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Research Paper

Structural equation modelling assessment of personal and social factors on hajj crowding among african pilgrims in Mina

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Abstract

African pilgrimage to the Mecca date back to the early years of Islam through the Sahara desert. The perception of this group of pilgrims as they embark on the sacred Mina prayer rituals directly translates to how they perceived crowding in Mina. Hajj rituals are carried out at Mina for a minimum of three days. The optimum provision and continuous improvements of the facilities for pilgrims determines how this group reacts to the crowded environment which invariably affects their psychology. This paper assesses the impacts of personal factors (control, expectation, mood and sociability) and social factors (interpersonal similarity, provision of information and activities) on crowding levels perception among pilgrim groups from African origins. A self-administered survey instrument was used in the collection of data from the African origin Hajj group totaling 156 in number. Data analysis was carried out utilizing SPSS on the descriptive data and AMOS for multivariate Structural Equation Modeling (SEM). The survey instruments internal consistency, sample adequacy Kaiser-Meyer-Olkin measure and exploratory factor analysis (EFA) found that the validity was within acceptable thresholds. The pilgrim groups from African origins measurement model revealed that sociability and interpersonal similarity had the highest correlation while level of perceived crowing and activities had the lowest correlation. Furthermore, for personal factors, sociability had the highest inverse impact and for social factors, interpersonal similarity. The authorities formulating policies to managing crowd levels and perception will invariably be affected by adapting these research findings to improve the Hajj experience. Subsequently, assessing several other factors, which effect Hajj pilgrims such as physical factors, provides an avenue for future research.

Keywords: *Crowding, Hajj, Personal, Structural Equation Modelling (SEM), Social.*

1. Introduction

Dengue Crowding is basically the stress which arise from been in a spatial constrained envelope or environment [1]. Crowding is related to unpleasant experiences by individuals visiting a certain location [2]. Several authors have examined crowding effects in other sectors hence, this study seeks to examine the crowd effect in Mina during the Hajj rituals [2, 3]. Crowds are of 11 different varieties and the pilgrims in Hajj form a crowd type defined in ways dependent on the eventuality of an event; (1) "A participatory crowd is the crowd of people involved in the actual activities of an event. Sometimes these people may be professional performers or athletes. At other times the people attending the event are participating in an actual sport, such as a marathon. Children may go up onto a stage to perform at the invitation of professional performers", or (2) "A dense or suffocating crowd is one in which individual physical movement is rapidly becoming less likely or impossible due to the density of the crowd. People are attempting to move, but they are either swept along with the movement of the crowd or are falling on top of each other. The results of this compression of people are fatalities and serious injuries due to suffocation" [4]. Hence, adequate understanding of the crowd perception improves crowd management and planning.

The psychological feeling while immersed in an area with high population density results in perceived crowding sensation [2]. This crowding sensation invariably leads to the feeling of stress which affects satisfaction of Hajj pilgrims [5, 6]. Individual perception has drawn great focus in recent crowding research while other theorist argue on the need to examine crowding as a group phenomenon [7].

Crowd density is defined by the individual present at a per unit given area determined by the per square mile/kilometer [7]. Visual displeasure, competition for scarce resources and diminishing personal space forms the basis for an act or event which creates crowding. Sequel to this situation, a stimulation of an emotion mostly negative is produced and finally a response to the crowd situation [7]. In 2012, official statistics places Mina pilgrims at an outstanding over 3 million people [8]. Due to the sacred nature of human life, safety and psychological health of pilgrims is of utmost priority for authorities during the Hajj rituals [8].

