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First Theme:

Fiqh (jurisprudence of Islam), Administrative and Human Studies

Forgetting and its Effect on Arafat Standing

A comparative jurisprudent study

Mortada Abdulraheem

Taif University

Abstract

Forgetting and its Effect on Arafat Standing

A comparative jurisprudent study

It is known that Islam treated innate aspects of human beings .It laid out special rules for all its behavior. It showed that may act spontaneously: doing a prohibited action or leaving out what he is obliged to do by mistake or forgetting. This makes a Muslim well guided in all his affairs in that life or the hereafter.

Forgetting is something that no one is away from it. In performing Hajj all people are subject to forget besides most pilgrims are unfamiliar with many of Hajj rites including what to do if someone forgot to perform some of the rites and the jurisprudent change of the ruling affected by forgetting.

This study consists of a prelude, seven topics and a conclusion

Prelude: contain the problem of the study, its importance, objectives, limits and the research plan.

First topic: Defining research terms and related expressions

First title: Defining research terms (forgetting – effect – Arafat Stand)

Second title: Related expressions :(inattentiveness –absentmindedness)

Second topic: Scholars' opinions concerning exiting Ihram for those who missed Arafat stand because of forgetting.

Third topic: Scholars' opinions concerning those who missed Arafat stand.

Fourth topic: Scholars' opinions concerning offering a sacrificial animal by those who missed Arafat stand.

Fifth topic: The ruling concerning those who attended Arafat stand but left before sunset and when they remembered they didn't return to Arafat.

Sixth topic: The ruling concerning those who attended Arafat stand but left before sunset. When they remembered they returned to Arafat before sunset then left Arafat after sunset.

Seventh topic: The ruling concerning those who attended Arafat stand but left before sunset. When they remembered they returned to Arafat after sunset.

Conclusion: It includes all findings achieved. The research is supplemented by a bibliography

Full text is available in Arabic section under this title

النسيان وأثره في الوقوف بعرفه

دارسة فقهية مقارنة

The Efforts of the General Presidency of the Commission for the Promotion of Virtue and Prevention of Sins; Their Experiences and Expertise In the Development of Services Provided to Pilgrims (Pilgrimage season of 1435 H)

Ahmed Belaos

General Presidency of the Commission for the Promotion of Virtue and Prevention of Sins

Abstract

Research Problem:

What is the role of the General Presidency of the Commission for the Promotion of Virtue and Prevention of Sins in the actions of Hajj?

Research Methodology:

The researcher depends on the extrapolation method and analysis.

Results:

1. The importance of the promotion of virtue and prevention of sins, and they are the direct business for pilgrims, which Induced by the leadership of this blessed Kingdom, and that the great efforts of the Commission in the service of pilgrims are notified.
2. The positive efforts of Commission's staff in the pilgrimage season to protect the religion by kindness and wisdom should not be affected by individual mistakes that some staff my done.
3. That the subject matter jurisdiction of the General The The Presidency of the Commission should not interfere with the jurisdiction of other agencies in the process of Hajj. Also that the Commission exercise its jurisdiction according to the regulation issued by the Council of Ministers Resolution No. (73), dated 16/03/1434 H according to the administrative organization of the Council of Ministers Resolution No. (286), dated 06/07/1435 H.

4. Establishment of distinctive participation of the General Presidency of the Commission in the process of Hajj through good selection of personnel and training, which is reflected in the satisfaction of the pilgrims and their acceptance, their response to advice and guidance, their willingness to accept the truth, their acceptance of the Commission's publications as well as their optimal use of such publications.

Recommendations:

1. The importance of coordination between the General Presidency of the Commission and the Ministry of Hajj: a partnership and cooperation agreement for the development of services provided to pilgrims, and consideration of the possibility of the involvement of the presidency in the Central Hajj Committee -.The importance of coordination between the General Presidency of the Commission and Hajj establishments to address irregularities that occur from some of the pilgrims out of ignorance.
2. The importance of coordination between the General Presidency of the Commission and some of the relevant authorities, such as the Civil Defense Board and Red Crescent, for installing notice boards and digital screens that display guidelines, thereby preventing the ascent of the pilgrims to the mountains, for their safety and well-being.

Full text is available in Arabic section under this title

جهود الرئاسة العامة لهيئة الأمر بالمعروف والنهي عن المنكر
وتجاربها وخبراتها في تطوير الخدمات المقدمة لضيوف الرحمن

Wearing The Medical Belt for the Muhrim

Ismail Marhaba

Umm Al-Qura University

Abstract

The subject of wearing medical belt for Muhrim is one of the subjectes that have appeared in our time with the development of the medical industry, however, has got a new development impressively has never illumination upon closer study show the reality, which is that the concept of the medical belt did not settles on the concept of what tightens its center , but is now expanding, according to the needs of the people, appeared of it the type that can be called it: (medical belt Shirt) and another type that can be called it: (medical belt shorts), and wearing these -I mean shirt and shorts - for Muhrim rule differs from wearing the belt tightens its middle.

Full text is available in Arabic section under this title

لبس الحزام الطبي للمحرم

Proposed Perception for the Role of Public Departmentsand Private Est. to Limit the Phenomenon of Performing the Rites of Hajj without Legal Permission.

Mahmood Kensawi
Umm Al-Qura University

Abstract

Title of the Study: Proposed Perception for the Role of Public Departmentsand Private Est. to Limit the Phenomenon of Performing the Rites of Hajj without Legal Permission.

It is well known that Kingdom of Saudi Arabia done and still do significant efforts to care with the two Holy Mosques, Holy Rites and serve the pilgrims to perform rites of Hajj and Umrah easily. With the increasing number of pilgrims annually, Human catastrophes have occurred during throwing sands (Jamarat), as well as during performing the rite of Tawaf. This lead to congestion on streets and roads and sitting down in Mina and Arfat. Therefore, the state seek to issue regulations and laws that stipulated specifying the pilgrims that are coming from abroad, as well as obliging interior pilgrims and residents to obtain permission to do the religious duty of Hajj within the Est. of interior pilgrims. This permission should be given each five years. So, Ministry of Interior and Governorate of Holy Makkah decided that pilgrimage without permission isn't allowed. Awareness Campaign was started in 1429 H by the initiative of his royalhighnessPrince/ Khalid Al-Faisal, Governor of Holy Makkah region during such period. These instructions were along with financial penalties to those who will breach this decision, as well as to drivers of sue theirvehicles to transport illegal pilgrims.

Although the continuing of such campaigns, the problem is till currently existed due to that somecitizens perform the rites of Hajj yearly, and the residents in K.S.A reached to 08 million and some of the illegal residents in K.S.A performs rites of Hajj more than one time without legal permission. They justify this due to their inability to pay the costs of Hajj to the EST.

In order to limit this Phenomenon, security department managed to return more than 700 persons, who breached to Hajj laws during Hajj season of 1435 H, as well as applying the financial penalties. Despite these efforts, about one million pilgrims abled to perform the rites of Hajj without obtaining legal permissions. From this point, the problem of the study raised from that pilgrims without permission lead to sitting down and congestions in Jamarat, Tawaf and Al-Sa'i. Furthermore, they annoy legal pilgrims, cause to vehiclescongestions and the spread of Epidemics and diseases. So, this study aimed to identify

the conceptof the Media campaign (Pilgrimage without permission is illegal), the reasons leading to that and the negative effects resulting from the breach of regulations. The study reached to that among the reasons of violations are Lack of respect for the pilgrimage regulations and high costs of Interior Pilgrims Est. The researcher suggests applying administrative procedures, by public departments and private Est. in cooperation with police department, such as acknowledging, upon obtaining entry visa and singing the work contract, not to do pilgrimage without legal permission to avoid dismissal or sending away

Full text is available in Arabic section under this title

تصور مقترح لدور الإدارات الحكومية والمؤسسات الأهلية في الحد من ظاهرة الحج بلا تصريح

The Role of Saudi Women in "Delalah" at Al Medinah

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Abstract:

The challenges confronting *Hajj*[1] management and organization may vary from cultural, religious, health and many other types of difficulties. Apart from the massive governmental efforts to organize *Hajj* and deal with its multiple and complicated challenges, parallel vigor is equally active in the social and private domain. Women both at Mecca and Medina have always been active facilitators of the remarkable experience of *Hajj*. Along with their male family members and peers, the women of Mecca and Al Medinah contributed in the civil hospitality services of "*Twafa*" and "*Delalah*". *Twafa* is the organized civil service at Mecca, while *Delalah* is at Al Medinah. While women's role in *Hajj* services is undeniable and historically unquestionable, very few researches and studies were conducted in that particular area. Due to the nature of privacy of women and their domestic domain very little attention was given to their activities as *Hajj* facilitators and cultural communicators to visitors of Al Medinah. Based on historic, cross cultural readings and interviews, the aim of this study is to 1- Discover the dimension of the service and cultural role played by women as *Hajj* facilitators at the area of Al Medinah. 2- Document the efforts exerted by women in this domain and its effects in the public and domestic spheres, 3- Suggest a preparation of a larger project that documents the efforts of women in *Hajj* at both Mecca and Al Medinah.

Study Problem:

Since the beginning of Islam in the Arab peninsula, women have always been active members of their societies. Due to their unique location at the prophetic city of Al Medinah, women of Al Medinah have always been an inseparable part of the city's preparation and hospitality to welcome and receive the

[1] Note on Transliteration :Due to the religious nature of the subject matter of this study some of the Arabic words are used, they are to be used in transliteration these are some of the examples: *Haj, Hajjis, Jihad, Mecca, Medinah, Mahram, Twafa, Delalah,*

prophet's visitors, however very few references document the role played by women in this domain. More specifically despite the spread of societal organizations active in the field of *Hajj* tourism and hospitality during modern times, very limited attention is given to documenting the Saudi women role and their participation.

Importance of the Study:

This study is particularly important for the documentation of the women's effort in *Hajj* services. Moreover, there is a specific significance of conducting this study and to write it in English to make it available to the English readers and researchers in this area. This study is to be considered as a seed to a more elaborative and comprehensive research project of encyclopedic nature to document the role played by Saudi women in social domains in general and in national projects like *Hajj* in particular.

Methodology:

The study is based on a qualitative approach using historic overview of the role played by women in *Hajj* in general and in Al Medinah in particular.

Objectives of the Study:

The aim of this study is to:

Discover the dimension of the service and cultural role played by women as *Hajj* facilitators at the area of Al Medinah.

Document the efforts exerted by women in *Hajj* services and hospitality and its effects in the public and domestic spheres.

Suggest a preparation of a larger project that documents the efforts of women in *Hajj* at both Mecca and Al Medinah.

Previous Studies and the Limitation of the Study:

One of the main limitations confronting this study is to find reliable sources documenting the role played by women in *Hajj* hospitality at Al Medinah. Besides very few books and references documenting such role, most of the material collected was from interviews, newspapers articles, autobiographies and travels of *Hajj* and recorded documentaries. Except of Faten Hussein's study on women in *Twafa* 2005, no other studies are known in this particular area and this current research is considered the first to focus on the role of women in the area of Al Medinah.

Introduction:

The Importance of *Hajj*:

Hajj is one of the most unique human experiences as it involves deep human interaction with people from different cultures, nations and languages. Due to the increasing numbers of Muslims attracted to perform *Hajj* every year, tremendous efforts are exerted both on the governmental and the societal levels to host,

serve and support the *Hajjis*. The Quran emphasizes the importance of *Hajj* in many locations and encourages human beings to interact and mingle during *Hajj* and many other occasions:

"And proclaim to mankind the Hajj (pilgrimage). They will come to you on foot and on every lean camel; they will come from every deep and distant (wide) mountain highway (to perform Hajj)." (Qur'an: 22:27)[1]

"O mankind! We have created you from a male and a female, and made you into nations and tribes, that you may know one another. Verily, the most honorable of you with Allah is that (believer) who has At-Tawe Verily, Allah is All-Knowing, All-Aware. (Qur'an:49:13).

Hajj is also stressed as one of the pillars of Islam in *Hadith* in numerous examples.[2] Besides its religious and intercultural significance, *Hajj* was also an opportunity for charity work to the people of Mecca and Al Medinah since the beginning of Islam. Even before Islam hospitality and service of visitors of Mecca was considered an honor[3].

The Particularity of Women *Hajj* and their Role in *Hajj* Services:

Hajj is equally obligated to both men and women, it is considered equal to *Jihad* in reward as expressed in *Hadith* narrated By 'Aisha :(The mother of the faithful believers) I said, "O Allah's Apostle! We consider Jihad as the best deed." The Prophet said, "The best Jihad (for women) is Hajj Mabrur" (Sahih Bukhârî Hadith Book 026, Hadith Number 595).

In addition to its uniqueness as a human and cultural experience, *Hajj* promotes the sense of unity and develops the person's sense of togetherness and tolerance towards people from different backgrounds and ethnicities. In their introduction to "Estimating the Impact of the *Hajj*: Religion and Tolerance in Islam's Global Gathering", Clininingsmith, Khawaja and Keremer stated that *Hajj* leads to a feeling of unity with fellow Muslims. More importantly, they emphasized that "It (*Hajj*) increased belief in equality and harmony among ethnic groups and Islamic sects and leads to more favorable attitudes toward women, including greater acceptance of female education and employment" (1). Such positive impact of *Hajj* is not limited to those who are performing the rituals but to all those who are working in the field as well, as they come in close contact to different nationalities and ethnicities which will accordingly develop their sense of openness to the world and acceptance of others (ibid).

Nevertheless, *Hajj* is a complex and challenging experience, besides the difficulties of performing the religious rituals themselves, the huge numbers, difficulty of communication, movements in masses to same places are amongst the challenges that face any organization of *Hajj*. The complexity of the experience itself and the interchanging factors and disciplines involved makes it an interesting case of interdisciplinary research and an area that really in need and demand of thorough examination and

1 Also see for more about Hajj in the Quran 2/128, 158,196,198, 3/97, 5/95, 96 and many other examples.

2 See (Hadith No. 112 (16), Book of Faith, Sahih Muslim, Vol. 1

3 See Abd Al Aziz 2009.

development. Women across Islamic history played an important role in *Hajj* hospitality and service, since the beginning of Islam: (Hadith) and it was historically proven that women were allowed to work in different venues and one of their main services to their societies was serving in the area of *Hajj* hospitality[1].

Historic Role of Women in Mecca & Al Medinah

Saudi Women & the *Hajj* Experience

Saudi women have always participated actively in providing services for the *Hajj*is. Even before the institutionalization of the *Hajj* guidance services, many of the domestic services were entitled to women. Though very limited studies were found in this area, historic and religious references and sources frequently refer to the domestic and health tasks shouldered by women especially at Mecca, Jeddah and Al Median where the *Hajjis* usually needed to stay[2].

In her introduction to the fifth volume *Alam Al Twafa* which is devoted solely to the female *Hajj* guides, Faten Hussein stated that many women across history practiced *Al Twafa*[3]*;* they were officially appointed by the Saudi government and were equally entitled to inherit the profession like male siblings (20)[4]. Especially at the two Holy cities, Mecca (including Mena and Arafat areas) and Al Medinah[5] the role of women was mainly domestic as most of the *Hajj*is were hosted in private homes till recently. One of the interesting points that worth mentioning here is the specializations among the families that work in both *Twafa* and *Delalah* as it is recorded that families will specialize in providing services to *Hajj*is from certain countries and geographic areas, women from these families in turn became experts in these specific cultures in terms of language, social traditions and cooking and other housing practices, it is also likely that marital relations happens between hosting families and *Hajjis* as both remain in contact for long periods of times even after *Hajj* itself. Such social and marital relations reinforce the specialization and promote language learning and support. Such cultural cross fertilization may in turn explain the cultural multiplicity of cities like Mecca and Al Medinah and richness of the social tapestry. In his memories of *Hajj*

1 See Hussein for more details 2005.

2 See Al Ansari 20, 169 and others.

3 See Alam Al Twafa : Twafa is defined in Hussein's study as : the profession of a person who receives the Hajjis, serves them and provides guidance to them (25).

4 As stated by Hussein in the above mentioned reference, no previous studies were devoted solely for the role played by women in facilitating Hajj and Twafa as a profession.

5 While guiding the Hajjis in Mecca is traditionally known as Twafa, it is known in Medina as Delalah, like Twafa, it is a family running profession till it was institutionalized by the Saudi government and it is currently mostly run by the Association of Adilaa (Hajj Guides) at Al Medina http://www.adilla.com.sa/portal/

and the services and hospitality of *Hajj*s, Mohamed Kamel Al Khja lists the specialization of each family working in Delalah according to the nationalities they host[1].

Lady Evelyn Cobbold's travelogue *Pilgrimage to Mecca*, first published 1934 is considered a unique documentation to the private spheres of social life at Mecca and Medina during the thirties of the twentieth century. The book derives its importance and value not only from being the first to be written by a Muslim women convert but also from its detailed description of the daily lives of women and children at the two holy cities, an advantage that distinguishes it from any other travelogue written by a male traveler. Being a Muslim herself, gave Lady Cobbold's writings an empathetic outlook that other mere journalistic accounts lack. This is one of the very rare documentation of the role played by Saudi women with regards to service during *Hajj* and *Umrah*. Lady Cobbold explained in details her stay in Al Medinah and the hospitality with which she was received and she gave a detailed account of the role played by women in the private spheres. The account also includes her description of the cleanliness of the houses, the interior decorations by women and their help and support in religious matters and visits to *Rawdah*. Deep cultural communication which is among *Hajj* rational and benefits can be sited at its best within the private spheres among women, as explained by Lady Cobbold (111-149).

Role of Saudi Women in *Hajj* during Modern Times

Despite their unquestionable presence in the historic literature of *Hajj* and *Umrah*, women in general lack sufficient representation in the modern history of the Kingdom. Moreover, women's efforts in the area of *Hajj* and *Umrah* hospitality and services continued to within the family and was rarely mentioned nor documented as part of the public service till very recently. However it is worth mentioning here that the lack of documentation of the women's role was mostly not deliberate as it is part of the cultural segregation and seclusion to women to the private sphere rather than the open and public domain of work. It is also noteworthy to highlight here that community and charitable work in general was not documented and institutionalized in the Kingdom of Saudi Arabia till very recently. Surprisingly the first four charitable organizations to be institutionalized are women organization which demonstrates the social role and responsibility entrusted to Saudi women despite the lack of documentation (Sadhan, 2011).

Nevertheless, Faten Hussein is one of the active members of *Twafa* community of Mecca her documentation of the role played by women in *Hajj* and *Umrah* is considered to be a single outstanding work in the field (2005). She surveyed a sample of female *Hajj* guides and reached a statistics that mainly

1see http://forum.makkawi.com/archive/index.php/t-89272.html

favors to increase the participation of women in *Hajj* services especially in the areas of reception, public relations, supervising of food preparation and catering services and paper work (48). The highest percentage of the sample surveyed were in favor of increasing the participation of women in first; reception and hospitality, second in providing religious guidance and teaching especially in female related issues with the percentage 94,83٪ and 82,76٪ respectively (67). Other services were also offered by women such as; medical care, helping in shopping, child care, keeping of valuable possessions and many other services that should not be underestimated (72). In addition to other numerous difficulties, inadequacy of trained female service providers and limitation of language communication topped Hussein's list of the obstacles facing women and limiting their involvement in the area of *Hajj* services.

In her more recent account on the matter of women's role in *Twafa*, Hussein's 2013 *My Experience in Twafa*, in addition to being a personal portfolio to her work in the field, it highlights the establishment of the first institutionalized non- profit organization to work in the field of *Twafa* in Mecca. She also documents the women's chapter in the organization and the support of such role by the civil society and Um Al Qura University. (Hussein 2013 p. 45) it is worth mentioning here that a parallel non-profit organization is also established in Al Medinah *the Private Organization for Guides* 1405 H. A committee of *Hajj* and Umrah was also established at Taibah University at Al Medinah which also has a women branch that is currently presenting services to women *Hajjis* and visitors of Al Medinah.

Conclusion and Recommendations:

Hajj is the fifth pillar of Islam and a unique trip that each Muslim wishes to perform at least once in lifetime. The number of women performing Hajj increases annually and due to the particularity of women issues during Hajj, more guidance and hospitality services are needed to be implemented every year.

Saudi women have always been an integral part of the society. More evidently in *Mecca*, *Jeddah* and *Al Medinah* as they are the cities that are honored with receiving those who come to perform *Hajj* and *Umrah*, the women's role in hospitality and Hajj services is undeniable, the works of women in *Twafa* in *Mecca* and in *Delalah* at *Al Medinah* have its roots in the societies for centuries, however very limited historic and social researches were conducted to document such role. It is the main purpose of this study to document such role that has been on-going since the beginning of Islam. Women of *Al Medinah* have been active in the field of *Delalah* with their male family counterparts for centuries and continued to carry on these services in modern time through social and public organizations like – and the committee of Hajj at Taibah University and many others. The study recommends the following:

- A more comprehensive work and an encyclopedic publication needs to be conducted to document the role played by women in *Delalah* services.

- More training and institutional professional preparation needed for women and especially university students and those in closer contact with *Hajj* and *Umrah* services to equip young women with the professional skills needed for the field.
- The establishment of a *Hajj* and *Umrah* Institute for women which advances a field of hospitality academic studies and profession.
- Produce a documentary for the historic services provided by women as a tribute to such role and religious services.

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Activating the purposes of Hajj season (hope and reality)

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Abstract

Unity and collaboration are considered the main purposes of Hajj season. Our relative disparity has been observed in applying and releasing the purposes of Hajj between excessive and negligent, so it was necessary to discuss the application of these purposes of the Hajj season, beginning with the achievement of these purposes and then applying the optimal approach .

This research is an attempt to study the applying of Hajj purposes in the season in terms of perception and knowledge of them and the methodology of the application, and identify bodies and responsibilities . The research aims for:

1. An understanding of the most important purposes of Hajj
2. A knowledge of ways to achieve the purposes of Hajj
3. The identification of groups and bodies to realize these purposes and their application
4. The statement of an optimal approach in order to apply these purposes
5. The statement of the benefits of applying these purposes in the season

Full text is available in Arabic section under this title

تفعيل مقاصد الحج في الموسم
(الواقع والمأمول)

Legitimate Purposes Pilgrimage: Its Importance and the Effects of its Absence

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Abstract

The Islamic legitimacy issues for the Hajj and Umrah were and still are the subject of attention of the nation's scholars, generation after generation. Among these are guidance of visitors to the Holy Mosque and helping them to achieve their intent and complete their "Hajj or Umrah Nusok". Despite the provisions of the rituals of jurisprudence addressed at the level of scientific research and the level of the statement and explanation and clarification to the general pilgrims, the purposes of Hajj and Umrah still have not yet been addressed much. This paper containing the following :

1. Definition of the purposes of Islamic legitimacy
2. Importance of intention in worship
3. An example of intention in worship
4. Provisions of the Hajj between the Fiqh and intention
5. Lack of Intention in Hajj: the effects and samples

Full text is available in Arabic section under this title

مقاصد الحج الشرعية
أهميتها.. وآثار غيابها

Evaluation of Transport Services by Visitors of Madina: Social Applied Study 1434 H

Abdullah Abdulrahman

The Custodian of the Two Holy Mosques Institute for Research of Hajj and Umrah

Abstract

The transportation process is one of the major issues and interests of The developing and developed countries generally because it's one of main factors which shape the all social and economic life. In addition, it's one of the factors of production, as economists say, transportation and roads are considered the major elements of infrastructure which contribute to the urbanization and development processes. Furthermore, they constitute main steps towards comprehensive development, and involve a lot of urbanization indicators that researchers depend on. In fact, Saudi Arabia has been interested in transportation issues since its inception in 1334H.

For this reason, the main interest of this study lies in the 1434 Hajj season and focuses especially in the several achievements realized in the area of transportation in Saudi Arabia, in particular in the Medina Mnora area. The total number of pilgrims from outside the Kingdom totaled 3 million.

So, the objectives of this study is to analyze many scientific theories in the area of transportation. The study also analyzes 900 cases of Madina visitors in 1433.

The study yielded results and made recommendations that may be presented to decision-makers and strategic planners in the area of transportation in Saudi Arabia. Likewise, they may also prove useful to transportation companies, as they try to increase performance and efficiency of their transportation services.

Full text is available in Arabic section under this title

تقييم خدمات النقل لزوار المدينة المنورة

دراسة ميدانية

Demand of Pilgrims for Takeaway In Mecca and Medina (Hajj season 1433 AH)

Al-Said Al-Sariti[1] , Nabeel Al-Arabi[2] , Ebrahim Al-Quliti[1]

1 Umm Al-Qura University

2 Taibah University

Abstract

Demand of pilgrims for takeaway In Mecca and Medina (Hajj season 1433 AH)

The meals are the most important daily expenditure items to pilgrims during their stay in Mecca and Medina. This study aims to explore the characteristics of the restaurant industry in the area around the Two Holy Mosques and the quality of restaurant services and specifications of meals provided to pilgrims. In addition, we estimate the demand function for meals. Among the findings of the study are that the average spending of non-Arabs on meals is greater than average spending of the Arabs, and that several things bother pilgrims including overcrowding in restaurants, lack of organization in the provision of the service, and the severe shortage of suitable places for eating-in especially for families. It is also found that a large number of pilgrims are buying meals, although their campaigns are committed to providing full meals. The study showed that the most preferred types of meals are barbecue, pizza and broast, and that hygiene controls in the restaurants and facilities are among the priorities of pilgrims. The study concluded with some recommendations to take advantage of the results.

Full text is available in Arabic section under this title

طلب الحجاج على الوجبات الجاهزة في مكة المكرمة والمدينة المنورة (موسم حج ١٤٣٣ هـ)

Evaluation of Health Services in Al-Madinah During Hajj 1433 H

Ramze Elzahrany, Ibrahim Abd El-Rahim , Abdulmonsef Rashowan
The Custodian of the Two Holy Mosques Institute for Research of Hajj and Umrah

Abstract

Evaluation of health services has occupied significant space in the literature of services evaluation, and has taken several directions and approaches; including evaluation of services by beneficiaries and users. The present research aimed to assess the satisfaction of visitors to Al- Madinah on the level of health services during Hajj season of 2012 (1433 AH). It also measured the relationships of the level of satisfaction and a number of demographic, social and economic characteristics of users. The study is mainly based on a questionnaire, distributed to deliberate samples of users of health services in the study area during its research period.

Preliminary descriptive tabulation and representation of the data showed high level of satisfaction in general about different aspects of health care system in Al-Madinah. Contradictory to the research original hypothesis, the results manifested very marginal role of different characteristics of users in determining their levels of satisfaction. It is hoped that this research will stimulate more specialized research, focusing on specific elements of the evaluation of health services, by a sample of both visitors to the city and its inhabitants, and provide a solid comparison between the results of both. As a result, we expect professional implementation of a policy that will enhance further advancement of these services, through the promotion of their positive aspects, and the elimination of shortcoming that may exist there.

Keywords:
Evaluation, Health Services, Al-Madinah Al-Manwarah

Full text is available in Arabic section under this title

تقيم الخدمات الصحية في المدينة المنورة
خلال موسم حج ١٤٣٣هـ

Proposed Model for Founding Professional Learning Communities in Hajj and Umrah Institutions

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Abstract

In light of the challenges and the rapid developments, old practices and roles are no longer useful to lead Hajj and Umrah services in our present era. Consequently, there will be no adaptation to the new data with the use of skills and competencies of the past era. Change in work environment (pilgrim service) requires a great deal of wisdom and knowledge at the same time as being serving a religious rite in a civilized manner with the objective of "Pure Hajj". Positive change requires effective leaderships having a forward-looking and ability to make sure of their intellectual readiness for change so that they are always ready to face any challenges preventing them of achieving satisfaction of the beneficiary i.e. (the pilgrim).

The Principle of continuous improvement is the primary reliable principle in today's world as representing an absolute necessity to achieve positive results especially in the field of organizations management of their human capital but the urgent reality involves a fundamental paradox, namely, that the continuous improvement uses up financial and human resources. However, good performance ultimately remains less expensive than continuing on poor performance. Thus, we have to ask an important question:
How can we reach institutional excellence along with minimizing wastage of resources?

In this context, real efforts must be made to guide and direct the concept of continuous improvement for a noble goal (Serving the Pilgrim) and achieving supreme purpose (Pure Hajj).

Subsequently, this worksheet was made to present a model setting the efforts exerted by Hajj and Umrah institutions and their supportive authorities as inputs and handling the key and similar processes among these institutions according to scientific and international standards with the object of improving the performance and founding internal professional learning communities in every institution and external professional learning communities with the rest of the institutions, to multiply by which the outputs in light

of the balance between administrative knowledge and skills acquired which in turn are reflected in growth of positive orientation with beneficiaries from this model.

Full text is available in Arabic section under this title

بناء مجتمعات تعلم مهنية في مؤسسات الحج والعمرة

(بناء النموذج في مهمة النقل لدى مؤسسات الطوافة)

Second Theme:

Health and Environmental Studies

Recognize the Cognitive and Behavioral Trends About the Use of Automated External Defibrillator Device by Saudi Red Crescent Paramedics in Hajj Season 1435H

Mohammed Al-Shareef , Yuseef Samkari , Haitham Malibari , Ahmed Al-Khorisi
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Abstract

The study objective: the team of researchers aims to recognize the cognitive and behavioral trends about the use of Automated External Defibrillator device (AED) by Saudi red crescent Paramedics in hajj season 1435H.

The study community: The paramedics field teams that participated in hajj season 1435H.

The study methodology: The study is specific with the use of some quantitative methods and designed as a descriptive survey, the main tool was an innovative questionnaire of the researcher's team.

The study results:

In what is related to cognitive side for paramedics participated groups, the researchers team noticed that there is a large proportion of the paramedics groups agree that the (AED) device is considered one of the most basic paramedics service, the percent was (94.23٪) out of 156 group, the percent of disagree was(3.2٪), The percent of neutral was (2.5٪).

The results showed another cognitive aspect for the researchers team as there are various replies about the probability of the risk of the use of (AED) device on the paramedic in the field or in the ambulance, the highest percentage of agree was (47.4٪), while the percentage of those who rejected (3.25٪) and there was a neutral percentage (17.35٪).

The results also showed a behavioral trend as most of the participants believe the priority to transport emergency case to a nearby health facility precedes to use the (AED) device for cases of cardiac arrest by (65.38٪), while the disagree percentage (23.07٪) and the percentage of neutrals (11.55٪).

Overall impression:

The researcher's team had a general impression about some behavioral and cognitive attitudes among paramedics groups. Firstly, there is a large percentage of the paramedic groups refers to the importance of an (AED) as one of basic devices with paramedic groups, from this point, the team of researchers assures the necessity to provide a device for all paramedics groups with percentage of (100٪). The

second point is about the probability to get a risk while using the AED in the field or in the ambulance. The study also showed that there is a certain percentage of the paramedics groups have behavioral tendency to transport priority of the case to nearest hospital on the use of (AED device).

Recommendations:

Out of these two trends, researcher team sees the necessity to intensify the training courses to improve cognitive and behavioral trends among the participating paramedic groups.

Full text is available in Arabic section under this title

الاتجاهات السلوكيات والمعرفية حول استخدام جهاز مزيل
الرجفان الخارجي الأوتوماتيكي من قبل مقدمي الخدمة
الاسعافية في هيئة الهلال الاحمر السعودي بموسم الحج
١٤٣٥هـ
(في نطاقات العاصمة المقدسة و المشاعر و الإسناد والفرق الميدانية)

SOLID WASTE in Pilgrims housing in Makkah in Hajj season 1435 H

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The Custodian of the Two Holy Mosques Institute for Research of Hajj and Umrah

Abstract

Solid waste handling is an issue of a national concern to many of the governmental and non-governmental sectors regarding their effect on the environmental health. Large numbers of pilgrims and visitors come to Makkah, Madinah and the holy sites every year leading to an increase in the amount of solid waste generated, which requires an integrated environmental management systems, e.g. solid waste collection, transfer, disposal and recycling.

Most of the pilgrims and visitors housing are concentrated mainly around the holy areas (Haram, Mina, Arafat and Muzdalifah) during the performance of Hajj. Some of the pilgrims perform Hajj after visiting the Prophet's mosque in Medinah, while others make the visit before Hajj. It has been observed that the pilgrims housing are fully occupied from 01th to 07th of Zullhijah, while Mina tents become fully occupied from 08th to 13th of Zullhijah, which generates enormous amounts of solid waste in such short periods. The big dilemma is concentrated mainly around the collection, storage and transportation of such waste outside the Holy areas in this small period. This is why our research aims to:

Estimate of waste generation rate in the Tints area at Mina

Estimate the rate of waste generation in the pilgrims housing

Suggest potential methods for the environmental management of solid waste (collection, transport, storage) in the Holy areas.

Field data were collected for waste in the pilgrims housing from 20th of Zulqeada to 15th of Zol Hijjah 1435 H, where measurements and field data collection was focusing mainly on measuring the rate of waste generation and identify the components of such wastes according to the nationality of the pilgrims and facilities offered by their Tawafa Organizations. The results showed that the lowest rate of waste were for the Iranian Organization in both Mina (0.54 kg/Pilgrim/day) and the pilgrims housing (0.50 kg/Pilgrim/day). The highest rate of waste generation was for Gulf pilgrims inside both Mina (2.73 kg/Pilgrim/day) and pilgrims housing (0.91 kg/Pilgrim/day). In terms of waste composition, it differed significantly in Mina when compared with the pilgrims housing. Results indicate that the waste content

was 60٪ organic waste and 22٪ plastic, paper and cardboard 11٪ and the remaining 7٪ other ingredients in the tents area at Mina, while 33٪ organic and 40٪ plastic and 16٪ cardboard and 11٪ of other ingredients of waste components in the housing area.

These findings are of great importance for the pilgrims housing to estimate the rate of waste generation and components during their stay in the pilgrims housing areas and in Mina. The provided results can help in providing the correct number of containers for the collection, storage of waste and frequency of transfer, which will result in a better environmental management in this period to prevent accumulation of waste during the peak period during Hajj.

Keywords: solid waste, housing pilgrims, containers, waste accumulation rate, Mina tents, Makkah.

Full text is available in Arabic section under this title

النفايات الصلبة بإسكان الحجاج بمكة المكرمة
خلال موسم حج ١٤٣٥ هـ : دراسة أولية

Food Quality in the Project to Save the Grace and Impact on the Environment and the Health of Haj " Al-Ber Charity Association as a model "

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Abstract

Coordinated the Al-Ber Society in Makkah with several organizations to send staff to collect growths foods that are untouched by the hands, and re-packaged and distributed to the needy of the pilgrims in Makkah which contributes to the provision of meals for the pilgrims a daily, due to the importance of the application of food quality in the reduction of poisoning food among the pilgrims. It has appear the importance of research in the extent of the application of food quality in the project to save grace, and its impact on the health of Haj . It was clear from the results of a survey of consumers opinion analysis of those meals that quality attributes have been achieved in the diets of the project. Also, it was the meals won consumer satisfaction of pilgrims from different nationalities, although some look to provide a better services, especially in the packaging and provide the meal, and temperature; to maintain the health and safety of the pilgrims . The study concluded that we are need for concerted efforts to implement all health requirements with the importance of intensifying of the role health observer of the Secretariat of the capital to assess the level of service provided

Full text is available in Arabic section under this title

جودة الغذاء في مشروع حفظ النعمة .... وتأثيره على صحة البيئة والحاج ، " جمعية البر الخيرية بمكة المكرمة نموذجاً "

The Effectiveness of the Use of Environmentally Friendly Technology in the Tanning Skins Guidance and Sacrifice to Improve the Environmental Performance

Muna Ibrahim

Al-Imam Muhammad Ibn Saud Islamic University

Abstract

There is no doubt that the leather tanning industry in the Kingdom is one of the industries that have the raw material available locally and are essential for the manufacture of leather industry and its derivatives represent an added value to the domestic industry as the size of the tanning market, estimated investment in excess of two billion riyalsSince the use ofThe tanning industry of the most promising sectors in the national economy Bmaldih the ability to compete and carry many of the burdens of development, in addition to its ability to achieve self-sufficiency of all leather products needed by the local market However, the tanning processes intervention where environmental pollution resulting from the remnants of chemical tanning agents, which work on Tovirguanp environmental safety and promote the application of modern techniques and the use of environmentally friendly materials calls rather than what is currently used, leading to comply with the requirements and conditions environment-friendly technology in the leather tanning is a model for sustainable development of economic and environmental impacts distinctive as it aims to completely eliminate sources of pollution old tanning area and create a new industrial society and is committed to environmentally compatible systems projectThe most important challenges facing the leather tanning is the use of chrome in the tanning process and the lack of treatment plants discharged water from leather tanning, and has been a project proposal for the use of environmentally friendly in the leather tanning technology to reduce environmental pollutants resulting from the leather tanning process The most important have exceeded paper is a draft proposal aims to create environmental infrastructure to be able to develop the use of environment-friendly technologies in Dabbagh operations

Full text is available in Arabic section under this title

فاعلية استخدام التكنولوجيا الصديقة للبيئة في دباغة جلود الهدى والأضاحي لتحسين الاداء البيئي

Electromagnetic Radiation and its effects on human beings: Survey and Environmental Recommendations

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ABSTRACT

Wireless mobile communication networks have become essential for human life. A great booming and huge investments are devoted to develop the services without taking into considerations the health effect of electromagnetic radiations of the base stations concerning with these services. Base stations for wireless mobile communication have brought Electromagnetic Field (EMF) sources to the permanent residences of people. A global increase in the level of electromagnetic background has taken place leading to its continuing presence in the environment. Cellular mobile radio communications have developed rapidly in KSA and are one of the most actively growing sectors of the national economy. The highest density of cellular mobile Base Station (BS) occurs in large cities and territories adjourning to them. More BSs are needed in rural and distant territories, as well as for the national digital trunk radio communication network. Many studies were made in this field and they did not prove that there is no effect for the EMF radiated from the mobile base stations. So, in this study we will present a survey for the different researches developed in this field and the recommendation to considerably reduce these effects. In the light of the recommendations a procedure will proposed to reduce the effect of EMF in KSA cities.

