# BOOK OF ABSTRACT

# 5th NATIONAL SEMINAR ON HAJJ BEST

# PRACTICES ON CROWD & HEALTH ISSUES

27th & 28th August 2013, Equatorial Hotel, Penang

Edited by

Professor Ahamad Tajudin Khader

Naimah Kassim

# TENTATIVE SEMINAR PROGRAM

## DAY-2 (28ᵗʰ August 2013)

| TIME | PROGRAM |
|---|---|
| 9.00 am  -  9.20 am | **PAPER PRESENTATION**<br>**Paper 8**<br>Prof. Madya Dr. Habsah Hasan<br>*School of Medical Sciences, USM*<br>Title: Respiratory Illnesses and Symptoms Among Malaysia Hajj Pilgrims |
| 9.20 am  -  9.40 am | **Paper 9**<br>Nurul Diana Dzaraly<br>*Faculty of Medicine and Health Sciences, UniSZA*<br>Title: Pattern of Common Health Problems During Hajj |
| 9.40 am  -  10.00 am | Refreshment break |
| 10.00 am  -  10.20 am | **PAPER PRESENTATION**<br>**Paper 10**<br>Nor Radhiah  Mat Nor<br>*School of Health Sciences, USM*<br>Title: Determination of The Health Economics Factor to Reduce Health Problems among Malaysia Pilgrims in Mecca and Madinah |
| 10.20 am  -  10.40 am | **Paper 11**<br>Muhammad Irfan Sana bin Muhamad Razip<br>*Faculty of Electrical Engineering, UTM*<br>Title: Development of Wireless Sensor Network for Crowd Monitoring Using Image Sensor |
| 10.40 am  -  11.00 am | **Paper 12**<br>Fahmi Bahri Sulaiman<br>*Faculty of Biosciences and Medical Engineering, UTM*<br>Title: The Effects of Low-Intensity Exercise Endurance (LIEE) Training Toward Hajj Pilgrims Cardiovascular Endurance in Performing Hajj Ritual Activities |
| 11.00 am  -  11.20 am | **Paper 13**<br>Muhammad Iqbal Tariq bin Idris<br>*Faculty of Biosciences and Medical Engineering, UTM*<br>Title: Pilgrims Perception of the Hajj Preparation Course: A Preliminary Investigation |
| 11.20 am  -  11.40 am | **Paper 14**<br>Muhammad Rahami bin Roslan<br>*Faculty of Electrical Engineering, UTM*<br>Title: RFID Based System For Malaysia Pilgrims Identification and Monitoring Through GSM |
| 11.40 am  -  12.00 pm | **Paper 15**<br>Mohd Arif Shuib<br>*Department of Psychology, UIAM*<br>Title: Development and Content Validation of Hajj Crowd Behavior Scale |

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# RFID BASED SYSTEM FOR MALAYSIAN PILGRIMS IDENTIFICATION AND MONITORING THROUGH GSM

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**ABSTRACT**- There are massive numbers of pilgrims performing the pilgrimage each year and it is highly challenging for the authorities to manage and monitor these pilgrims especially when an emergency is occurring. In this project, a pilgrim tracking system with the help of Radio Frequency identification (RFID) is proposed. A Prototype of RFID Based System for Malaysian Pilgrims Identification and Monitoring through GSM has been successfully developed which involves integration between the hardware and software. In this system, each pilgrim is given an ID card with active tag that operating at 2.4 GHz. The system can detect and monitor the Malaysian pilgrims (with tag) who enter specific area and who have passed through specific points. The information will be sent and recorded by the Malaysian Department in Makkah. In case of an emergency, missing pilgrims can be identified and details identity of the respective pilgrims can be accessed. Consequently, information of the missing pilgrims is then sent to the group leaders through GSM module to alert them about the missing person. The proposed system enables identification and verification of pilgrims' identity that will be most useful at risky places such as along the tunnel to Mina and also can be used for traffic planning, crowd controls and pilgrims routing. This project begins with the hardware setup which constitutes of the RFID reader, 5 of 2.4 GHz active RFID tags and the GSM module. Next a database of pilgrims and the graphical user interface (GUI) are created using the Microsoft Office Access and Microsoft Visual Studio respectively. The GUI contains details on tag detection, tag lost identification and the integration with the GSM module. Finally the system is integrated with GSM module through hyperterminal software which enable real-time updates to be sent to the respective leaders in case of any emergency.