The personal factors impact (control, expectation, mood and sociability) presents a pivotal influence on perception of crowding which dictates the significance of this study. As pilgrim groups such as the pilgrims of African origins, embark on the holy obligatory journey to Mina with high expectations. Interestingly, Lee and Graefe [9] found that crowding perception went beyond physical consideration for this journey but indirectly extended towards environmental expectations. Hence, there exist a diversity of expectations from attendees such as urban and rural dwelling perception difference. Another key construct to assessing crowd perception is control, which is defined as the ability/inability of a pilgrim to exercise control within their immediate environment. Shelby,

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Vaske, and Heberlein [10] found that innovations to crowding control are initiated in line with event timing, availability of resources, access to venue ease and strategies put in place by management. Strategies such as classification of activities and data collection method had no effect crowding perception. Stemming from the ideal of maintaining a sustainable pilgrim experience in Mina, this paper assesses the effects of personal factors (control, expectation, mood and sociability) on perceived crowding levels among pilgrim groups from African origins. Subsequent sections will present the literature and theoretical background of the study, data results and discussions.

2. The hajj

The Hajj is the fifth pillar of Islam. It is an obligatory ritual for every physically fit and financially capable Muslim. The journey traverses from Mecca to the holy sites of Mina, Muzdalifah and Arafat. The journey is broken down according to Al-kodmany [11] and. Al-Qahtaanee [12] "on the first day, pilgrims visit the Sacred Mosque in Mecca and then stay overnight in Mina, about 6 km (3.7 miles) southeast of Mecca. On the second morning, pilgrims depart to Arafat, about 14 km (8.7 miles) southeast of Mina. At sunset, they make their way back and stay overnight in Muzdalifah, about 3 km (1.9 miles) 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". Similarly, Al-kodmany [11] and Al-Haboubi states that the stoning ritual "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 135m between the small and medium, and about 225m between the medium and large. Each Jamarah comprises a post and a circular basin to collect pebbles".

3. Hajj crowding and social factors

3.1 Interpersonal similarity

Psychological unity is argued to be characterised in a participatory crowd such as pilgrim on Hajj in Mina [4]. However, the interpersonal traits of the African group differs as each individual arrives the Hajj from according to statistics [13] a total of 58 countries in Africa. Interpersonal similarity was found to be an important factor affecting crowd perception when the interpersonal similarity is positive and considered to be of important to the individual [14]. Among Turkish teenagers, interpersonal distance had a significant effect of crowding and no effect on density while sex and friendship among the group had main and interaction effects [15]. Interpersonal bonds and chanced meetings as the Hajj progresses is envisaged to increase. Coincidental meetings by new flat mates in building design for shared accommodation enhances interpersonal bonds and invariably improves the well-being of the individuals [16]. The sense of interpersonal dissimilarity was observed by individuals from Hong Kong in problematic behaviours of mainland Chinese tourist to Macau. Notably highlighted was bumping into each other in the crowd [17]. Nationality had a significant moderating effect on crowding perception for tourist visitors to urban Taiwanese historical sites. Taiwanese and foreign tourist were found to be more crowd tolerant than mainland Chinese counterparts [18]. This highlights the important role of assessing the heterogeneity of the crowd. Previous study [19] posits that similarity in features such as physical appearance, attitudes, personality, and demographics information acts to stimulate cohesiveness which leads to reduced crowding levels. Similarly, similarity brings individuals closer together [20]. Distance between individuals underscores the levels of crowd perception [21]. In underwater scuba diving crowding tendencies, recreation managers having similar roles to Hajj authorities are faced with the challenge of ensuring biophysical and social conditions meet legal and jurisdictional objectives and standards [22]. Number, proximity, and clustering of divers were found to be the overriding crowding factors. This discussions leads to the first hypothesis:

H1: Level of perceived crowding in Hajj is significantly affected by Interpersonal similarity

3.2 Provision of Information

Complex cognitive task performance and emotional reactions was found to be improved in shoppers by providing information about the effects of crowding and aversive effects of the high-density situation in the shop [23]. The Hajj uniqueness requires basic traveller information which was found to be in short supply to meeting end-users requirements in transportation sector [24]. Visitors favoured information-based management to address these increasing use-pressures. The inadequacy in information attracted high use of tracks which stimulated a feeling of being crowded [25]. To counter the prevalence of crowding, Brown,. Kappes, and Marks [26] developed an information dissemination system to promptly updated individuals mobile devices with information and incentives to help alter path movement to diminish crowding perception. Location based information updating was also found to alter individual movement to locations to avoid crowding perception [27]. In health sector, inadequate information provision decreases the level of satisfaction and increase in crowd perception [28]. Information should possess "clear signposts and simple, audible public address messages are vital. Poor communications can lead to people stopping, moving against the flow of the crowd, blocking passages or making frequent demands on staff for directions. Visitors without information, or given contradictory information, can become frustrated and aggressive" [29]. This discussions leads to the second hypothesis:

H2: Level of perceived crowding in Hajj is significantly affected by provision of information

3.3 Activities

Crowding at a particular place is affected by the level of activity from participating individuals [10, 22, 30, 31, 32]. Activities which require social interaction and information seeking leads to individuals who are more crowding tolerant as opposed to activities which are solitude in nature [10, 31, 33]. Individuals partaking in an event for the first time are also prone to feeling a level of heightened crowding when compared to those accustomed to the events in the past [31, 33]. Diversification of tourist activities was opined to minimise crowding and improve satisfaction which is achieved through dispersal of visitors via internal mechanisms [34]. The level of crowd density present at a location affects the individuals target to achieve a goal which invariably leads to crowding experience [35]. In a parallel study on place satisfaction, Eder and Arnberger [36] posits that place attachment determines a higher level of attachment to an area for a particular activity preferred by the individual. Crowding due to level of activities/norm of behaviour was found to be reliant on site-specific encounters leading to less acceptable crowding for various activities and locations [22, 37]. Activities enjoyed at a forest retreat highlighted that there was little difference between activities enjoyed by different ethnic groups [38]. Social crowding in increased where there are a large number of number of customers and sales personnel simultaneously participating in shopping and service activities [39]. This discussions leads to the third hypothesis:

H3: Level of perceived crowding in Hajj is significantly affected by activities

4. Hajj crowding and personal factors

4.1 Expectations

Hajj experience or attendance of events provides a platform for

both negative and positive experiences responses. Lawler [40] defined this responses as a situation where for reaction there must be an equal or opposite reaction. In this case, pilgrims are expected to act as a corresponding outcome. In the eventuality of such outcomes, different reactions are derived while factors such as attractiveness of outcome, self-esteem, personal traits, present settings, past experiences and communication level with others become the determining factor [40]. Expectation studies have been carried out in various setting from customer care, leisure event and now religious pilgrimage. The importance of expectation was found to decrease satisfaction in recreational boat racing participants due to the increasing crowds at the event. The participants reactions was stimulated by the close proximity to a lake and coast line with the impending disaster looming [41]. In addition, as the participants increased, there was impediments to the main events which resulted in unplanned distractions [41]. According to Machleit, Eroglu, and Mantel [42], when shopper visiting a large shopping space expect the possibility of crowding, expectation moderates the outcome reaction to cope with the crowd satisfaction levels. Schreyer and Roggenbuck [43] used a wilderness attitude scale to discover a variation in different outcome reactions in people embarking on a wildlife tours. Sensitivity to crowds was found to be a determinant of satisfaction and personal experience in both day and overnight tours. Shelby, Heberlein, Vaske, and Alfano [44] in an attempt to encompass expectation, recommended the provision of realistic information about the situation of the event to give participants a real world expectation of the situation. The Hajj significance lays much emphasis on the spiritual expectations. Therefore, this study explores the anticipatory provision of pilgrim expectation needs:

H4: Level of perceived crowding in Hajj is significantly affected by expectations