Keywords:

Electromagnetic Field Radiation; EMF exposure; Exposure Limit; SAR.

INTRODUCTION

Potential health effects of man-made EMF have been a topic of scientific interest since the late 1800s, and have received particular attention during the last 30 years. EMF can be broadly divided into static and low-frequency electric and magnetic fields, where the common sources include power lines,

household electrical appliances and computers, and high- frequency or radiofrequency fields, for which the main sources are radar, radio and television broadcast facilities, mobile telephones and their base stations, induction heaters and anti-theft devices [1].

The frequency band of microwave radiation is regulated from 300 MHz to 300 GHz. The electromagnetic spectrum are very widely used in different areas of science and technology. These radiation are categorized as non-ionizing. radiation. The radiation in frequency range of 300 MHz to 10 GHz can be easily absorbed in biological tissues and human beings. Due to this property, microwave radiations are extensively used in medicine where heating of the tissues is desired, specifically, in pasteurization of foodstuff, medical diathermy and hyperthermia of cancerous tissues for treatment, etc. While using high power microwave equipments, the safety of the operating personnel is a matter of concern [2].

Unlike ionizing radiation (such as gamma rays given off by radioactive materials, cosmic rays and X-rays) found in the upper part of the electromagnetic spectrum, EMF are much too weak to break the bonds that hold molecules in cells together and, therefore, cannot produce ionization. This is why EMF are called 'non-ionizing radiations' (NIR). Figure 1 shows the relative position of NIR in the wider electromagnetic spectrum [1].

The International Bodies, Governmental and Private Organizations for Limiting Exposure to Electromagnetic fields (up to 300 GHz)

In 1974, the International Radiation Protection Association (IRPA) formed a working group on non-ionizing radiation (NIR), which examined the problems arising in the field of protection against the various types of NIR. At the IRPA Congress in Paris in 1977, this working group became the International Non-Ionizing Radiation Committee (INIRC). In cooperation with the Environmental Health Division of the World Health Organization (WHO), the IRPA/INIRC developed a number of health criteria documents on NIR as part of WHO's Environmental Health Criteria Programme, sponsored by the United Nations Environment Programme (UNEP). Each document includes an overview of the physical characteristics, measurement and instrumentation, sources, and applications of NIR, a thorough review of the literature on biological effects, and an evaluation of the health risks of exposure to NIR. These health criteria have provided the scientific database for the subsequent development of exposure limits and codes of practice relating to NIR [3].

At the Eighth International Congress of the IRPA (Montreal, 18–22 May 1992), a new, independent scientific organization the International Commission on Non-Ionizing Radiation Protection (ICNIRP) was established as a successor to the IRPA/INIRC. The functions of the Commission are to investigate the hazards that may be associated with the different forms of NIR, develop international guidelines on NIR exposure limits, and deal with all aspects of NIR protection [3].

The Federal Communications Commission (FCC) in United States of America (US) regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. An independent U.S. government agency overseen by Congress, the commission is the United States' primary authority for communications law, regulation and technological innovation. So it is responsible for consumers, public safety, accessibility, competition and technological and economic opportunity [4].

Several countries all over the world established their governmental bodies to regulate the usage of wire and wireless communications (National Telecommunications Regularity Association) NTRA and get the responsibility to introduce a code for limiting the exposure of human beings to electromagnetic fields.

France, Spain, Belgium, UK, Switzerland, Italy, Russia, Brazil and Egypt regulate the risk of mobile phone base station by their regulatory bodies. And a survey for their efforts will be mention later.

Electromagnetic radiation Effect on Human Health.

The adverse health effects depend on factors such as the type of radiation (ionizing or non-ionizing); the quantity of dose absorbed; the rate at which the dose was absorbed; radio sensitivity of the cells involved; the polarization of the EMF wave; and the distance from the source. The quantity of EMF doses absorbed by the human body is an important factor and is measured in units called the specific absorption rate (SAR) or gray [5], an amount of radiation that releases one joule of energy per kilogram of matter. RF fields below 10 GHz (to 1 MHz) penetrate exposed tissues and produce heating due to energy absorption. The depth of penetration depends on the frequency of the field and is greater for lower frequencies. Absorption of RF fields in tissues is measured as a Specific Absorption Rate (SAR) within a given tissue mass. The unit of SAR is watts per kilogram (W/kg). SAR is the quantity used to measure the "dose" of RF fields between about 1 MHz and 10 GHz [7]. In practice, direct measurements of SAR are only feasible under laboratory conditions. Recommended maximum exposure levels in terms of electric and magnetic field strength as well as power density are therefore given in addition to SAR limits.

Measuring The Biological Impact Of EMF

Both the telecommunications industry and the biomedical engineering research sector have multiplied peer-reviewed scientific studies to determine whether prolonged exposure to electromagnetic waves poses a danger to human health. Biologists concede a wide range of opinion on the subject. While numerous scientific studies report that exposure to EMF has an impact on human tissues and cell development, experts do not agree on how much exposure may lead to health risks for adults or children and some research results seem to contradict previous results [8],[9]. The exposure interval time takes a great effort by the scientists. The effect of long term exposure to base stations and mobile phones on

human profiles is studied in [9]. The results of this study showed that significant decrease in volunteers' Adrenocorticotropic hormone (ACTH), cortisol, thyroid hormones, prolactin for young females, and testosterone levels. The conclusion revealed that high EMR effects on pituitary–adrenal axis. Also a long term interval time during sleeping under the influence of a GSM 1800 electromagnetic far field and biomedical effects was studied in [10].

The impact of high electromagnetic field levels on childhood leukemia (CL) incidence was studied in [11]. And conclude that, Epidemiological studies show a consistent association between ELF-EMF and CL. A 1.4- to 1.7-fold increased risk for exposure levels above 0.3 μT compared to <0.1 μT was found in pooled analyses. Although some bias may persist, it is possible that this is a causal association. Till date, research on RF-EMF and CL is limited and thus no firm conclusions can be drawn. The development of CL is likely to be a "multihit" process in which EMF might play a role. Some hypothesized biological mechanisms are proposed by which EMF could cause CL; however, none of these mechanisms have been consistently confirmed in experimental research. The impact of ELF-EMF exposure on CL incidence is likely to be limited, showing an overall (population attributable risk) PAR% of 1.9% worldwide. However, considering the variability of exposures between countries and regions, a substantial contribution of ELF-EMF to CL incidence cannot be ruled out.

In [12] a survey for 82 students was done. 12 students identified with specific health hazards in a questionnaire of 25 questions with different parameters of the daily usage and identified disease during the period of past one year. The conclusion is shown in table (1).

While the Deoxyribonucleic acid (DNA) and the effects of EMR was studied in several work as mentioned in [8].

After the previous survey about the biomedical hazard due to the exposure to EMR, standard exposure limits was done by WHO and ICNIRP as an International Organizations. The telecommunications and health regularities in different countries use these standards to eliminate EMR effects on human beings.

Standard Exposure Limits

$$SAR = c\Delta T/\Delta t \quad (1)$$

$$SAR = \sigma E^2/\rho \quad (2)$$

where ΔT is the temperature rise (in ◈C) within the time interval Δt (in seconds), and c is the tissue (or phantom material) specific heat capacity in J/Kg◈C, σ is the tissue conductivity (S/m), E is the rms electric field strength induced in the tissue (V/m) and ρ is the mass density (kg/m^3).

Doses of more than 400g SAR can severely damage the human vascular system, which can lead to death within 48 hours. Whole-body doses between 10-40g SAR causes less vascular damage, but they lead to loss of fluids and electrolytes in the intercellular spaces, death occurs within ten days due to imbalance of fluid and electrolytes[5], [13] .

Absorbed doses from 1.5-10g SAR cause destruction of human bone marrows leading to infections and death within 4-5 weeks after exposure. Radio sensitivity of the body has to do with allergy of our body systems on exposure to EMF waves. That is to say two persons of the same body weight can be exposed to the same amount of radiation and yet respond differently in terms of health effects [5], [13].

For mobile base stations, ICNIRP recommends that the general public exposure should be limited to 2 W/kg in any 10g for the head and body, 4 W/kg in any 10g for limbs and in addition 0.08 W/kg for the whole body and all of these subject to an averaging period of 6 minutes [6].

To understand the previous values of SAR we need to know how much the g SAR contains power absorbed in human body by kgm. So we have to know the United States standards, i.e., 1g SAR and IEEE-1528 (IEEE P1528 D1.22003), as well as the European standards, i.e., 10g SAR and EN50361 (CENELEC EN503612001).

Human Exposure to Radio Frequency Sources

Electrical currents exist naturally in the human body and are an essential part of normal bodily functions. All nerves relay their signals by transmitting electric impulses.

Most biochemical reactions, from those associated with digestion to those involved in brain activity, involve electrical processes. The effects of external exposure to EMF on the human body and its cells depend mainly on the EMF frequency and magnitude or strength. The frequency simply describes the number of oscillations or cycles per second [1].

The ITU define the Exposure domain into three domains: Personal Area, Immediate Area, and Wide Area [14]. A survey to the exposure effects in these areas will be introduced.

Human Exposure to household/office appliances/electronic devices (Immediate Area)

Using ICNIRP fact sheet 2010 shown in table (2) and The measurements results shown in table (3) that gotten by [4], it is possible to say that, The most household/office appliances/electronic devices produce high levels of electric and magnetic fields which are actually lower than the standard exposure limits.

Human Exposure to Electromagnetic Radiation from Wireless Devices (Personal Area)

In [6], a comparative study of of Human Exposure to Electromagnetic Radiation from Wireless Devices (DECT, WLAN and Bluetooth, as well as wireless communication devices based on proprietary standards in the frequency range of 30 MHz to 6 GHz in Home and Office Environments had done. Table (3) shows an overview of the tested device classes and the results of the dosimetric and far-field exposure assessments for [6] . Only the maximum values of each device class are shown. The E-field values are indicated for a distance of 20 cm and 1 m. and the results conclude that in the very near future the background exposure in everyday life situations will exceed exposures from base stations and

broadcast stations. This will considerably increase the complexity of epidemiological studies. The dominant source with respect to local and cumulative exposure will, however, remain the cellular phone.

Human Exposure To Electromagnetic Radiation From Mobile Base-Station (Wide Area)

To determine the exposure near the mobile base stations under real life conditions needs to consider several aspects.

The RF field distribution, which depends on several environmental factors, field levels are varying in space and time. Multipath propagation and fading effects lead to scenarios that are often not easy to reproduce leading to large uncertainty budgets [15], [16]. Considerable variations of the field levels in the GSM 900, DCS 1800, UMTS, Broadcasting and FM frequency range were found in restricted areas, e.g. the relation between the maximum field level and the average field level within one cubic meter was found to be typically between 2 and 5, the ratio between the maximum and minimum being much larger.

One approach to describe exposure scenarios is to use laws of field distribution, e.g. Rayleigh, Log Normal, Rice. Within the examined areas it was not possible to find clear relations between field scenarios defined by distance, LOS or NLOS conditions (Line Of Sight, Non Line of Sight) and Indoor versus Outdoor conditions. Preliminary results indicate that the meteorological conditions on the ground like water or snow may have an important impact on the propagation of reflected waves [14].

The hazardous electromagnetic field levels can be quantified analyzing the thermal response of the human body exposed to the HF radiation. Thermally harmful effects can occur if the total power absorbed by the body is large enough to cause protective mechanisms for heat control to break down. This may lead to an uncontrolled rise in the body temperature (hyperthermia). The problem to be considered is by itself twofold: first the rate of power deposition in tissue due to the electromagnetic radiation has to be determined; and then the related temperature distribution within the body has to be calculated [17].

For the mentioned factors above, many studies take the average power spectral density that human beings exposed to as a suitable unit to measure the EMR exposed to human beings from mobile base stations.

Many countries establish its own bodies to regulate and limit the exposure of EMF radiation. In the next sections examples of these countries and their efforts will be introduced.

The EMF uncertainty problem

The EMF uncertainty problem is the lack of scientific certainty. An independent non-profit UK-based organization, writes that, to establish an association between EMF and health effects, the certainty of causal association must be extremely high (95–98%) and that health effects related to smoking, asbestos, thalidomide, lead in petrol, etc., would not have been identified using these criteria [16]. Given the non-

conclusive research of potential risks to human health, which probably will remain inconclusive for decades (in particular, for long-term health effects), a relevant question is: 'How should consumers and policy makers navigate in this environment of uncertainty?'.

The precautionary principle legalizes more research in the field, makes the government more accountable, takes seriously potential future risks and effects, makes it possible to sanction industries/organizations for non-compliance and accommodates the public worry and need for further information. More information about the uncertainty problem exists in [16]. A comparative study in 5 countries (France, UK, Spain, Belgium and Switzerland) was done by Olivier Borraz and Danielle Salomon in Workshop on base stations and wireless networks organized by WHO in 2005. France, UK and Spain adhere the ICNIRP guidelines however Belgium and Switzerland not.

Another comparison study between Australia and New Zealand Government Responses in WHO 16th Seminar in Geneva by David Black MBChB FAFOM MARPS June 2005 and he saw that:

Strict compliance required in Australia

Good practice required in New Zealand

Still some legal challenges in Australia, but less Environment Court Cases in New Zealand now rarely reach Court.

Many countries had taken some actions to eliminate the exposure to EMF depending on the recommendations of international authorities, such as the WHO, the ICNIRP and ITU. Some of them make their own protocol to control the establishment the mobile base stations other was contented with define the exposure limit like in Italy, the government defined three level for radiation Exposure limit less than 60 V/m, Attention level equal to 6 V/m and the Quality goal is 6 V/m [18].

Russia established its own protocol by define the Obligatory maximum permissible levels (MPL) near BS in Russia are contained in the Sanitary-epidemiological norms and regulations SanPiN 2.1.8/2.2.4.1190–03 "Hygienic requirements for installation and operation of terrestrial mobile radio communication equipment". This norm was issued by the Ministry of health of Russia in 2003. For BS operating in UHF range (300–3000 MHz), the norm limits the MPL of equivalent plane wave power density to 10 μW/cm2 under non-occupational exposure conditions. This MPL for public exposure was introduced in 1984 for the first time.

Providing electromagnetic safety for the population around BSs is under state control and has a multi-stage character [19].

1. Before any BS installation is permitted a calculation of the EMF intensity in the surrounding territory is made.

2. On the basis of the calculation results the operator obtains the permission for BS installation

3.After completion of the BS installation EMF intensity measurements are carried out. Measurement results are submitted to the territory authority of the Federal service who issues permission to allow BS operation.

4.Periodic checks are carried out once every 1–3 years.

In Egypt they also made their own protocol for macrocell, microcell and Laser protocol. They define The maximum permissible power density a human being can be safely exposed to must not exceed 0.4 mW/cm^2 (CDMA-GSM 900 MHZ- GSM 1800 MHZ). The endorsed technology of measurement should be identified. They put some conditions restricted to the service providers such as:

1. When the antennas are mounted, the horizontal distance between them and human beings must be not less than 6 meters in the direction of the main beam.

2. The horizontal distance between the centers of two pylons on the same building must not be less than 12 meters.

3. The antennas used must be high-gain antennas and the front gain compared to the back gain must not be less than 20 dB for macrocell. For more details see [20].

As we saw, each country made its own protocol to ensure that the human beings exposure not exceed a certain level of exposure which is 0.45 mW/cm^2, defined by ICNIRP for mobile networks,. Some countries permit more exposure level; such as US and Canada that allow the maximum permissible power density a human being can be safely exposed to is 0.57 mW/cm^2[4].

How can we calculate the safety distance from the source of radiation? The answer will be introduced in the next section.

Safety Distance Calculations For Macrocell

From the infield sites, the maximum power sent from transmission unit to the antenna is 50 Watt (for one directive antenna). Suppose we have four antennas serve four sectors, they may be represented by one Isotropic radiation source with input power equal to 200 Watt which equivalent to 53dBm. Due to cable losses (3dBm) and combiners losses (6dBm).The maximum input power to the antenna = 53-9 = 44 dBm

For the directive antenna that used in mobile base station for macrocell; it has gain between 16 dB and 17 dB (high gain antenna) in the main beam direction and decreases about 20 dB in the back loop direction.

THE Effective Isotropic radiated power (EIRP) from the radiated source is equal to:

$(EIRP) = Max.\ Power + Ant$

$= 44 + 16 = 60$ dBm

EIRP (main) $\cong 60 dBm \cong 1000 Watt$

The power spectral density can be calculated from [4],

$$\text{Standard Isotropic Power Density}(SIPD) = \frac{EIRP}{4\pi D^2} \quad (3)$$

Where D is the distance from the radiation source.

If we consider the safety limit for United States of America which equal to 0.57mW/cm^2 so;

$$D_{main} = \sqrt{\frac{EIRP}{4\pi \times (5.7)}} = 3.74\text{m} \quad (4)$$

For the ICNIRP exposure level which equal to 0.4 mW/Cm^2

$$D_{\text{main}} = \sqrt{\frac{\text{EIRP}}{4\pi \times (4)}} = 4.46\text{m} \quad (5)$$

Considering the directivity of the source (antenna) and human behavior, the safety distance may be considered equal to 6 meter in the direction of the main field.

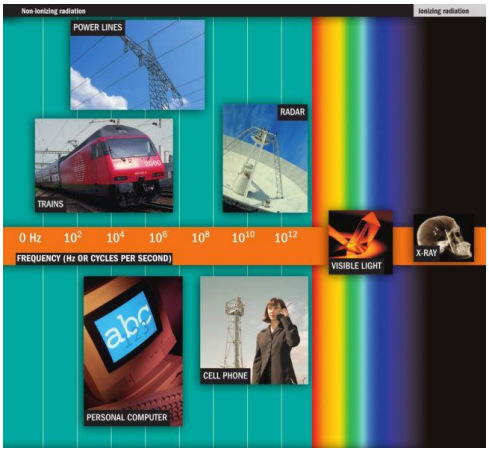

Figure 1. The electromagnetic spectrum [1]

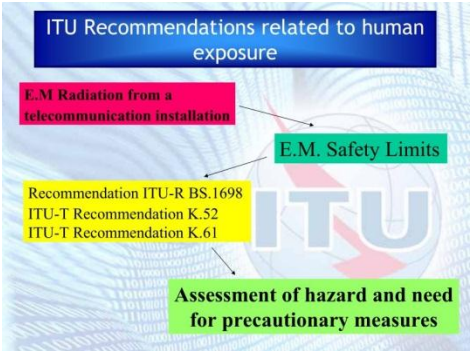

Figure 2. The ITU recommendation to eliminate the EMR effect on human beings. [14]

TABLE 1. QUESTIONNAIRE RESULTS [12]

S. No.	No of years used	No of calls made	No of calls received	Diseases Identified
1	3	3/day	10/day	Ear Problem
2	2	166	176	Fever, Drozziness
3	2	300	--	C, Fever
4	1	--	9678	Ear Problem
5	2	2/day	2/day	Headache, Fever
6	2	400	800	Ear Problem
7	5	15000	20000	Headache, Teeth Problem
8	5	500	1000	Ear Problem
9	4	10000	20000	Headache
10	2	1000	2000	Ear Problem
11	3	15/day	5/day	Headache, Sleeping disturbance
12	2	10/day	7/day	DIP

Table 2. Basic restrictions for human exposure to time-varying electric and magnetic fields [4]

Exposure Characteristic	Frequency Range	Internal Electric Field (Vm-1)
Occupational Exposure		
CNS tissue of the head	1-10 Hz	0.5/f
	10 Hz – 25 Hz	0.05
	25 Hz – 400 Hz	2x10-3f
	400 Hz – 3 KHz	0.8
	3 KHz – 10 MHz	2.7x10-4f
General Public Exposure		
CNS tissue of the head	1-10 Hz	0.1/f
	10 Hz – 25 Hz	0.01
	25 Hz – 400 Hz	4x10-4f
	400 Hz – 3 KHz	0.4
	3 KHz – 10 MHz	1.35 x 10-4f
All tissues of the head and body	1 Hz – 3 kHz	0.4
	3 KHz – 10 MHz	1.35 x 10-4f

f is frequency in Hertz; all values are RMS; in the frequency range above 1000Hz, RF basic restrictions need to be considered additionally

Table 3. Measured EMFs near some household/office Appliances/electronic devices [4]

Appliance	Near the appliance		1m from the appliance	
	Magnetic field (μT)	Electric Field (V/m)	Magnetic field (μT)	Electric Field (V/m)
Computer monitor	1	1500	0.1	300
Water cooler	4	500	0.1	40
Refrigerator	0.4	1000	0.1	150
Laptop charger	6	800	0.04	50
Laptop	0.08	1500	-	80
Photocopy machine	0.8	1500	0.2	350
Hair dryer	70	40	-	-
Electric blanket	33	2000	-	-

Table 4. Worst-case results of the incident E-fields and 1g/10g SAR of the different device classes [6].

Device class	Test frequency range [MHz]	Max. 1g SAR [W/kg]	Max. 10g SAR [W/kg]	Max. E-field [V/m] (20cm)	Max. E-field [V/m] (100cm)	ICNIRP limit [V/m]	ONIR* limit [V/m]
Baby Surveillance	40 – 863	0.115	0.077	8.5	3.2	29	4
DECT**	1880 – 1900	0.087	0.055	11.5	2.9	60	6
WLAN	2400 -2484	1.93	0.81	3.9	1.1	61	6
Bluetooth PC	2402 – 2480	1.31	0.49	3.1	1	61	6
peripherals	27 - 40	<0.005	<0.005	<1.5	<1.5	28	4

*Swiss ordinance for non-ionizing radiation (ONIR) limits for fixed transmitters with ERP of >6W

** Extrapolated maximum for asymmetric transmission mode (fixed part only)

Conclusion, Recommendations and Future Work

There is no a confirmation that the electromagnitic radiation from mobile base station has no effect on human beings and the EMF uncertainty problem is still exist. So, it is required to make some precautions to ensure that the human beings exposured to EMF for a long time period will be safe.

According to the privious calculations and the recommendations of ITU [14] shown in figure 2 its recommended that:

The nearest distance allawable for human beings from the radiation source is 6 meters.
Periodical measurements for power spectral density radiated from mobile base stations for a long term exposure to ensure that it not exceed the ICNIRP defined threshold.
Acoording these measurments, Start to study a certain protocol belong KSA to ensure that the maximum exposure limit for human being from the mobile base station not exceed the ICNIRP defined limit.

An analytical model will be assigned as a future work to represent the power spectral density for power radiated from mobile base station depending on the base station technical specifications and the distance away from the antenna.

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Live Saving in the Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community by establishing the Public- access Automated External Defibrillator (AED) Program and the First Responder AED Program

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Abstract

Out-of-hospital cardiac arrest (OHCA) during Al Hajj represents a challenge to Saudi Arabian health authorities. There were 40 sudden cardiac arrest cases in the period of Al Hajj Season 1423/ 2002 in the Grand Mosque of Holy Makkah of which only 3 cases were revived post cardiopulmonary resuscitation (CPR). Defibrillation is the most effective treatment and should be performed within 3 minutes. However, time to first shock was delayed due to delayed arrival of the medical team owing to crowdedness and long distance and AEDs were unavailable. Holy Quran stated: {And Who Ever Saves Live, It Is As If He Saved All Mankind}, Al- Maa'idah, 5:106:32. The aim of this project is to save lives in the Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community by establishing the Public- access AED Program and the First Responder AED Program.

Methods:

The work in this scientific paper is one of the recommendations of my previous scientific papers entitled: Pilgrims Health in the 20th and 21st Centuries; Al Hajj: The Oldest and the Largest Mass Gathering; and Al Jamarat Ritual: The Emerging Critical Cornerstone of Al Hajj, These papers were published and presented at the 13th Scientific Meeting for Al Hajj, Al Omra and Al Ziarah Research, the Custodian of the Two Holy Mosques Institute for Al Hajj, Al Omra and Al Ziarah Research, Omm AL Qura University in Holy Makkah in KSA, the 14th and the 15th World Congress on Disaster and Emergency Medicine in Scotland and Netherlands, respectively. In addition, an extensive review was conducted using computerized databases Medline and PubMed for searches from 1966 through December 2014.

Islamic books, biomedical journals and the proceedings of the Lancet International Conferences on Mass Gathering Medicine (MGM) and the World Congress on Disaster and Emergency Medicine (WCDEM) were also scanned for relevant topics. Arabic/ English language articles/ topics containing information

pertinent to public- access AEDs programs and first responder AED programs were read, abstracted, analyzed and compiled.

Results:

Areas with a high incidence of cardiac arrests are defined as those with 1 cardiac arrest every 5 years. AEDs are needed to be deployed in 10.6٪ of the city area, providing coverage for 66.8٪ of all cardiac arrests. After predicted response time calculation and given the high crowd density in the Two Holy Mosques and Al Mashai'r (more than 4 persons/M2), not only strategic placement but also uninterrupted AED accessibility warrants attention if public access defibrillation is to improve survival after OHCA. Public- access AED program and first responder AED program in the Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community can be divided into 3 levels based on the type of potential first responder who is basic life support (BLS) certified and is expected to use AED. Level 1 refers to nontraditional responders (eg. police officers, scout members, firefighters, security personnel, the employees of the General Presidency for the Holy Mosque and Prophet Mosque Affairs , airport personnel, flight attendants) who have a duty to respond as part of their every day responsibilities. Level 2 refers to targeted trained "citizen responders" who may be employed by a worksite/ inland and seaport transportation means/ study places/ sport centers but who do not have an explicit duty to respond. Level 3 responders are trained family members, members of Al Hajj Missions/ Al Tuwafah / Al Adela' Establishments and friends living with or visiting a person at high risk for sudden cardiac arrest.

Conclusion:

Preventable deaths from sudden cardiac arrest in the Two Holy Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community can be eliminated when public- access AED program and first responder AED program are established. Given the Tawaf Arena Rradius is 50 M from the Center of Holy Ka'bah; the medical director's targeted response times (3 Min- 180 S); the Emergency Medicine goals at Mass Gatherings and the previous Hajj Experience, the number of AEDs required in the Two Holy Mosques and Al Masha'ir (Arafat, Mina, Muzdalifah) can be calculated and the public- access AED program, as well as the first responder AED programs can be established.

Key Words:

KSA, Holy Makkah, Al Hajj, Pilgrims, The Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) , MGM, Emergency, Sudden cardiac arrest, CPR, AEDs, Public- access defibrillation, First responder.

Live Saving in the Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community by establishing the Public- access Automated External Defibrillator (AED) Program and the First Responder AED Program

INTRODUCTION

Al Hajj is the oldest and the largest mass gathering ever known to mankind. Al Hajj is an annual, six- day, mobile, outdoor, religious event when more than 3 million Muslims from more than 180 countries including the Kingdom of Saudi Arabia (KSA), gather in the holy shrine of Holy Makkah (Earth Umbilicus) to perform this 5th cornerstone ritual of Islam.

Out-of-hospital cardiac arrest (OHCA) during Al Hajj represents a challenge to Saudi Arabian health authorities. There were 40 sudden cardiac arrest cases in the period of Al Hajj Season 1423/ 2002 in the Grand Mosque of Holy Makkah of which only 3 cases were revived post CPR. Defibrillation is the most effective treatment and should be performed within 3 minutes. However, time to first shock was delayed due to delayed arrival of the medical team owing to crowdedness and long distance and AEDs were unavailable. Holy Quran stated: {And Who Ever Saves Live, It Is As If He Saved All Mankind}, Al-Maa'idah, 5:106:32. The aim of this project is to save lives in the Two Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community by establishing the public- access AED program and the first responder AED Program.

METHODS

The work in this scientific paper is one of the recommendations of my previous scientific papers entitled: Pilgrims Health in the 20th and 21st Centuries; Al Hajj: The Oldest and the Largest Mass Gathering; and Al Jamarat Ritual: The Emerging Critical Cornerstone of Al Hajj. These papers were published and presented at the 13th Scientific Meeting for Al Hajj, Al Omra and Al Ziarah Research, the Custodian of the Two Holy Mosques Institute for AL Hajj, Al Omra and Al Ziarah Research, Omm AL Qura University in Holy Makkah in KSA, the 14th and the 15th World Congress on Disaster and Emergency Medicine in Scotland and Netherlands, respectively.

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RESULTS AND DISCUSSION

Sudden cardiac arrest is an abrupt unexpected cessation of breathing and circulation and is the leading cause of death in the United States of America (USA) as well as most developed nations. Treatable pulseless ventricular tachycardia (VT) and ventricular fibrillation (VF) are the most common mechanisms of cardiac arrest (60-80٪) resulting from acute coronary syndrome, left ventricular hypertrophy, preexcitation syndromes and familiar cardiac conditions including long QT syndrome and Brugada syndrome (Seraj and Harvey 2007). Other less frequent mechanisms are brady- asystoles/ asystole and pulseless electrical activity (PEA) resulting from cardiac and extra- cardiac causes.

Defibrillation is indicated for the management of cardiac arrest due to pulseless VT and VF.

Defibrillation is non synchronized delivery of energy during any phase of cardiac cycle. The delivered shock causes the electric current to pass through the heart from the negative to the positive electrode. It causes the whole heart to depolarize and contract simultaneously interrupting and terminating the abnormal electrical rhythm and thus allowing the sinus node to resume normal pacemaker activity.

Defibrillation was first used in humans by Claude Beck, a cardiothoracic surgeon on congenitally diseased heart. Closed chest defibrillation was discovered in the 1950s in Russia.

In 1959, Bernard Lown designed the modern- day monophasic defibrillators (360 Joules). In 1980s, the safer more successful low energy less damaging (150- 200 Joules) biphasic defibrillators were discovered (Resuscitation Council UK 2014). Earlier in 1965, defibrillators have been essential part of pre hospital care since Frank Pantridge shown that defibrillation could be done in the field on the streets of Belfast, Northern Ireland (American college of Emergency Physicians ACEP 2014).

AEDs (asynchronized defibrillators) are simple and relatively inexpensive (Figure 1). They are devices that can be utilized by certified BLS providers in pre hospital or in hospital settings while the manuals have to be used by advanced cardiac life support (ACLS) providers. While CPR is in progress to maintain cerebral perfusion, AEDs will recognize the shockable rhythm and order the operator to press the shock button. AEDs cannot be overridden manually and can take 10 - 20 seconds to determine arrhythmias. AEDs are highly accurate with some modules demonstrating 100٪ specificity and 90-92٪ sensitivity for coarse VF (Bossaert L 1997). Semi AEDs are similar to AEDs but can be overridden and usually have an ECG display and also have the ability to pace. Additional critical care patient monitoring can be incorporated like noninvasive blood pressure, pulse oximetry, end- tidal Pco2 in intubated patients, as well as other physiologic parameters. The device should have recording capabilities so that the cardiac arrest can later be reviewed for medical oversight and quality assurance reasons (ACEP 2011, Alshinkity et al 2005, Alshinkity IS 2000).

Unlike AEDs, manual machine necessitates the presence of certified ACLS personnel to diagnose, interpret the rhythm and deliver shocks (asynchronized defibrillation or synchronized cardioversion) to the patients.

The most frequent cause of cardiac arrest in children is respiratory in origin. However, children 8 years or older may have life- threatening arrhythmias due to structural heart diseases and AEDs can be used (Vetter VL and Haley DM 2014, Nishiuchi et al 2014). An AED with pediatric attenuator is ideal for children, as this feature allows the delivery of a lower dose of energy in pediatric patients. In the event of VF, a weight related dose of 2 J/Kg can be used initially, followed by 4J/Kg subsequently. If an AED with a pediatric attenuator is not available, then standard AED may be used.

The aim of defibrillation is termination of abnormal rhythm and restoration of normal perfusing rhythm. Step- by- step technique of AED use includes the followings:

1. While CPR is ongoing, open the package containing the defibrillation pads with attached cable and connector. With the chest prepared (hair shaving, wiping dry, jewelry removal, medication patches removal) carefully pull off the protective backing from the pads. Attach the pads to chest wall (Antero- Apical, Anteroposterior or Apex- posterior position).
2. Turn on the device and follow the voice prompts.
3. Initiate the analysis of the rhythm and ensure there is no movement during the analysis. If the shock is indicated, the device will automatically charge up to a preset level.
4. Check that no one is in contact with the patient or trolley and call out "Stand clear".
5. Discharge the shock (note that fully automated defibrillators do not require the operator's input to discharge a shock).
6. Continue CPR and manage according to the universal resuscitation protocols.

Possible complications include skin burns, inadvertent electric shock to others and defibrillation induced myocardial damage. Patients requiring defibrillation will need intensive monitoring and close post resuscitation care (ACEP 2011, WADEM 2014).

Figure 1: AEDs Models.

OHCA accounts for 250.000 - 350.000 sudden cardiac deaths per year in the USA. OHCA is a leading cause of death (70٪) and only 3-8٪ of patients survive to leave the hospital neurologically intact (Sanna et al 2008). Defibrillation is the most effective treatment and should be performed within 3 minutes. Unless treated promptly, VF becomes less coarse and eventually converts to less treatable rhythm of fine VF or asystole.

The AED represents an efficient method of delivering defibrillation to persons experiencing OHCA and its use by both traditional (healthcare professional) and nontraditional (non-healthcare professionals) first responders appears to be safe and effective (Marenco et al 2011). Early defibrillation is the use of AEDs by trained public-safety personnel (Alshinkity IS 2013, Kassanoff et al 1972). First responder AED programs may increase the number of people experiencing sudden cardiac arrest who receive bystander CPR; can reduce time to defibrillation; and may improve survival from sudden cardiac arrest. The survival rate is up to 90٪ in the first minute. However, defibrillation effectiveness diminishes with each passing minute (Kassanoff et al 1972, Seraj and Harvey 2007).

Community- based studies show increased cardiac arrest survival when first responders are equipped with AEDs rather than waiting for paramedics to defibrillate. Prompt application of an AED shows a greater number of patients in VF compared with initial rhythms documented by late -arriving emergency medical services (EMS) personnel (Winkle RA 2010). Survival of OHCA treated by police officers equipped with AEDs in Rochester, USA, has averaged 50٪ resuscitation, with median time from collapse to defibrillation of about 5 minutes (ACEP 2014).

A meta-analysis by Sanna et al evidenced a risk ratio (RR) of 1.22 (95٪ C.I.: 1.04-1.43) of surviving to hospital discharge for people treated with CPR+AED as compared to CPR- only. The second meta-analysis showed a RR of 1.39 (95٪ C.I.: 1.06-1.83) of surviving to hospital discharge for people treated with CPR+AED as compared to CPR- only. The results of this meta-analysis demonstrate that programs based on CPR plus early defibrillation with AEDs by trained non- healthcare professionals (trained layrescuers/ bystanders) offer a survival advantage over CPR -only in OHCA (Sanna et al 2008). Laypersons trained and equipped to use AEDs in public places can double survival to hospital discharge compared with that which can be achieved by laypersons rescuers who can only perform CPR while awaiting EMS arrival (Hallstorm et al 2004).

