sampling adequacy and exploratory factor analysis revealed that the research instrument was suitable. The internal pilgrim group measurement model revealed that orientation strategies and routing strategies had the highest correlation. Furthermore, disorientation cause (0.63), spatial anxiety (-0.59), orientation strategies (0.60) and routing strategies (-0.61) were all significantly affecting level of crowding perception except coding and signage (-0.52). In summary, the findings will aid in directing policies aimed at improving crowd control by authorities in Mina.

1. Introduction

Spatial crowding leads to decreased positive emotion of an individual present at a crowded location (Kim et al., 2015). According to Gifford (2007) crowding definitely is not a mere matter of how many people are around. Crowding has been studied in different sectors such as facilities management in higher tertiary institutions (Abubakar and Kasim, 2013), facilities management for the elderly (Keeling et al., 2015), hospitality management (Zehrer and Raich, 2016), travel and tourism management (Hyun and Kim, 2015), banking sector (Adiele and Opara, 2014), disaster management (Chu et al., 2014) and marketing (Garaus et al., 2014). Perceived crowding is defined as the psychological counterpart to population density of an area (Neuts and Nijkamp, 2012) as opposed to figures from numerical measure of the population (Kim et al., 2015). Kendrick and Haslam (2010) found that crowding leads to stress which can affect Hajj pilgrims' satisfaction. Crowding studies showed that crowding is based on an act or event like reduction in space, competition for resources and visual unattractiveness (Gifford, 2007). The official number of pilgrims visiting Mina in 2012 was estimated to be over 3 million. Hence, the safety and psychological state of pilgrims is of utmost concern for authorities during the Hajj rituals. Pilgrims react to perceive crowding in different ways which leads to reoccurring crowding disasters (Alnabulsi and Drury, 2014). Due to the continuous drive to attain sustainable pilgrim experience in Mina, this paper examines the effects of physical factors (coding and signage, disorientation causes, spatial anxiety, orientation strategies and routing strategy) on perceived crowding levels among internal group of

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pilgrims. Subsequent sections will assess the theoretical background of the study and present the results and discussions.

2. Hajj Sustainability

The Hajj journey is an obligatory ritual for every physically fit and financially capable Muslim. The journey includes the visits to the holy sites of Mecca, Mina, Muzdalifa and Arafat. According to Al-kodmany (2013) and Al-Qahtaanee (1997), the journey started on the first day by visiting the Sacred Mosque in Mecca and then stay overnight in Mina, about 6 km southeast of Mecca. On the second morning, pilgrims depart to Arafat, about 14 km southeast of Mina. At sunset, they make their way back and stay overnight in Muzdalifa, about 3 km south-east of Mina. On the third morning, pilgrims go to the Symbolic Stoning of the Devil Site, conduct rituals and then rest in Mina. Al-kodomany (2013) and Al-Haboubi (2003) described the stoning of the devil at Mina valley as “comprises of three Jamarat: Al-Sughrah (small), Al-Wustah (medium) and Al-Kubrah (large), or Al-Aqabah. The three Jamarat are located along two connected straight lines, with about 135 m between the small and medium, and about 225 m between the medium and large. Each Jamarah comprises a post and a circular basin to collect pebbles”. Figure 1 depicts different physical scenarios during Hajj. The gathering of different people together brings many positive social and economic benefits, but also presents several negative outcomes such as high crime, incidence of injury and illness, severe traffic delays and pollution. Hajj accommodation comprises from the most basic to sophisticated with a large number of pilgrims having to share public facilities and live in semi-permanent tents which possesses inadequate storage, cooking space, transportation, refrigeration, and proper food handling which increases the risk of spreading disease. Difficulty arises from managing recognised and approved suppliers of bulk foodstuffs to the food providers at the site, insufficient capabilities for the disposal of liquid and solid waste, inappropriate storage and removal of liquid waste, and poor control of rodents and insects that affect health and the environment (Johansson et al., 2012). During Hajj, waste management, water usage, wastewater generation, wastewater treatment, transport vehicles, littering, plastic bottles, used diapers, food packaging remains a huge task for authorities and is compounded by ignorance, over enthusiasm, illiteracy of pilgrims and lack of commitment to handle the environmental resources (Ahmad, 2016).