4.2 Control

Control as aforementioned in the introduction plays a vital role in pilgrim satisfaction as it provides an avenue for pilgrims "need to demonstrate one's competence, superiority, and mastery over the environment" [39, 45]. During crowding, responses and assessment of the situation is derived from the control characteristics present in the individual [39, 46]. There is an exceeding joy derived when an individual can exert control in crowded environments this in turn raises the satisfaction and perception [39, 47]. To improve coping behavior which is an offshoot reaction to crowding, it is important to create an awareness and anticipatory atmospheres to minimize the risk of crowd perception which could lead to chaotic response [39, 48]. Similar to the moderation of expectations, control partially mediates unsatisfactory feeling of crowding in a shopping mall [39]. Control was found to be an important factor for design of elderly dwelling homes to cater for short term crowding effects on the their health. This will assist in ensuring a sense of control of their environment to reduce crowd sensation [49]. In the service industry, customer taking control of their or feeling the sense of control of their environment helps to boost interaction with the environment. Hajj authorities are presented with the challenge of providing a smooth interaction between pilgrim and the environment in Mina [39, 50, 51]. Control can also be implemented through sufficient provision of information about the layout and products of a particular destination [39, 52]. The use of technology to adequately equip information centres mediates the relationship between the visitors emotions and the environment [39, 51]. Ultimately, no matter how high the density if an individual feels a sense of control, the individual reacts positively to the crowd situation [39, 51, 53]. This discussions leads to the fifth hypothesis:

H5: Level of perceived crowding in Hajj is significantly affected by control

4.3 Sociability

Seclusion points to individuals with some form of health concerns or some a naturally occurring phenomenon. However, sociability theory posits that social perception increase or decrease according to the individuals' dispensation to mixing with other individuals irrespective of the diversity spectrum [7]. Shopping malls crowding was found to be stimulate positive effects on social shoppers while task shoppers opted to avoid crowded malls due to lack of control of the environment. The use of advanced technological advertisement, transformation of creative mall design and use of technology can counter such reactions for task shoppers and inclusion of food stalls also improves shopping experience for social shoppers [1]. Research from store employees on customer feedback found that customers preferred products which lack social promotions in crowded situation to those with social promotions in the same conditions [54]. This denotes the tendency of social avoidance by some individuals. Although the Hajj involves group association to improve safety and coordination, individual within groups differ in terms of their threshold for association which lead to the sixth hypothesis:

H6: Level of perceived crowding in Hajj is significantly affected by sociability

4.4 Mood

The mood condition is a resultant of the individual state of mind once placed in a crowded situation. [5] research found that limited space increases displeasure. To enhance mood control of pilgrims with African origins, negative emotions reflecting displeasure from limited space need to be examined. A study on retail shopper also found this same trend of limited spaces affecting the customers [55]. Erratic behavior stimulated by prolonged exposure to crowd in elderly individuals is rampant [49]. Weather temperatures during the Hajj ritual combined with the crowd patterns could further increase this phenomenon [56] termed as "excitation transfer effect". This phenomenon transcends to increase in not only the temperature but also increase in hostility cognition among individuals. Emotional mood of shoppers in a shopping mall mediates the relationship towards crowding satisfaction [42]. Hui and Bateson [51] found that as crowding levels increase, the pleasantness of a shopping experience diminishes. The mood of shoppers in a crowd improved with the provision of music and cultural decoration [57]. Among Malaysian shoppers, there is a communication need to convey inquiries between customer and store staff, which rapidly increase sales output during festive events. Here, gender such as male and female interaction was found to be a moderating factor to attaining satisfaction. Thus, mood in this study is hypothesized as:

H7: Level of perceived crowding in Hajj is significantly affected by mood

5. Methodology

The data was collected in Mina during the time frame for the Hajj rituals. Pilgrims were categorized into six (6) groups; African, Turkish, South-East Asia, Internal, Asia and Europe. For this paper, the main target was pilgrims with African origins. The pilgrims with African origins were randomly selected among the Hajj pilgrims visiting Mina. A survey instrument was develop and divided into two (2) sections; constructs measure and demographic. Demographics were mainly ordinal responses while construct measure section used a five (5) Likert scale response (1 strongly disagree to 5 strongly agree). A total of 200 questionnaires were distributed among pilgrims with African origin, 165 were returned denoting a 755 acceptable rate of return while 9 were unusable. Data analysis was done with two software programs. First is the Statistical Package for the Social Sciences (SPSS) for descriptive

analysis. Second is the Analysis of Moment Structures (AMOS) for multivariate Structural Equation Modeling (SEM). Reliability and validity of the implemented instrument were also carried out.