There are three levels of public- access AED programs based on the type of potential first responder who is basic life support (BLS) certified and is expected to use AED. Level 1 refers to nontraditional responders (eg. police officers, scout members, firefighters, security personnel, the employees of the General Presidency for the Holy Mosque and the Prophet Mosque Affairs, airport personnel, flight attendants) who have a duty to respond as part of their every day responsibilities. There has been considerable experience demonstrating benefit with minimal risk for this group (Riegel et al 2006). Level 2 refers to targeted trained "citizen responders" who may be employed by a worksite/ inland and seaport

transportation means/ study place/ sport centers but who do not have an explicit duty to respond. There has been good experience with level 2 AED workplace use in British rail stations, oil platforms in North Sea, electricity plants, passenger cruise ships, and merchant marine vessels (Hallstorm et al 2004). Level 3 responders are trained family members, members of Al Hajj Missions/ Al Tuwafah/ Al Adela' Establishments and friends living with or visiting a person at high risk for sudden cardiac arrest (prior acute myocardial infarction, left ventricular ejection fraction less than or equal to 35٪, prolonged QTc, sustained inducible VT) (SCAA 2014).

Millions of people attend mass gathering events every year. The common feature of all mass gatherings is that the injury, illness rate and sudden cardiac arrest incidence of those attending are greater than the average non- gathered population and that they may be the subject to a catastrophic accident or attack with large numbers of injured or dead persons.

The collapse and death of two un- resuscitated spectators in the Nebraska University Football Stadium in 1965 was a stimulus for the modern era of MGM. The incidence of sudden cardiac arrest in mass gatherings ranges from 0.3 to 4 per 1,000,000 spectators with high survival- to- discharge rate of 20 ٪ - 100 ٪ (ACEP 2013). The incidence of sudden cardiac arrest and the efficiency of AED application in the Grand Mosque of Holy Makkah were studied by Dr. Al Dosari. There were 40 sudden cardiac arrest cases in the period of Al Hajj season 1423/ 2002 (Table 1). CPR was initiated in 26 of them, another 14 were labeled as dead on arrival of the medical team based on clinical examination and only 3 cases were revived post CPR. Asystole was the initial rhythm in 11 cases with delayed time to first shock. AEDs were unavailable. He concluded that many deaths were potentially preventable and that the utilization of AEDs as well as mobile emergency medical technicians (EMTs) units is highly recommended (Alshinkity IS 2007).

Table 1: Cardiac arrest patients in the Holy Grand Mosque of Holy Makkah, Al Hajj Season 1423/ 2002.

Number of cardiac arrest patients	40
Number of resuscitated patients	26 (65٪)
Number of unresuscitated patients	14 (35٪)
Number of resuscitated patients with asystole as initial rhythm	11 (42.3٪)
Number of patients revived post CPR	3 (11.5٪)
Neurological status of patients revived post CPR	Unknown
Time to first shock	Delayed
AEDs	Unavailable
EMTs	Unavailable

Strategic placement of AEDs is pivotal for public-access defibrillation. Public-access AEDs are being implemented in many countries worldwide (Winkle RA 2010). Regardless the financial implications, areas with a high incidence of cardiac arrests were defined as those with 1 cardiac arrest every 5 years. AEDs are needed to be deployed in 10.6٪ of the city area, providing coverage for 66.8٪ of all cardiac arrests (Hazinski et al 2005, Zakaria et al 2010).

Given a medical director's targeted response times (3 Min- 180 S) and the goals at mass gatherings, the number of AEDs required can be calculated (Crocco et al 2004). Studies from the University of North Carolina Hospitals found that the predicted emergency EMTs response times were 363 S for the longest football stadium distance, and 187 S for the basketball arena (Motyka et al 2005, Khodari AE 2013). AEDs are cost effective at sites where there is a high density of both potential victims and resuscitators (Ho et al 2014). Placement at residential units such as private homes / apartment complexes, golf courses, health clubs, and similar venues is less cost effective; however, the visible devices are good for public awareness of the problem of sudden cardiac arrest and provide reassurance to patrons (Winkle RA 2010). Limited AED accessibility at the time of cardiac arrest decreased AED coverage by 53.4٪ during the evening, nighttime and weekends, when 61.8٪ of all cardiac arrests in public locations occurred. (Alshinkity et al 2004, Alshinkity IS 2007, Al Turki M 2010, Z Al Abideen H 2010, Hansen et al 2013). Given the high crowd density in the Two Holy Mosques and Al Mashai'r (more than 4 persons/M2), not only strategic placement but also uninterrupted AED accessibility warrants attention if public access defibrillation is to improve survival after OHCA (Alshinkity et al 2005, Alshinkity IS 2007, Al Turki M 2010, Z Al Abideen H 2010, Hansen et al 2013).

CONCLUSION AND RECOMMENDATIONS

Preventable deaths from sudden cardiac arrest in the Two Holy Holy Mosques, Al Masha'ir (Arafat, Mina, Muzdalifah) and the community can be eliminated when public- access AED program and first responder AED program are established. Given the Tawaf Arena Rradius is 50 M from the Center of the Holy Ka'bah; the medical director's targeted response times (3 Min - 180 S); the Emergency Medicine goals at Mass Gatherings and the previous Hajj Experience, the number of AEDs required in the Two Holy Mosques and Al Masha'ir (Arafat, Mina, Muzdalifah) can be calculated and public- access AED program, as well as first responder AED program can be established.

Special attention should be given to uninterrupted AED accessibility during the evening, nighttime and weekends as well as other high risk times/ locations. Follow up of patients revived post CPR to learn their neurological status on Cerebral Performance Category scale (CPC scale) and Glasgow Coma Scale (GCS) is mandatory. This is to be performed inside and outside the KSA before and after pilgrim's departure for research outcomes and quality assurance purposes. This experience of public- access

AED program and first responder AED program can then be nationalized to Holy Makkah city/ state and to other cities and states in the KSA.

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Rehabilitation requirements of camels and cows modern slaughter house for food safety management system (ISO 22000) during Hajj season 1434 H

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Abstract

Rehabilitation requirements of camels and cows new slaughter house (Moisem 4) for Food Safety Management System (ISO 22000) during Hajj season 1434 H have been studied through the work of what is known as gap analysis to determine the current status of the slaughter house in terms of the extent of its conformity with the requirements of the Food Safety Management System (ISO 22000) , in addition to the preliminary program for the system and know the strengths and weaknesses through the list of system examination (Check list). The results showed the possibility of rehabilitating the slaughter house to the requirements of food safety management system (ISO 22000) if the senior management of the Islamic Bank for Development to appoint a team of food safety in order to remove all the weaknesses and maintaining levels of strengths with the implementation of programs, mechanisms and optimization recommendations to match the requirements.

Full text is available in Arabic section under this title

متطلبات تأهيل مجزر الجمال والأبقار الحديث لنظام إدارة السلامة الغذائية (إيزو ٢٢٠٠٠) أثناء موسم حج ١٤٣٤هـ

Seroprevalence of Listeria monocytogenes Infection Among Imported Sacrifice Sheep in Makkah During Hajj Season 1434H

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Abstract

Annually huge numbers of small ruminants particularly sheep were imported shortly before pilgrimage season mostly from countries of the Horn of Africa, where circling disease (*Listeria monocytogenes*) is endemic. *L. monocytogenes* is the causative agent of one of the most important zoonotic disease and it transmitted to human being through direct and indirect contact with infected animals. Imported animals may be infected and carry the antibodies of the causative agent without showing any clinical manifestations. So, a total of 1000 random blood samples were collected from such imported sheep during Hajj season 1434H for seroprevalence of *L. monocytogenes*. Serum samples were tested for the presence of specific *L. monocytogenes* antibodies using sheep anti-LLO IgG Immunoassay kit. Out of 1000 tested sera, 178 (17.8٪) were carried antibodies against Listeriolysin O (LLO) protein of *L. monocytogenes*. Also, public health significant as well as entrance of such zoonotic diseases into the country through imported animals was discussed. It was recommended that control measurements should be applied to avoid spreading of this food-borne zoonotic infectious agent into the crowded regions such as Makkah Al-Mukaramah and Al Madinah Al-Monourah. This study indicated that circling disease should be added to the list of the quarantine infectious diseases, especially through the Jeddah Islamic Port. Using of Anti-LLO ELISA for diagnosis of the previous exposure of the imported ruminates to the *L. monocytogenes* is also recommended. Furthermore, establishing of a national project for the intensive production of sheep as a substitute for the animals importation was recommended.

Key words:

Listeria monocytogenes, seroprevalence, imported sheep, Makkah Al-Mukaramah, Al Madinah Al-Monoruah.

Introduction

Listeria monocytogenes is the causative agent of listeriosis, a severe nervous disease associated with a high case fatality rate. Among the domestic animals, the disease most commonly occurs in ruminants (Cooper & Walker, 1998). Following the initial isolation and description in 1926 *L. monocytogenes* has been shown to be of world-wide prevalence and is associated with serious disease in a wide variety of animals, including man. Although a number of forms of listeriosis are easily recognized, the epidemiological aspects and pathogenesis of infection in ruminants remain poorly understood (Low and Donachie, 1997).

Listeriosis is one of the most important food-borne diseases of humans (World Organisation for Animal Health, 2012). *L. monocytogenes* is an important food-borne pathogen and is widely tested for in food, environmental and clinical samples (Gasanov et. al. 2005). Ingestion of contaminated food causes an infection, named listeriosis, which characterized by a variety of severe syndromes, such as encephalitis, meningoencephalitis, septicemia and abortion (Rocourt & Cossart, 1997). Listerial encephalitis is essentially a localised infection of the brainstem that occurs when *L. monocytogenes* ascends the trigeminal nerve. Clinical signs vary according to dysfunction of the damaged nerve nuclei (Scott, 2013).

The protein Listeriolysin O (LLO) was purified and used for development of an immunoassay for diagnosis of listeric infections in sheep. Anti-LLO antibodies were shown to be consistently produced in sheep after experimental challenge with *L. monocytogenes* serovar 4b. The assay also successfully detected and measured specific anti-LLO antibodies in the sera of silage-fed sheep among which listeric enteritis and abortions had occurred (Low et al. 1992). It was confirmed that LLO is highly immunogenic and induces a strong humoral immune response during infection, even when animals were infected with subclinical infecting doses of *L. monocytogenes*. The knowledge of the kinetics of antibodies to LLO will be helpful for interpreting the serodiagnosis in patients and for studying the exposure of human or animal populations to *L. monocytogenes* (Lhopital et al., 1993).

Shoukat et al. (2013) described the development of indirect ELISA employing immunodominant non-cross-reactive synthetic peptides of LLO (LLO-1 and LLO-2) and its comparison with that of purified LLO based indirect ELISA. Overall seropositivity with LLO-1 and LLO-2 peptides revealed comparatively less cross-reactivity in comparison to that of purified LLO. Antibodies against purified LLO and synthetic LLO-1 peptide based ELISAs detected antibodies even in samples from which non-pathogenic Listeria spp. were isolated; however, LLO-2 peptide did not reveal any ALLO antibodies from those samples which were culturally positive for non-pathogenic Listeria. It was concluded that LLO-2 peptide can serve as an ideal virulent marker for serodiagnosis of ovine listeriosis.

Experimentally, antibodies to listeriolysin O were detectable in lambs after both oral and subcutaneous challenge with *L.monocytogenes* (Low and Donachie, 1991). Experimental serological assays based on the detection of anti-listeriolysin O have been used in some epidemiological investigations and as

support for the diagnosis of culture-negative central nervous system infections (World Organisation for Animal Health, 2012).

Listeriosis is a zoonotic disease, and decisive role in the prevention of food-borne listeriosis in human beings is the reduction of the presence of this microorganism in all the critical stages of the food production and the distribution chain, including the epidemiological surveillance of livestock (Farber & Peterkin, 1991). Thus, sensitive and specific tests to identify *L. monocytogenes*-infected animals are of great importance in carrying out epidemiological surveys to develop appropriate control strategies (Amagliani et al., 2006). So that the current study aims to determine the seroprevalence of *L. monocytogenes* infection among imported sacrifice sheep in the Holy city of Makkah during Hajj season of 1434H using a specific anti-LLO ELISA test.

Materials and methods

Sample population

Blood samples were collected from the jugular vein of one thousand sheep from the livestock yards of the Saudi project for utilization of sacrificed animal′ meat in the Holy city of Makkah during the Pilgrimage season of 1434 H. All of the investigated sheep were imported from the Horn of Africa shortly before the Hajj season. During 4-8 Dhu Al-Hijjah, the blood samples were collected from sacrifice sheep in the main farm of the Saudi project for utilization of sacrificed animal′ meat.

The tested sheep were males, of 2-3 years old and of the barbari breed. The investigated sheep were randomly selected. Clinical examination indicated that they are apparently healthy.

The sera were harvested from blood samples at the same day and kept at -20◉C freezer till time of serological testing.

Serological testing

Serum samples were tested for the presence of specific *L. monocytogenes* antibodies using the sheep anti-LLO IgG Immunoassay kit (Diatheva) according to the manufacturer′s instructions. The diluted sera (1:100) were tested in duplicate on microtitre strips coated with the listeriolysin O (LLO) antigen. The antigen–antibody complex was detected by adding anti-IgG HRP-conjugated globulin, and revealed by incubating the strips with the chromogen solution.

Absorbance was measured at 405 nm by an ELISA microwell plate reader. Each sample was classified as positive, negative or equivocal by interpreting its mean absorbance value as indicated in the datasheet supplied with the kit.

Results

Clinical examination

Thorough clinical examination of the randomly selected sheep indicated that all investigated sheep are clinically-healthy.

Seroprevalence

Detection of anti-LLO antibodies by the commercial ELISA was carried out for a total of 1000 serum samples obtained from the investigated sheep. One hundred seventy eight (17.8٪) out of 1000 tested ovine sera were serologically positive for listeriolysin O (LLO) protein of *L. monocytogenes* (table 1).

Table (1): Results of ELISA for detection of anti-LLO antibodies

Animal species	Total number	Results of ELISA for detection of anti-LLO antibodies			
		+ve	٪	-ve	٪
sheep	1000	178	17.8	822	82.2

Discussion

Listeria monocytogenes is a facultative intracellular Gram-positive food-borne bacterium, increasingly recognized as being responsible for severe infections in both animals and humans. *L. monocytogenes* is ubiquitous in nature and it can survive under a wide variety of environmental conditions, so that it is present both in raw and processed foods (Giammarini et al., 2004; Ramaswamy et al. 2007). A wide variety of animal species can be infected by *Listeria monocytogenes,* although most of the clinical listeriosis occurs in ruminants. Most infections in animals are subclinical, but listeriosis can occur either sporadically or in epidemic form (World Organisation for Animal Health, 2012). So that determination of the *L. monocytogenes* seroprevalence among sacrifice sheep imported into the Holy city of Makkah was necessary.

The common clinical manifestations of listeriosis in animals include encephalitis, septicaemia and abortion, especially in sheep, goats and cattle (World Organisation for Animal Health, 2012). Epidemiological association of *L. monocytogenes* strains in two outbreaks of listerial encephalitis in small ruminants was reported (Wiedmann et al. 1994). During the current serosurvey, no clinical sigs were observed on the investigated sheep. The seropositive cases may be either due to subclinical infection or previous exposure to the *L. monocytogenes*. Most *L. monocytogenes* infections in animals are subclinical (World Organisation for Animal Health, 2012). Healthy carriage of *L. monocytogenes* has also been reported in a variety of animal species, including small ruminants (Low and Donachie, 1997).

In addition to the economic impact of listeriosis in animals, there is a link between animals and their role as a source of infection for humans primarily from consumption of contaminated animal products. Infection can be as a result of direct contact with infected animals (World Organisation for Animal Health, 2012). Subclinical infection may occur with apparently healthy animals excreting the pathogen for long

periods (Fthenakis et al., 1998; Wagner et al., 2000). So that, presence of subclinically infected seropositive imported sacrifice sheep may increase the risk for human infection especially for Muslims, who slaughter their sacrifice animal with himselfs.

Listeriolysin O (LLO) is a virulence determinant of *L. monocytogenes* (Cossart & Portnoy, 2000). Listeriolysin O (LLO) is a dominant antigen target of anti-listerial immunity (Shoukat et al., 2013). In this study, commercial immunoassay kit was used for detection of antibodies against listerolysin O of *L. monocytogenes* in the serum samples of the tested sheep. Baetz and Wesley, (1995) stated that a positive response to the LLO-based dot-blot and ELISA assays is indicative of previous or current infection with *L. monocytogenes*. It was found that a polypeptide limited to the 411 amino-terminal residues of LLO is a specific and sensitive antigen for the detection of anti-LLO antibody (ALLO) (Gholizadeh et al., 1996).

Seropositivity for anti-listeriolysin O antibodies (ALLO) was observed in 41.13 and 33.76٪ of goats and sheep, respectively (Barbuddhe, et al., 2000). A total of 120 serum samples were tested by listeriolysin-O (LLO) based indirect ELISA of which 19.16٪ turned out to be seropositive. The percentage of seropositivity was higher in goats those aborted (Elezebeth, et al. 2007). In the current study, the results of anti-LLO ELISA revealed that 178 (17.8٪) out of the investigated 1000 ovine sera obtained from non-symptomatic sheep were positive. Amagliani et al. (2006) found that, the rate of positive animals using an anti-listeriolysin O IgG immunoassay kit in non-symptomatic flocks did not exceed 10٪.

It was suggested that LLO is an excellent antigen for use in detecting *Listeria* infection in sheep (Baetz et al., 1996). It was indicated that antibodies to LLO are constantly produced during oral infection even with a low infecting dose, thus confirming that LLO is highly immunogenic. Detection of antibodies to LLO can therefore be used to detect sheep that have been previously exposed to *L. monocytogenes* (Lhopital et al., 1993). The present study suggested that the LLO ELISA may be used as suitable rapid test in the animal quarantines for detection of antibodies of *L. monocytogenes* in the sera of the imported ruminant animal flocks. Giammarini et al. (2004) suggested the possible application of the recombinant LLO for large-scale production of immunodiagnostic tests for listeriosis detection at least in sheep and likely also in other species. Gasanov et. al. (2005) mentioned that the traditional methods for identification of *L. monocytogenes* are the gold standard; but they are lengthy. As a result more rapid tests were developed based on antibodies (ELISA) or molecular techniques (PCR or DNA hybridization). While these tests possess equal sensitivity, they are rapid and allow testing to be completed within 48 hours.

Conclusion and recommendations

The current study concluded that the seroprevelance of *L. monocytogenes* infection among the investigated barbari sheep imported from the Horn of Africa shortly before the Hajj season of 1434H was 17.8٪. It was suggested that the LLO ELISA may be used as suitable rapid test for detection of

antibodies of *L. monocytogenes* in the sera of the imported sacrifice ruminant animals. Adding of the listeriosis to the list of the infectious quarantine diseases was recommended. Public health significant and possibility of transmission of such food-borne zoonotic disease to the pilgrims should put in consideration. Also, control measurements should be applied to avoid spreading of this infectious agent into the crowded regions such as Makkah Al-Mukaramah and Al Madinah Al-Monourah. Furthermore, establishing of a national project for the intensive production of sheep as a substitute for the ruminant animals importation was recommended.

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Temperature Trend on Makkah, Saudi Arabia

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Abstract

The main objective of this study is to investigate the trend and the distribution of temperature in 29 years period (1985 to 2013) over Makkah, Saudi Arabia, the holiest city for all Muslims. The mean monthly of daily maximum, daily minimum and daily mean temperatures are investigated, deviations from the reference period (1985–2013) were obtained. By analyzing the data, the results showed that; the number of hot days/nights increased annually by 1.5966/1.832 days while the number of cold nights decreased annually by 0.4054 nights. The annual mean of daily mean temperature increased with 0.0398°C per year while the annual mean of daily maximum temperature rose with 0.0552°C per year and the annual mean of daily minimum temperature increased with 0.0398°C. The monthly mean of mean temperature (Tmmean) of 23.98°C was found in January while a maximum mean temperature of 35.95°C in July while the monthly mean of maximum temperature (Tmmax) of 43.88°C was found in June and the a minimum of 30.54°C in January and the monthly mean of minimum temperature (Tmmin) varied between a minimum of 18.82°C in January and a maximum of 29.59°C in August. From the above findings we can conclude that Makkah is suffering from a considerable warming temperature trend and there is an increasing medical risk from heat waves that will be more intense or longer, or those occurring earlier in summer, so, specific attention towered: the energy demands for extra cooling, water resources, draughts, medical preparedness should be paid by the decision makers in order to minimize these risks over the pilgrims who gathered annually to perform hajj rituals and visitors.

Key words: extreme temperature, heat waves, human health, Makkah, Saudi Arabia

Introduction:

The Global warming is the most significant environmental problem the world experiencing today as concluded by the four IPCC Reports [1], [2], [3], [4]. Following these reports, several long-term of temperature studies have been done on different scales and there is a temperature increase globally as shown in [5], hemispherical as in [6] which showed that the rate of annual warming for global land areas

over the 1901– 2000 period is 0.078°C per decade, and regionally as in [7] which showed that there an increase in the surface temperature of the Earth with 0.6°C – 0.8°C during the 20th century.

According to the satellite measurements, the lower troposphere air temperatures have increased between 0.13°C and 0.22°C per decade since 1979 [8].

Other regional studies over the south Mediterranean [9] showed that the summer temperatures have increased during the last 3 decades of the 20th century while the mean annual temperature records have a warming trend over the 1939 to 1989 period over Turkey [10] and a significant warming trend after the years 1957 and 1967 for the minimum and maximum temperatures in Jordan [11]. Also, a study over Kuwait [12] showed that the maximum yearly temperature is persistently exceeding its mean value during the last two decades and a considerable worming temperature trend and the rainfall decrease were the main reasons of the aridity in the Middle East which should be considered for rural development and water resources management in KSA [13].

Another study [14], showed that there is a statistically significant temperature increase of 0.07°C/decade over Kuwait during the period 1950-1990. The Variability of wintertime surface air temperature (SAT) of 24 observing sites in the KSA based on time series over thirty one years in length (1978-2008) [15] showed that there is a warming trend in winter time during the last 2 decades at most sites and there is significant warming trend after the year 1997 with a rate of 0.03◈C/year. The extreme temperature trends over Jeddah, 70km away of Makkah, has been analyzed and studied by [16] for 40 years (1970 to 2006) and found that there is a significant increase in hot days per year and relatively smaller decrease in hot nights and confirm the increase in summer time temperatures and that the monthly and annual mean maximum temperatures have increased more than the mean and mean minimum temperatures.

The surface air temperature (SAT) data of 19 meteorological stations distributed through the KSA using cumulative sum, cumulative annual mean, and the Mann–Kendall rank statistical test for the period of 1978–2010 and has showed that there is a negative temperature trend (cooling) with 0.03 ◈C/year for all stations during the first period (1978–1997), followed by a positive trend (warming) 0.06◈C/year in the second period (1998–2010) with reference to the entire period of analysis [17].

In Makkah, the area of study, the outdoor temperature may exceed 45°C in summer. Exposes to high outdoor temperatures can result in heat exhaustion or heat stroke in many pilgrims, especially those who are not acclimatized [18].

In the current study, the behavior of the observed daily mean temperatures over Makkah has been investigated using 29 years (1985 to 2013) observation data collected from the Presidency of Meteorology and Environment is Saudi Arabia (PME) meteorological observing station.

The temperature issue in Makkah has special importance since the Hajj takes place annually once a year on the 9th to 12th of the lunar month of Dhu Al Hijjah (**Figure 12**) referring to the Arabic, Islamic, Hejra Calendar (The Islamic Calendar began on the year 662 AD, the year in which the Prophet Mohammed

travelled to Medina.). During that annual event a drastic increase in the numbers of Pilgrims to Makkah; approximately four millions performed the Hajj in 2013. Moslems of more than 80 different nationalities, performing hajj and all of them hoping that the God will accept their devotions, bless their pilgrimage and forgive their sins[19]. So, the knowledge of the temperature trends may help the decision makers to make the right precautions in order to minimize or avoid the possible impacts of the extreme heat. Since the extreme temperatures can affect many areas of the society. It raises the power demand for air conditioning, create dangerous conditions for human health [20], [21].

Data and Site Description:

Kingdom of Saudi Arabia (KSA) occupies about 86% of the area of the Arabian Peninsula (AP)[22] and spreading throughout AP, hence the climate of KSA could be representative for the AP climate [23]. Makkah is very famous city, located around 70 km away from eastern coast of the Red Sea and the capital of Makkah Province (**Figure 1**). Makkah (latitude: 21.4 degree North, longitude: 39.85 degree East) and has an area of 153,128 km^2 [24]. It is a narrow valley at a height of 277m above sea level. Its population in 2013 was 7.7 million [24], although visitors multiple of this number every year during Hajj period held in the month of Dhu al-Hijjah, the Islamic Calendar, and proposed to increase year by year. Makkah is the birthplace of the prophet Mohammad (peace be upon him), and the place of the revelation of the Holy Quran. Makkah is regarded as the holiest city in the religion of Islam because of the obligation of Hajj since Muslims are required to visit at least once in their life-time and perform a pilgrimage. In the modern times, Makkah has seen tremendous expansion in size and infrastructure. Today, more than 15 million Muslims visit Makkah annually, including several million during the few days of the Hajj period. As a result of that, Makkah has become one of the most cosmopolitan and diverse cities in the Muslim world. This study incorporates daily mean, maximum and minimum values of temperature in the current analysis. The standard methods have been used to check the completeness and erroneous values.

Figure 1: Location of Makkah on Saudi Arabia Map

Methodology

Using simple and known statistics, the number of hot and cold nights and days were estimated using daily maximum and minimum temperatures (**Figure 2**) recorded during different year.

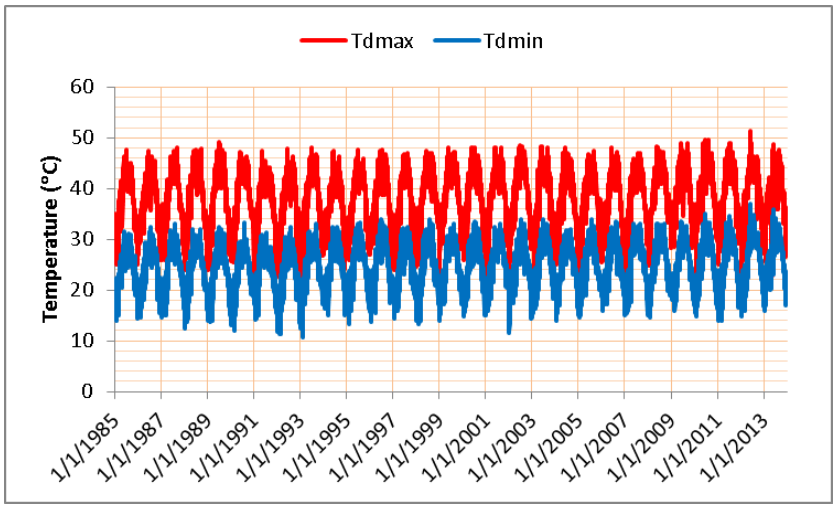

Figure 2: Daily maximum and minimum Temperatures during the period (1985-2013) over Makkah

The hot days are considered as hot if the maximum daily temperature Tdmax becomes ≥ 35°C, the hot nights are defined when daily min temperature Tdmin ≥ 20°C , the cold days are defined as cold when Tdmax ≤20°C and finally the cold nights are classified as cold when Tdmin becomes ≤15°C [16]

The monthly and annual standard deviations were calculated. The temperature range has obtained by taking the difference between the maximum and minimum temperatures of the daily mean values.

Results and Discussion

The data of daily maximum (Tdmax), daily mean (Tdmean) and daily minimum (Tdmin) values of temperature, monthly mean of maximum (Tmmax), monthly mean of daily mean (Tmmean) and monthly mean of minimum (Tmmin) values of temperatures and annual mean of maximum (Tamax), mean (Tamean) and minimum (Tamin) values of temperatures variability were studied and discussed in the coming paragraphs.

4.1 Temperature Data Summary

The overall variation of maximum, mean and minimum valued of daily maximum, daily mean and daily minimum of temperature over data reporting period (1985-2013) is summarized in Table 1. The maximum, mean and minimum of daily maximum temperature (Tdmax) were 40.67°C, 38.2°C and 35.78°C, respectively with standard deviation of 1.204°C. Similarly the maximum, mean and minimum of daily mean temperature (Tdmean) were 33.34°C, 31.64 °C and 29.86°C with standard deviation of 0.839°C and daily minimum temperature (Tdmin) varied between 22.34°C and 26.95°C while the overall mean was 26.95°C with standard deviation of 1.125°C as given in **Table 1**.

Table 1: Mean Temperature data Summary for Makkah during 1985-2013

Label	Max(°C)	Mean(°C)		Min(°C)	Std. Dev. (°C)
Tdmax	40.67	38.20		35.78	1.204
Tdmean	33.34	31.64		29.86	0.839
Tdmin	26.95	24.80		22.34	1.125

4.2 Frequency of Hot/Cold Days and Nights

The number of hot days and nights and cold days and nights during the whole period were calculated and depicted in (**Figure 3**). It is shown that the number of hot nights and the number of hot days per year are on the increase. The regression lines of best fit show that the frequency of the hot nights has increased by 1.832 nights per year and that of hot days increased by 1.597 days each year. Also, the number of cold nights per year is on the decrease while the number of cold days is not observed. The regression lines of best fit show that the frequency of the cold nights has decreased by 0.405 nights per year.

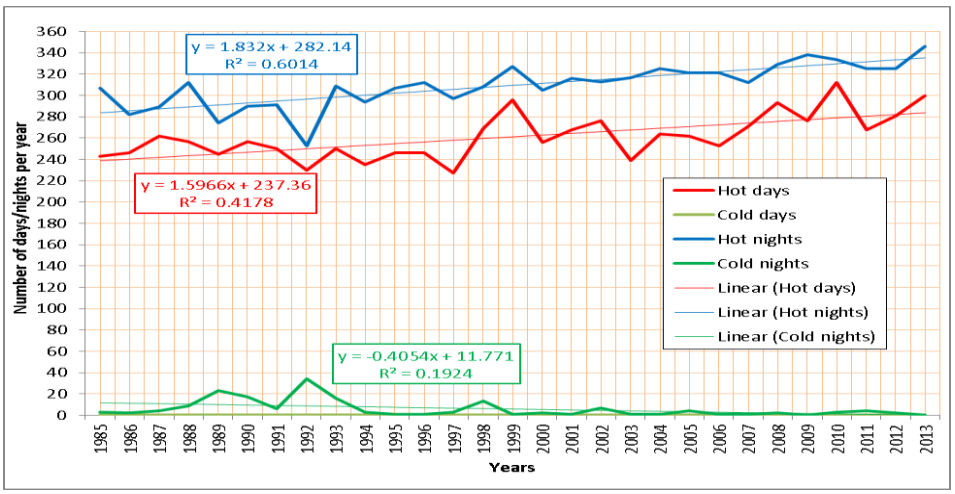

Figure 3: Annual frequency of hot days and nights and cold days and nights

Variation of Daily Mean Temperature (Tdmean)

The long term monthly mean (Tmmean) temperature were calculated using daily average values during the period 1985 to 2013 and are shown in (**Figure 4**). The monthly minimum and maximum of daily mean values are also displayed in this figure. The minimum mean temperature of 23.98°C was found in January while a maximum mean temperature of 35.95°C in July. This means that the ratio of hottest and coldest months was 1.499.

Higher values of mean temperature were observed from May to September, as shown in (**Figure 4**). The monthly maximum of 37.68°C and minimum of 20.49°C of the daily average temperatures were also observed in July and February, respectively. In this case the ratio between the hottest and cold temperature months was 1.84. Also, the same trend was followed by the monthly minimum values of the daily average temperature with hottest to coldest month's temperature ration of 1.613.

The monthly mean temperature (Tmmean), the corresponding standard deviations, difference between the monthly maximum and minimum temperature of daily mean values (range) and the covariance are given in

Table 2.

It is found that the higher values of covariance (COV) correspond to higher standard deviations (SD) and smaller values of covariance to smaller standard deviations.

Higher values of COV and SD were observed for the winter months and the lower values for summer which is an indicative for relatively more sable temperatures in summer. COV varied between 0.19٪ and 8.02٪ corresponding to September and February during the year. This shows that the temperature in September is most stable and least in February.

Figure 4: Variation of monthly mean, maximum and minimum temperature

Table 2: Statistical summary of monthly mean temperature of daily mean values

Month	Mean(°C)	Std. Dev. (°C)	Range (°C)	COV. (٪)
Jan	23.98	1.07	4.54	1.43
Feb	24.93	1.68	7.06	8.02
Mar	27.31	1.13	4.27	2.15
Apr	30.95	0.92	3.58	2.59
May	34.31	0.89	3.95	2.05
Jun	35.93	0.65	2.58	3.35
Jul	35.95	0.68	3.34	2.70
Aug	35.65	0.63	2.8	2.49
Sep	34.89	0.63	2.43	0.19
Oct	32.26	0.67	3.07	3.00
Nov	28.51	0.89	3.52	2.37
Dec	25.60	1.03	3.78	3.06

Trend analysis of Monthly Mean of Daily Mean Temperatures (Tmmean)

The trends of monthly mean values of daily mean temperature over different years were obtained using linear regression best fit lines. The linear regression trends for all the months from January to December are shown in (**Figure 5**)(a-i), respectively and the corresponding best fit equations along with coefficient of determination are summarized in Table 3.

Table 3: Linear regression equation for all the months (Tmmean)

Month	Regression line	R^2	Month	Regression line	R^2
Jan	y = 0.0205x - 16.924	R^2 = 0.0263	Jul	y = 0.0385x - 41.041	R^2 = 0.2351
Feb	y = 0.1145x - 204.01	R^2 = 0.3365	Aug	y = 0.0356x - 35.56	R^2 = 0.2402
Mar	y = 0.0306x - 33.947	R^2 = 0.0535	Sep	y = 0.0027x + 29.45	R^2 = 0.0013
Apr	y = 0.037x - 43.023	R^2 = 0.1179	Oct	y = 0.0429x - 53.548	R^2 = 0.3017
May	y = 0.0292x - 24.123	R^2 = 0.0785	Nov	y = 0.0339x - 39.271	R^2 = 0.1048
Jun	y = 0.0478x - 59.637	R^2 = 0.387	Dec	y = 0.0437x - 61.753	R^2 = 0.1303

It is clear from (**Figure 5**) (a) to (c) that monthly mean of daily mean temperature have increased during the whole months and the annual increases were shown in (**Figure 6**), it is clear from this figure that the major increase occurred in February, June, December, October , July and April with annual increase of 0.1145°C, 0.0478°C, 0.0437°C , 0.0429°C , 0.0385°C and 0.0306°C, respectively, which implies that

the months February, June, December, October , July and April Tmmean increased by 3.3205°C, 1.3862°C, 1.2673°C, 1.2441°C, 1.1165°C, 1.073°C during the last 29 years (**Figure 7**).