**Keywords**: RFID, GSM module, Identification, Microsoft Office Access, Visual Studio

# DEVELOPMENT AND CONTENT VALIDATION OF HAJJ CROWD BEHAVIOR SCALE

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**ABSTRACT** – Effective and safe simulations of large crowd during Hajj are vital as the statistics of hujjaj are reaching four million per season in the coming years. Capturing the underlying behavioural factors of hujjaj before the hajj season could yield effective safety practices, evacuation simulations, and injury preventions. The current paper aims at addressing the gap in the literature in terms of assessing crowd behaviour during Hajj. A new measuring instrument, which includes 30 self-rating questions divided into three sub-scales, is proposed. Using a pool of items accumulated from the statements of pilgrims during an Umrah season, the preliminary internal reliability of the scale was established. Content validity ratio was calculated by a group of subject matter experts and used to demonstrate the instrument's content validity. A series of item analysis and item revision procedures was also conducted to increase the instrument's psychometric properties. It is hoped that the development of this scale will offer important insight on effective and safe simulation of crowd during hajj. Some possible implications of this new instrument are discussed in relation to test administrations, crowd dynamics, and overall Hajj management.

**Keywords:** Crowds, behavioural factors of hujjuj, Hajj Pilgrims

# ASSESSING PSYCHOSOCIAL ELEMENTS OF CROWDS DURING HAJJ: SCALE CONSTRUCTION AND CONTENT VALIDATION

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**ABSTRACT –** Effective and safe management of large crowds during Hajj are vital as the statistics of pilgrims or hujjaj are reaching four million per season in the coming years. Capturing the underlying psychological and social factors affecting this crowd type before the Hajj season could yield efficient safety practices, evacuation simulations, and injury preventions. The current study aims at addressing the gap in the literature in terms of assessing psychosocial elements of crowds during Hajj. A new measuring instrument, which includes 104 self-rating questions divided into three sub-scales, is proposed. Using a pool of items accumulated from the statements of pilgrims during an Umrah season, the preliminary internal reliability of the scale will be established. Content validity ratio will be calculated by a group of subject matter experts and used to demonstrate the instrument's content validity. A series of item analysis and item revision procedures will also be conducted to increase the instrument's psychometric properties. It is hoped that the development of this scale will offer important insight on effective and safe simulation of crowds during Hajj. Some possible implications of this new instrument are discussed in relation to test administrations, crowd dynamics, and overall Hajj management.

**Keywords: crowd, scale development, behaviour, emotion, thought, Hajj**

## INTRODUCTION

In the current scenario of Hajj management, much effort was channelled into managing crowds using sophisticated tracking and positioning systems as well as computer simulations and automated video analyses (Johansson, 2010). For example, Khozium, Abuarafah, and Abd Rabou (2012) proposed a closed monitoring system to trigger safety measures using thermal cameras, while Curtis, Guy, Zafar, and Manocha (2011) developed a system to simulate the movement of individual agents in large-scale crowds performing the Tawaf. Although these trends contribute significantly to the management of Hajj, the main issue remains on the psychological makeup of the crowds that influences the behaviours of the hujjaj.

History has shown that mass gatherings attended by large crowds of people can potentially lead to disasters such as crushing, stampede, asphyxiation, and deaths. For instance, the Ibrox stand incident of 1902 in Glasgow has reoccurred at Bastia in 1992 while the crushing accident at Bolton in 1946 has a striking similarity with the Hillsborough disaster (Mohd Mahudin, 2003). As a place of human activity, Hajj is no less prone to disasters than any other. Indeed, it has been demonstrated that the increased volume of hujjaj largely contributed to several deadly disasters such as the 1990 Al-Ma'aisim tunnel stampede (1426 deaths) and the occasional stampedes and crushes that occur in Mina at the stoning of the Devil ritual (1994: 270 deaths; 2001: 35 deaths; 2003: 14 deaths; 2004: 251 deaths; and 2006: 346 deaths) (History of deaths on the Hajj, 2007).

Without understanding the crowds and crowd behaviours, Berlonghi (1995) argues that people are left with random attempts at crowd control and crowd management, which, in turn, may result in serious losses of life, health, property, and money. He emphasises that those involved in crowd management and crowd control must foresee the nature of the crowd that will be in attendance and must be able to observe the behaviour of a crowd while an event is taking place and make timely decisions for effective action. Problems can arise if the relevant authorities do not foresee and prepare for a variety of crowd situations. Nevertheless, despite the increasing number of hujjaj performing the Hajj every year, the various psychosocial factors of Hajj crowds are not well understood and still represent a challenging question for further investigation.