Figure 1: Spatial, Signage and Routing Features of Hajj (Webster 2011)

2.1 Sustainable Physical Factors and Hajj

The physical factors are argued to be of immense importance to the crowding perception of individuals at any given function. These are determined by several factors for instance the architectural orientation of the location which is measured in buildings by ceiling height, furniture, window placement, partitions and barriers including all other architectural elements. Research on high rise buildings found that the incorporation of long corridors as opposed to short corridors reduced the crowding perception of residents. The amount of sunlight entering a room reduces the level of crowding including graphical colour brightening of the room. In Hajj settings, the authors envisage in unison to earlier research position by Gifford (2007) that orientation of buildings, sizes of the routes and availability of landmarks influence these physical architectural attributes. Signage and coding are pivotal factors in managing tourist crowd visiting the world heritage site of Petra in Jordan (Mustafa and Balaawi, 2013). Sociopetal arrangement of seats to face each other as opposed to sociofugal arrangement to face away from each other leads to less crowding perceptions (Gifford, 2007). Adiele and Opara (2014) found that there was a positive and significant correlation between physical architecture and customer patronage which invariably affects customer patronage if signage, window dressing and spatial layout were not sufficient. Chu et al. (2014) found that using an agent-based egress simulation tool named SAFEgress, which incorporates important human and social behaviours will improve safety and disaster management affecting crowd movement and evacuation. In examining building design typology, (Keeling et al., 2015) highlighted that crowding perception is equivalent to the ‘need for withdrawal’ where agile mobile workers working in areas outside the conventional work space preferred less contact or need for interaction. The physical design layout of stadiums

contributes significantly to the atmosphere level of the stadium (Balaji and Chakraborti, 2015). Poor building design in retail stores leads to customer feeling confused (Garaus et al., 2014).

Scale of measurement investigates the size of the area under investigation from a small room to a big location as Mina where the Hajj is performed. To adequately comprehend the dissimilarities in various scales of measurement, researchers are tasked with examining the densities of people at the location and distances to commercial and leisure locations. A comparative research for residence/home against larger public spaces found that physical and psychological factors predicted crowding better while in the public space, psychological had a higher impact (Gifford, 2007). Abubakar and Kasim (2013) found that physical factors contribute towards crowding in residential higher education facilities. Place variations also influences crowding perception which varies from place to place such as within the confines of one's home, dynamic situations at the office and recreation activities at the beach. The variation of culture shock syndrome experienced by various Hajj groups differs as the internal pilgrims are readily at a familiar environment than others. This attribute will lead to anxiety among pilgrims in responding to disorientation caused by for example similarity of tents which is the major element in Mina, difficulty in understanding Mina blocks coding style, inadequate landmarks to be used to return back to the campsite and difference in landmarks and visual features between day and night. Regular visits to highly populated beaches will evoke less crowding perception (Gifford, 2007). The tents around Mina for pilgrims reflect a similarity to this previous research. Zehrer and Raich (2016) study on crowding in ski resorts found that individuals rated a 44 % crowd as a sign of popularity of the resort. Similarly, in a study of spatial crowding in cruise ships, perceived spatial crowding had negative effects on all three dimensions of perceived value (uniqueness value, status value and hedonic value) which directs the conclusion that irrespective of the spatial crowding cruise travellers still held the perceived *value in high standards (*Hyun and Kim, 2015). Having discussed the theoretical background of this study, the conceptual model is adapted and highlighted in Figure 2.