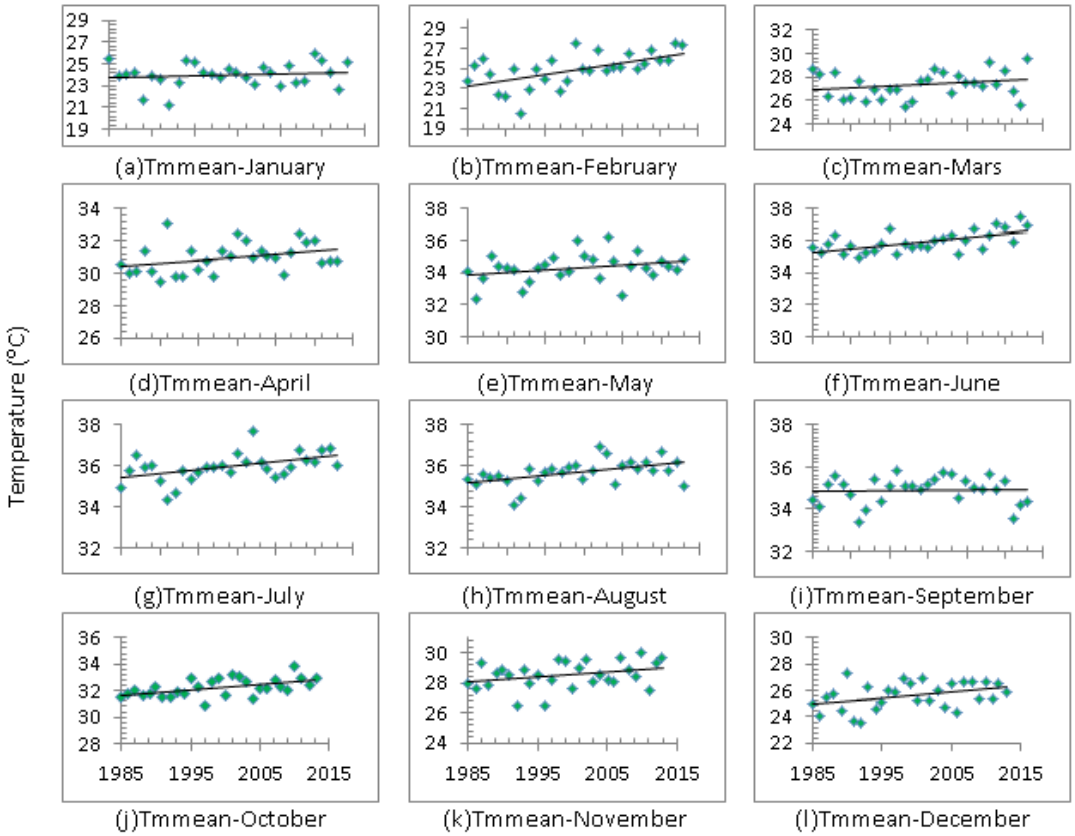

Figure 5: Linear regression trends of monthly mean of daily mean temperatures

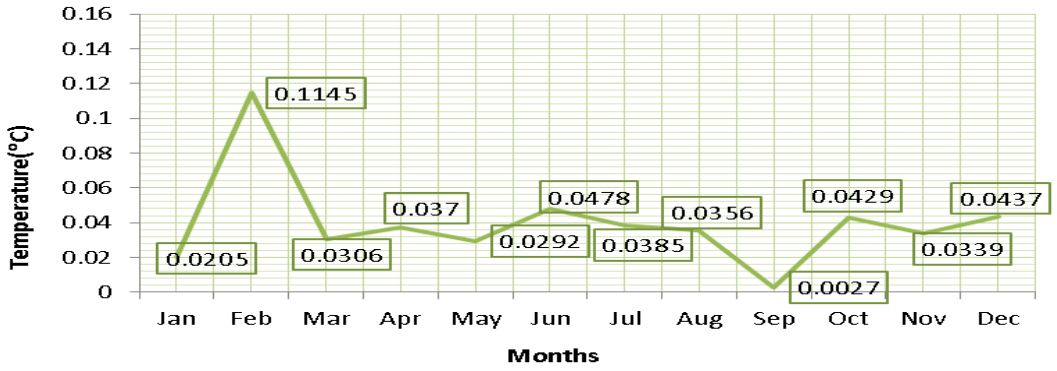

Figure 6: The annual increase in monthly mean of the daily mean temperature (Tmmean)

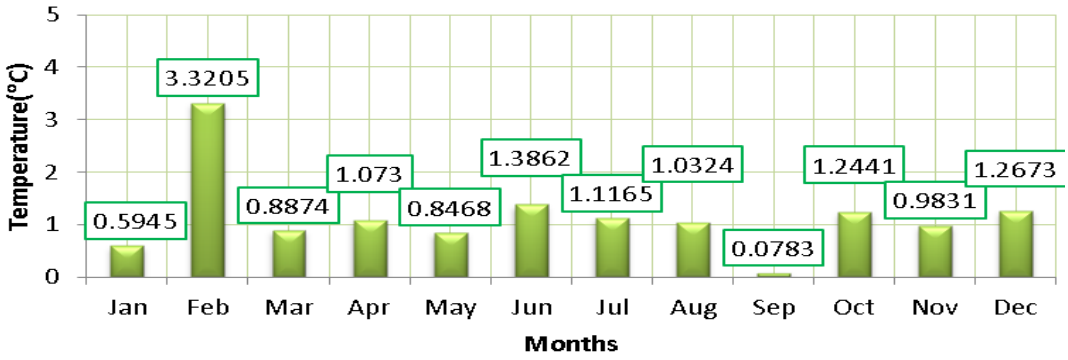

Figure 7: Tmmean total increase in the last 29 years

Trend analysis of Annual Mean of Daily Mean Temperatures (Tamean)

From (**Figure 7**) it is clear that the trend of the annual mean of daily mean temperature increasing with 0.0398°C per year. This implies that over the last 29 years the annual mean temperature of Makkah has increased by 1.1542°C.

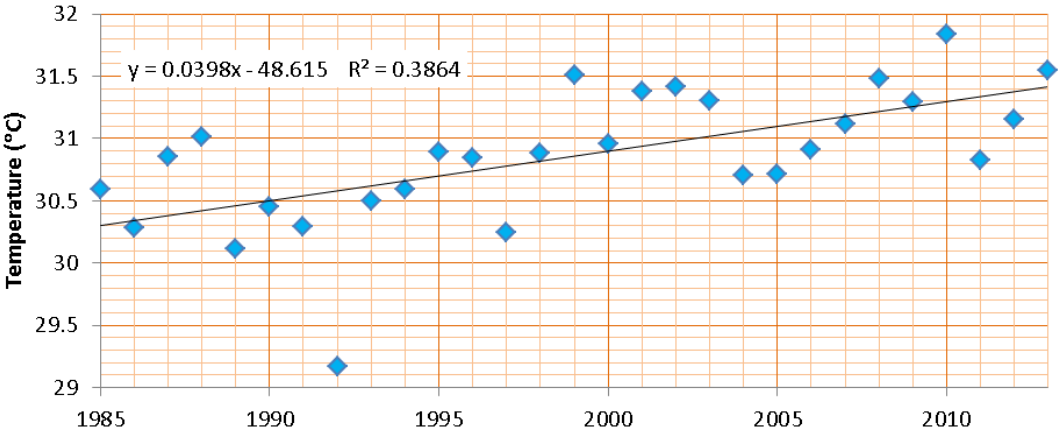

Figure 8: Trend of annual mean of daily mean temperature (Tamean)

As shown in (**Figure 9**) the annual deviations from overall mean temperature show increasing trends during the periods 1985 to 1986 , 1989 to 1997 and 2004 to 2005, and decreasing trends during 1998 to 2003 and 2007 to 2013.

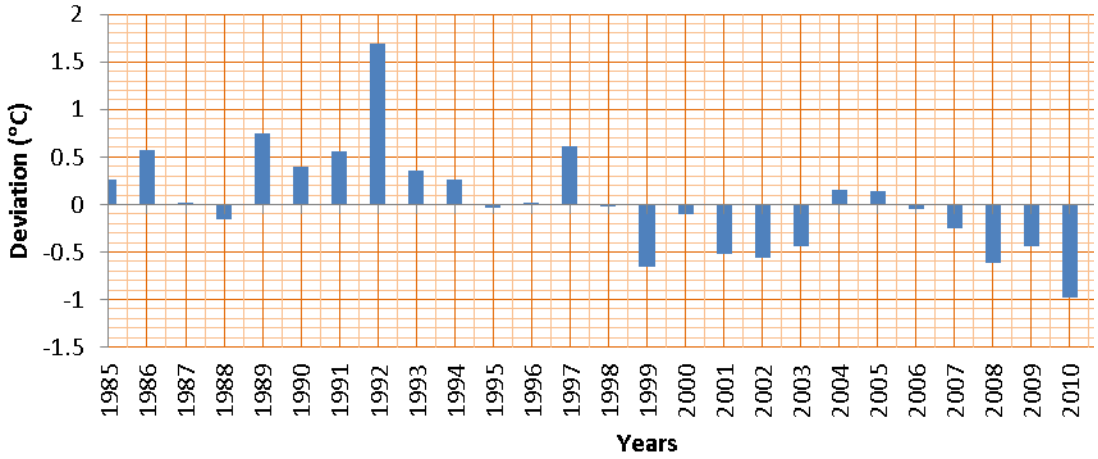

Figure 9: Trend of annual deviation from overall mean (Tamean)

Variation of Daily Maximum Temperature (Tdmax)

The long term monthly mean (Tmmax) temperatures were calculated using the daily maximum temperature values during the years 1985 to 2013. As shown in (**Figure 10**), the monthly minimum and maximum of the daily maximum temperature values over the entire period is also clear from the figure. The maximum value of Tmmax of 43.88°C was found in June while a minimum of 30.54°C in January. This means that the ratio between the temperatures of the hottest to coldest months was 1.436. The Tmmax was found to be greater than 30°C during the entire period and exceeds 40°C during the months May, June, July, August and September which almost the half of the year.

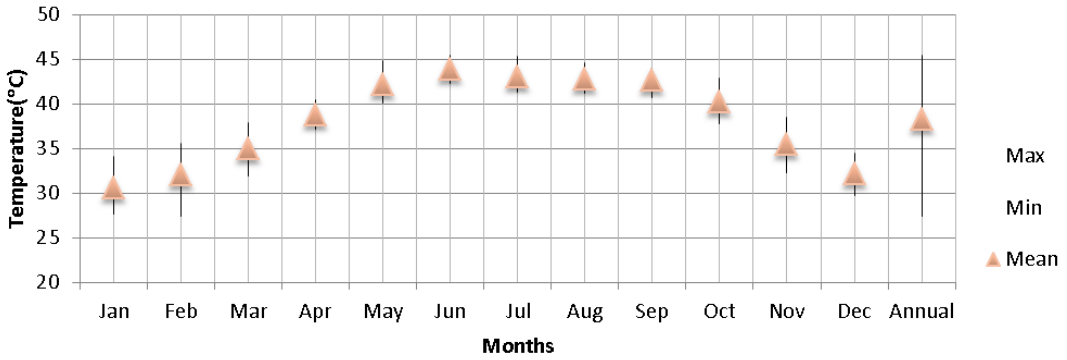

Figure 10:Variation of monthly mean, maximum and minimum temperature of daily maximum values

(**Figure 11**) shows the daily maximum temperatures which exceeds 44°C. The extreme (51.3°C) temperature has been recorded in 6 June 2012. There are three cases on 3 July 1989, 21 June 2010 and 7 August 2010 have recorded maximum temperatures 49.2 °C, 49.9 °C, 49.3°C, respectively. The best fit regression line show an increase of 0.0002 days of extreme temperatures per year. The extreme

heat is well connected to the cause of Heat Stroke, Sun Stroke, Heat Syncope; Heat Cramps; Cardiovascular Diseases, Epilepsy, Diabetes, Breathing Disorders, Dehydration, Sunburn, Blisters, Syncope, Viral Infection, Bacterial Infections, Gastrointestinal Diseases, Respiratory Diseases, Falls-Sprains/Strains, Cuts and Abrasions, Burns, Crush Injuries, Bone Fractures [25] and exacerbates many pre-existing health conditions. The extreme heat specially with increasing humidity conditions are more stressful to human health more than isolated hot days [26, 27].

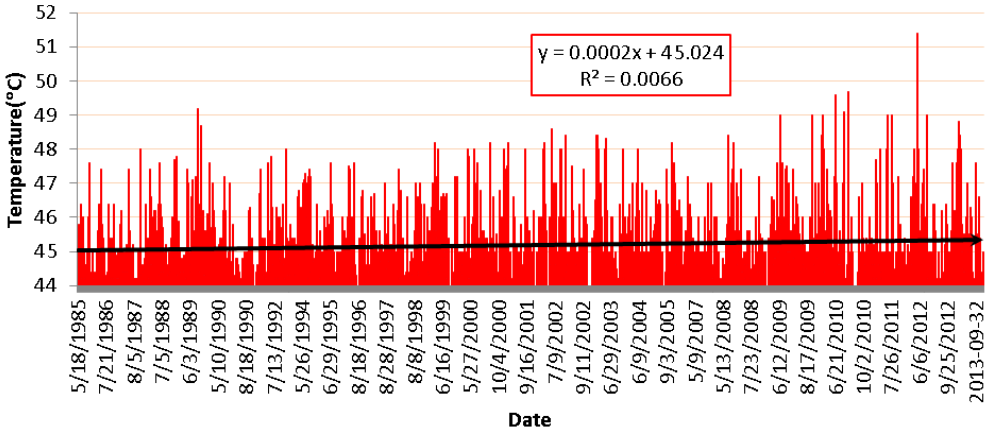

Figure 11: Daily Maximum Temperature greater the 44°C

The monthly mean temperature (Tmmax), their corresponding deviations from overall means and standard deviations and COV are given in **(Table 4)**. Higher mean values of COV and standard deviations were observed for winter months (January, February and December) while lower for summer months (May to October). This indicated that the temperature in summer is relatively more stable.

Table 4: Statistical summary of monthly mean temperature of daily maximum values

Month	Mean (°C)	Std. Dev.(°C)	Mean Dev.(°C)	Range(°C)	COV.(%)
Jan	30.54	1.41	-0.000517241	6.54	3.46
Feb	32.05	2.02	-2.75862E-05	8.18	9.71
Mar	34.91	1.46	-0.000931034	5.95	3.37
Apr	38.69	1.09	-0.000586207	3.4	4.09
May	42.09	1.20	3.43021E-15	4.75	2.87
Jun	43.89	0.80	-0.000551724	3.21	2.88
Jul	43.06	0.89	-4.13793E-05	4.05	2.94
Aug	42.77	0.80	-0.000172414	3.38	1.949
Sep	42.66	0.825	-3.44828E-05	3.22	0.61
Oct	40.18	1.06	-6.89655E-05	5.09	4.16
Nov	35.45	1.39	-0.000724138	6.22	4.20
Dec	32.15	1.49	-1.10257E-15	4.71	6.16

Trend analysis of Monthly Mean of Daily Maximum Temperatures (Tmmax)

(**Figure 13**) (a to l) show the linear regression trends of monthly mean of daily maximum temperature from January to December, from these figures. As shown in (**Figure 14**), the monthly mean of daily maximum temperature have increased in all months with annual increase of, 0.0494, 0.1387, 0.0481, 0.0585, 0.041, 0.0412, 0.042, 0.0278, 0.0087, 0.0594, 0.060, 0.0619 for the months January to December respectively. This implies that the monthly mean of daily maximum temperature have increased with 1.4326°C, 4.0223°C, 1.3949°C, 1.6965°C, 1.189°C, 1.1948°C, 1.218°C, 0.8062°C, 0.2523°C, 1.7226°C, 1.74°C and 1.7951°C during the last 29 years (**Figure 15**).It noticed that the most significant increase was in February. The corresponding best fit equation and the determination coefficient are mentioned in (**Table 5**).

Figure 12: Pilgrims in Arafat during the 9th the lunar month of Dhu Al Hijjah

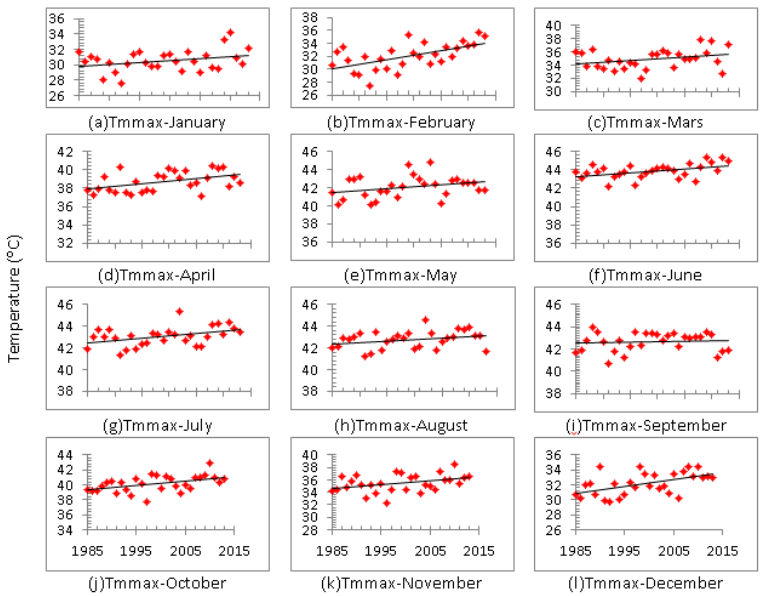

Figure 13: Linear regression trends of monthly mean of daily maximum temperature

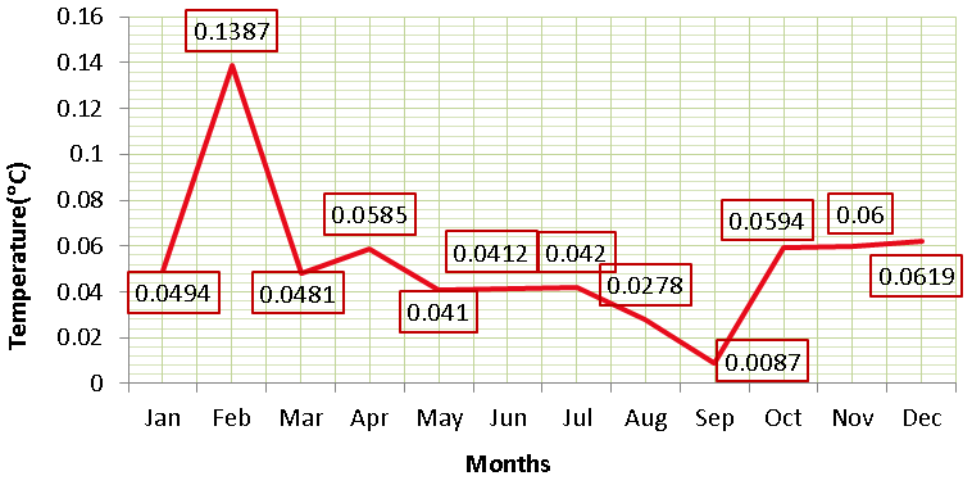

Figure 14: Annual increment in the mean of monthly mean of daily maximum temperature (Tmmax)

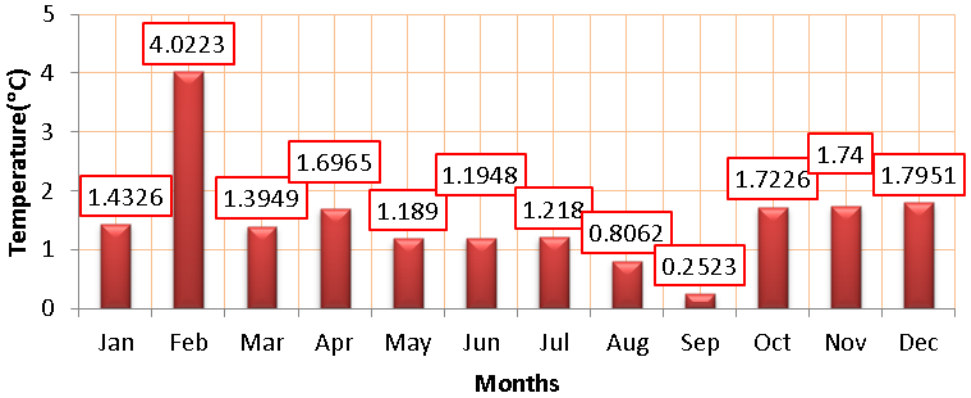

Figure 15:Tmmax total increase in the last 29 years

Table 5: Linear regression equation for all the months (Tmmax)

Month	Regression line	R^2	Month	Regression line	R^2
Jan	y = 0.0494x - 68.233	R^2 = 0.0896	Jul	y = 0.042x - 40.901	R^2 = 0.1612
Feb	y = 0.1387x - 245.2	R^2 = 0.3417	Aug	y = 0.0278x - 12.892	R^2 = 0.0875
Mar	y = 0.0481x - 61.32	R^2 = 0.0785	Sep	y = 0.0087x + 25.33	R^2 = 0.008
Apr	y = 0.0585x - 78.239	R^2 = 0.2091	Oct	y = 0.0594x - 78.635	R^2 = 0.2269
May	y = 0.041x - 39.908	R^2 = 0.0841	Nov	y = 0.06x - 84.39	R^2 = 0.1348
Jun	y = 0.0412x - 38.476	R^2 = 0.1904	Dec	y = 0.0619x - 103.38	R^2 = 0.3112

Trend analysis of Annual Mean of Daily Maximum Temperatures (Tamax)

As shown in (**Figure 16**), the annual mean of daily maximum temperature show an increasing trend with an annual rise of 0.0552°C, which implies that over the last 29 years the annual mean of daily maximum temperature of Makkah has increased by 1.6008°C.

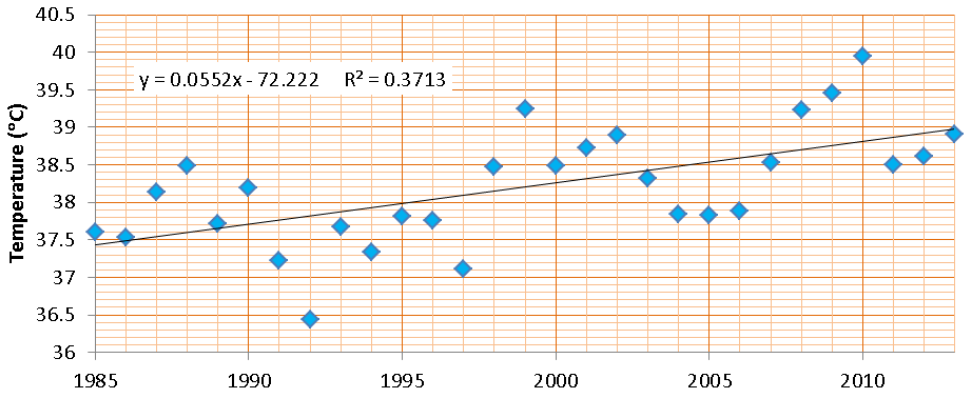

Figure 16: Trend of annual mean of daily mean temperature (Tamax)

(**Figure 17**) shows that the annual deviation from overall mean temperature show positive trends during the periods, 1985 to 1987 , 1989 to 1997, 2004 to 2006 and negative trends during the periods 1988, 1998 to 2003 and 2007 to 2013.

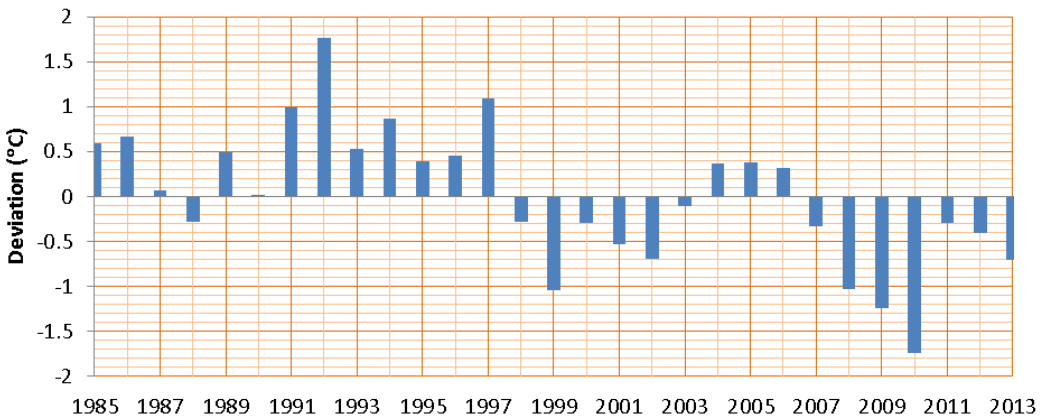

Figure 17: Trend of annual deviation from overall mean (Tamax)

Variation of Daily Minimum Temperature (Tdmin)

The monthly mean temperatures along with the monthly maximum and minimum of daily minimum (Tmmin) values during the period 1985 to 2013 are shown in (**Figure 18**). The Tmmin varied between a minimum of 18.82°C in January and a maximum of 29.59°C in August. This means that the ration

between the hottest to the coldest Tmmin is 1.572. Tmmin is found to be greater than 20°C during the whole year except for January and February.

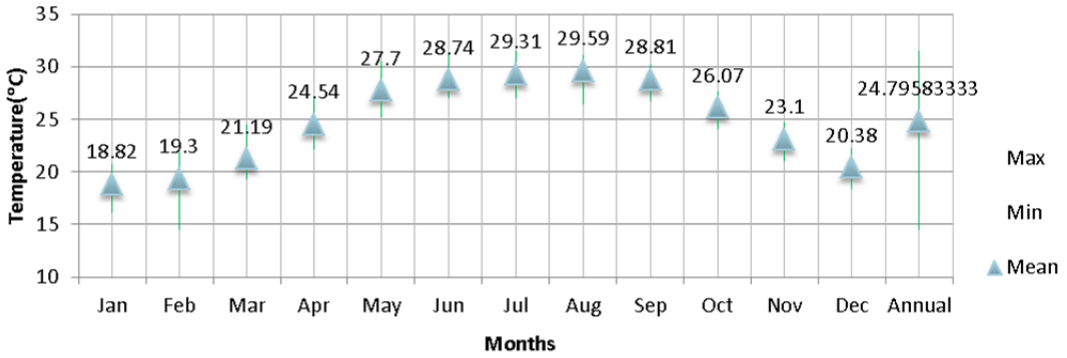

Figure 18: Variation of monthly mean, maximum and minimum temperature of daily minimum values

The monthly maximum of daily minimum temperatures (37°C) was recorded in the 2nd of June 2012 while the monthly minimum of daily minimum temperature (10.6°C) was recorded in the 8th of February 1993 as shown in (**Figure 19**). This means that the ration of hottest to lowest minimum temperature was 3.49.

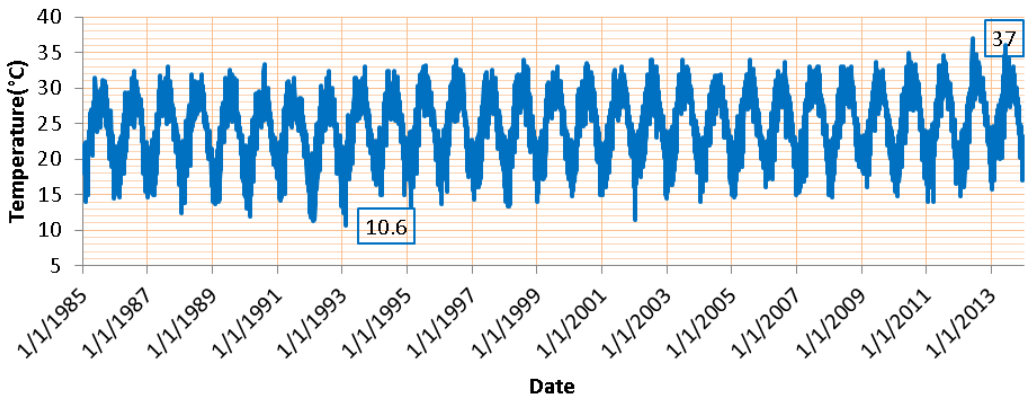

Figure 19: Variability of daily minimum temperature during the period 1985 to 2013

The monthly mean of daily minimum temperature (Tmmin), the corresponding standard deviations from overall mean, the range, and the COV are given in (**Table 6**). Again higher values of COV and standard deviation were observed for February.

The deviations of monthly mean temperature from overall mean show negative values for all months the highest values observed in January -0.0000586207°C and lowest in July -0.000931034°C.

The maximum range of 7.54 °C was observed for February and minimum of 3.45°C in September.

Table 6: Statistical summary of monthly mean temperature of daily minimum values

Month	Mean (°C)	Std. Dev. (°C)	Mean Dev. (°C)	Range (°C)	COV (%)
Jan	18.82	1.118806432	-5.86207E-05	4.6	3.891
Feb	19.31	1.819478895	-5.51724E-05	7.54	10.437
Mar	21.19	1.156291741	-0.000344828	5.13	4.897
Apr	24.54	1.210178609	-0.000137931	4.76	5.416
May	27.71	1.162200753	-0.000655172	5.33	4.735
Jun	28.75	1.203095351	-0.000931034	4.26	8.506
Jul	29.31	1.129394319	-9.31034E-05	4.47	7.52
Aug	29.60	1.152320854	-0.000275862	4.71	7.347
Sep	28.82	0.824892738	-0.00062069	3.47	3.214
Oct	26.08	0.900352695	-0.000241379	3.55	5.828
Nov	23.10	0.887764115	-0.000137931	3.62	4.667
Dec	20.38	0.944911574	-0.000103448	3.91	4.334

Trend analysis of Monthly Mean of Daily Minimum Temperatures (Tmmin)

The linear regression trends of monthly mean of daily minimum temperatures from January to December are shown in (**Figure 20**) (a to l), the corresponding best fit equations in (**Table 7**). The increasing trends in the values of Tmmin were observed in all months of the year with an annual increase (Figure 21), 0.0556°C, 0.1491°C, 0.07°C, 0.0774°C, 0.0677°C, 0.1215°C, 0.1075°C, 0.105°C, 0.0459°C, 0.0833°C, 0.0667°C and 0.0619°C for January to December respectively. This implies that in Makkah the Tmmin has increased during the last 27 years with 1.6124°C, 4.3239°C, 2.03°C, 2.2446°C, 1.9633°C, 3.5235°C, 3.1175°C, 3.045°C, 1.3311°C, 2.4157°C, 1.9343°C and 1.7951°C (**Figure 22**), for January to December respectively.

Trend analysis of Annual Mean of Daily Minimum Temperatures (Tamin)

The annual mean of daily minimum temperature, as shown in (Figure 23), showed significant increasing trend with an annual rise of 0.0398°C which implies that over the last 29 years the annual mean of daily minimum temperature of Makkah has increased by 1.1542°C. As shown in (**Figure 24**) the annual deviations from overall mean temperature show positive trends during the periods 1985 to 1986, 1989 to 1994, 1997, 2004 to 2005 and 2011 and then negative trends for the periods 1988, 1999 to 2003, 2006 to 2013.

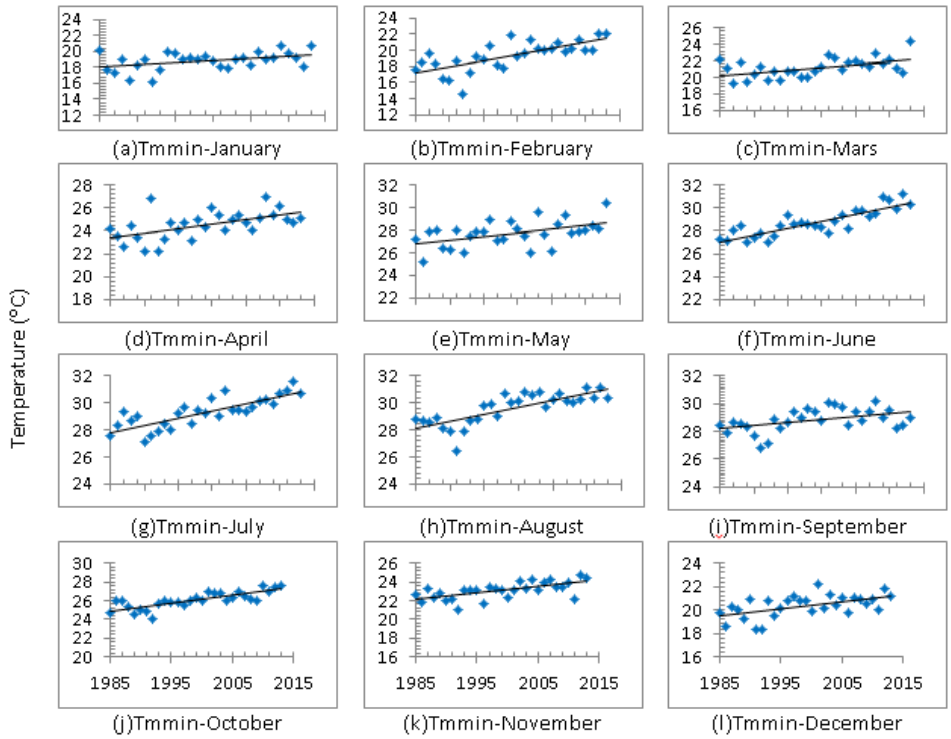

Figure 20: Linear regression trends of monthly mean of daily minimum temperature

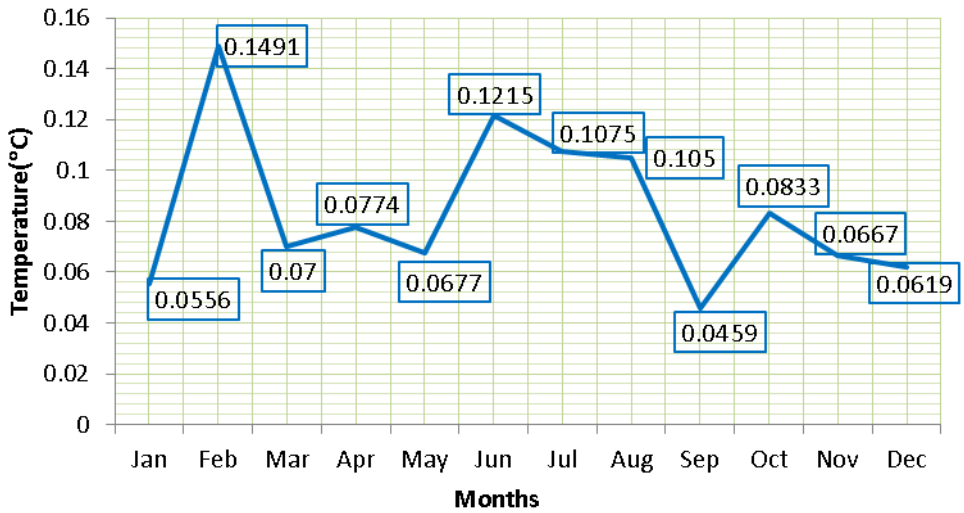

Figure 21: Annual increment in the monthly mean of daily minimum temperature (Tmmin)

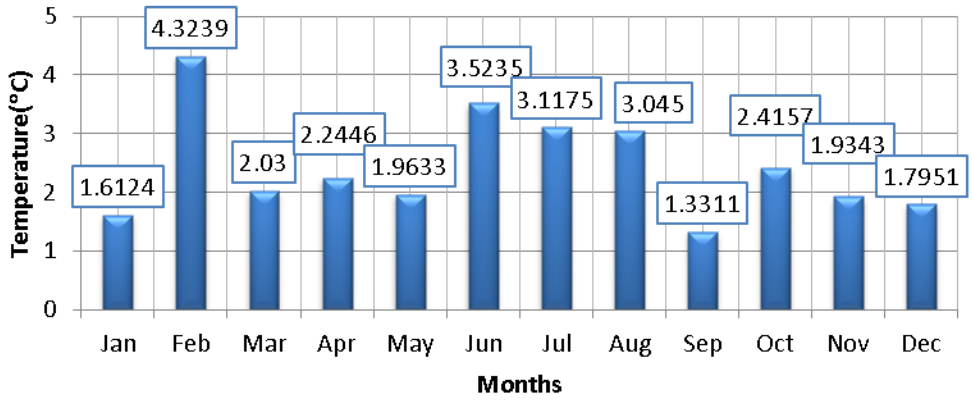

Figure 22: Tmmin total increase in the last 29 years

Table 7: Linear regression equation for all the months (Tmmin)

Month	Regression line	R^2	Month	Regression line	R^2
Jan	y = 0.0556x - 92.294	R^2 = 0.179	Jul	y = 0.1075x - 185.59	R^2 = 0.6569
Feb	y = 0.1491x - 278.75	R^2 = 0.4869	Aug	y = 0.105x - 180.21	R^2 = 0.6015
Mar	y = 0.07x - 118.65	R^2 = 0.2654	Sep	y = 0.0459x - 62.958	R^2 = 0.2246
Apr	y = 0.0774x - 130.12	R^2 = 0.2963	Oct	y = 0.0833x - 140.36	R^2 = 0.62
May	y = 0.0677x - 107.52	R^2 = 0.2456	Nov	y = 0.0667x - 110.18	R^2 = 0.4089
Jun	y = 0.1215x - 214.17	R^2 = 0.7396	Dec	y = 0.0619x - 103.38	R^2 = 0.3112

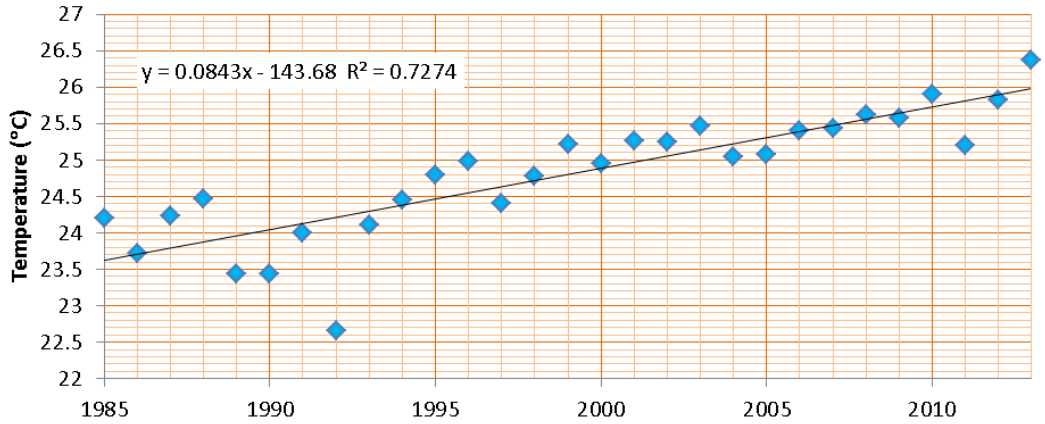

Figure 23:Trend of annual mean of daily maximum temperature (Tamin)

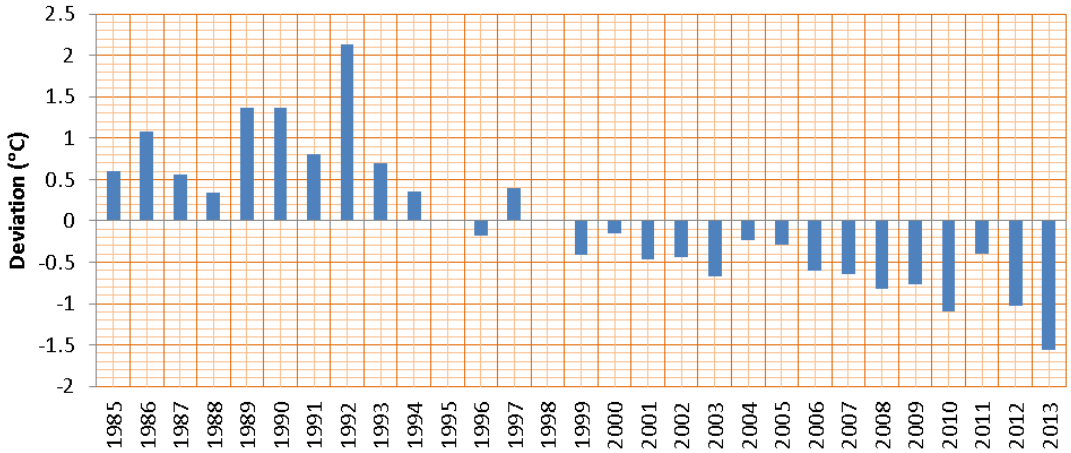

Figure 24: Trend of annual deviation from overall mean (Tamin)

Conclusion

The main findings of this study could be summarized in the following points:

The number of hot days/nights increased annually by 1.5966/1.832 days and the during the period 1985 to 2013 and during the last 29 years the hot days/nights have increased by 45.30/53.128 days

The number of cold nights decreased annually by 0.4054 which implies that the number of clod nights were decreased with 11.7566 days during the last 29 years where the number of cold days disappeared.