Having this perspective in mind, the present study ventures a shift from testing technologies to investigating the crowd itself, particularly its psychosocial elements. While there are studies that examined the psychosocial aspects of crowds in other settings such as music festivals (e.g., Hutton, Zeitz, Brown, & Arbon, 2011) and rail settings (e.g., Mohd Mahudin, 2003; Mohd Mahudin, Cox, & Griffiths, 2012), the development of a scale designed to measure the psychosocial elements of crowds during Hajj remains unexplored. Given the limited amount of work conducted in this area, this study aims to construct and validate the content of a new instrument that captures the psychological and social influences within Hajj crowds that influence hujjaj behaviours. It is assumed that the psychosocial elements of the crowds may be interrelated with hujjaj behaviours, emotions, and thoughts. A new scale for the measurement of these elements is useful to reflect the psychosocial features of Hajj crowds. As the proposed scale intends to uncover the various psychosocial elements in crowds that may influence hujjaj behaviours, it is anticipated that we could now understand this specific crowd type better. Consequently, the proposed scale is envisaged as an instrument that could offer important insight on effective and safe simulation of crowds during Hajj.

## LITERATURE REVIEW

Contemporary literature on mass gatherings focuses mostly on medical care (e.g., Hutton, Zeitz, Brown, & Arbon, 2011; Zeitz et al., 2009) or the use of technologies in predicting and controlling the large crowds (e.g., Curtis, Guy, Zafar, & Manocha, 2011; Khozium, Abuarafah, & Abd Rabou, 2012). While these all are important issues, they do not adequately capture the comprehensive understanding of crowd behaviour. Of particular concern have been the role of psychological and social factors that may influence the way crowds react, especially in relation to religious events such as Hajj. Although less studied, there is some evidence that crowd behaviour and movement during the Hajj are relatively unique in that they involve a set of fixed rituals that need to be performed at specific hours and days in assigned locations (AlGadhi & Mahmassani, 1991). Furthermore, the Hajj crowds are motivated by different goals in their activities, which influence how they respond to certain crowd behaviours.

In essence, the psychosocial aspects of crowds within Hajj crowds are, to some extent, under-researched. Although Arbon (2004) has proposed a conceptual model that delineates how three domains: biomedical, environmental, and psychosocial interplay in mass gatherings, this model however is limited to the area of mass gathering health and medicine. Nevertheless, even within this area, Hutton and colleagues (2011) argue that the environmental and biomedical domains of mass gatherings have been centre staged in research compared to the psychosocial domain. According to them, knowledge of the key features of the psychosocial domain and how they interact with other domains to affect the health and safety of the crowd are still lacking.

One reason for the lack of studies addressing this issue is possibly related to the continued emphasis on density as an objective measure of crowds. Evidence from literature suggests the meaning of crowd as a construct varies with a researcher's theoretical predispositions. For example, a study of public pedestrian by Toyosawa and Kawai (2005) found that crowds can be measured selectively depending on the nature of the target space i.e., either flowing or stagnated. The more recent study by Srivastava, Ng, Delp, & Lafayette (2011) refer crowd density level as the number of persons present in the scene. On the contrary, a study by Hutton et al., (2011) included the psychosocial domain to measure and monitor crowd behaviour during the 2010 Adelaide Big Day Out - an estimated of 35,000 gathering of people.

This differing conceptualisation of crowds has, in turn, led to a differing measurement method for assessing the variety of crowd types. To date, a standardised instrument has yet to be developed that assesses the different psychosocial elements of crowds, especially within Hajj context. Consequently, there is a need to develop an accurate and reliable instrument that can capture the various psychosocial aspects of crowds for use during the Hajj and Umrah, and potentially in other mass gathering settings as well. Having a measurement scale that enables real-time identification of changes in crowd behaviours during Hajj process can allow the relevant authorities to modify the existing setting or program to influence change in people behaviours to assist with the crowd control and risk management (Hutton, Zeitz, Brown, & Arbon, 2011).