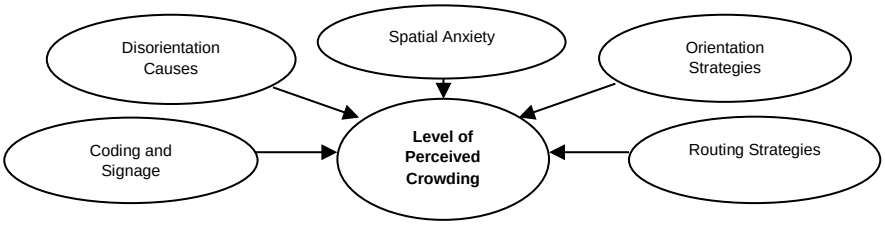

Figure 2: Conceptual Model on Hajj Sustainable Physical Factors

3. Methodology

The data was collected for 3 d in Mina during the Hajj season of 2015. Pilgrims were categorized into seven (7) main Hajj groups by the Saudi Hajj Ministry; the south-eastern Asia pilgrims, the (non-Arab) African pilgrims, the Arab pilgrims, Turkish and Muslim pilgrims in Europe and America, the Southern Asia pilgrims, the Iranian pilgrims and the internal pilgrims (Barhamain, 1997). Data was collected from all groups and for this paper, the main focus was towards the internal pilgrims which make up 35–40 % of the total number of pilgrims. The internal pilgrims were randomly selected from the massive numbers of pilgrims visiting Mina. Convenience sampling (non-probability sampling) was chosen due to the ease of identification cluster for the earlier mentioned seven groups divided for data collection. Delivery of questionnaire was done by recruited temporary workers from each group of pilgrims having knowledge of their culture and language. The research instrument was divided into two sections; demographic and constructs measure (coding and signage, disorientation causes, spatial anxiety, orientation strategies and routing strategies). Demographic measurement was mainly ordinal responses while construct measure section utilised the four point Likert scale of responses where 1 indicates strongly disagree and 4 indicates strongly agree, in order to receive certain tendency from the respondents (Lozano et al., 2008). Questions were generated from literature and went through a panel of expert screening and subsequent selection of appropriate questions. Six hundreds questionnaires were distributed to the internal pilgrims, 473 were returned forming an acceptable return rate of 82.5 %, while 22 were unusable. The data was analysed by using Statistical Package for the Social Sciences (SPSS) for descriptive analysis and Analysis of Moment Structures (AMOS) for Structural Equation Modeling (SEM). Instrument reliability and validity was also carried out to assess the research instrument (Enegbuma, 2016). Instrument reliability assesses the stability and comprehension of respondents towards the research instrument (Tabish and Jha, 2012) to adequately measure the variables of this study (Enegbuma et al., 2015). The data was examined for internal consistency on the instrument administered (Hair et al., 2013). All the variables produced Cronbach alpha values of above 0.60, which is above the recommended minimum threshold (Enegbuma et al., 2015). The responses were measured through a Likert scale which allows for freedom of opinion and relative ease of data analysis with the

assumption that strength/intensity of experience is linear (Hair et al., 2013). The Cronbach alpha values were coding and signage (0.878), disorientation causes (0.866), spatial anxiety (0.880), orientations strategies (0.912) and routing strategy (0.888) and perceived crowding level (LCP) 0.918. Instrument validity assessed the sample adequacy and multivariate normality (Enegbuma et al., 2015) measured by the results from the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity values which assesses the appropriateness of the proposed grouping of attributes (Tabish and Jha, 2012). KMO test is a measure of sampling adequacy that compares the magnitudes of the partial correlation coefficients of the items measuring the variables, while Bartlett's test of sphericity tests if the correlation matrix is an identity matrix. The KMO for this study is 0.877 which is above the accepted minimum threshold of 0.6 and the Barlett's test of sphericity is significant by $p < 0.05$ (Enegbuma, 2016). Instrument validity is further tested through Exploratory Factor Analysis (EFA).