The regression trend analysis of monthly mean temperatures Tmmean, Tmmax and Tmmin showed worming in Makkah and the covariance values indicated stable temperature patterns.

The Tmmean minimum mean temperature of 23.98°C was found in January while a maximum mean temperature of 35.95°C in July

The monthly mean of daily mean temperature have increased during the whole months and the annual increases

Tmmean increased by 3.3205°C, 1.3862°C, 1.2673°C, 1.2441°C, 1.1165°C, 1.073°C during the last 29 years

The trend of the annual mean of daily mean temperature increasing with 0.0398°C per year, which implies that over the last 29 years the annual mean temperature of Makkah has increased by 1.1542°C

The maximum value of Tmmax of 43.88°C was found in June while a minimum of 30.54°C in January.

The number of days of recoded temperatures exceeds 44°C increased 0.0002 day annually during the period.

The monthly mean of daily maximum temperature have increased with 1.4326°C, 4.0223°C, 1.3949°C, 1.6965°C, 1.189°C, 1.1948°C, 1.218°C, 0.8062°C, 0.2523°C, 1.7226°C, 1.74°C and 1.7951°C during the last 29 years

The annual mean of daily maximum temperature show an increasing trend with an annual rise of 0.0552°C, which implies that over the last 29 years the annual mean of daily maximum temperature of Makkah has increased by 1.6008°C.

The Tmmin varied between a minimum of 18.82°C in January and a maximum of 29.59°C in August.

The monthly maximum of daily minimum temperatures (37°C) was recorded in the 2nd of June 2012 while the monthly minimum of daily minimum temperature (10.6°C) was recorded in the 8th of February 1993

The Tmmin has increased during the last 27 years with 1.6124°C, 4.3239°C, 2.03°C, 2.2446°C, 1.9633°C, 3.5235°C, 3.1175°C, 3.045°C, 1.3311°C, 2.4157°C, 1.9343°C and 1.7951°C,

Acknowledgments

The author acknowledges very much the International Center for Theoretical Physics (ICTP), Associate Program, for providing the facilities needed for performing this study. Thanks should be expressed to the Presidency of Meteorology and Environment in Saudi Arabia for providing the observation dataset. Also, the author would like to acknowledge Prof. Dr. A. H. Asghar (the dean of the Custodian of the Two Holy Mosques' Institutes for Haj and Umrah Research), Dr. Turki Habeebullah (the head of the Environment and Health Researches Department) for their support and encouragement.

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Using Air Q2.2.3 Model to Predict the Cases of Respiratory System Diseases Resulting from Exposure to Dust Inhaled in Mecca

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Abstract

This study focused on assessing the impact of particulate matter on population health in four different districts represented neighborhoods of Makkah city (Shubaikah, Misfalah, Aziziyah, Awali) in Saudi Arabia during the period from 1 Ramadan 1434 H until 27 Safar 1435 AH . The study indicated the presence of high concentrations of dust in the central region (Shubaikah), ranged between 186.1 - 343.2 µg/m3 with an average concentration of 254.6 µg/m3. In Misfalah area, concentrations ranged between 145.6 - 271.4 µg/m3 with an average concentration of 184.9 µg/m3, in Aziziyah ranged from 92.4 - 253.8 µg/m3 with an average concentration of 162.4 µg/m3, and in Awali ranged from 44.5 - 119.8 µg/m3 with an average 56.0 µg/m3 concentration in Awali throughout the measurement period (1 Ramadan 1434 H until 27 Safar 1435 AH) . These values did not exceed the permissible limits in protecting the environment and the Regulations of the General Presidency of Meteorology and Environment Protection Act to dust pectoris (340 µg/m3 average daily). The reason for high concentration is because the development work in the Holy Mosque, especially in the northern area of the Mosque and the impact of heavy traffic around the area. In Misfalah and Azizia areas, the high concentrations due to the density of population, human activities and traffic. Also been applied to the simulation model (AirQ2.2.3) to predict the number of hospital admissions due to respiratory diseases in the city of Makkah during the period of one year, depending on the actual number of cases registered at the Ministry of Health Saudi Arabia (3872 in the case of every 100,000 people). Ranged between (18-3050 case in every 100,000 people an average of 1534 cases) . The coefficient of concentration and response between 0.49 (0.05 - 0.70) for each 10 µg/m3 increase in the concentration of all study sites . The model results were compared to studies conducted in other countries around the world.

Key Words:

Particulate matter - respiratory diseases - dose inhalation - lung cancer - AirQ2.2.3 – Makkah

Full text is available in Arabic section under this title

استخدام نموذج Air Q2.2.3 للتنبؤ بحالات أمراض الجهاز التنفسي الناتجة من التعرض للأتربة الصدرية المستنشقة في مدينة مكة المكرمة

Spatial Distribution of Electromagnetic Waves of the Telecommunications Company's Towers in the Central Area of the Holy Mosque and the Holy Sites

Waleed Abu Al-Saud , Turky Habibuallah , Esam Morsi , Atef Fathi
The Custodian of the Two Holy Mosques Institute for Research of Hajj and Umrah

Abstract

The high prevalence of the telecommunications company's towers, especially those in the center of the residential neighborhoods and near schools clearly raised the concern among citizens and the fear of its related potential health consequences of exposure to the electromagnetic fields caused by the growing proliferation of such towers. Thus, this study was planned to locate the occurrences of the wireless towers around the central area of Haram, Makkah and estimate the severity levels of the electromagnetic fields in order to assess the status of the trends in the energy frequencies that can affect the public areas and the extent of deployment of the terrain in the area, then compare the results to the national and international standards for maximum exposure to such waves to further protect the health of the pilgrims and residents in these parts of the Holy City of Makkah. The study show the impact of the waves on the terrain in relation to the population density located within narrow valleys. However, all of the values observed in the central area of Haram indicate that it does not exceed the minimum recommendations of the International Commission on non-ionizing radiation protection (ICNIRP) and "the national guidelines for the human exposure to certain electromagnetic waves currents" issued by the Saudi communications and information technology authority.

Full text is available in Arabic section under this title

التوزيع المكاني للموجات الكهرومغناطيسية لأبراج شركات الاتصالات بالمنطقة المركزية للحرم المكي الشريف والمشاعر المقدسة

Combating Pollutants Between Rest Rooms and the General Area of the Holy Mosque in Makkah.

Omar Ahmed , Atef Asghar , Ibrahim Abd El-Rahim , Anas Dablol
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Abstract

Saudi Arabia is leading country for managements of human crowds and gatherings, where various services regarding basic life requirements and sanitation (toilets, bathrooms, Ablution sinks) are provided around the Holy mosque in Makkah. Too much toilets are available, distributed around different areas of the Holy mosque (Haram). The present study aimed to control contamination may be produced while using these toilets and to keep the areas between Haram and toilets clean, dry and free of contamination and to be suitable to practice prayers. To understand this, on the beginning, behaviors of people using these toilets was observed and documented, and then the health requirements were evaluated through a special checklist form and lastly the level of contamination was evaluated by taking culture swabs from knobs and floor surfaces at exit doors of toilets for aerobic bacterial count. The results showed that; behaviors such as sleeping, sitting and selling and begging inside toilet were notable, hand washings hygiene was absent, instruction signs, lack of means of drying and disinfectants use. The bacterial count showed that the floor surfaces at exit doors were highly contaminated 71.1٪. It was recommended that, unfavorable personal behaviors should be forbidden, hand washing and water drying means should be available, hand washing hygiene should be effective, increasing number of cleaners number during mass gatheringr, following regular cleaning and disinfection guidelines, applying nano technolgy techniques for effective sterilization.

Full text is available in Arabic section under this title

مكافحة الملوثات بين دورات المياه وساحات المسجد الحرام

Waste Biorefinery in Makkah: A Solution to Convert Waste produced during Hajj and Umrah Seasons into Wealth

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Abstract

The concept of waste biorefinery is known as one of the several energy recovery technologies capable of producing multi products in the form of biofuels and value-added products treating different fractions of municipal solid waste (MSW). The conversion technologies such as anaerobic digestion (AD), pyrolysis, transesterification, incineration treat food, plastic, meat, and lignocellulosic wastes to produce liquid, gaseous and solid biofuels. Makkah city landfills receive about 2750 tons of waste every day. Whilst during the Ramadan and Hajj seasons, these quantities become 3000 tons and 4706 tons per day respectively. More than 2.5 million animals were sold for slaughtering in 2014 Hajj, and their blood and organic solid waste were disposed untreated. Similarly, around 2.1 million plastic Zam-Zam cups were wasted every day during the 2014 Ramadan time. In the first three days of 2014's Ramadan, 5000 tons of food was wasted only in Makkah municipality. Collectively, about 3853 tons of waste were generated each day during 2014 Hajj and Ramadan. The waste from Al-Haram and Al-Masha'ir (Mina, Muzdalifah and Arafat) and their surroundings was mainly composed of organics (upto 68.5%). There is no waste-to-energy facility existing in Saudi Arabia. The waste biorefinery in Makkah will divert upto 94% of MSW from landfill to biorefinery. The energy potential of 2171.47 TJ and 8852.66 TJ can be produced if all of the food and plastic waste of the Makkah city are processed through AD and pyrolysis respectively. The development of AD and pyrolysis under waste biorefinery will also benefit the economy with gross savings of 405 and 565.7 million SR respectively, totalling to annual benefit of 970.7 million SR. Therefore, the benefits of waste biorefinery in Makkah city and other parts of the Saudi Arabia are numerous including the

development of renewable-energy science and research, solving solid waste problems, new businesses and job creation opportunities and minimizing environmental pollution.

Introduction

In Saudi Arabia, millions of muslims gather every year to perform worship from all over the world at Al-Haram (Holy Mosques in Makkah and Medina) and Al-Masha'ir (Mina, Arafat and Muzdalifah) (Figure 1). The area of Al-Haram mosque in Makkah, including indoor and outdoor prayer space is 356,800 square meters, where more than 2 million muslims can worship, especially during the Ramadan (the 9 month of the Islamic lunar calendar) and Hajj (the 12 month of the Islamic lunar calendar). Hajj is one of the largest gatherings in the world every year. More than 23,000 municipality workers and 450 scouts participated only in cleaning operations for the gathering of 2.1 million muslims in 2014 Hajj (Hazaimeh, 2014). The Makkah city landfills receive about 2750 tons of waste every day. While, these quantities become 3000 tons and 4706 tons per day during the Ramadan and Hajj respectively. The peak of waste generation occurs during 8 - 13 Zulhijjah (the time of Pilgrimage) and last ten days of Ramadan (the month of fasting).

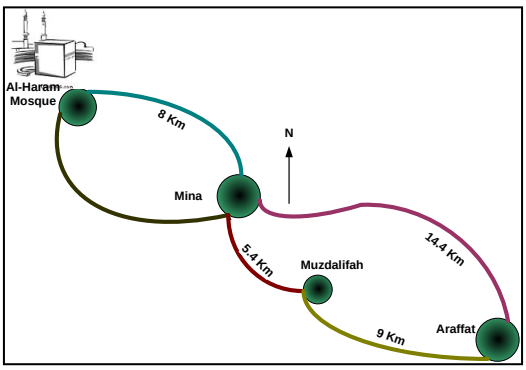

Figure 1. Map of Hajj route and destinations

In 2014 Hajj, more than 2.5 million animals were sold for slaughtering (Amtul, 2014). Similarly, around 2.1 million plastic Zam-Zam cups were wasted every day during the 2014 Ramadan. Around 5000 tons of food was wasted only in the Makkah municipality in the first three days of 2014's Ramadan, (Irfan, 2014). As a whole, during the 2014 Ramadan and Hajj time about 3853 tons of waste were generated every day. The sources of these wastes are food (44٪), plastics (23٪), paper and cardboards (16٪), leather and rubber (8.5٪), textiles (2٪), glass (1.2٪), aluminium (1.4٪) and others (3.5٪) (Mashat, 2014; Abdul Aziz et al., 2007). While, during the normal days, the range of waste generation from Al-Haram mosque was food (10-21٪), plastics

(38-46٪) and paper (11-25٪) (Abu-Rizaiza and Al-Ghamdi, 2001). During the 2014 Hajj, the estimated waste generation rate per pilgrim was 2.24 kg per day with total waste generation of 141.2 thousand tons.

The waste collection becomes a challenging task for authorities during Hajj and Ramadan seasons. The normal waste management principles don't apply in such conditions, where millions of Muslims are gathered in certain locations. Therefore, there is an immediate need of waste biorefinery in Makkah city for the sustainable disposal of these wastes with value-added material and energy recovery. The benefits of waste biorefinery in Saudi Arabia are numerous such as the development of renewable-energy science and research, solving solid waste problems, new businesses and job creation opportunities, and minimizing environmental pollution.

Methodology

The year 2014 is considered as a baseline year for the forecasting of the number of Pilgrims and waste generation until 2024. The number of pilgrims have increased with a yearly rate of 1.15٪ from 1993-2014 (CDSI, 2011). The total waste generation during the Hajj times (one month in Lunar Calendar) in Al-Haram and Al-Mashair has increased from 91.34 to 114.24 thousand tons with an annual rate of 2.38٪ from 1993-2006 (Abdul Aziz et al., 2007). This average percentage (2.38٪) of 14 years' time is used to forecast the total waste generation in Hajj periods of 2007-2014 (Table 1). The rate of pilgrim's increase (1.15٪) along with rate of total waste generation in Hajj (2.38٪) is used to calculate the waste generation per pilgrim from 2007-2014 and then forecasting it further until 2024. The waste composition values (Figure 2) are used to calculate the total waste amount of each waste category/type.

Table 1. The total pilgrims and waste generation in the month of Dhu al-Hijjah

Hijri year	Gregorian years	Total Pilgrims (million)	Total waste in Dhu al-Hijjah (thousand tons)
1415	1995	1.86	110.53
1420	2000	1.91	138.5
1425	2005	2.25	104.79
1430	2009	2.31	125.51
1435	2014	2.10	141.18
1440	2019	2.23	158.81
1445	2024	3.25	178.63

The values of physical and chemical compositions of food waste generated in Makkah city were assumed to be similar to the work of Khan and Kaneesamkandi (2013), which also analysed the biodegradable waste of Saudi Arabia (Table 2). These values were used to select the conversion technologies suitable to different fractions of municipal solid waste (MSW) under waste biorefinery.

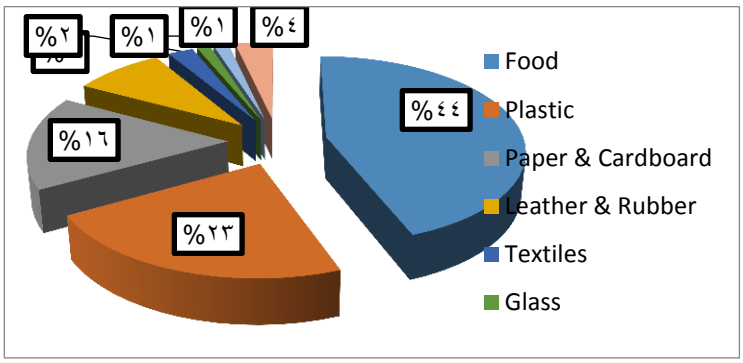

Figure 2. Average waste composition from all areas of Makkah during Ramadan and Hajj

There are many established waste-to-energy technologies all over the world such as anaerobic digestion (AD), incineration, gasification, pyrolysis, fermentation, transesterification, etc. Waste conversion to bioenergy takes place using three main conversion processes: thermochemical, biochemical, and physicochemical processes (Nizami et al., 2014). Thermochemical processes use high temperatures to convert waste feedstock to bioenergy, typically in the form of electricity and heat and bioproducts. Within thermochemical conversion, three processes are available: pyrolysis, gasification and combustion. Biochemical technologies use biological agents to convert biomass feedstock to energy, typically in the form of liquid and gaseous fuels.

Table 2. Physical and chemical composition of food waste

Physical composition (٪)		Chemical composition (٪)	
Rice	38.72	Moisture	38.4
Bakery products	18.74	Carbohydrates	25.56
Meat	25.15	Crude Protein	17.26
Fat	13.03	Crude fat	15.27
Bones	2.19	Fiber	0.3
Fruit and vegetables	2.16	Ash	3.21

Biochemical conversion includes anaerobic digestion and fermentation processes. Physicochemical technologies use chemical agents to convert biomass feedstock to bioenergy, typically in the form of liquid fuels. Transesterification is widely used in the physicochemical conversion pathway (Nizami et al., 2014). Three technologies; anaerobic digestion, pyrolysis and transesterification are selected based on waste type, composition and generation rate (Table 2 & Figure 2).

Results and Discussion

Pilgrims and Waste Generation

The total population of Saudi Arabia has reached to 31 million in 2014, with 1.96 million population of Makkah city. In 2014, the total estimated waste generation in Makkah city was 1.23 million tons, including waste generated by local population (1 million tons), pilgrims (0.14 million tons) and Ramadan visitors (0.09 million tons). This waste rate is projected to become more than double with 2.6 million tons in 2020 based on projected local population, pilgrims and umrah visitors (Table 1). The food (44٪) and plastic (23٪) wastes are one of the prominent waste streams (Figure 2), with amounts of 546.53 and 279.44 thousand tons respectively among the overall collected waste in Makkah city throughout the year. The Hajj and Ramadan periods add a significant amount of food and plastic wastes due to food serving in disposable plates and cups.

In Al-Masha'ir, most of the generated waste is from Mina (Table 3), where pilgrims stayed most of their time. On average, 3409.9 and 1772.4 tons of food and plastic was wasted each day during 2014 Ramadan and Hajj. The alarming news is the wastage of 35-40٪ cooked rice annually with the total amount of 3 million tons per year, the worthy of 1.6 billion SR (Saudi Gazette, 2014). Such a waste with high fraction of organic contents (upto 68.5٪), especially the food waste with high moisture content (38.4٪), carbohydrates (25.6٪) and proteins (17.3٪) make it very suitable feedstock for waste-to-energy technologies (Table 2).

Nevertheless, the animal slaughtering also produces animal related waste, i.e. bovine, blood wastes, etc. in huge quantities each year, especially during the Hajj periods. According to Amtul (2014), more than 2.5 million, animals were sold for slaughtering in 2014 Hajj. Typically, 12٪ waste per body weight is generated in sheep and goat slaughtering, while cattle slaughtering generate 38 percent waste (Singh, 2013). This waste includes rumen, blood, stomach, intestine, tallow and fats. There is no such information available on the amount of waste generated by slaughtering during the Hajj periods. However, it is evident that this animal blood and solid waste quantities are huge in Saudi Arabia, and they are currently disposed without treatment.

Table 3. Total waste generation from Arafat, Muzdalifah and Mina during Hajj seasons

Hajj		Waste Generation (thousand tons)		
Hijri year	Gregorian year	Arafat	Muzdalifah	Mina
1415	1995	5	0.3	21
1416	1996	5.5	0.4	22
1417	1997	6	0.45	31
1418	1998	5	0.4	22
1419	1999	6	0.35	22.5
1420	2000	8	5	18.5
1421	2001	7	5.5	20
1422	2002	7	6.5	21
1423	2003	11	8	21.5

Proposed Waste to Energy Technologies

Anaerobic Digestion (AD) of Food Waste

The anaerobic digestion (AD) process converts organic matter into biogas that can be used for heating, generating electricity and as a biofuel (Nizami et al., 2009). There are different types of anaerobic digesters that can carry out this digestion process; such digesters are classified based on whether it is a wet or dry process, a batch or continuous process, the number of phases or stages in the digestion, their operating temperature, retention time and organic loading rate (Nizami et al., 2010 & 2011; Nizami and Murphy, 2010). In Saudi Arabia, AD technology is suitable for food waste due to its high organic contents and the physical and chemical characteristics (Table 2). Moreover, a protein-rich waste in form of blood waste (from animal slaughtering) can also be digested anaerobically as single substrate or combined with food waste. A production of 98.7 million m^3 of biogas with total energy of 2171.5 TJ or 0.6 TWh can be achieved, if all of the food waste (0.55 million tons/year) is utilized in AD (Box 1). Nonetheless, a gross saving of 405 million SR per year can be added to the country's economy by developing biogas plant in the Makkah city (Box 2).

Box 1. Biogas and pyrolysis fuel oil production and their total energy potential (2014)

Biogas yield

Total food waste generated = 0.5465 million tons/year

Typical biogas value from food waste = 180.6 m^3/ton (Banks, 2009)

Total biogas production from food waste = 98.70 million m^3/year

Biogas energy potential = 22 MJ/m^3 of biogas or 6.1 KWh/ m^3 of biogas (Banks, 2009)

Therefore, total annual biogas energy potential = 2171.47 TJ or 0.60 TWh

Pyrolysis fuel oil yeild

Total plastic generated = 0.2794 million tons/year

Typical fuel oil production from pyrolysis (1kg of mixed plastic (PE, PP and PS type) = 0.8 Kg oil (Nizami et al., 2014b)

Total pyrolysis oil potential = 223.55 million Kg/year

Pyrolysis oil energy potential= 39.6 MJ/ Kg ((US-EPA, 2012)

Therefore, total annual pyrolysis energy potential= 8852.66 TJ or 2.46 TWh

Pyrolysis of Waste Plastics into Fuel-Oil

The waste plastic is the second large municipal waste streams in the Saudi Arabia and even in Makkah city at the rate of 279.4 thousand tons per year. Final disposal of such wastes represents operational and environmental overburden to most landfills. The production and consumption of plastics during the Hajj and Ramadan in form of Zam-Zam drinking cups and disposable plates have increased to an alarming level over the last decade. In pyrolysis process, waste plastic is decomposed thermochemically in the absence of air at temperatures of upto 500 ^{0}C and converted into liquid (fuel-oil), solid (charcoal) and gaseous (syngas) fractions. The fuel-oil is similar to diesel, with lower sulphur and higher cetane value in comparison to traditional diesel. A production of 223.5 million kg of fuel-oil with total energy of 8852.7 TJ or 2.5 TWh can be achieved if all of the waste plastic generated in Makkah city (0.2794 million tons/ year) is utilized in the pyrolysis process (Box 1). A gross saving of 565.7 million SR per year can be added to the country's economy by developing pyrolysis plant in Makkah city (Box 3).

Box 2. Cost benefit analysis of producing biogas from food waste in KSA

Solid waste management (SWM) cost	
*SWM budget =	702.31 million SR / year
Cost of waste dumping/disposal =	572.36 SR / ton
Total amount of food waste =	0.5465 million tons
Total cost of food waste =	312.81 million SR
Therefore, annual direct saving by discontinuing the food waste dumping =	312.81 million SR
Biogas technology revenue	
Typical energy value of food waste anaerobic digestion =	958.6 KWh/ton
Total energy value of food waste =	523.90 million KWh
Electricity cost	
Current domestic electricity cost =	0.22 SR/KWh
Total benefit =	115.26 million SR
**Waste collection, plant operational and maintenance cost =	23.05 million SR
Therefore, the total revenue from biogas technology =	92.21 million SR
Gross benefit	
Gross benefit =	Annual direct savings + annual revenue fro biogas technology 405.018 million SR / year

* The budget of SWM assumes 30% of the total annual budget considering, which is 29 billion SR for Sewage and SWM activities (Maria, 2013). We worked out SWM on the basis of the waste fraction of Makkah total waste / whole Saudi Arabia waste in 2014.

** Estimated to be 20% of the energy benefit value

Biodiesel from Used Cooking Oil and Fats

A large fraction of the country MSW is also consisted of used cooking oil, from households and restaurants, and fats from food and animal waste. Transesterification is a process of converting such fats and oils into biodiesel by recycling polyesters into individual monomers. It is a chemical reaction by which fats or oils are reacted with short-chain alcohols such as methanol or ethanol. Glycerol, soap, excess alcohol is also produced besides biodiesel, which are removed by using different standard methods. There are no data and information available regarding the amounts and compositions of used cooking oil, fats and meat waste separately.

Waste Biorefinery

There are certain limitations associated with each waste to energy technology based on process efficiency, commercializing, feedstock, infrastructure requirements and end use applications. It is difficult for an individual technology to achieve zero waste concept and competes with other renewable-energy sources like wind, solar, etc. The technological solution to these limitations is to select the conversion technologies based on waste composition and characterization and integrate technologies in a waste biorefinery. A biorefinery is basically a cluster of conversion technologies producing chemicals, fuels, power, products, and materials from different feedstock at one platform. A waste biorefinery is proposed for Makkah city (Figure 3), which utilize the city MSW during the normal days, Hajj and Ramadan periods. Five different conversion technologies such as AD, composting, pyrolysis, rendering and transesterification and algae biofuel are placed in the waste biorefinery to treat food, plastic, used-oil and animal waste respectively (Figure 3).

Box 3. Cost-benefit analysis of producing fuel-oil from pyrolysis of waste plastics

Solid waste management (SWM) cost	
*SWM budget =	702.31 million SR / year
Cost of waste dumping/disposal =	572.36 SR / ton
Total amount of plastic waste =	0.2794 million tons
Total cost of plastic waste =	159.94 million SR
Therefore, annual direct saving by discontinuing the food waste dumping =	159.94 million SR
Pyrolysis technology revenue	
Typical energy value of fuel oil from plastic waste =	11000 KWh/ton
Total energy value of plastic waste =	3073.84 million KWh
Electricity cost	
Current domestic electricity cost =	0.22 SR/KWh
Total benefit =	676.24 million SR
**Waste collection, plant operational and maintenance cost =	270.50 million SR
Therefore, the total revenue from pyrolysis technology =	405.75 million SR
Gross benefit	
Gross benefit =	Annual direct savings + annual revenue from pyrolysis technology 565.69 million SR / year

*Worked out on the basis of the waste fraction of Makkah waste/whole Saudi Arabia in 2014.

**Estimated to be 40% of the energy benefit value

The waste will be tipped and segregated automatically based on the material properties and send to the designated technologies. The energy generated in combined heat and power (CHP) plant in form of electricity and heat will be utilized in pyrolysis, rendering and transesterification, algae production, and AD. The CHP will be running on the fuel (fuel-oil) generated from plastic pyrolysis. The organic fractions such as food, paper, animal blood and agriculture waste will be pretreated and separated into liquid and solid streams. The liquid stream will be injected into the AD reactor to produce biogas at a thermophilic temperature. The biogas will be upgraded to be used as compressed natural gas (CNG) in vehicles. During biogas upgrading and CHP plant operation, the CO_2 will be captured using water scrubbing method and utilized in the algae production. The liquid left over from the AD reactor will provide a medium for algae growth. The solid stream after the organics pretreatment will be used in enclosed-vessel thermophilic composting, and the product (compost) will be used as organic fertilizer for horticulture and agricultural purposes. The animal waste such as bovine, used-oil from homes and restaurants, and algae-oil will be converted into lard, tallow and biodiesel using rendering and transesterification process (Figure 3). The biodiesel will be cleaned and used as vehicular fuel. The surplus electricity generated in the CHP plant will be connected to the national grid. This proposed waste biorefinery in Makkah will not only be sufficient to run its own various processes without external energy, but also provide surplus liquid (biodiesel) and gaseous (CNG) fuels and value-added products (organic fertilizer, lard, tallow, syngas and charcoal). The CO_2 capturing and use of liquid waste for algae growth will reduce the greenhouse gas (GHG) impact and pollution of the waste biorefinery.

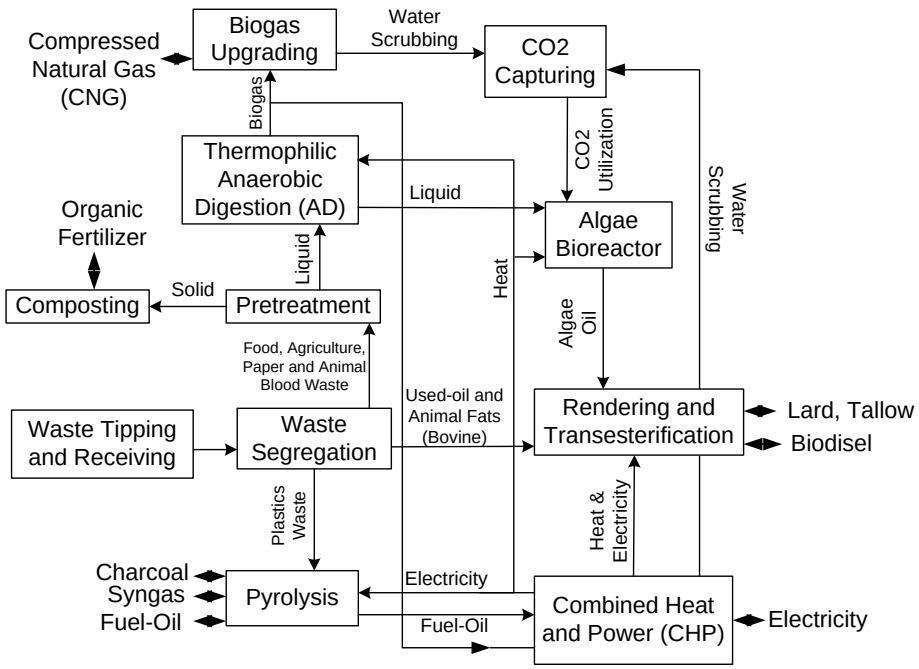

Figure 3. The integrated waste biorefinery in Makkah City

Conclusion

A review of the perspective of waste to energy technologies in Makkah city of Saudi Arabia is carried out based on the limited available data. However, the real selection of the conversion technologies will be carried out in conjunction with the fieldwork on waste characterization and laboratory analysis of selected technologies. The food (44.2٪) and plastic (22.6٪) wastes are the two main waste streams in Makkah with total estimated annual production of 564 and 279 thousand tons respectively by local population, pilgrims and umrah visitors. The overall waste produced is highly organics (68.5٪) including food, paper, cardboard and leather and food waste covers most of it with a high portion of carbohydrates, proteins and fats. An estimated production of 98.7 million m^3 of biogas with total energy of 2171.5 TJ can be achieved annually, if all of the food waste produced in Makkah city is utilized in anaerobic digestion. Similarly, 223.5 million kg of fuel-oil, i.e. equivalent to diesel with total energy of 8852.7 TJ can be produced annually if all of the waste plastic of Makkah city is processed in the pyrolysis technology. The development of biogas and pyrolysis technologies will also benefit the economy with gross savings of 405 and 565.7 million SR respectively, totalling to annual benefit of 970.7 million SR. The concept of waste biorefinery can be applied in other cities as well, which will not only solve the MSW problems, but also contribute significantly to the national energy requirement and economy of the Kingdom.

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Securing Meat Hygiene and Safety During Hajj: Experiences from the Hajj Season as part of a K.S.A. Project for the Utilization of Hadi and Sacrificial Meat

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Abstract

In this presentation, we provide an overview of our work as part of a general involvement of the King Faisal University in the yearly pilgrimage. The goal is to serve pilgrims of the Holy Mosque and the citizens providing sanitary veterinary supervision at all stages. With its involvement in this long-term program, the King-Faisal University contributes continuously since 25 years (1410H, 1993G) to this public service providing extensive work and training programs with more than 757 veterinarian participations over the years.

This year, the participants of the program counted 41 professors, specialists, veterinarian, and graduate students. The main contribution of the team was to diagnose meat diseases by conducting ant- and post-mortem inspections of slaughtered sheep and therefore to contribute to the sanitary veterinary overview at all stages. Meat inspections are carried out (i) during the initial stages of the processing, (ii) after slaughter and sacrifice, (iii) during dressing, (iv) during evisceration, washing, packing and freezing, until sacrificial meat is finally sent the poor Muslims spread across 25 countries. As an important and final step, all gathered and analyzed data samples were submitted to the Islamic Bank to provide empirical data and important insights that can be used in future pilgrimage seasons .

In detail, we rejected 57 out of 39512 sacrificial animals (0.14٪) during ante-mortem inspections. A high proportion of 12 of these rejected animals (overall 0.03٪) were rejected due of emaciation. Only one was due to rhinitis (overall 0.002٪). During post-mortem inspection we rejected 162 (0,41٪) animals due to pseudo tuberculosis and 1 animal (0.002٪) due to pleurisy.

For comparison the percentage of rejected animals in ante-mortem and post-mortem inspection of 1430-1434H(2010-2014DM) has reached 1.05٪ and 1,10٪ respectively.

Among others, the program provides an important opportunity to intensively train graduate students conducting meat inspections under the supervision of experts who have largely contributed in developing and executing this project.

Keywords: Hadi, Sacrificial Meat, Hajj, Hygiene, Safety, Experiences, Training, Ante-mortem, Post-mortem, Utilization, Project, K.S.A.

Full text is available in Arabic section under this title

تأمين صحة و سلامة اللحوم أثناء الحج:
خبرات من مواسم الحج في إطار مشروع المملكة العربية
السعودية للإفادة من الهدي و الأضاحي

Third Theme:

Engineering and Urban Studies

Developing a Spatial Data Infrastructure (SDI) for Pilgrims' Movement and Transportation during Hajj days in Holy Places

Riza Al-Yaqubi
King Abdulaziz University

Abstract

The safety of pilgrims is one the most important issues faced by authorities to make sure that Hajj rituals are carried out in the best condition. Management of pilgrims crowds' movement as well as their transportation among Holy places during Hajj days are two main key aspects to take into consideration to ensure their safety. The management of pilgrims' crowds, the monitoring of their displacement in addition to the proposition of safe and optimal transportation paths require a suitable Spatial Data Infrastructure (SDI). In this paper, we present an SDI that intends to provide useful and relevant spatial information and spatial analysis to support decision making for pilgrims' crowd management, monitoring, and simulating emergency strategies. To achieve this goal, a Spatial Database was designed in order to model the approach adopted in planning pilgrims' displacement and transportation among holy places (Arafah, Muzdalifah, Mina) during Hajj days. We also developed a Multi-Modal Transportation Network (MMTK) composed of the main transportation modes used during Hajj days, namely; Bus routes, Train network, and Pedestrian paths. This MMTN contains also assembly points inside Mina and Arafah camps. The elaborated Spatial Database and Multi-Modal Transportation Network ensure defining a powerful SDI dedicated to support all aspects of pilgrims crowds' management. In addition, it can be used to offer useful Location Based Services (LBS) for pilgrims while performing Hajj rituals. At the end of this paper, we'll present the simulation results that we've conducted based on the developed SDI. These simulations are related to the following movements; 1) from Mina's camps to Arafah's camps, 2) from Arafah's camps to Muzdalifah, and 3) from Mina's camps to Jamarat.