*Why the current study is important?*

Two gaps can be identified in the literature. First, where crowds and mass gatherings have been investigated, researchers have tended to focus on objective, density aspects of crowd management (e.g., Toyosawa & Kawai, 2005), and less on

subjective, psychosocial aspects of the crowd. Second, while the advance, technical and mechanical aspects of crowd management are well captured in the literature (e.g., Johansson, 2010), the psychosocial aspects of the Hajj crowds remain relatively unexplored. Both gaps provide major warrant for the current study.

This study is important in the area of crowd behaviour and Hajj management for two reasons. First, it provides an extended theoretical evidence on the notion of crowdedness as a psychosocial domain, hence improve our understanding of how people behave, feel and think in highly crowded situations. Second, the study offers possible sound psychometrically measures that captures notion of crowdedness in a broader scope, with potential implications for understanding crowd behaviours during Hajj.

**METHODOLOGY**

*Design*

This study will employ cross sectional survey methods to obtain data for analysis. Three main domains of behavioural, emotional, and thoughts are hypothesised to capture the measure of psychological and social influences within Hajj crowds. The proposed items, gathered from a preliminary data of experiences from those performing Umrah, are compiled and will be piloted to participants who are the local Hajj candidates for the 2013 Hajj season. Comments about the items will also be solicited from a panel of experts dealing with crowd and Hajj management issues.

*Participants*

For the pilot study, a group of 75 hujjaj candidates (40 females; 35 males) for 2013 Hajj season will be selected using simple random sampling. Participants will be recruited from the local Hajj management institution in Kelana Jaya. The sample frame and the location of the selected participants are appropriate for the study because being the central host of the grand hajj training in Malaysia, the Kelana Jaya centre provides the most variation of participants and the extensive experiences of the institutions' in managing the training prior to the Hajj.

As for the expert panel, 15 panellists with at least 10 years of experience in crowd studies and Hajj operations will be approached for the content validation stage. The potential panellists may include Hajj management officers, emergency response team officials, crowd safety managers, as well as academics, researchers, and policy makers.

*Measures*

A new measuring instrument, which includes 104 self-rating items, is proposed. These items, which were gathered from the statements of pilgrims during an Umrah season, are divided into three main domains (sub-scales): Behaviour, Emotion, and Thoughts and will be piloted to target participants using paper and pencil mode. The Behaviour domain has 41 items, which will be rated on a 5-point Likert scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). In this domain, the participants will rate one's own behaviour and that of others. Similar format will be followed for the Emotion domain, which consists of 33 items. As for the third domain, being a complex variable, only one's own thoughts will be measured. 30 items will be used as a measure of the Thoughts domain. For each domain, summative scores will be calculated, in which higher scores indicate higher psychosocial elements in that

particular domain. Besides asking participants to rate all the items, they will also be asked to comment on the wording and phrasing of each questions. This step is done to check face validity of the instrument.

Meanwhile, a group of subject matter experts will be invited to comment and check the instrument's content validity. In this phase, the experts will be asked to rate each item either as "*Essential*", "*Useful but not essential*", or "*Not necessary*" with regard to the appropriateness of the instrument in measuring psychosocial elements of crowds during Hajj as a construct. Finally, the feedback from both the pilot participants and the experts will be used to revise and modify the instrument.

*Procedures*

After appropriate approval from relevant authorities is granted, the questionnaire will be administered to 75 hujjaj candidates during their Hajj preparation training. Five enumerators, who will be previously trained, will be assigned to collect data at the location. Completed questionnaires will then be analysed for reliability using Cronbach's Alpha. In addition to the internal reliability analysis, content validity ratio (CVR) will be calculated following Lawshe's (1975) formula. CVR values range from -1 to +1, where values closer to +1 indicate experts are in agreement that the item is essential to content validity. Lawshe (1975) suggests that if more than half of the panellists rated an item to be essential, than the item has at least some content validity. A series of item analysis and item revision procedures will also be conducted to test the instrument's psychometric properties.

## CONCLUSIONS

The aim of this study is to propose a quantitative measure of psychosocial elements of crowds during Hajj. More specifically, it is assumed that by combining the behavioural, emotional, and cognitive (thoughts) elements of crowds, a new scale can be established and consequently be used to measure and predict the psychological and social influences within Hajj crowds. As the study attempts to explore a novel area in crowd research, it is envisaged that it will set the ground for further establishment of a comprehensive crowd assessment for use in the overall crowd management and Hajj operation.

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