Instrument reliability assesses the stability and comprehension of respondents towards the research instrument to adequately measure the variables of this study [58, 59, 60]. The data was examined for internal consistency on the instrument administered. All the variables produced Cronbach Alpha values of above 0.60. This is more than the recommended minimum threshold [59, 61, 62]. The responses were measured on a Likert scale. This scale offers freedom of opinion and relative ease of data analysis with the assumption that strength/intensity of experience is linear [61, 62, 63]. Expectation (PFE) 0.868, control (PFC) 0.838, sociability (PFS) 0.700, mood (PFM) 0.874, interpersonal similarity (SFIS) 0.874, provision of information (SFPI) 0.865, activities (SFA) 0.863 and perceived crowding level (LCP) 0.918.

Instrument validity assessed the sample adequacy and multivariate normality 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 [58, 62]. 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 0.699 which is above the accepted minimum of 0.6 and the Barlett's Test of sphericity is Significant by $p<0.05$ [59, 61]. Instrument validity is further tested through Exploratory Factor Analysis (EFA).

6. Results and discussion

In Figure 1, pilgrims of African origins are mainly aged between 31-40 years (33%) while others are aged 21-30 years (31%), 41-50 years (14%) and the lowest group of above 70 years (1%). The result of age disparity towards the younger pilgrims will lead to more openness to personal and social factors when compared to the elderly frailty perceptions. The next figure reveals educational background with high school having the highest occurrence of 27%, while others are BA/B.Sc./B.Eng. (22%), read and write (19%) and illiterate and PhD had the lowest by 6%.

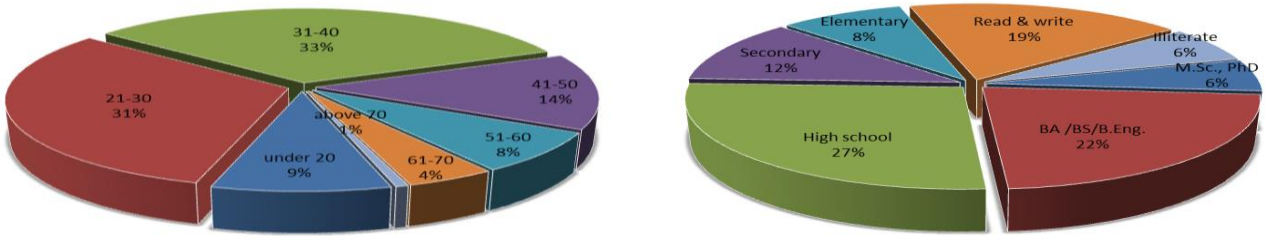


Fig. 1: Age and Education Level of Respondents

The demographics revealed a prevalence of male pilgrims of African origins as 69.2% while the female counterparts were 30.8%. This finding is consistent with the number of overall pilgrims embarking on the journey to Mina. Married pilgrims of African origins formed the bulk of the respondents as 73% while 26.9% unmarried. This can be traced to the aged statistics discussed previously. In terms, of defining Hajj experience, it is evident from the 55.8% pilgrims of African descent residing in the cities that there will be a slight variation to their perspective experience. City dwellers are readily adept with crowding conditions when compared to their counterparts from the rural areas. This amount of time spent in Mina by the pilgrims of African origins was above average, as 58.3% prefer to spend more than two night for extended experience while 4.5% were of the preference to commuting to Mina daily. A noteworthy finding is the mode of transportation to Mina. 32.1% prefer to walk into Mina although the vast majority use bus transportation means.

6.1 Measurement model

Measurement models demonstrate the existing relationships between items and latent construct. To ensure appropriateness, that statistical values of fitness for the measurement and structural model have to align within any three (3) fit index categories namely; absolute fit, incremental fit and parsimonious fit [59, 61, 62, 64, 65]. The minimum thresholds of indices is p-value ≥ 0.00, X2/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 [61], [62], [64]. The statistics of the measurement model had a RMSEA value at 0.64, CFI at 0.934 and close to a perfect fit and CMIN of 1.627. The fit statistics are adequate within the acceptable thresholds and factor loadings to establish convergence validity of the perceived crowding level.