Introduction

Hajj is considered as the one of the most important acts of worship in Islam. It is the fifth pillar of our glorious religion, and it is an obligatory worship for Muslims who are able to perform it. ALLAH Almighty says in the Holy Quran in the interpretation of the meaning: *"And Hajj (pilgrimage to Makkah) to the*

House (Ka'bah) is a duty that mankind owes to ALLAH, those who can afford the expenses (for one's conveyance, provision and residence)" [Aal 'Imraan 3:97] . In addition to financial ablity, performing Hajj involves physical efforts to bear the hardship of Tawaaf, Saa'i and more specifically travelling among Mina, Arafah and Muzdalifah. In order to help pilgrims to carry out Hajj rituals in the best and safe conditions, it is necessary to manage pilgrims crowd's movement as well as their transportation among Holy places in an efficient way. Such successful management requires a powerful Spatial Data Infrastructure (SDI) that intends to provide useful and relevant spatial information and spatial analysis to support decision making for pilgrims' crowd management. Spatial Data Infrastructure (SDI) aims to coordinate the exchange and the sharing of spatial data between active users within a spatial data community (Erik de Man, 2006). It is intended to ensure an easy and secure access and retrieval of spatial datasets (Coleman and McLaughlin, 1998). In addition, an SDI provides a useful framework to develop effective Location based services (LBS) (Smith et al, 2004). According to Rajabifard and al. (2000), an SDI includes five components: people, access, policies, standards, and data. People are an important component of an SDI, due to their roles in processing data and in decision-making. The relation between people and data is determined through network access; policy, privacy and liability; standards and interoperability (Smith et al, 2004). The following figure summarizes the relations among SDI components (Rajabifard et al., 2000):

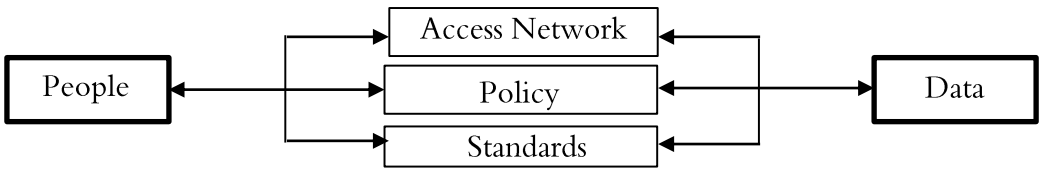

Figure 1: Relations between SDI Components (Rajabifard et al., 2000)

From the perspective of managing piligrims' grouping and transportation, we'll focus on two main components of an SDI which are Data and People. Hence, in this paper, we propose to design a Spatial Database that models the main concepts related to planning piligrims' displacement and transportation among holy places (Arafah, Muzdalifah, Mina) during Hajj days. We highlight how the spatial data has to be structured to provide useful and suitable information to pilgrims and decision makers during Hajj days in Holy places. In addition, we develop a Multi-Modal Transportation Network (MMTK) that is composed of the main transportation modes used during Hajj days, namely; Bus routes, Train network, and Pedestrian paths. This MMTN contains also assembly points inside Mina and Arafah camps. As a result, we present some simulations conducted based on the developed SDI (traveling from: 1. Mina's camps to Arafah's camps, 2. Arafah's camps to Muzdalifah, and 3. Mina's camps to Jamarat).

Modeling the Spatial DB for Pilgrims' movement and Transportation:

In order to design a suitable Spatial Database for piligrim's movement and transportation in Holy places during Hajj days, it is necessary to clearly specify the different needs of both pilgrims and authorities.

After that, we have to model those needs as classes and relations based on Database Modelling formalism. Then, the DB will be populated with the appropriate spatial and descriptive data relevant for Hajj activities.

Required information for pilgrims and authorities:

The required information for pilgrims and authorities during Hajj Days may be summarized as follow:

Gathering places:

Gathering places mean the locations where pilgrims will be gathered together from their camps (in Arafah, Mina or Muzdalifah). These places are already predetermined by the authorities for each Tawafah Institution. Based on these gathering places, the traveling routes and departures times are determined in order to optimize the displacement and the transportation of pilgrims among Holy places.

Movements planning of Pilgrims:

The movements of pilgrims among Holy places during Hajj days are prescribed in the Quran and the Sunna of the Prophet Mohammed peace be upon him. These movements consist of the following:

The ninth day of Dhu'l Hijja (Arafah Day): After the sunrise, the pilgrims move from Mina to Arafah, and they remain there until the sunset.

After the sunset of Arafah Day: The pilgrims move from Arafah To Muzdalifah.

The tenth day of Dhu'l Hijja: The pilgrims go out from Muzdalifah to Mina before the sunrise.

From the tenth to thirteenth days of Dhu'l Hijja: The piligrims move to the Holy Mosque to perform Tawaaf and Saa'i. In addition, they have to move from their camps in Mina to the Jamarat each day to throw stones.

Allowed traveling itineraries

The Hajj authorities determine a priori the allowed itineraries that pilgrims of each Tawafah institution must follow and respect. Hence, the authorities inform these institutions about departure times, gathering places (in Mina, Arafah and Muzdalifah) in addition to the access gate to Jamarat.

The used transportation modes:

The pilgrims may use one or several transportation modes based on the predetermined routes given by Hajj authorities for each Tawafah institution. The available transportation modes available for pilgrims among Holy places are mainly: 1) Bus, 2) train or 3) traveling on foot.

Designing the Spatial Data Model:

After highlighting the required information in the previous section, we introduce our Spatial Data Model that is proposed to support pilgrims' movement during Hajj days. First of all, we define the main classes and relations used in such a model. Then, we present the whole model via the Unified Modeling Language (UML).

Components of the Spatial Data base:

In order to meet the needs of both pilgrims and Hajj authorities, the Spatial Data Base model should include the following main components. Note that there are some other constituents not described here but will appear in the Conceptual Data Model presented in the following section.

Road Segment: The road segment is used to model roads mainly dedicated for Bus transportation. However, some of these roads can also be used by pedestrians. Each road segment may be delimited by a U-turn, a Tunnel, an Intersection, a Junction with Pedestrian Segment, and a Bridge.

Intersection: An intersection may occur among two or many road segments.

Bridge: A Bridge can be defined as a link between two road segments, and it has a higher elevation (or Z value) than the road segments.

Tunnel: A tunnel links between two road segments, however, it has a lower elevation (or Z value) than the road segments.

Pedestrian Segment: A pedestrian segment is a pathway exclusively reserved for pedestrians. Pedestrian segments may be partitioned based on Jamarat gates, Camp entrances (for Mina, Arafah and Muzdalifah), Junctions with roads Segments, Junctions with Train Segments (Train Station), and Gathering Points.

Train Segment: A train segment is a part of the train railway which is delimited by two successive Train Stations. It is also characterized by its one-way direction of traveling.

Train Station: In our model, a Train Station is considered as a junction between a path used for pedestrian and a Train Segment. It allows pilgrims to use the train transportation mode.

Holy Place: Holy Places are the places that the pilgrims must visit in order to perform Hajj rituals. They correspond to the geographic extent of Arafah, Mina and Muzdalifah.

Camp: Camps represent Pilgrims' housing allocated to Tawafah institutions.

Jamarat Gate: Jamarat contain several gates that help in managing pilgrims' movement in this strategic place. Entrance gates are allocated to Tawafah institutions based on several criteria such as the location of the camps and the itinerary from Arafah to Jamarat.

The UML Model of the Spatial Database:

The conceptualization of our proposed model was undertaken using the Unified Modeling Language (UML). In this model, we have specified classes and relations that are important for an SDI intended to support navigation for pilgrims and decision making for Hajj authorities. This model is mainly based on the concepts described in the previous section. The following figure summarizes the Conceptual Data Model (CDM) with the UML specification language for the elaborated Spatial Database.

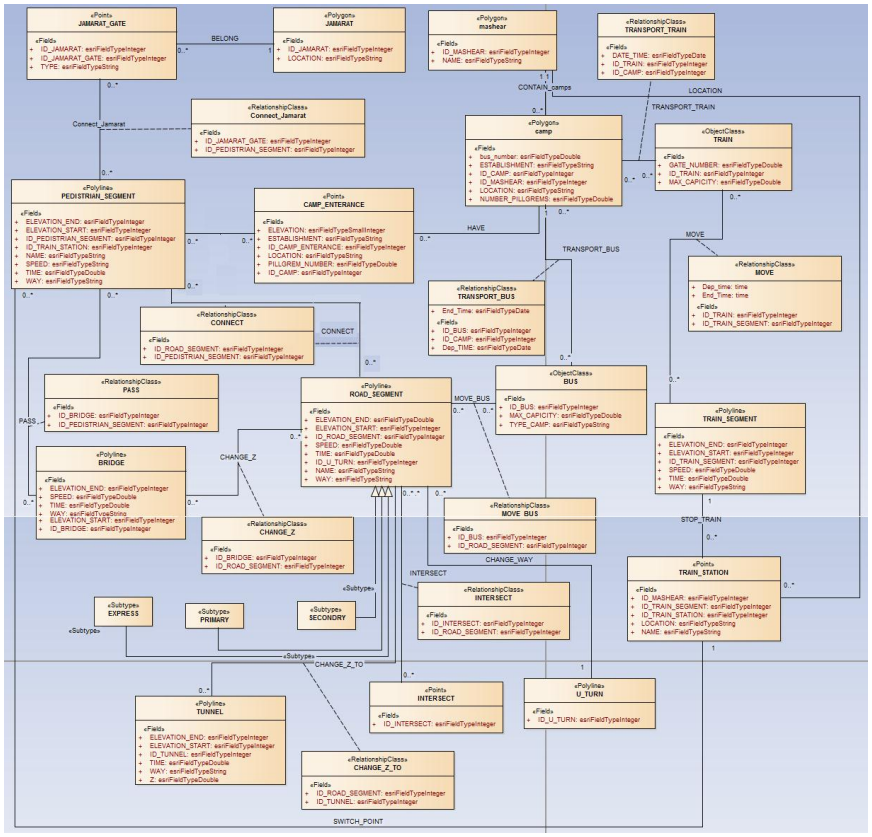

Figure 2: The CDM in UML language for the proposed Spatial Data Model

Multi-Modal Transportation Network for Pilgrims' movement and Transportation:

During Hajj days, pilgrims often need to travel with more than one transportation mode (on foot, bus or train). Therefore, it is required to provide pilgrims with navigational information that consider simultaneously all these transportation modes. For this reason, the implementation of a suitable Multi-Modal Transportation Network (MMTN) is crucial. An MMTN may be defined as a transportation network where two or more different modes may be used for a single travel in which a traveller has to make a transfer (Van Nes, 2002). The figure 3.a illustrates the general concept of Multi-Modal Transportation Network.

In order to model and to implement such a network in our case, we use the CDM presented earlier in Figure 2. More specifically, we have introduced some classes that ensure the transfer between different transportation modes such as 'Train Station' and the relation 'Connect' between 'Pedestrian Segment' and 'Road Segment'. In addition, for each component of the network, we introduce an elevation value (-1, 0 or 1) to model the transition of the elevation between roads or pedestrian segments in one hand, and 'Tunnels' and 'Bridges' on the other hand. Furthermore, the MMTN has to take into account other characteristics like authorized directions and Speed. The figure 3.b shows the Multi-Modal

Transportation Network for supporting pilgrims' movement and transportation during Hajj days produced based on the proposed Spatial Data Model.

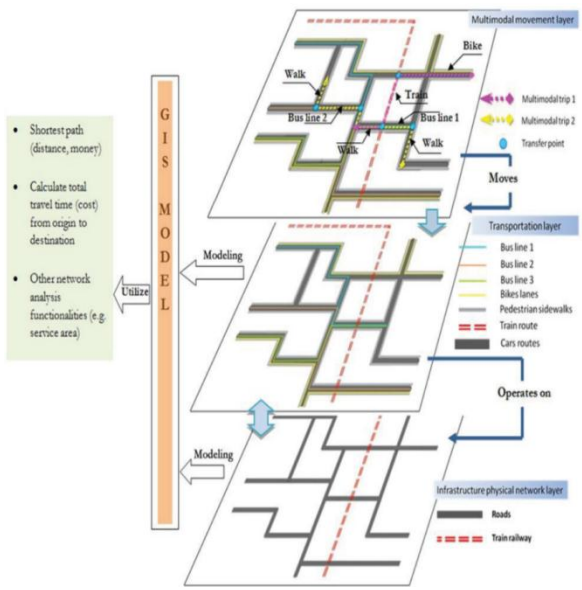

Figure 3.a

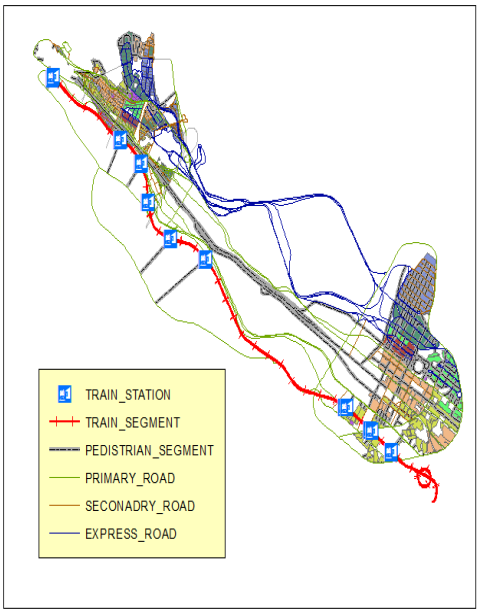

Figure 3.b

Figure 3: The concept of MMTN: a. the general concept (Mahrous, R.F. (2012)) and b. the concept for pilgrims' movement and transportation.

Pilgrims grouping and transportation simulation:

In this section, we present the results of our simulation of pilgrims grouping and transportation among Holy places during Hajj days. These simulations are related to the following movements; a) from Mina's camps to Arafah's camps, b) from Arafah's camps to Muzdalifah, c) from Muzdalifah to Jamarat and d) from Mina's camps to Jamarat.

From Mina's camps to Arafah's camps:

After the sunrise of the ninth day of Dhu'l Hijja, the pilgrims move from Mina to Arafah, and they remain there until the sunset. The first step in this journey is to group the pilgrims in 'Gathering points' from their 'Camps entrances' in Mina (Figure 4.a). Then, from these gathering points, each group of pilgrims will follow a specific itinerary based on the criteria specified by Hajj authorities. In this simulation, we used the constraints of travel time in addition to the allowed directions. However, our developed SDI may take into consideration more complex restrictions such as the traffic density and the approved transportation mode assigned to each 'Tawafah' Institution. Figure 4.b shows the Multi-Modal aspect of the proposed itineraries from each gathering points in 'Mina' camps to the destination gathering points in 'Arafah' camps. We note that some pilgrims may take a pedestrian path, and then they take the train to Arafah

station. After that, they may walk till the gathering points in 'Arafah' camps (figure 4.c). Finally, the pilgrims will move from the Gathering points to their camp entrances in 'Arafah' (figure 4.d).

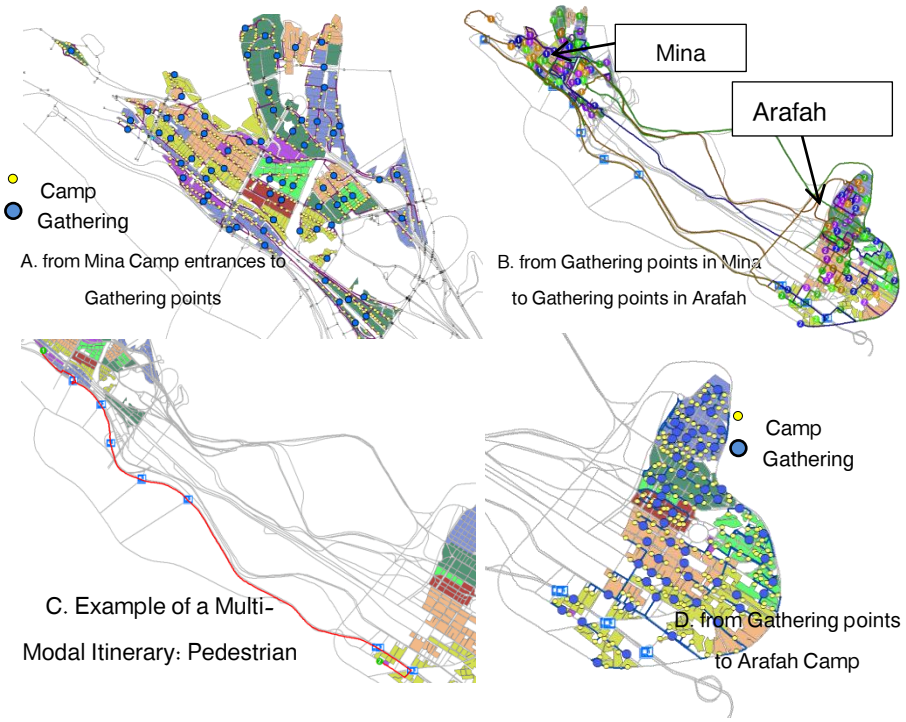

Figure 4: The simulation of pilgrims grouping and transportation in the ninth day of Dhu'l Hijja (phases A, B, C and D).

From Arafah's camps to Muzdalifah:

The second main phase is the transportation of pilgrims from Arafah Gathering Points to Muzdalifah's Camps. Based on the developed SDI, the authorities may decide which camp will be allocated to each Tawafah institutions (Figure 5). It is also possible to calculate the best routes from Arafah's gathering points to Muzdalifah if the camps in this latest are already allocated.

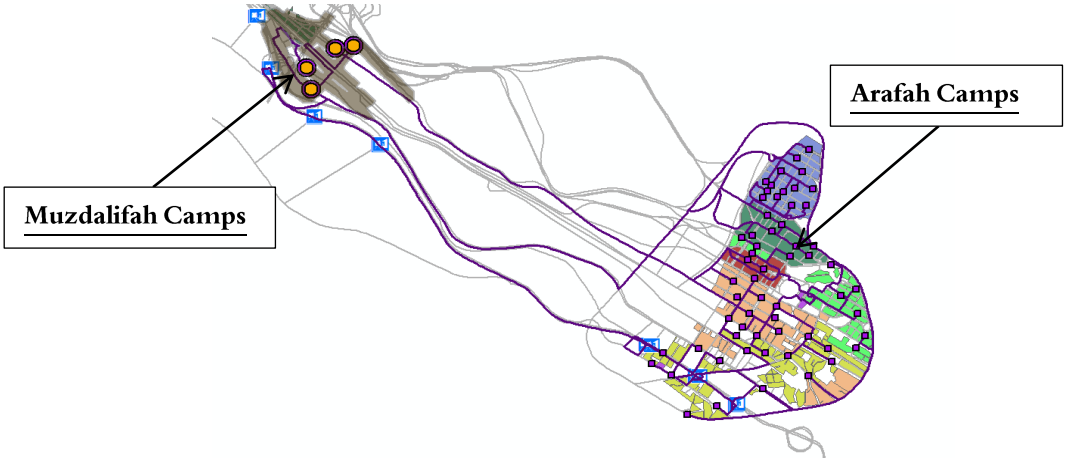

Figure 5: The simulation of pilgrims grouping and transportation from Arafah to Muzdalifah.

From Mina's camps to Jamarat:

In the same vein, we may generate the optimal routes from Mina's Camp entrances to the main gates of Jamarat. Based on the developed SDI, we can either determine the appropriate Jamarat gate for each Tawafah institution (Figure 6), or we can define the best trajectories based on the decision of Hajj authorities. Note that the same procedure may be applied to the displacement from Muzdalifah's camps to Jamarat.

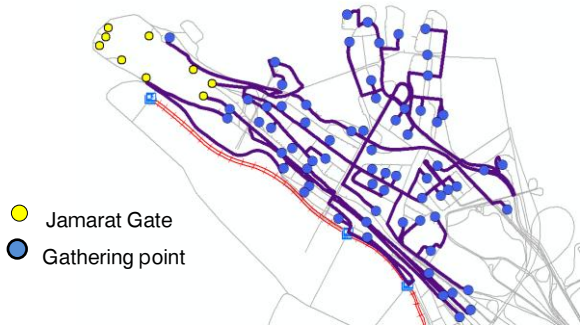

Figure 6: The simulation of pilgrims' movement from Mina's camps to Jamarat

Conclusion and Future Work:

In this paper, we have developed a prototype of a Spatial Database model that supports Multi-Modal Transportation. This Spatial DB can be considered as the core of an SDI dedicated to managing pilgrims' grouping and transportation in Holy places during Hajj days. In addition, we have presented some simulations of pilgrims' transportation while performing Hajj rituals. The proposed itineraries can be communicated as Location Based Services (LBS) to pilgrims or Tawafah institutions, through the use of smart phones for example, in order to be aware of their assigned routes. Furthermore, the proposed solution may be very effective in assisting Hajj authorities to determine the optimal routes and transportation modes while taking into consideration the desired restrictions. We would like to mention

that the designed Spatial DB must be updated at the beginning of each Hajj season in order to ensure reliable analysis and results.

As future work, we will investigate the use of Multi-Agent based modeling to simulate the behavior of pilgrims and transportation vehicles taking into consideration the Multi-Modal aspect of displacement and the restrictions imposed by Hajj authorities.

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An Urban Study to facilitate Al-Baqia visit in Al Madinah

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Abstract

Al-Baqia cemetery is considered the major cemetery for Madinah residents since the prophet's era. It's located near the prophet's mosque and spans an area of 180,000 m^2. Buried in it are the prophet's companions and some of his family members. Currently, most of the visitors of Madinah visit Al-Baqia cemetery. It's open for visitors twice a day; after Fajr and Isha prayers for a short time and only for men. Due to the large number of visitors and the regulations it has become difficult to visit. This study aims to improve the quality of the existing situation through the following objectives: to fulfill the aim of visiting a cemetery, to allow people visiting the cemetery to do so in a safe, secure and easy way and to prevent negative behaviors. To complete this study a comprehensive literature review and field data will be collected.

Full text is available in Arabic section under this title

دراسة عمرانية لتسهيل زيارة البقيع بالمدينة المنورة

Makkah and Madinah are Smart Cities
Planning Perspective

Sami Barhamain
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Abstract

Millions of Muslims visit Makkah and Madinah to perform Hajj, Umrah, and Ziyarah. The two holy cities sites huge development projects that include renovation and construction of infrastructure, roads, housing, public transportation...etc. The enlargement projects of the two holy mosques are started and going to be the greatest ever in history. The Saudi government is encouraging all its agents to be managed and giving services electronically. All those factors and other represent good opportunities to convert the cities of Makkah and Madinah to be smart cities (SC). The research discussed different planning models of SC and recommended one that suits the two holly cities. Few challenges and obstacles that may face the conversion process are recognized and discussed in order to reduce their negative impacts. This research is an important road map and agenda for both the researchers and the people in charge who are interested in the development of Makkah and Madinah in order to converting them to be smart cities

Full text is available in Arabic section under this title

مكة المكرمة والمدينة المنورة مدينتان ذكيتان
دراسة تخطيطية

The Development of Automatic Sorting Centers to Facilitate the Passage of Pilgrims' Vehicles

Fadel Othman

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Abstract

Governmental agencies apply pilgrimage permits instructions at entrances of Makkah city. However, the manual disclosure of permits, is a slow process and causes severe vehicles congestion, which delays passage of pilgrims' vehicles for a long time, even though they have the required permits.

This paper discloses a design proposal for a vehicles sorting center equipped with modern techniques to facilitate the passage of pilgrims' vehicles to spare them the discomfort hustle in the inspection area.

It is proposed to provide pilgrims just after crossing passport counters at the airport through their trip organizer, or through officials of Internal Pilgrims Companies arranging their Hajj trip before arriving to Makkah, with Pilgrimage Permits in the form of smart bracelets containing Active Radio Frequency Identification Device (RFID) or the like, which sends unique signals that can be read by an automated reader a few meters away.

Automated sorting centers before Makkah will be provided with RFID readers and electric gates which will open automatically once identifies then, without having to stop the vehicle. The number of tracks equipped with automatic gates should be proportional to the expected demand.

The design of the tracks in the sorting center allows direct guidance of registered pilgrims' vehicles toward the road leading to Makkah with minimum delays. Progressive routing gradually redirects unauthorized vehicles toward inspection sidewalks or retention parking to perform the required action.

To avoid the intersection of vehicles and the resulting delay, sorting center will be provided with a bridge or tunnel for directing pilgrims' vehicles toward Makkah, without being influenced by vehicles crowded due to screening procedures. Wherever needed, the center should be provided with under passes to prevent the intersection of pedestrians with vehicles especially in the inspection and sorting areas.

Surveillance cameras will allow the officials in the control center to inspect the vehicle visually, and managing traffic jams remotely, limiting the number of the workforce for operation. Cameras that identify vehicles' registration plate number will be used to identify licensed vehicles for transporting pilgrims.

Pilgrims' smart bracelets will also allow them to access multiple services in the future such as the identification of the location, identity identification, medical file for ambulatory services, and access permits to services for in camps, restaurants and the like, which will encourage pilgrims to use them and increase their economic feasibility.

Full text is available in Arabic section under this title

تطوير مراكز فرز آلية لتسهيل عبور مركبات الحجاج

The Role of the King Abdulaziz City for Science and Technology in Research Support for the Development of Services and Facilities of the Holy Places

Mohammed Khiami ， Suliman Al-Fadhl ， Ahmed Al Saqan
King Abdulaziz City for Science and Technology

Abstract

Encouraging and supporting scientific research are some of the main objectives of King Abdulaziz City for Science and Technology, to help the various authorities in Saudi Arabia, including the Ministry of Hajj, in the implementation of sustainable development plans. The recruitment of scientific research is one of the most important means required to raise the quality of services provided to visitors and pilgrims in the Hajj and Umrah seasons and the development of the holy sites in Makkah and Medina. So the city has sought to support related research projects through a number of programs for large and small research grants and graduate students grants. The research grants from the city include several research projects to upgrade and develop the services and facilities of the Holy Land. The supported projects which include environmental and engineering fields are：

a study of crowd administration of pilgrims using cloud computing; a study on the technical design of a system using radio waves to track and monitor the movement of crowds of pilgrims; a study on public water coolers' quality in the Holy City; a study on the use of water jets to mitigate climatic conditions during the pilgrimage season; a study on the impact of suspended particles on lung function; a study on the spread of infection of intestinal protozoa in Medina during the Hajj season, and a study on the positioning and electronic tracking for people using Global Positioning System and the adjacent field of mobile phone systems.

Due to the importance of benefiting from effective use of research grants to serve the development issues, this paper focuses its discussion on three axes：

1. Appropriate research grants from the city to develop the services and facilities of the Holy Places
2. The possibility and methods of research grants directed to achieve the priorities and objectives of a sustainable development plan for the Holy Places. And،

3. The proposed method used to communicate with beneficiaries to deliver the results of research studies to take advantage of them.

Full text is available in Arabic section under this title

دور مدينة الملك عبدالعزيز للعلوم والتقنية في دعم
أبحاث تطوير خدمات ومرافق المشاعر المقدسة

Fourth Theme:

Awareness and Media Studies

Impact of communication incipience of the pilgrims' residential context on their communication behaviors and perceptions

Fazal Khan - Othman Gazzaz

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Abstract

This study has examined relationship between communication incipience of the Hajj pilgrims′ residential context and their communication behavior and perceptions. Per communication infra-structural theory of Ball-Rokeach and her colleagues, communication incipience is defined as a degree of openness of communication action context (CAC). Availability and proximity of communication incipient features of physical and social-architectural structures of the housing units and their neighborhood indexed communication incipience of the CAC. Data were collected from a probability sample of the sojourner community of the Egyptian pilgrims within their housing units in the Holy city of Makkah al-Mukarramah, Saudi Arabia. Multiple regression analysis found that degree of openness of the CAC had a statistically significant impact upon number and frequency of communication contacts made in problem situations and pilgrims′ perception after controlling for the effect of demographic variables. Recommendations are derived for the structural aspects of the pilgrims′ housing projects and for future research for further testing the relationship .

Introduction

Background &Significance of the Study

The Hajj & Omrah pilgrims, in their 4-6 weeks′ stay in the two Holy cities, may best be characterized as unique geo-ethnic communities of sojourners. These sojourner communities are housed in neighborhoods comprising sets of multistoried buildings that are scattered throughout the Holy city of Makkah al-Mukarramah. Additionally, many of these enclaves have ethnic restaurants, shopping areas, medical clinics, native Hajj mission outlets & a bussing service of their own. Hence, during the Hajj season, the Pakistani, the Indian, the Bangladeshi,

the Turkish, the African, and the Iranian Pilgrim-enclaves become unmistakably identifiable. These pilgrims go to the Holy Mosque for a few hours and then return to their Housing units and neighborhoods for rest and recreation. These sojourner communities generally remain tuned out of traditional & online mass media due to accessibility, time-budgeting, focal interest, and other reasons. Hence, in the information campaign jargon, these sojourner geo-ethnic communities may qualify as hard to reach communities through mass media. In order to effectively reach out to these communities with public service and civic announcements, an information campaign, among others, will have to use and be interwoven with the pilgrims' interpersonal communication networks. Nevertheless, as per the wisdom of Sandra Ball-Rokeach's communication infrastructure theory (CIT), interpersonal communication networks are influenced by the communication action context (CAC) of the residential neighborhood of a target audience (Ball-Rokeach, Kim, & Matei, 2001).

Specifically, the CIT assumes that the more communication incipient; i.e., communication facilitating, the features of a residential context are, the greater is the degree of communication among the residents that in turn has various psycho-social and behavioral implications for the individual members and the community. In terms of the geo-ethnic neighborhood communities of the Hajj & Omrah pilgrims, the proposition may be altered as follows: The more communication incipient the physical features of a residential context of a pilgrim neighborhood are, the greater is the degree of problem-related communication among the residents of a particular pilgrim neighborhood having, in turn, certain psycho-social and behavioral implications for them.

Evidently, the landmark studies in the CIT tradition of communication research have mainly focused on the act of communication, the neighborhood storytelling networks (STN), rather than on the communication action context (CAC) per se. The broad research question, therefore, that the present study seeks to answer is: what is the relationship between the communication incipient or communication producing features of the residential context of the pilgrims and the actual communication contacts they make in problem situations, and their perception of the situation. Specifically, the present study examines some of the communication incipient features of the pilgrims' residences and their residential neighborhoods as aspects of CAC and tries to determine if at all the degree of openness of a CAC impacts upon communicative action that the pilgrims take in problem situations. The results of the study are expected to have implications for the necessity of improving the communication incipience of the pilgrims'

residential enclaves. Additionally, the study may also have relevance for prospective projects of constructing concrete structures and buildings for housing the Hajj and Omrah pilgrims.

Communication action, communication action context & communication incipience in CIT

Communication action, communication action context and communication incipience are among the major concepts that characterize communication infrastructure theory (CIT) and bear relevance to the present study. CIT is born out of Ball-Rokeach and her colleagues' on-going work on Community Metamorphosis Project (for details see Metamorphosis Project Technical Report at http://www.metamorph.org) that deals with the processes of social transformation and change in communities. This idea has a much wider purport than the much limited aim of the present study. The CIT accords communication infrastructure a significant role in how particular social processes in a neighborhood work to produce community level outcomes. Particularly, individuals and communities are assumed to actively seek goals of survival and growth through connections to communication resources as there is an interplay between communication environments, individuals, and communities (Ball-Rokeach S. , 1998). Communication infrastructure is the basic communication system of a community (Wilkin, 2013) and is generally defined as 'a neighborhood storytelling network set in its residential communication action context' (Ball-Rokeach, Kim, & Matei, 2001, Kim & Ball-Rokeach, 2006 a; Kim & Ball-Rokeach, 2006 b; Matsaganis, 2006). That means, communication infrastructure of a neighborhood comprises two elements; viz, a communication action or the neighborhood's storytelling network (NSN), and a physical, psychological and the socio-cultural context (CAC) within which the communication action happens or the NSN is situated; (Wilkin, 2013; Ball-Rokeach, Kim, & Matei, 2001).

A community NSN is any kind of communicative action that addresses the residents as individuals or as community, and that relates to issues of interest to the residents of a community or neighborhood. The NSN essentially consists of everyday conversations and neighborhood stories that the residents, community organizations and the mass media create and disseminate (Kim & Ball-Rokeach, 2006 a). Moreover, the CIT distinguishes between three levels of storytelling agents or actors ranging from micro to meso to macro levels. This distinction is based on their primary storytelling referent and on their imagined audiences. Hence a communicative action is a multilevel phenomenon where communication action happens at the micro level (individuals interacting among themselves or storytellers are

residents in their networks of family, friends, and neighbors), the meso level (community specific mass media or organizations are the primary storytellers), and at the macro level the national/international mass media tell stories about the city, the nation, and the world at large with their imagined audience being the population of a city, a state or a region (Matsaganis, 2006; Wilkin, 2013; Ball-Rokeach, Kim, & Matei, 2001).

The CAC in communication infrastructure refers mainly to physical, psychological, and sociocultural resources of the residential neighborhood that promote communication between the residents. These resources of a residential neighborhood determine communication incipience of a CAC. So, in CIT, communication incipience is an important characteristic of a CAC. Communication incipience is ensured through those physical features of a residential area that by virtue of their social architecture bring the residents together and allow them to congregate and socialize (Kim & Ball-Rokeach, 2006 a), like for example, parks, streets, condominiums, housing complexes & hotels, shopping areas, neighborhood clinics, and information counters and common kitchens in the buildings, building lounges and the building and the neighborhood prayer halls or mosques, and of course the restaurants etc. Psychologically, communication incipience refers to the degree to which the residents of a neighborhood feel free to engage each other without fear and with comfort and ease (Matei, Ball-Rokeach, & Qiu, 2001). Socio-culturally, such characteristics of a CAC like degree of class, ethnic, and cultural similarity may facilitate or hinder communication among the residents (Matsaganis, 2006).

According to Ball-Rokeach et al., (2001), a CAC varies along a dimension of "openness and closedness". An open CAC encourages people to engage each other in communication and a closed context discourages such encounters. "Any particular context may have elements of openness and closedness" (Ball-Rokeach, Kim, & Matei, 2001, p. 396)

Communication infrastructure of the Pilgrims' residential context

Communication infrastructure of the residential context of various sojourner communities' of the pilgrims is characterized by a degree of uniformity. This is because although the pilgrims belong to diverse national, socio-cultural and ethnic backgrounds, a somewhat identical communication infrastructure gets created due to somewhat standardized system of services provided by the host and the native governments coupled with a standardized and a spiritually egalitarian nature of the Hajj ritual itself. Nevertheless, considerable variability does exist within

and across communities in terms of the quality of the housing units and the residential neighborhood contexts, and the availability and physical proximity of services for the everyday and the mundane needs of the pilgrims. This results in variation in the number and kind of resources available in close proximity to the pilgrims and hence the number of problems faced, and the agenda of issues and concerns that get communicated within the respective NSNs. Similarly, pilgrims' neighbourhoods do vary in terms of the meso level storytellers because not all neighborhoods have mosques and not all mosques have Dars organizers or the Dars sessions or the ethnic or the community media services.

In terms of the CACs too we are likely to see considerable degree of intrinsic variations. These variations may have to do with the availability and the proximity of the shopping areas, restaurants, medical clinics, information counters, and digital screens etc. inside the buildings or the availability and the physical proximity of the offices of the Hajj missions or the host government Hajj ministry desks or branch offices. The physical availability and proximity of services within and/or from the housing units is another element to consider within a particular CAC. In sum, intrinsic variations are likely to be found within and across residential neighborhoods in NSN as well as in CAC: the two components of the communication infrastructure. The just identified variations in CAC might lead to variations in the degree of communication incipience of the context where the communication action or the NSN happens.

Furthermore, as already noted, the CIT literature has focused a great deal on NSN and its impact on various community level social and psychological processes and behaviors (Ball-Rokeach, Kim, & Matei, 2001; Kim & Ball-Rokeach, 2006 b; Kim & Ball-Rokeach, 2006 a) but not as much on the CAC's linkages with communication behaviors. Although a case may be built for inferring CAC's impact on differential pattern of communication contacts in across community comparisons in some studies (e.g.,Wilkin, 2013; Wilkin, Ball-Rokeach, Matsaganis, & Cheong, 2007), our literature search was unable to turn up any study that might have directly tested the linkage between the degree and/or the nature of openness of a CAC with the communication behaviors of the residents and their community-related attitudes and perceptions – the idea highlighted in the original CIT study of Ball-Rokeach et al., (2001) . Therefore, there seems to be a need to somehow fill up this gap, and the present study tries to accomplish that in a limited manner.

Objective

The main objective of the present study, therefore, is to:

Examine the effect of communication incipience of the pilgrims' residential context (CAC) on their communication behavior and perceptions.