4. Results and Discussion

4.1 Demographic of respondents

Figure 3 revealed that internal pilgrims were predominantly aged between 31 to 40 y (45 %). In terms of education, undergraduate had the highest occurrence of 56 %. Demographic of respondents revealed that 90.7 % of the respondents were male while 9.3 % were female. This is consistent with the predominance of male pilgrims among internal group. Most of the internal pilgrims were single having 69.8 % while the remaining 30.2 % were married. The economic undertone of internal pilgrims direct a high number of people resided within the mega cities at 46.1 %. Hence, the individuals from mega cities perceived crowding differs to those from villages. 67.2 % of internal pilgrims preferred to spend more than two nights in Mina as opposed to those who preferred to commute which was 5.1 %. The bulk of internal pilgrims (60 %) preferred train as the transportation to Mina and a noteworthy 1.9 % arrived by motorcycle.

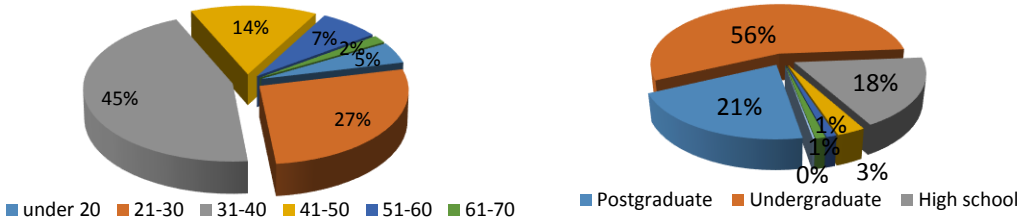

Figure 3: Age and Education Level of Respondents.

4.2 Measurement Model

The measurement model demonstrates the existing relationships between items and their underlying latent construct (Enegbuma, 2016). The fit values for measurement models have to fall within at least one of three fit indices categories namely; absolute fit (Awang et al., 2015), incremental fit (Xiong et al., 2015) and parsimonious fit (Hair et al., 2013). The minimum thresholds of indices is p-value ≥0.00 (Awang et al., 2015) - < 0.05 (Hooper et al., 2008), X^2/df (CMIN) ≤ 2.0, GFI, AGFI, NNFI and CFI 0 (no fit) to 1 (perfect fit), RMSEA<0.05 (very good fit); 0.05-08 (Fairly good fit); 0.08-0.1 acceptable; >0.1 (unacceptable) by previous researchers (Hair et al., 2013). The statistics of the measurement model had a RMSEA value at 0.061, CFI at 0.953 and close to a perfect fit and CMIN of 2.216. The fit statistics are adequate within the acceptable thresholds and factor loadings to establish convergence validity of the perceived crowding level. The next step is to specify the structural model.

4.3 Structural Model

The structural model in Figure 4 and corresponding statistical test of conceptual model factors in Table 1 revealed that coding and signage effect on perceived crowding level was found to be inversely related at -0.52 and insignificant in this study. This finding is consistent with previous researches (Keeling et al., 2015) where coding and signage plays pivotal roles in decreasing the level of perceived crowding. This suggests that the more efficient the coding and signage by provision of adequate directional signs, language of directional signs and access to the signs and codes, perceived crowding will be greatly diminished. The results revealed that disorientation causes was significantly affecting the level of perceived crowding by 0.63. This is consistent with previous findings (Balaji *and* Chakraborti, 2015) where improper physical design layouts lead to disorientation and dissatisfaction of individuals present at a crowding event. Spatial anxiety was found to be significant but inversely affecting the level of perceived crowding in this study. These findings are consistent with previous research (Gifford, 2007). This implies that the pilgrims feel a reduction in the ways they perceive spatial anxieties such as the first time they leave the camp, decision on which directions to turn to destinations, trying out new

routes on map and familiarisation with unfamiliar places which will reduce the level of anxiety and level of perceived crowding. Orientation strategies were found to be significantly affecting level of perceived crowding at 0.60. This is consistent with previous studies (Zehrer and Raich, 2016). This suggests that if the internal pilgrims are good with keeping tracks of directions (north, south, east or west), connections to campsite, change in directions, referring to a road map of Mina and asking for directions, the crowding perception will be reduced. Routing strategy significantly and inversely affect the level of perceived crowding at -0.61. This is consistent with previous studies (Zehrer and Raich, 2016). This suggests that when pilgrims are over surrounded by crowds which hinder visual features of the routes, presence of multiple routings, similarity in landmark building and confusion of mental images of routes will lead to the perception of crowding.