6.2 Structural model

Mood of pilgrims has the highest significant impact of 0.34 on perceived crowding levels as shown in Figure 2 (structural model) and Table 1 (path coefficient). This finding are consistent with previous research [5, 42, 49, 55, 56, 57] which highlights the pivotal importance of mood in a crowded setting. Infusion of music to calm the individual, spatial design alteration, stimulants to reduce temperature are recommendation to enhance mood in diverse setting according to previous research. Hajj authorities need to constantly formulate innovative provisions to alleviate the mood of pilgrims with African origins to overcome the perception of crowding.

Level of perceived crowding was impacted on inversely by a -0.15 significance by expectation in this study as shown by the structural model. This finding is consistent with previous research [40, 41, 42, 43, 66, 67] which posit that level of crowding perception reduces from the direct impact of successfully meeting individual expectations. Past experiences of pilgrims of African origins are brought to bare in determining how they experience Hajj. Similarly, the openness to communicate with other pilgrim groups and individuals is also attributed to expectations before embarking on the journey. Settings of the present affects how they react, imbibed personal traits and features that are attractive cumulate to the overall expectation experience. This dictates consistent training in handling safety matters and human relations for effective inquiry communications for the pilgrims of African origins to alleviate level of crowding expectations.

Level of perceived crowding was impacted on inversely by a -0.06 insignificance by sociability in this study as shown by the structural model. Some pilgrims want to take advantage of the Hajj to worship Allah rather than being a part in a social endeavor, which explains the insignificance of this construct. This characteristics behavior was found in previous research on shoppers who chose to block every other distractions and maintain a constant focus on the

shopping task at hand. They thereby avoid all other distractions [1]. The findings also suggests that pilgrims of African origins from the other category of pilgrims may not necessarily engage in discussion with Hajj authorities during Hajj rituals which are consistent with Palcu, Kleber, Florack, Palcu, Kleber, and Yoon [54].

Level of perceived crowding was impacted on inversely by a 0.05 insignificance by control in this study as shown by the structural model. The observation dictate that as control increases, there is a decrease in the levels of perceived crowding. This can be improved by providing adequate information provision and building design. However, efforts towards technological improvements [11. 68. 69] are on the increase and facilities need to be improved to cater for alternate designs and information provision.

Activities amongst social factors had the highest insignificant relationship of 0.07 impacts on perceived crowding level. From the measurement model inverse relationship and insignificance in the structural model suggests that the knowledge and spiritual yearning to embark on the Hajj reduces the effect of activities on crowding perception. Interpersonal similarity had the second highest insignificant impact on perceived crowding level by 0.06 while provision of information was the least impact by 0.03. The findings suggest that social factors are generally not contributing factors for African pilgrim groups as they tend to have a good understanding of the social distance, information and activities to be carried out during the Hajj.