Method

Sample & Data Collection

Final data collection was done by five trained Arabic-speaking graduate students from a probability sample of the Egyptian pilgrims. Data collection was carried out within the housing units of the pilgrims. Ten male adults were randomly selected for interview from each of the 25 housing units selected through a combination of stratified-systematic sampling procedure. The population comprised 118 building units. Each unit housed hundred or more pilgrims and were stratified into three strata.

Concepts & Measures

The study contains three major constructs in addition to four demographic variables of age, education, Hajj family status, and whether performed Hajj before. The three major constructs used in the study were: communication incipience of the pilgrims' residential context or CAC (the main predictor construct), communication action or communication behavior of the pilgrims, and the pilgrims' Hajj-related perceptions -- the two latter comprised sets of major criterion constructs.

Communication incipience of the CAC conceptually is the extent of openness of a CAC with an open or more open context being "one that encourages people to engage each other in communication, whereas a closed [or less open] context discourages such encounters" (Ball-Rokeach, Kim, & Matei, 2001, p. 396). Operationally, the indicators of the degree of openness comprised availability within, or in close proximity of, the pilgrims' housing units of such physical or social architectural structures that had the potential to bring people in close contacts to one another. That is, the structures where the pilgrims were likely to congregate within the huge structures of their own residential units and their wider residential neighborhoods. Eleven items comprised the structural features of the residential context: 1) proximity of the neighborhood mosque to the housing unit; 2) availability of Dars (lecture) sessions in the mosque; 3) proximity of restaurants to the building; 4) proximity of shopping areas; 5) proximity of clinics; 6) availability of lounge facility inside the building; 7) prayer hall inside the building; 8) availability of common kitchen in the building; 9) digital/electronic screens (EBBs) inside the building

carrying announcements for the pilgrims; 10) availability of information counters; 11) and the number of persons occupying a single room. Degree of openness of CAC (M=2.56, SD=.45) was a mean score on this 11-item index. These items were analysed through a PCA solution that identified two components; viz, the extra-building structural features of the neighborhood and the intra-building structural amenities.

Pilgrims' communication behavior conceptually was the pilgrims' use of communication contacts for help and/or information in problematic situations. Operationally, it was instanced through two types of question. An open-ended query asked the pilgrims to name the two most important sources that they contacted in problem situations. The answer ranged from no source named to only one source named to two sources named. This 3-point ratio scale measured the number of sources contacted (M=1.07, SD=.76). The fixed-response query measured the frequency of use of various sources in problem situations. The 11 items on the list were: 1) the mainstream Saudi mass media; 2) the electronic/digital billboards; 3) the Mualam or his agents; 4) the building info.-counters; 5) the co-pilgrims/family/or friends;6)the dars organizers in the neighborhood mosque; 7) the Saudi security officials; 8) the Saudi Hajj ministry officials; 9) the Internet/YouTube; 10) the Egyptian Hajj mission officials; 11) the available Egyptian mass media. A principal component analysis (PCA) with oblique rotation was conducted on these items of frequency of communication contacts. Component analysis identified three components; viz., **contacting the mediated sources; contacting the Saudi official sources; and contacting the Egyptian Hajj mission and community sources.**

Four perception variables included in the study were: 1) the perceived helpfulness of sources (M = 3.70, SD = 1.33) indexed through a single-item 5-point scale (1 = very unhelpful to 5 = very helpful) asking the pilgrims as to how helpful the sources were; 2) the number of problems perceived as faced (M = 1.37, SD = 1.04) -- an open-ended query asking the pilgrims to name problems that they personally or people around them faced during their stay, a ratio level scale that ranged from 0 problem mentioned to 3 problems mentioned; 3) perceived satisfaction with the Saudi services (M = 3.86), SD = .79) -- a 12-item mean index comprising 5-point scales (1 = very dissatisfied to 3 = feel neutral to 5 = very satisfied) measuring perceived satisfaction of the pilgrims with services provided by the Saudi government; 4) perceived satisfaction with the Egyptian Hajj mission services (M = 3.92, SD = 1.25).

Data Analysis and Results

Statistical Procedures Used

The study used a number of statistical tools to prepare and statistically describe the predictor and the criterion variables and to test the effect of the predictor variables as required by the study's objective such as univariate and bivariate descriptive statistics, principal component analysis (PCA), and multiple regression techniques.

Results

Although we did not test a priori expectations about the relationship and the basic intent of our study was an exploratory one, yet under the assumption of CIT we did expect positive relationship between the present study's openness predictors and the communication contact and perception criteria. If more communication contacts are made in a communication incipient CAC and more problem-related information exchanges ensue, fewer will be the perceived problems, which could translate into greater perceived satisfaction with services in CACs high in degree of openness.

Table 1 provides zero-order Pearson Product Moment correlation coefficients between predictor and criterion variables and gives us an initial idea of the linkages between the CAC and its communicative action criteria. Of interest are the first three columns of figures. These columns contain zero-order coefficents representing the relationships of the three CAC openness predictors; viz., a generalized dimension of degree of openness of CAC, an extra-building or the neighborhood features-based openness, and an intra-building features-based openness with the eight criterion variables. Except for the criterion variables of the "frequency of use of the mediated sources", and the "frequency of use of the Saudi official sources", the rest of the six criteria significantly related with the CAC openness predictors. The coefficients range from weak relationship (e.g., r = -.14 between intra-building-based feature & number of problems reported) to moderate (e.g., r = .40 between perceived helpfulness of sources & generalized openness of CAC) to strong (e.g., r = .56 between satisfaction with Egyptian services and generalized openness of CAC). In sum, out of a possible 24 pairs of relationships 18 were significant in the expected directions). Zero or no relationships were found in six instances all pertaining to use of mediated sources & use of the Saudi official sources with each of the three predictors. Since openness of CAC is primarily conceived in terms of interpersonal openness, absence of no relationship with the mediated sources is quite understandable given

the time-budgeting constraints of the pilgrims. Nevertheless lack of any relationship with the Saudi official sources is something that we need to be concerned about.

Table 2 summarizes the multiple regressions of the eight criterion variables on the generalized openness predictor and three demographic variables. Standard multiple regressions were performed with the three openness predictors and the three demographic variables were all entered as single blocks. The entries for the predictors are standardized partial beta (β) coefficients. As evident in Table 2, except for the frequency of use of the mediated sources and frequency of contacting Saudi official sources, which are respectively predicted by education and age, degree of the openness of CAC predict the rest of the six criteria after controlling for the effects of the three demographic predictors of age, education, and whether performing Hajj with family members. More interestingly perhaps, since the coefficents are the standardized partial regression coefficients (β, that is), we find in Table 2 that for all the six criterion variables, the generalized degree of openness of CAC is the strongest predictor. Across predictor comparisons aside, in terms of the criteria-wise impact, we find that the most impact of the degree of openness is on satisfaction with the Egyptian services (β = .60) followed in that order is the impact on satisfaction with the Saudi services (β = .58), the impact on perceived helpfulness of sources (β = .45), the Egyptian interpersonal & community sources (β = .30), and the number of sources contacted and the number of problems mentioned (β = .22; β = -.22).

Table 3 summarizes the multiple regressions of communication contacts and perception variables on the three demographic and the two types of the CAC's openness predictors. These analyses were conducted to help us identify the specific features of the CAC's openness (cf. the last two columns of Table 3) that would have the significant impact on the criterion variables after the effects of the rest of the predictors are accounted for. For example, on the number of sources contacted, it is the intra-building-based openness that matters than the neighborhood-based openness. Similarly, in terms of the impact on Egyptian community & interpersonal sources, the intra-building-based openness figures more prominently than the neighborhood-based openness of CAC (compare, for example, β of .24 with β of .15). On perceived helpfulness of sources & number of problems mentioned, on the other hand, the intra-building-based openness has no effect at all. Instead it is only the neighborhood-based openness that is impactful. On the two satisfaction criteria, whereas both types of CAC's openness count, it is the neighborhood-based openness that figures more prominently.

Summary of the Main Findings &Conclusion

In sum, our study has highlighted that residential context, which forms a CAC within which the Egyptian pilgrim-sojourners situate their communication action, plays an important role in determining their communication contacts and perceptions.

Particularly, our study found that the degree of openness of communication action context (CAC) of the pilgrims' residential neighborhood not only prominently figures as a major factor influencing their communication behavior in problem situations (number of communication contacts made, and the extent of interpersonal and community contacts made) but also their perceptions; i.e., perceptions about the number of problems faced, helpfulness of the sources contacted, and satisfactions with the services provided to them. It was found that the more communication incipient (open) a residential area CAC is, the more likely the pilgrims are to contact increased number of interpersonal and community sources, and contact them more frequently, perceive the sources as more helpful, report fewer problems, and report greater degree of satisfaction with the services provided.

It was also found that the degree of openness, as determined by availability and proximity of certain physical features, of CAC may not be a monolithic construct. It may rather be characterized by at least two latent dimensions each exhibiting differential impact. These dimensions are identified as 1) the housing-unit based communication incipience of the CAC; and 2) the neighborhood based communication incipience. The former dimension mainly comprises availability of such structural features like provision of common kitchens, the information counters, and a prayer hall within the premises of large housing units. This dimension figures more prominently in impacting upon the number of contacts made and the frequency of contacting interpersonal and community sources. The latter dimension comprises proximity of such structural facilities in the housing neighborhood like shopping centers, eating places, and the health clinics and this dimension figures more prominently in impacting upon the pilgrims' perceptions and is largely responsible for creating favourable perceptions among the pilgrims about the sources contacted and the services provided.

Recommendations

Relationship should be further examined in samples from other pilgrim populations and also from general population segments.

In the present study we relied mainly on exploratory factor analysis and multiple regression techniques. For future the relationship should be examined through confirmatory factor analysis and structural equation modeling (SEM) techniques with expanded CAC, communication ecology and perception items so that an understanding can be developed about the mechanism involved in the relationship.

For the immediate task of the pilgrim housing, we propose that the housing projects should include such structural features like provision for common kitchens, prayer halls, and information counters inside the building and perhaps provision of electronic billboards on each flour displaying short and informative messages.

Each housing unit may be turned into a complex that should have such facilities like restaurants, eateries, clinics, convenient stores and neighborhood mosques. The language in the Dars sessions in the neighborhood mosques should include the language of the neighborhood community.

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Table 1

Zero-Order Correlations Between Predictor & Criterion Variables

Criterion Variables ↓	Predictors					
	Degree of Openness of CAC	Neighbor-hood Features	Intra-Bldg. Features	Educ.	Age	Family Status
1. Number of Comm. Sources Used	.19** (224)	.17** (238)	.22** (230)	.30** (250)	-.21** (250)	-.10 (248)
2. Use of Mediated Sources	.02 (224)	-.02 (220)	.07 (220)	-.01 (238)	-.13* (229)	-.06 (228)
3. Use of Saudi Official Sources	-.02 (206)	.07 (220)	-.06 (220)	.29** (229)	-.22** (229)	-.04 (228)
4. Use of Egyptian Official & Community Source	.29** (206)	.22** (220)	.29** (220)	.19** (229)	-.07 (229)	-.11* (228)
5. Perceived Helpfulness of Sources	.40** (153)	.39** (161)	.18* (161)	-.02 (166)	.04 (166)	-.02 (165)
6. Number of Problems Reported	-.26** (224)	-.18** (238)	-.14* (238)	-.03 (250)	-.05 (250)	.04 (248)
7. Satisfaction with Egyptian Services	.56** (200)	.55** (213)	.33** (183)	-.04 (192)	.03 (192)	-.10 192)(
8. Satisfaction with Saudi Services	.55** (173)	.49** (183)	.29** (213)	-.03 (213)	-.07 (223)	.06 (223)

Note: Figures are pairwise Ns; *p .05; **p .01

Table 2

Regression of Communication Contact and Perception Variables on Demographic &

The Extent of Openness of the Pilgrims' Residential Context Variables

Independent Variables →	R^2	Age	Educ.	With Family (1=yes, 2=no)	Openness of Residential Context
1. Number of Sources Contacted	.122**	-.13*	.21**	-.06	.22**
2. Freq. of Contacting Egyptian Community & Interpersonal Sources	.121	-.04	.17*	-.04	.30**
3. Frequency of Use of Mediated Sources	.099**	-.04	.28**	-.10	.02
4. Frequency of Contacting Saudi Official Sources	.054*	-.19*	.08	-.05	.01
5. Perceived Helpfulness of Sources	.197**	-.02	.03	.06	.45**
6. Number of Problems Mentioned	.054*	-.04	-.04	.03	-.22**
7. Satisfaction with Saudi Services	.33**	-.05	.02	-.02	.58**
8. Satisfaction with Egyptian Services	.35**	-.16**	.00	.07	.60**

Note: *p?.05; **p?.01; Regression *df* = 4; Residual *df* range from 121 to 218.

Table 3

Regression of Communication Contacts and Perception Variables on Demographic &

The Intra- and the Extra-Building Structural Features of the Pilgrims' Residential Context Variables

Independent Variables →	R^2	Age	Educ.	With Family (1=yes, 2=no)	Intra-Bldg. Structural Features	Extra-Bldg. Structural Features
1. Number of Sources Contacted	.14**	-.14*	.20**	-.06	.19**	.12
2. Freq. of Contacting Egyptian Community & Interpersonal Sources	.14**	-.06	.16*	-.03	.24**	.15*
3. Frequency of Use of Mediated Sources	.10**	-.04	.29**	-.06	.09	-.05
4. Frequency of Contacting Saudi Official Sources	.07*	-.19*	.08	-.04	.01	.10
5. Perceived Helpfulness of Sources	.16**	.00	-.00	.05	.06	.38**
6. Number of Problems Mentioned	.04	-.03	-.00	.01	-.07	-.15*
7. Satisfaction with Saudi Services	.27**	-.05	-.03	-.00	.18*	.43**
8. Satisfaction with Egyptian Services	.34**	-.15*	-.06	.10	.13*	.53**

Note: * p ? .05; ** p ? .01. Regression *df* = 5; Residual *df* range from 154 to 231.

Exposure to Digital Signage and Message Recall: Determining the Effectiveness of the Billboard outside the Prophet's (PBUH) Mosque at Madinah al-Munawwarah

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Abstract

The present study has examined the pilgrims' use, perceptions and recall of the digital signage set up on the street opposite to the King Fahd Gate of the Prophet's (PBUH) Mosque to determine its effectiveness as a PSA tool. Data from the present study is also juxtaposed with data from a previous study on non-digital LED-scrolling billboards to highlight the effectiveness of the digital screens. Two types of measures of exposure, exposure frequency and screen usage in problem situations, are correlated with measures of unaided and aided recall. Partial correlations controlling for the demographic, exposure context, message-related interaction, and perceived usefulness of the screens were used to understand the mechanism of exposure-recall relationship. The main conclusion derivable from the above analysis of the factors of effectiveness --data on screen use, audience perceptions of the digital signage, and message recall -- is that despite its potential for great utility and effectiveness as a PSA tool the particular digital signage is performing below par. Recommendations are proffered on improving the effectiveness of the signage.

Introduction

Background & Significance

Digital signage is a useful tool of disseminating public service and commercial messages to a target audience in highly frequented locations. Frequency and pervasiveness with which the electronic billboards are used the world over is, in itself, a testimony to their effectiveness as message carriers. Advertising through electronic billboards is part of the outdoor or the out of

home advertising market and is one of the fastest growing segments of the media industry in the Western world (Lopez-Pumerarejo & Bassell, 2009; Gambetti, 2010). Perhaps inspired by this worldwide trend of the use of digital signage, the Saudi government authorities have started deploying digital signage in and around the Harama'en Sharifa'en (the Two Holy Mosques) area for guidance of the pilgrims. One such big-sized non-scrolling digital billboard has been set up directly opposite to the King Fahd Gate of the Prophet's (PBUH) Mosque. This billboard mainly carries public service announcements (PSA) including the Prophet's (PBUH) ahadiths.

The effectiveness assumption of the billboards, per se, may well be a safe assumption to make but as our previous study of the EBBs in the Haram area has also demonstrated this is not always the case (Gazzaz, Khan, & Iqbal, 2014). In that particular study, the EBBs were found to be of limited use due to a number of location, size, message content and formatting deficiencies. Since we, too, believe that the electronic billboards can yet be effectively employed in various stages of the Hajj process, and since the structural and format factors of the particular digital signage put up outside the King Fahd gate of the Prophet's (PBUH) Mosque are different from the al-Haram al-Shareef signage at the time of previous study at Makkah al-Mukarramah, we propose to examine the utility of the particular digital billboard set up outside the Prophet's (PBUH) Mosque as well.

Additionally, Gazzaz, Khan & Iqbal (2014) may have inadequately examined exposure-recall relationship. For example, the dynamics of relationship were examined in terms of exposure frequency and unaided recall only. It can be argued that the effect of frequency of exposure on aided recall might be different from the unaided recall. Similarly for determining the effects of exposure on recall perhaps we need to conceptualize exposure more specifically as exposure to digital screens in actual situations of need and difficulty rather than a general frequency of looking at the screens while in the area. Moreover, unlike the signage under study outside the Prophet's (PBUH) Mosque, the studied signage in the above cited study comprised of the traditional LED-scrolling message boards of relatively smaller size. Of late, these scrolling-screens have been augmented with bigger-sized digital screens where a displayed message remains static for a few second and then changes.

Nevertheless, our contention is that putting up digital billboards at some vantage points with digital messages endlessly scrolling or flashing across the screens does not automatically guarantee the intended results. The literature on outdoor or Digital Out Of Home (DOOH) advertising and billboard signage tells us that the structural variables of the billboards, such as

location, size, message content, format and presentation variables, and the respondent variables like their demographic characteristics, their exposure characteristics, and their exposure context characteristics relate to effectiveness or recall of digital signage (Osborne & Coleman, 2008; Brown & Rothschild, 1993; Calder & Sternthal, 1980; Chevalier & Mayzlin, 2006; Donthu, Cherian, & Bhargava, 1993; Nelson, 2002; Raymond, 2003; Riebe & Dawes, 2006)

The present study, therefore, examines the pilgrims' perceptions of and exposure to the digital signage in question, and their learning from the screen. Whether the pilgrims, at all, notice these billboards and benefit from them. That is, the broad research question being addressed here is: What is the effectiveness or utility of the digital signage outside of the King Fahd Gate of the Prophet's (PBUH) Mosque? Effectiveness or utility of the electronic billboards implies the degree to which these billboards engage the pilgrims' exposure and attention. The construct effectiveness, in the minimum, also implies the extent to which the pilgrims learn and retain information from these boards. Learning; i.e., information recall, from the public information campaigns is indeed important for attitudinal and behavioral effects of a PSA campaign.

Furthermore, as of now, apart from a couple of small scrolling billboards there is just one major digital screen at the start of the street opposite to the King Fahd Gate area and there is definitely an urgent need to beef up digital signage in and around the Prophet's (PBUH) Mosque area for improved guidance of the pilgrims. Input from the present study shall be of use and value to putting up more digital signage in the area.

Hence, together with Gazzaz, Khan, & Iqbal (2014) study of the EBBs around the Holy Masjid in Makkah al-Mukarramah, the present study shall shine more light on how best to more pervasively deploy the digital signage to the pilgrims' advantage in the Harama'en as-Sharifa'en.

Literature Review

Theoretical Framework

Since the above identified broad research question relates with factors of effectiveness of digital signage, hence, in order to focus the study, we will provide a quick overview of outdoor advertising literature that pertain to structural and respondent related features of the digital screens' effectiveness.

Digital Signage: Factors of Effectiveness

Scant direct research on the factors that determine the effectiveness of the electronic billboards in information campaigns is available (Osborne & Coleman, 2008). Much of the past research on the outdoor advertising campaigns predates the widespread use of technological advances in the outdoor advertising like the introduction of the digital billboards. Additionally, a persistent preoccupation of researchers with television advertising coupled with difficulty of employing experimental methods in outdoor advertising research leaves us with little available research wisdom on the utility of the EBBs as a publicity tool. Nevertheless, television advertising research and research on traditional billboards generally lead us to conclude that a number of factors like the structural characteristics of the billboards, the message characteristics, characteristics of audiences, their exposure patterns and the situational context of exposure, may influence audience learning and information retention, and in turn the billboards' effectiveness in information campaigns. Taylor, Franke, & Bang (2006) has identified two criteria of billboard effectiveness as attention to billboards and improving recall. Hence use of clever creative execution of billboard messages is important. The traditional billboard literature has also identified short copy and simple message (single message, and use of clever phrases and/or illustrations) as one of the five principles of effective billboard advertising and higher recall (Taylor, Franke, & Bang, 2006; Bhargava, Donthu, & Carbon, 1994).

Additionally, for the digital billboards, distraction due to message clutter, the message scrolling speed, use of cellphones, and the presence of friends while frequenting the area have been found to significantly interfere with attention to billboards and thus recall of the billboard messages (Raymond, 2003; Riebe & Dewes, 2006). Similarly, talking with others about the message content (Nelson, 2002), attitudes toward the utility of the billboards as information resource, and exposure and attention to the screens, and the structural features of the billboards like the size of the billboard, the wordiness or readability of the message, the use of animations & action, the font size, the speed with which the messages scroll or flash through the screen all may influence the billboard recall and their utility in information campaigns (Donthu, Cherian, & Bhargava, 1993; Taylor, Franke, & Bang, 2006; Osborne & Coleman, 2008).

Types of Recall

Literature on message effectiveness, as noted above, has used message recall as a factor of message effectiveness. In the absence of standardized measures of recall, some researchers

argue for using types of recall to determine and understand message effectiveness (Bigsby & Monahan, 2013). Assumption is that type of recall differentially relates to different aspects of memory. Memory mainly comprises processes of encoding (involves message processing and evaluation), storage (maintenance of encoded information in relation to previously stored information, and retrieval -- access and use of old information, (Bigsby & Monahan, 2013; Lang, 2000). Bigsby & Monahan (2013) differentiate between recognition recall, the aided and the unaided recall. Recognition recall involves a kind of multiple choice test wherein a respondent is to select the target message from a list of choices. Aided recall involves describing specific part of a message; e.g., saying a word to the respondent and then asking him to describe the message pertaining to that key word. An unaided recall may comprise asking a respondent to describe any message seen on a digital billboard, for example. The unaided recall a least sensitive measure yields least amount of information recall (Bigby & Monahan, 2013).

It is argued that unaided recall is a better indicator of elaborative processing or high involvement with the message and aided recall is more likely outcome in low-involvement situation or shallow processing (Lang, 2000). The amount of time between exposure and recall may also impact recall. It may be aided recall is more likely in longer time duration between exposure and recall but recalls assessed immediately after exposure might not be well differentiated (Bigsby & Monahan, 2013).

Objectives of the Study

In view of the foregoing, and to adequately answer the above mentioned broad research question, the present study has posited the following specific research objectives:

To examine the pilgrims' use of and perceptions about the digital signage in the area directly opposite to the King Fahd Gates' of the Holy Mosque at Madinah al-Munawwarah.

To correlate the digital signage use with the aided and the unaided recall of the screen messages.

To identify factors that may strengthen the effectiveness of the digital billboard as a PSA tool.

Benefits:

The data created through the above objectives is expected to not only help determine the effectiveness of the particular digital signage in question but will help develop guidelines on

how best to more pervasively employ digital billboards as a public service and civic information channel of information for the pilgrims in the Holy places in general.

Methods

Instrument Development

A survey instrument was developed in the months prior to Ramadan containing a mix of closed and open-ended questions tapping information on the pilgrims' use and perceived utility of the electronic billboard to them. The questionnaire was developed through an extensive review of the questionnaire from the previous year's study and through discussions sessions with colleagues well-experienced in field data collection from the pilgrims as well as those having extensive familiarity with the use of the electronic billboards in and around the Holy places. The questionnaire was initially prepared in the English language that was subsequently got translated into the Arabic & the Urdu languages. These translated versions were closely scrutinized for their close conformity to their English version and the purpose of the study.

The final interview schedule comprised of a mix of standard close-ended questions that tapped the pilgrims' socio-demographic status, and the open-ended questions that tapped their exposure and attention to the billboards and information recall in addition to tapping their perceptions of and attitudes about the electronic billboards. The questions also focused on issues of location and size of the billboards, substance of the content, and its display and presentation. Some of the questions also tapped the context within which exposure to the billboards happened. The recall items in this year questionnaire included both the unaided and the aided recall items. The aided recall was measured as per Bigsby & Monahan (2013) operationalization of that construct. According to them, the aided recall involves describing specific part of a message to the respondent; e.g., saying a word to the respondent and then asking him to describe the message pertaining to that key word. As such in the present study, the aided recall comprised a battery of five key phrases picked from over 25 messages displayed on the main non-scrolling digital billboard and the respondents were asked to describe the messages pertaining to those key words. This yielded a ratio level measurement with scores ranging from 0 (No message correctly described to 5 (all 5 key words correctly linked to description of five messages. The unaided recall was measured as per our previous

study (Gazzaz, Khan & Iqbal, 2014). As such, operationally, the unaided recall comprised asking a respondent to describe any message seen on the digital screen under study.

Sample and Data Collection

Data were collected by four trained interviewers. Prior to data collection, the interviewers were trained. Two detailed and extended training sessions were held with four post-graduate and doctoral students, who also had had considerable prior experience of interviewing the pilgrims for the purpose of field surveys. The points that were emphasized and discussed in the training sessions pertained to the purpose of study, the techniques of interviewing, meaning and purpose of each of the questions in the interview schedule, instructions for the interviewers, and how to correctly record the answers. Each interviewer was asked to conduct five interviews as a practice run. Further training happened through joint debriefing session through video conference.

Two hundred interviews were completed by these interviewers in two languages from a non-probability convenience sample of the pilgrims, who frequented the area opposite the Kind Fahd and the Al-Salam Gates of the Mosque. The data was collected in different time periods of the day.

Since a secondary purpose of this year's data gathering was also to pretest a few question items for the Hajj season's study pertaining to communication ecology of the Egyptian pilgrims, 75 percent of the respondents were Arabic speaking. And close to 65 percent of the Arabic speaking respondents belonged to Egypt.

3.3: Coding and Data Cleaning

After the data were collected in the month of Ramadan, the coding of the responses commenced. While coding the close-ended questions was pretty simple, responses to open-ended questions have been quite time-consuming. Two coders developed a detailed listing of the responses to each of the open-ended questions that helped us develop a detailed coding scheme for the responses to open-ended questions. Some open-ended questions that entailed multiple responses were coded through multiple-response method while some others through multiple dichotomy method of coding. After the coding of the open-ended items, the data were input into SPSS data files. Univariate frequency runs on the collected data were

carried out and a complete codebook was created. The codebook was analyzed for stray coding and missing data to clean up the data for analysis.

Data Analysis and Results

Statistical Procedures Chosen

To meet the study's objectives, the collected data were analyzed through descriptive statistical analysis comprising univariate and bivariate frequency distribution, conditional contingency tables, and zero-order and partial correlations. Because of the non-probability nature of the sample, interval estimation and significance testing were not considered.

Use of the Screen & the Context of Exposure

A number of billboard-use variables were looked at. Table 1 summarizes the findings on the pilgrims' exposure to the digital billboard and their exposure context. Operationally, the pilgrims' use of the billboards meant frequency of exposure to the digital signage in the specified area. 67.6% sometime or often look at the screen while in the study area. The rest (32.4%) either mostly never look at the screen or chose not to respond to the question When asked on a 3-point scale, ranging from 1 (never) to 3 (often), how often did they use the billboards when faced with a problem, 33.3% of the pilgrims reported actually using the screen in problem situation sometime or often, whereas 66.7% never use it in problem situations. Only about 5% of the pilgrims ranked billboards in top two sources of help in problem situations. The rest relied most on other sources of information and help like family, friends, mualams, and the tour operators and others.

Two exposure-related contextual variables in Table 1 respectively are: the context (whether alone or in the company of others while in the area), and the subsequent interpersonal interaction about the content of the message. These variables were included because, according to the literature reviewed above, these could potentially influence message recall. Over 35% of the respondents said they were usually alone in the area and a little over 64% said they were usually in the company of friends and others. A little over 54% of the respondent never talked with others about the messages seen on the screen, the rest (close to 46%) talked, at least, sometime about the billboard messages with others.

Pilgrims' Perceptions about the Digital Signage

The pilgrims' perceptions about the electronic billboards were indexed essentially by three items in the instrument: a closed-ended item, and a set of two open-ended questions. The close-ended question measured the degree of perceived usefulness or utility of the billboards to the respondents. On a 3-point scale, ranging from not at all helpful to very helpful, the respondents were asked about how much helpful did they think the billboard were to them. About 31٪ of the sample did not respond. The pilgrims' perceptions are shown in Table 2. Of those who responded, about 6٪ perceived the billboards as not at all helpful to them. Over 94٪ perceived the screen as helpful.

The open-ended set tried to tap the pilgrims' perceptions about the structural characteristics of the billboards. The first question asked if they could indicate places where the EBBs were needed most. About 62٪ of the sample (109 of 176 cases) responded to the question by indicating at least one location. Out of 127 valid responses from 111 cases, three places stood out distinct in the analysis; viz, in the area around the Prophet's (PBUH) Mosque (19.3٪ of cases), on streets to the Mosque (19.3٪ of cases), and near the Mosque's gates. These areas may be ordered on a continuum of most general (around the Mosque) to most specific (on the gates of the Mosque).

The second open-ended question asked them to indicate changes to the present screen that would increase it utility to them as an information resource. Close to 57٪ (100 of 176) responded to this question proposing at least one change, and 43٪ of the cases (76 of 176) did not answer the question. A total of 132 responses from 100 cases were coded by two coders into eleven broad categories with an inter-coder agreement of over 97 percent (disagreement in a few items were resolved through discussions). Five categories of responses stood out. These pertained in descending order to: Bigger screens are needed (31٪ of cases), no change needed to the present screen (30٪ of cases), and tied categories of increase the number of screens and include messages in other languages apiece with 24٪ of cases, increase the practical utility (pilgrims' problem-oriented) of information (14٪ of cases).

The Pilgrims' Message Recall

The unaided and the aided recall were examined. Tables 3 & 4 respectively report the frequencies of the categories of recall for each of the two recall-types. For the unaided recall, the pilgrims were asked in an open-ended query to recall whatever messages they had seen on

the screen. The answers were coded into a 3-point scale ranging from recalled no message to recalled part of a message to recalled one complete message. The aided recall was a ratio level measure where the pilgrims were asked to recall a message from a key word from the screen's messages. In all 5 key words for five messages (a word a message apiece) were given. The score thus could range from 0 (recalled no message) to 5 (recalled all five messages).

Little over 58 percent of the cases (102 out 176) did not respond to the question. Of those who responded (74 cases in all) to the question, 32.4% did not recall anything. Fifty-percent recalled part or some of the message and 17.6% recalled at least one complete message.

In terms of the aided recall, Table 4, 45.0% of 140 cases who responded could not recall a single message. 30.7% recalled one message and 20.0% recalled two messages and three messages. Little over 4% correctly recalled than three or messages. Average recall score on a scale of 0-5 was .88, with a median of 1.

When asked about reasons for non-recall, 71.6% of 176 cases did not respond or did not know the reason. Of those who responded 76% said that they did not either see the message or did not pay enough attention. Twelve percent apiece cited language barrier and the fast changing screen.

How Recall Relates to Exposure

Unaided Recall was first examined in bivariate distribution across categories of exposure (cf. Table 5) and then, by way of simple elaboration analysis, bivariate relationship between billboard exposure and recall was examined across categories of the variable "pilgrim groups" (Table 6).[1] These tables together suggest that there may be an over-all weak relationship between frequency of exposure and recall. For example, in zero-order table (Table 4) the Goodman Kruskal's tau is .19 indicating a weak relationship. But when we elaborate the relationship further by controlling for the effect of pilgrim group we find in the conditional table (Table 6) that the relationship between exposure frequency and unaided recall may be weak among the Urdu- speaking group (Goodman Kruskal's tau of .19 for that group) but moderate

[1] The ordinal variables of frequency of exposure and extent of unaided recall were each recoded into dichotomous variables respectively comprising no exposure and some exposure, and no recall and some recall categories for the purpose of crosstabs. The pilgrims were divided into two groups on the basis of language. The pilgrims from the subcontinent speaking Urdu comprised the Urdu speaking group, and the pilgrims from the Arab countries in the Arabic speaking group.

for the Arabic speaking group (cf. Goodman Kruskal's tau of .26 for the Arabic speaking group in Table 6).

Table 7 gives a bigger picture of the relationship between the two criterion variables of recall (the interval level 3-point unaided recall scale and the ratio level 6-point aided recall ranging from zero message recalled to 5-messages recalled correctly) and exposure frequency (3-point ordinal scale) and several other predictors. The other antecedents of recall in the table that are found in the literature are argued to predict, mediate or moderate the effects of exposure on recall are: age in years, educational level completed (6-point interval scale), pilgrim groups (a dichotomy), frequency of interaction about the message (a 3-point ordinal scale), perceived usefulness of screen (a 4-point ordinal measure), area frequenting status (a dichotomy of being alone or in company), and screen usage in problem situation (a dichotomy of usage). The frequency of exposure and the screen usage are two different types of exposure variables. While the former taps a general or incidental attention to the screen, the latter variable implies a more involved perhaps motivated exposure and attention to the screen.

A number of weak to moderately strong relationships seem to show up in Table 7. At the zero-order level the unaided recall seem to be predicted by frequency of exposure (r=.19), by education (r=.29), by interaction about the message (r=.34), by perceived usefulness of the screens (r=.31), and by screen usage in problem situations (r=.32). The aided recall on the other hand seem to be predictable at the zero-order level by exposure (r=.30), by interaction about the message (r=.22), by perceived usefulness of the screen (r=.34), and by screen usage in problem situations (r=.27). The entries in the table are zero-order product moment Pearson correlation coefficients. That means nothing is partialled out of the bivariate relationships. Although in small samples these might not be very reliable but with bigger-sized samples (size greater than 100), these may be taken as a good and somewhat more reliable direction pointers.

Apart from these just noted nine predictor-criterion relationships, several moderately strong zero-order inter-predictor relationships are also evident in Table 7. For example, as compared to non-Arabs, the Arabs (mostly Egyptians) are likely to be in the company of others while in the area of the screen (cf. frequenting status & pilgrim group, r= -.24), and they are more likely to talk about the screen message with others (r= -.31), and they are more likely to use digital signage in problem situations than the non-Arabic speaking group (r= -.42).

Additionally, the more the people use the digital screens in problem situations the more they chat about the message with others (r=.68) and the more they perceive the screens as a useful resource in problem situations (r=.33). Similarly, the more highly educated the pilgrims the more they perceive the digital screens as a helpful resource in problem situations (r=.32). Now the question is what these zero-order correlations between pairs of predictors tell us. Since some of these predictors also relate highly with aided and unaided recall like the screen uses, exposure, perceived usefulness of the screens, and interaction about the screen's messages, the chances are that the exposure-recall relationships might be due to other relationships. Hence there is a need to go beyond the zero-order relationships to determine spuriousness. Hence we looked at partial correlation as well.

Table 7 also provides 7th order partial correlation of frequency of exposure with the unaided and the aided recall. The control variables were: age, education, pilgrim group, interaction with others about the message, perceived helpfulness/usefulness of the message, individual status while frequenting the screen area, and screen usage in problem situations. As the note to Table 7 shows, the attenuation to original zero order correlation coefficient was minimal in the case of the unaided recall (.19 vs. .18). This implies that the weak relationship may have survived the test in the sample. The aided recall upon the 7th order control improved from the original zero-order r=.30 to the 7th order partial r of .36. This implies that probably a moderately strong relationship between exposure and aided recall does obtain in the sample.

Usage of screens in problem situation, the other exposure variable, that appears strongly related with the unaided recall (r=.32) and the aided recall (r=.27) was further examined through partial correlation procedures. The 7th order partial figures shown at the foot of Table 7 indicate considerable attenuation in the original zero-order coefficients. For the unaided recall the reduction was from an r of .32 to an r of .04 and for the aided recall the coefficient reduced to .13 from .27.This probably implies that the original relationship in the sample is either spurious (explainable by a control variable) or, depending on the nature of the variables is indirect. That is, it is being explained or mediated by one or another of the control variables in the study. Now controlling for the effects of all of the above test variables in a single block does not provide us with the opportunity to understand the effect of each variable and thus elaborate the relationship between the screen usage in problem situations and recall. Moreover, since our belief is that screen usage in problem situation is likely to be a motivated and an involved activity hence understanding the mechanics of its relationship with the two types of recall may

give us insight into the effectiveness of the digital screens as a PSA tool. Hence, it was decided to partial out the control variables in ordered steps entering variables one at a time to a cumulative control.