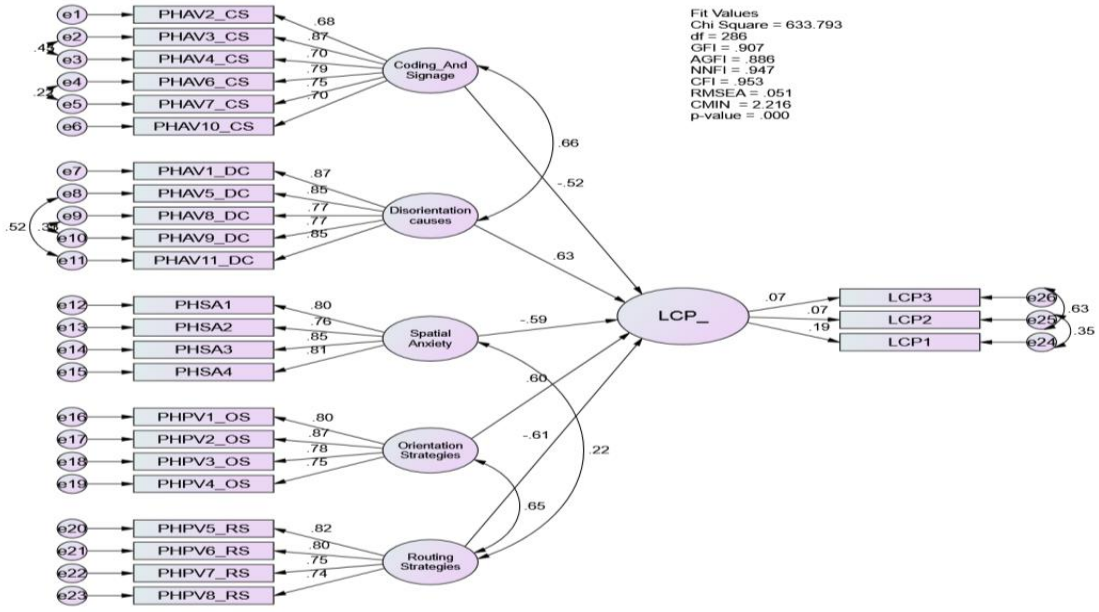

Figure 4: Structural Model of Hajj Sustainable Physical Factors

Table 1: Test of conceptual model factors (C.R. above +/- 1.69 = significant)

			Estimate	Path Estimate	S.E.	C.R.	P	Remark
LCP	<---	Coding_and_Signage	-0.108	-0.52	0.069	-1.559	0.119	Insignificant
LCP	<---	Disorientation_Causes	0.106	0.63	0.056	1.898	0.058	Significant
LCP	<---	Spatial_Anxiety	-0.113	-0.59	0.049	-2.324	0.020	Significant
LCP	<---	Orientation_Strategies	0.102	0.60	0.058	1.751	0.080	Significant
LCP	<---	Routing_Strategies	-0.114	-0.61	0.067	-1.705	0.088	Significant

5. Conclusion

The study set out to establish a basis for examining a sustainable physical factor affecting the Hajj crowding perceptions in Mina that comprised the coding and signage, disoreintation causes, spatial anxiety, orientations strategies and routing strategy. Key findings that are worthy of highlighting are the inverse effects of coding and signage, spatial anxiety and routing strategy on level of perceived crowding by internal pilgrims. This suggests that this group is familiar with the codes, less susceptible to axiety and familiar with the routes. However, disorientation causes and orientation strategies were found to be significant and positively affecting the level of perceived crowding. Hence, Hajj authority should look towards improving these factors to imrpove the perception of crowding in this setting. Future study will look towards measuring the social factors affecting internal pilgrims and in combination with physical factors.

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