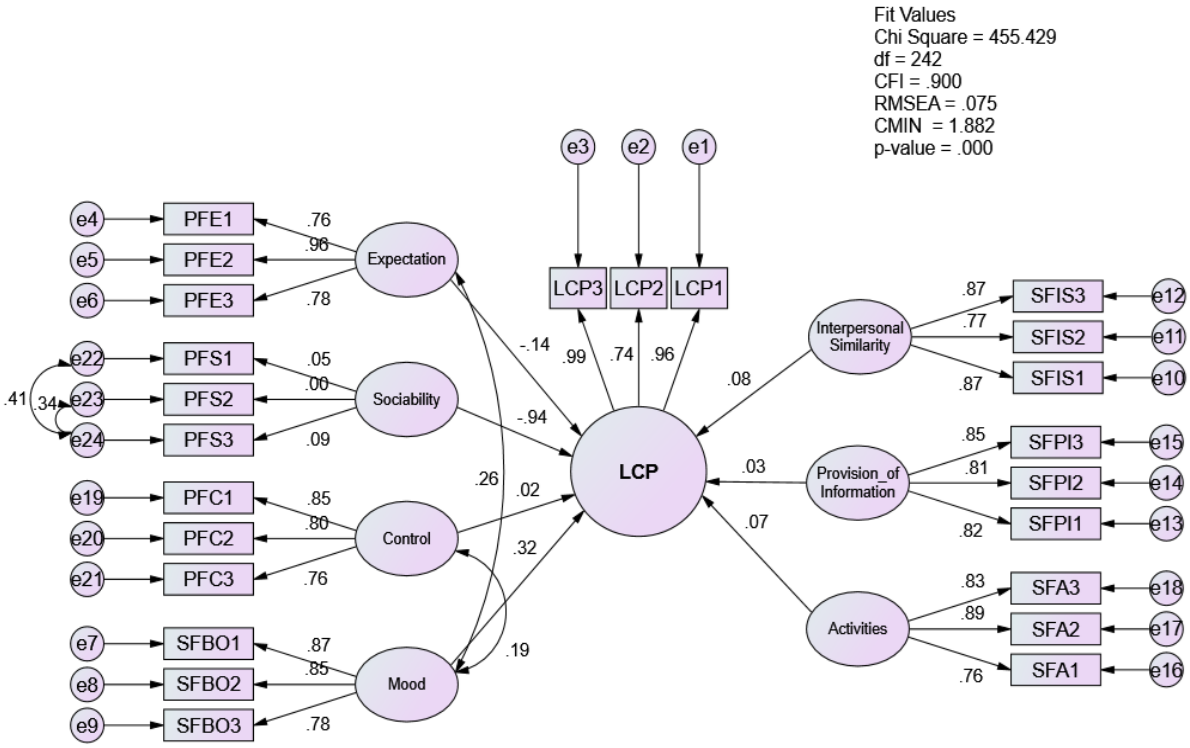


Fig. 2: Perceived Crowding Level Structural Model

Table 1: Hypothesis Testing

			Estimate	S.E.	C.R.	P	Label
LCP	<--	Expectation	-0.186	0.110	-1.696	0.090	Significant
LCP	<--	Sociability	-16.065	23.821	-0.674	0.500	Insignificant
LCP	<--	Control	0.019	0.088	0.215	0.830	Insignificant
LCP	<--	Mood	0.295	0.083	3.544	***	Significant
LCP	<--	Activities	0.089	0.099	0.907	0.365	Insignificant
LCP	<--	Provision of Information	0.034	0.084	0.409	0.683	Insignificant
LCP	<--	Interpersonal Similarity	0.068	0.070	0.966	0.334	Insignificant

7. Conclusion

The aim of this study was to examine the crowd level perception of pilgrim especially among the pilgrims of African origins using the personal factors (control, expectation, mood and sociability) and social factors (interpersonal similarity, provision of information and activities). The survey instrument developed was validated creating a reliable means for future crowd perception measurement in Hajj. Sociability as shown in the measurement model, had the highest correlation between control and mood. This confirms that pilgrims of African will communicate/interact better when they perceive that they have control over the environment. This will invariably affect the level of mood. Control, mood, sociability and expectation all were found to be impacting on levels of perceived crowding. Interestingly, the relationship between perceived crowding levels and expectation was inverse. The structural model of the persona and social factor hypothesized by this study revealed that mood and expectation were significant while sociability and control were insignificant. The impact was categorized according to weightage of impact which follows mood, expectation, sociability and control. This study found that the mood of African pilgrims during performing rituals in Mina was regarded as the most important factor. This buttresses the major area for improvement focus regarding pilgrims of African origins to Hajj in Mina. To achieve the required personal factors improvement needs for African pilgrims, adequate information on the environment in Mina needs to be improved, inter-personal interaction training for Hajj authorities, improvements in technology monitoring of pilgrims, and provisions outlets for digital displays and resting. Amongst the social factors, activities interpersonal and provision of information listed according to weight affected perceived crowding levels. These were all insignificant in this study among the African group. Further research will be assessing several other factors, which effect Hajj pilgrims such as physical factors, provides an avenue for future research.

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