Tables 8 & 9 provide the zero order and the first to the 7th order partial coefficients for the relationship of the screen usage with the unaided and the aided recall variables respectively. In Table 8, we see a significant drop in the size of partial coefficient at the 5th order partial. The drop is from a moderately strong relationship (r =.28) to a virtual no relationship (r =.10). The variable entered at the 5th order is interaction (frequency of talking about the screen messages with others). Since theoretically screen usage is likely to precede interaction in time order, we can safely conclude that the relationship/effect of screen usage on unaided recall is not direct but through the interaction about the screen message. Hence the interaction may be said to mediate the relationship of the screen usage on unaided recall.

Table 9 elaborates the relationship of the screen usage with the aided recall. Two points are noteworthy in this table. Firstly, we notice a suppressor role for the variable pilgrim group in the screen usage-recall relationship. When the effect of the pilgrim group is controlled for, the size of the 4th order partial coefficient improves (from r =.24 for the previous step to r =.34 at the 5th order). The suppressor role is understandable because we know from Table 7 that the variable pilgrim group has a negative relationship (r = -.42) with the screen usage and a weak but a positive relationship with aided recall (r =.11, DF = 140) in the sample. Hence, when this undermining effect is controlled for the positive relationship between the screen usage and the aided recall gets a boost. Secondly, we notice that the relationship seems to be disappearing at the 6th order partial (r =.13, DF = 95). The control variable at the 6th order partial is the extent of perceived usefulness of the digital screen. Since perceived usefulness of the screen might not logically precede screen usage, one may argue that the effect of the screen usage on aided recall might in part be through perceived usefulness of the digital screen. That is, the screen usage in problem situation leads to perceived usefulness of the digital screens in problems that in turn leads to improved scores on aided recall.

Figure 1

Screen Usage and Unaided Recall

Indirect Relationship

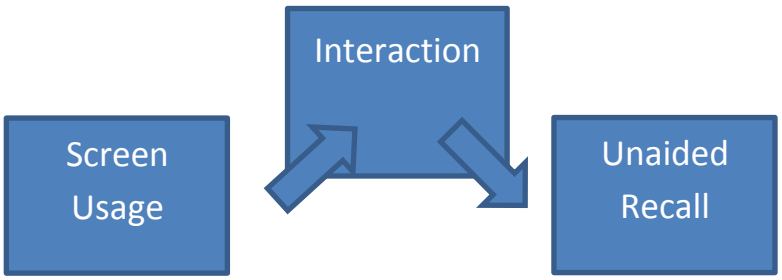

Figure 2

Screen Usage and Aided Recall

Indirect Relationship

The Scrolling & the Digital Boards: Juxtaposing the Results

Tables 1, 2, & 3 contain figures from the present study on digital signage as well as the previous study on LED-scrolling billboards. Black figures in parentheses in the two tables are the findings from the previous study on the scrolling billboards. Although both the populations comprised the Ramadan Omrah pilgrims, yet the figures represent two different non-probability

samples of pilgrims and may not be directly comparable. Nevertheless, these figures do highlight some interesting points of comparisons. The LED-scrolling boards seem more noticeable, and a higher percentage of respondents say they use them sometime/often yet a higher percentage do not talk about the messages carried by the EBBs. Perhaps these screens do not deeply engage the attention of the respondents, who seem to be missing out on the substance of the messages. That is why perhaps fewer people perceive the scrolling boards as helpful (cf. Table 2). The language barrier is not cited as acutely in the present digital signage study as in the previous one of the 1433 (H).

The just-noted points are further borne out from Table 3 on unaided recall of messages. As compared to the present study almost 100٪ more respondents fail to recall anything from the scrolling screen (32.4٪ vs. 63.7٪); fewer people recalling some message from the screen and even far fewer recall one complete sentence/message. Aided recall was not examined in the scrolling billboards study.

Conclusion

Summary of the Main Findings

The main objective of the study has been to find out about the pilgrims' use and perceptions of the digital signage on the street opposite to the King Fahd Gate of the Prophet's (PBUH) Mosque, to correlate their exposure and use to recall of the digital signage, and to highlight factors that can help improve its effectiveness. The data analyzed in the previous section leads us to the following composite conclusion:

Although the main digital signage is highly visible in the area, barely one-third of the sample uses it in problem situations. Despite being perceived as useful in problem situations by almost the entire sample, the digital signage hardly gets cited as one of the top two sources of help. Half of the sample does not talk about the messages with others, which impacts negatively on message recall and the utility of the signage.

Messages were poorly recalled with little over half of the sample could not correctly recall messages with tips. In the sample, exposure and screen usage seem to have a weak to moderately strong relationship with recall.

As for the dynamics of the effect of screen usage, the process in the sample seems to be thus: the screen usage influences discussions and perception about the messages and these in turn

produce message recall. If the screen usage does not produce interaction or positive perceptions about the message, the message recall might not instance.

Upon juxtaposing the digital signage data with the LED-scrolling board data from the previous study, we may conclude that although the scrolling boards tend to be more noticeable, the digital signage more deeply engages the attention, leads to greater interaction with others about the messages, and more positive perceptions about the usefulness of the screens and better recall.

Nevertheless, the factors highlighted in the sample that might improve the effectiveness of the digital signage are: increasing the size and the number of the screens, putting up screens near the major gates of the Prophet's (PBUH), and increasing the practical utility and linguistic variety of the messages.

In terms of two factors of effectiveness of the digital signage: its capacity to engage the pilgrims' attention, and its capacity to produce awareness and learning, the main conclusion derivable from the above analysis of the data is that despite its potential for great utility and effectiveness for the pilgrims the digital signage under study is not that much effective.

Recommendations

1. Based on the study's data and the just mentioned conclusion, the following recommendations, pertaining to the structural and substantive characteristics of the digital signage, are proffered to increase their utility as a public service announcement (PSA) tool that:
2. Somewhat bigger digital screens should be installed on the major gates of the Prophet's (PBUH) Mosques.
3. The displayed message should be simple preferably limited to one short sentence.
4. Where possible illustrations should also be used.
5. The text should be cast in bigger type-size.
6. The screen should change not sooner than after every 15 seconds.
7. The text should be cast in the Urdu, the Turkish, and the Persian, the Malay, the Bengali, and the French languages besides the present Arabic and the English languages.
8. The message content should be such that the pilgrims should perceive them as helpful and it should have practical relevance for the pilgrims so that they feel like talking to others about it.

9. Big-sized scrolling screens carrying very short messages and scrolling very slowly should be installed near the digital screens to supplement the digital screens as the scrolling screens seem to have the capacity to capture attention better.

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Table 1

Pilgrims' use of the billboards & the context of exposure

Pilgrims who …	Percent	N
Looking at the screen sometime/often while in the area	67.6 (77.8)	176 (122)
Use the screens sometime/often in difficulty	33.3 (43.6)	164 (170)
Cited billboards as one of top two sources	4.8 (11.4)**	124 (175)
Are usually alone while frequenting the area	35.5 (30.3)	169 (175)
Never talk about the EBBs messages with others	54.2 (67.5)	118 (154)

*Figures within parentheses pertain to billboard study of Masjid al-Haram Shareef.

**These pertain to top three sources hence not comparable.

Table 2

Pilgrims' perceptions about the effectiveness of EBBs

Frequency Distribution of the Pilgrims' Perceptions	Percent	N
Perceived the screens as helpful	94.6 (70.3)	111 (121)
Proposed at least one new location	67.6 (54.0)	176 (175)
On Streets to Al-Haram	19.3 (23.5)	127 (129)
Near the Haram Gates	67.0 (20.2)	127 (129)
At least one structural change to the EBBs	56.8 (62.0)	100 (175)
Changes in: location, size, number, format (a maximum of two responses)	64.0 (49.0)	100 (143)
Increase number of screens	24.0 (23.0)	100 (143)
Increase the size	31.0 (20.0)	100 (143)
Change the presentation format	5.0 (4.0)	100 (143)
Increase the practical relevance of the content	13.0 (8.4)	100 (143)
Increase the religious content	1.0 (3.0)	100 (143)
Include other languages	24.0 (37.8)	100 (143)

Table 3

Unaided Recall of the Messages

Pilgrims who recalled	Percent	N
Nothing from the screens	32.4 (63.7)	74 (113)
Some message from the screen	50.0 (30.1)	74 (113)
One complete sentence from the screen	17.6 (6.2)	74 (113)

Note: Figures in the parentheses belong to the previous scrolling boards study

Table 4

Aided Recall of the Messages

Pilgrims who correctly recalled	Percent	N
Nothing	45.0	140
One message	30.7	140
Two messages	20.0	140
Three to five messages	4.3	140

Table 5

Unaided Message Recall by Exposure to the Screens Exposure

		No Exposure %	Some Exposure %
Recall	No Recall	100.0	25.8
	Some Recall	0.0	74.2
	N	100.0(6)	100.0(66)

Goodman-Kruskal's tau= .19

Table 6

Unaided Message Recall by Exposure by Groups

Pilgrim Groups Urdu-Speaking Arab Pilgrims Exposure

		No Exp. %	Some/frequent Exp. %	No Exp. %	Some/frequent Exp. %
Recall	No Recall	100.0	33.3	100.0	22.2
	Some Recall	0.0	66.7	0.0	77.8
	Total (N)	100.0 (1)	100.0 (21)	100.0 (5)	100.0 (45)

Goodman-Kruskal's Tau: (.19) (.26)

Table 7*

Zero-order Correlations between Predictor & Criterion Variables

The 7th order partial correlation between Exp. - frequency and the unaided and the aided Recall respectively were (.18) & (.36) after the effects of Age, Educ., Pilgrim Group, Interaction, Usefulness, frequenting status, & Screen usage in difficulty were partialled out. The 7th order partial coefficient between screen usage in problems and the un-aided and the aided recall respectively were (.04) & (.13) after the effects of Age, Educ., Pilgrim Group, Interaction, Usefulness, frequenting status, & frequency of exposure were

Variables ► ▼	1	2	3	4	5	6	7	8	9	10
Exposure Frequency	1 144									
Unaided Recall	.19 (67)	1 69								
Aided Recall	.30 (131)	.43 (67)	1 140							
Age	-.03 (144)	-.15 (69)	-.14 (140)	1 176						
Educ.	.02 (144)	.29 (69)	-.14 (140)	-.19 (176)	1 176					
Pilgrim Groups	-.13 (144)	-.14 (69)	.11 (140)	-.10 (176)	-.06 (176)	1 176				
Interaction	.12 (117)	.34 (61)	.22 (111)	-.08 (118)	-.07 (118)	-.31 (118)	1 118			
Usefulness	-.06 (111)	.31 (58)	.34 (105)	-.02 (111)	.32 (111)	-.17 (111)	.15 (104)	1 111		
Frequenting Status	.12 (144)	.03 (69)	-.05 (139)	.15 (169)	-.03 (169)	-.24 (169)	.10 (118)	-.01 (111)	1 169	
Screen Usage in Problems	.15 (133)	.32 (65)	.27 (132)	-.07 (164)	.03 (164)	-.42 (164)	.68 (112)	.33 (103)	.05 (157)	1 164
Mean	2.16	1.87	.88	43.21	2.70	1.28	1.54	2.17	1.64	1.34
Sd.	.75	.68	1.03	11.27	1.25	.45	.65	.50	.48	.47

partialled out

**Figures in parenthesis are pairwise Ns.

Table 8

Correlation Coefficients of Unaided Recall with Screen Usage*

	Zero 0rder	1st Order	2nd Order	3r Order	4th Order	5t Order	6th Order	7th Order
Screen Usage	.32 (63)	.31 (62)	.30 (61)	.30 (60)	.28 (59)	.10 (54)	.04 (50)	.04 (49)

*Figures in parentheses are degrees of freedoms of Pearson's r. The partial coefficients control for exposure, age, education, pilgrim group, interaction, perceived usefulness, and frequenting status respectively in that order.

Table 9

Correlation Coefficients of Aided Recall with Screen Usage

	Zero 0rder	1st Order	2nd Order	3r Order	4th Order	5t Order	6th Order	7th Order
Screen Usage	.27 (130)	.24 (128)	.24 (127)	.24 (126)	.34 (125)	.22 (104)	.13 (95)	.13 (94)

*Figures in parentheses are degrees of freedoms of Pearson's r. The partial coefficients control for exposure, age, education, pilgrim group, interaction, perceived usefulness, and frequenting status respectively in that order.

Appendix

جامعة ام القرى معهد خادم الحرمين الشريفين لابحاث الحج والعمرة	دراسة قياس استخدام وتلقى المعتمرين للتوعية من خلال الشاشات الاليكترونية فى المنطقة المركزية بالمدينة المنورة كمصدر معلومات

CASE NUMBER: ..... (AREA.....)_ ☐☐☐

NUMBER OF THE INTERVIEWER: ☐☐

DATE OF THE INTERVIEW: (.....).2013 ☐☐

01	Your nationality?	(.....)	☐☐☐
02	How old are you?	(.....) years old	☐☐☐
03	Marital status:	1. Married 2. Single	☐
04	Any of your family members with you?	1. Yes 2. No	☐
05	Are you performing Omrah as a group?	1. Yes 2. No	☐
06	Did you perform Omrah during Ramadan before?	1. Yes 2. No	☐
07	Education:**(Circle the number for the response)**	**1-** Did not go to school **2-** Matric or less **3-** Higher Secondary. **4-** Bachelor **5-** Master or above **6-** Others	☐

08 Did you personally or people around you face any situations during your stay in the Kingdom for Omrah that bothered you or created difficulties or complications for you personally or people around? Pl. name as many problems as you can recall.. **(Interviewer, list all the problems in the space provided)**

.....
.....
.....
.....

☐☐
☐☐
☐☐
☐☐

09 Of these, which ones would you say are the two most important problems that need immediate attention of the authorities **(Interviewer record in the space provided in the order indicated by the respondent):**

I.....
II.....

☐☐
☐☐

10 Thinking about all of the ways of communicating for information and help in **problem situations**, pl. name two most important sources that you turned to for information and help in case of a problem. **(Interviewer list the names of the sources in the order indicated in the space provided).**

I.....
II.....

☐☐
☐☐

11	Following are the communication sources that the pilgrims use to communicate (get or give information or help) about any problem they encounter in the Kingdom during their Hajj/Omrah sojourn. Tell us how often do you use each of the following for information.. . Would you say you use each of these never, sometime or often to communicate about the problems? **(Read out the items to the respondent and circle the number of the response.)**					
	Use the Saudi mass media system like newspaper, TV, and radio etc.	1- Never	2- Sometime	3- Often	9- DK	☐
	Use the Digital screens & signboards	1- Never	2- Sometime	3- Often	9- DK	☐
	Talk to tour operator/private agent	1- Never	2- Sometime	3- Often	9- DK	☐
	Go to information counters in the area	1- Never	2- Sometime	3- Often	9- DK	☐
	Talk to friends, family, co-pilgrims	1- Never	2- Sometime	3- Often	9- DK	☐
	Talk to govt. officials/agencies	1- Never	2- Sometime	3- Often	9- DK	☐
	Any other source. (Pl. specify)	1- Never	2- Sometime	3- Often	9- DK	☐

12	There are Dars sessions in the Prophet (PBUH) Mosque. How often do you attend these Dars sessions ?					
	1- Never	2- Sometime	3- Often	4- Very often	9- DK	☐
13	If you do not attend, why do you not attend these Dars? ..... ----------					☐☐ ☐☐
14	Are there any Dars sessions in the Prophet (PBUH) Mosque in your own language? 1. Yes 2. No 9. DK					☐
15	How often do you pass by or remain in this particular area? 1. Never 2. Sometime 3. Often 4. Very Often 9. DK					☐
16	**H**ave you seen digital screen/billboard in this area? 1. Yes 2. No 9. DK					☐
17	When you are in this area or pass through it, you are: 1. Usually alone 2. Usually with others. 9. DK					☐
18	When you are in this area, how often do you look at the screens and/or the messages? 1. Never 2. Sometime 3. Often 4. Very Often 9. DK					☐
19	When you look at the TV/LED screen messages roughly for how long do you look at them (Interviewer press for response in seconds or minutes): Minute ---------- Seconds ----------					☐☐☐☐
20	How often do you talk about the messages on the screen with others?					

	1. Never 2. Sometime 3 Often 4. Very Often 9. DK	☐
21	How much helpful these Screens were in providing you with useful information: 1. Not at all helpful 2. Helpful 3. Very helpful 9. DK	☐
22	Can you name places where you think these TV/ digital screens are needed most:	☐☐ ☐☐ ☐☐ ☐☐
23	What changes to these TV screens, if any, do you want made? **(Interviewer explain the changes in terms of location, size, information content, or the manner in which the messages are scrolled/flashed, and record the answer)**	☐☐ ☐☐ ☐☐ ☐☐
24	Can you recall any message from the LED/ digital screen in full or in part?	☐☐ ☐☐ ☐☐ ☐☐
25	I say a word or a phrase from the Screen's messages Can you recall anything about the messages? **1- Water** ..... **2- Children** ..... **3- Pathways in the Haram area**..... **4- Masjid's Gate numbers/names** ..... **5- Carrying your belongings**	☐☐ ☐☐ ☐☐ ☐☐ ☐☐
26	If you cannot recall a message can you guess why you can't? **(Interviewer, help the respondent with the reasons. Tell him it could be due to problems with the screen or that he was not paying attention etc.)**	☐☐ ☐☐

.....

.....

27 Cell phones are a useful source of getting or giving help in problem situations. How often do you talk to each of the following for problems through cell-phones? **(Interviewer explain that here talking means getting or giving help not just exchanging pleasantries or hello, hi type of calls.)** You talk through cell phones about problems for information and help:

To friends & family within the Kingdom and or co-pilgrims	**1.** Never	**2.** Sometime	**3.** Often	**9- DK**
To tour operator/private agent	**1.** Never	**2.** Sometime	**3.** Often	**9- DK**
To Saudi govt. officials/agencies	**1.** Never	**2.** Sometime	**3.** Often	**9- DK**
To any other source. (Pl. specify).....	**1.** Never	**2.** Sometime	**3.** Often	**9- DK**

28 SMS messages are sent to cell phone by government carrying useful information and guidance for pilgrims how often do you receive them?

1. Never 2. Sometime 3 Often 4. Very Often 9. DK

29 **How often do you read them?**

1. Never 2. Sometime 3 Often 4. Very Often 9. DK

30 **How helpful are these messages?**

1. Not helpful 2. Helpful 3. Very helpful 9 DK

31 **If you find them unhelpful, why do you say so?**

.....

.....

32 How much satisfied do you think you are with the behaviors of officials or the quality of services provided. For each of the following tell me if you are very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, or very dissatisfied with each of the following agencies or officials. **(Interviewer ask the question, read the responses and circle the relevant numbers)**

Items	Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied	No Answer
How much satisfied are your with the overall efforts of the Saudi govt. for the pilgrims	1	2	3	4	5	9
Behavior of tour operators or agents	1	2	3	4	5	9
Saudi Immigration services	1	2	3	4	5	9
Law & order agencies	1	2	3	4	5	9

	Saudi Health services	1	2	3	4	5	9	☐
	Guidance & info. services in and around the Prophet (PBUH) Mosque	1	2	3	4	5	9	☐
	Cleanliness/Hygiene in & around the Prophet (PBUH) Masjid	1	2	3	4	5	9	☐
	Eating Facilities	1	2	3	4	5	9	☐
	Saudi crowd management services	1	2	3	4	5	9	☐
	Residential facilities	1	2	3	4	5	9	☐

33	Do you know there is complaint office of the Saudi Hajj Ministry in Madinah where you can go to for help? 1-Yes 2. No	☐
34	If yes, do you have the telephone contact number of that office? 1-Yes 2. No	☐

Thanks for your cooperation

Jazzaka-Allahu Khairan

The Role of New Media in Facing Some of the Visitors Issues in the Prophet's Mosque

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Abstract

Research Problem: The Research Problem can be identified in this main question. What is the role of new media in addressing some issues facing the visitors of the Prophet's Mosque؟

Study Questions:

1. What is the extent of using new media devices in public؟
2. What is the most issue facing the visitors of the Prophet's Mosque؟
3. What is the most frequently used of new media application in case of problems occur؟

Importance of This Study:

1. The special status of the Prophet's Mosque in Muslim heart.
2. The large number of problems facing the visitor in the Prophet's Mosque .
3. The accumulation of pilgrims and visitors in the Prophet's Mosque.

Study objectives:

1. Knowing the extent of public use for new media devices.
2. Monitoring the most frequent issues that dace the visitors in the Prophet's Mosque.
3. Knowing the most frequently applications used in case of problems occur.

Full text is available in Arabic section under this title

دور وسائل الإعلام الجديد في مواجهة بعض مشكلات زوار المسجد النبوي الشريف

The Effect of media Publications and Their Impact on the Awareness of Visitors to the Grand Mosque

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Abstract

The General Presidency for the affairs of the Grand Mosque and the Prophet's Mosque provides many media efforts, which is originally aimed to raise awareness among the visitors of the Grand Mosque and the Prophet's Mosque for the existence of services and miscellaneous issues. This is in addition to a set of guiding information (religious and organizational), that will help visitors and facilitate their visit, and make it easier for those in charge of the affairs of the Grand Mosque and the Prophet's Mosque to do their jobs in a way that is both organized and as stress-free as possible .

This paper seeks to examine the impact of media materials (which include leaflets, brochures, bulletins of the Two Holy Mosques, posters inside the Haram and its precincts, screens, informative signs, Haram magazines, the website of the Presidency, documentaries and movies that are displayed inside visitor's residence, and SMS messages) on visitors of the Grand Mosque and the extent to which these publications have achieved their target (religious targets, awareness targets, indicative, or other goals), through the use of a scientific theory referred to as the media uses and satisfaction theory .

This essentially means audience informational materials that satisfy the needs and meet the latent desires, i.e.: This theory has two assumptions about the visitors to the Grand Mosque:

First: The extent of the use of information materials produced.

Second: After checking the process of use, what kind of influence has happened? This is called cognitive satisfaction needs.

Full text is available in Arabic section under this title

تأثير المواد الإعلامية وانعكاساتها على توعية
زائري المسجد الحرام

The role of health awareness campaigns provided by the Saudi Ministry of Health to supply the pilgrims health information

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Abstract

Public information campaigns are considered one of the important research areas to raise awareness of health issues, to which communities devote a special interest. If we look at media campaigns as an area of study, we find that it is particularly important, where they combine all of the personal contact and the public. Scientists confirm the importance attached to health information campaigns designed to raise awareness among the masses, of whom directly related to human health, and of interest to the first hypothesis in life.

With a special emphasis on giving more attention to these topics and health issues as well as educate the pilgrims, the Saudi Health Ministry focuses on the concept of health and media campaigns to raise awareness of health, through health programs so as to to achieve the following objectives :

1. Definition of healthy behaviors in order to avoid the spread of diseases and health risks during the pilgrimage season .
2. Publication of ways to prevent and discourage the adoption of these behaviors .
3. Presentation of the range of medical services provided by the ministry during the Hajj period .
4. Follow-mail marketing methods for the delivery of health information through electronic newspapers. And the use of social media, mobile phone messages, and radio stations for Internal pilgrims .
5. Contributing to raising the level of health awareness among Saudi citizens and pilgrims .
6. Informing Saudi citizen and pilgrims for the importance of vaccines and baits, as the first line of defense against disease, especially in the period of Hajj.

Full text is available in Arabic section under this title

دور حملات التوعية الصحية المقدمة من وزارة الصحة السعودية في امداد حجاج بيت اللّه الحرام بالمعلومات الصحية واتجاهاتهم نحوها

Fifth Theme:

Technology and its Applications

Visual Surveillance for Hajj and Umrah: A Review

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Abstract

This paper presents advances on crowd management research with specific interest on high density crowds such as Hajj and Umrah crowds. In the past few years, there has been increasing interest in pursuing video analytics and visual surveillance to improve the security and safety of pilgrimages during their stay in Makkah. Most works published in these aspects addressed topics ranging from people counting, density estimation, people tracking and modeling of motion and behaviors. Despite the fact that visual surveillance research has matured significantly in the rest of the world and had been implemented in many scenarios, research on visual surveillance for Hajj and Umrah application still remains at its early stages and there are many issues that need to be addressed in future research. This is mainly because Hajj is a very unique event that shows the clustering of millions of people in small area where most advanced image processing and computer vision algorithms fail to generate accurate analysis of the image content. There is a strong need to develop new algorithms specifically tailored for Hajj and Umrah applications. This review aims to give attentions to these interesting future research areas based on analysis of current visual surveillance research. The review also pinpoint to pioneer techniques on visual surveillance in general that can be customized to Hajj and Umrah applications.

INTRODUCTION

Visual Surveillance

Visual surveillance is one of the important tools for improving public safety and security in urban areas. All major cities in the world have begun installing CCTV cameras in public areas and sensitive areas for preventing and predicting possible crimes and accidents. Moreover and due to the availability of cheap and ubiquitous surveillance camera, these cameras have been installed in shops, hotels and even small outlets [1]. Effective visual surveillance system is one of the key components for cities to be ready for major world events such a religious gathering (Hajj), sport events such as World Cup and Olympic Games as well as political and business gatherings (demonstrations, conferences etc). All cities hosting

major world events proudly declare the sophistication of visual surveillance systems they implemented such as London which is the world most surveillance city and Vancouver winter Olympics [2].

Hajj Security

The city of Mecca, home for Al-masjid Al-Haram is prayer face of Muslims and to which millions of Muslims assemble at the end of every Muslim's lunar year for the Hajj. In short period, the Holy city of Mecca faces more than three times its usual capacity which poses serious security, safety and health challenges to the authorities of the Kingdom of Saudi Arabia. Hajj contains several rituals that are performed in Al-masjid Al-Haram and the holy sites (Menna, Muzadlifa and Arafat) [3]. Figure \ shows sample images for Hajj captured at different locations, the first row shows images captured for Tawaf which is circulating around the Kabba. The second row shows images captured from al Jamarat which is the place for stoning the Devil. The third row shows images captured in Saffa and Marwa. The forth row is mount Arafat and the last row shows the tents of Menna where pilgrims stay there for three days for stoning the Devil in the Jamarat place [4].

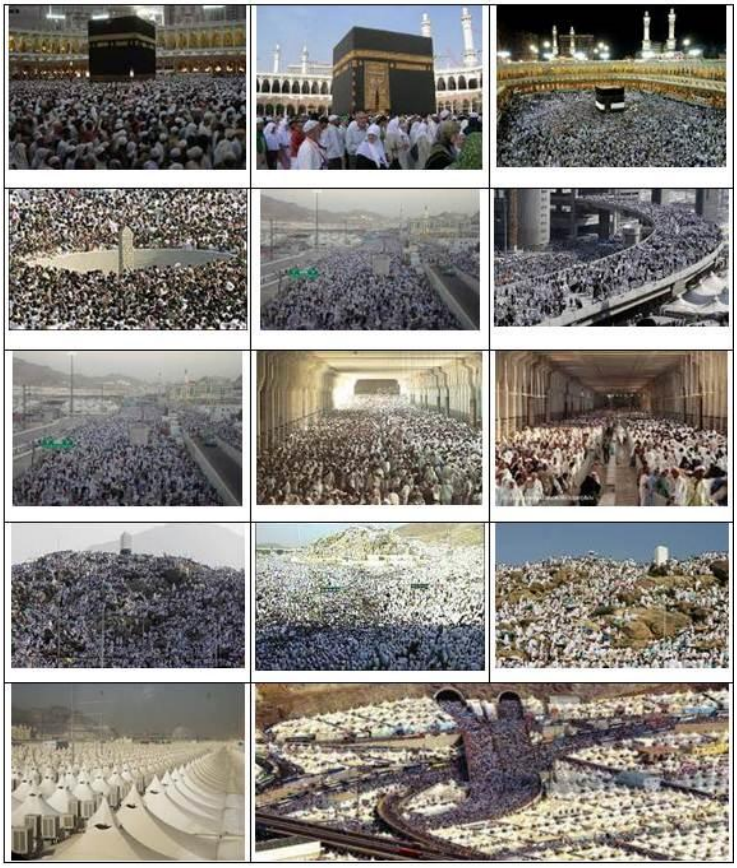

Figure 1: Crowded areas at different parts of Hajj rituals

The remaining of this paper is organized as follows; section 2 present research progresses on people counting for Hajj and its applications. Finally section 3 presents a comprehensive conclusion to this survey and it shows future research direction of visual surveillance for Hajj applications.

PEOPLE COUNTING

This section covers some of the published works on people counting from images captured using surveillance cameras. The section starts by scanning the published research articles in this matter. Then it provides a detailed discussion and analysis to these works and finally it points out what methods among these are suitable for Hajj and Umrah applications and how they can be approached.

2.1 Related Works

Table 8. Comparison of research articles published on people counting

Paper	Algorithm used	Advantages	Disadvantages	Accuracy
[5]	Used Bayesian model for image segmentation	-Bayesian model can learn complex image features	Not good for high density crowd	N/A
[6]	- Used blob extraction from sequence of images - Counting using trained model with neural networks	-Removing shadow and background	-Requires training phase and training data -Assumed maximum of 30 pedestrians per image	80٪
[7]	-Passing people counting using overhead stereo camera	- No issues of occlusion - Gives count as well as the direction of movement	- Limited testing was performed - Narrow field of view for cameras	N/A
[8]	-Used specialized IR sensor for detecting and counting humans	- Fast processing - Accurate for low density crowd	- Narrow field of view - Not suitable for large crowd	N/A
[9]	- Used blobs extraction from sequence of image with a known background image	- Joint estimation of density and count	- Not suitable for high density crowd - Errors due to occlusions	85٪
[10]	- Used a camera mounting on a moving car to detect and count crowd	- Simple method to detect a moving person -Can distinguish between vehicle and human	- It assumes movement of the camera - It fails to detect crowd moving in undetermined direction	N/A
[12]	-Used Haar wavelets to detect head-like features and filter it using SVM	-People counting form single image	-Requires training phase -Verification was done with human likes puppet	Above 90٪

	classification - Apply perspective correction		not real crowd scenarios	
[13]	-Use background differencing to detect people -Use foreground ratio in small blocks are recorded for small moving window	-Radial Basses Functions (RPF) features learn good model for filtering out false blobs	-Uses a sequence of only 7 frames to do neural network classification of detected blobs -Requires training phase	89٪
[14]	-Use a group of sensors to extract the foreground image -Used neural network with the extracted silhouette to project the visual hull of the scene	-Real time counting performance	-Using multiple sensors induces high cost -Cameras calibration overhead -Testing was done with limited data	N/A
[15]	-Fusion of IR with visual camera to detect and count people	-IR can work in total darkness	-IR images does not provide sharp edges for body silhouette	N/A
[16]	-Employed histogram filter to extract human sized blobs from foreground image	-Ultra low computations been implemented on Imote2 sensor node -histogram is robust to intensity fluctuations	-suitable for counting few peoples only	N/A
[17]	-Employed median filtering for selecting the background -Genetic algorithm was used for selecting foreground threshold and blob size	-The algorithm has been developed for real crowd scenarios with thousands of peoples	-Limited training data was used for genetic algorithm training -Not robust to illumination variations	N/A
[18]	Used local features of the object blob such as (area and perimeter) with camera calibration as prior step	-Invariant to the scene by taking knowledge of the camera position with respect to the scene (scene invariant) -Applied perspective correction to the image	-Requires camera calibration -Requires a training step using annotated set of data -It relies on accurately detecting the human in the image	N/A

Discussion and Summary

This previous literature reviews showed rich and diverse attempts to people counting from images that employs different computer vision and image processing algorithms. Table 1 summarizes the previous listed works. The accuracy report is based on what was reported on the paper with their dataset. This mean the accuracies are not comparable with each other across different works as some used simple data while other used high density crowd images. Simple people counting approach where performed by subtracted a known or trained background of the scene from each new frame and then counting the number of valid blobs in the foreground image [9]. This is only viable in low density crowd where all people are clearly visible to the camera and they can easily be distinguished from the background of the scene. Some worked tried tuning the background removal and blobs filtering stages in order to get accurate count by using genetic algorithm optimization [16] and histogram filters [15]. Another works performed people counting at gates using the concept of virtual gates with overhead cameras [7] or with specialized IR cameras [8]. Some researcher had proposed preprocessing steps to improve the counting such as [6] which removed shadow and [5] which presented Bayesian estimators for image segmentation.

Another class of method learned the counting of crowd from low level image features. The motivation of these works was the difficulty in detecting the presence of people in high density crowds due to severe occlusion [11]. Image features could be in form of texture or color histogram and they have learned it using regression method such as support vectors regression or linear regression. Such algorithms are mostly common for computing the crowd density but they can also be employed for crowd counting application. New research trends on people counting for Al-masjid Al-Haram should use image features instead of detecting people because of the large number of people in one image. These image features can be frequency properties of textures or color distribution or interest point detectors such as HOG or SIFT or other low level or high level image features that can be combined with machine learning to produce accurate count. In addition to that, using this kind of algorithms should keep in mind that the density is not uniformly distributed all over the image as some parts of the image tends to be with no people due to barriers. Interest point detector can false detect people in these areas which produce wrong count. To overcome those local features can be processed in small and overlapping image blocks with associate confidence level of each block that can be later aggregated to produce the final count [35].

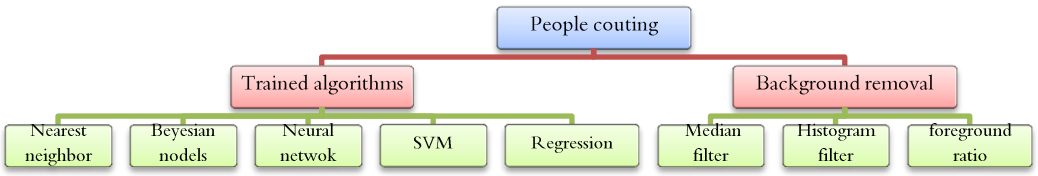

Figure 5. Hierarchical classification of techniques and methods used for people counting from images.

CONCLUSION

This paper surveyed research work on visual surveillance with focus on surveillance of Hajj and Umrah. The paper also addressed papers about dense crowd surveillance to expand the content as the number of research articles published on Hajj and Umrah surveillance is not sufficient enough. Most of the published work on people counting relied on detecting the object blob then counting it which is not appropriate for large crowds. Recent trends extracted local image features and directly related them to the crowd counting using machine learning tools. However these techniques have not been implemented on people counting in Hajj and Umrah and this direction needs to be pursued further to adopt these methods to Hajj and Umrah crowd counting.

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Using Big Data Tools to Analyze Tweets Related to Hajj Sentimentally

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Abstract

Millions of Muslims gather annually at The Sacred Places in Makkah to perform Hajj. Many of them use Twitter to talk about their experience as well as communicate with their relatives and friends. Sentiment analysis helps to measure people's opinion about a matter which facilitates taking decisions. This paper uses Spring XD, Hadoop, Hive, and Microsoft Excel to collect, refine, and visualize tweets. There is no doubt that Hajj involves many data, so this paper presents the importance of using big data tools effectively in Hajj to enhance the services provided by different organizations.

Introduction

We live currently in the era of tremendous amount of available data. Big data is a term that is widely spread and used these days. Also, it has many definitions. One definition that is relevant to the proposed use of big data in this paper is "a new attitude by businesses, non-profits, government agencies, and individuals that combining data from multiple sources could lead to better decisions" [1] [2]. According to The Saudi Arabian Central Department of Statistics and Information, 2,085,238 Muslims coming from various countries all over the world have performed Hajj this year [3].

Twitter is one of the most popular social networks worldwide [4]. It is also widespread in Saudi Arabia as Saudi has the highest number of active Twitter users in the Arab World (2.4 million active users) [5] [6]. This paper uses Spring XD, Hadoop, Hive, and Microsoft Excel as a proof of concept to collect, refine, and visualize tweets. Furthermore, there is no doubt that Hajj involves many forms and types of big data, as the previous numbers show, so this paper presents the importance of using big data tools effectively in Hajj to enhance the services provided by businesses, non-profits, government agencies, and individuals.

Related Work

Big data tools and techniques are used in many fields. For instance, the White House declared a nationwide initiative related to big data which includes six federal departments and agencies pledging $200 million to research projects in big data arenas [7]. Also, similar initiatives have been established in other countries like UK [8]. In Saudi Arabia, the Saudi mobile carrier Mobily has recently established its own infrastructure for big data with the help of Teradata and Hortonworks. It aims to provide enhanced services that are designed to target individuals [9]. The research community has some good studies for Twitter sentiment analysis and big data like [10], [11], and [12].

To IBM, big data means big return on investment. Furthermore, it claims that 20٪ decrease in patient mortality could be achieved by analyzing streaming patient data, 92٪ decrease in processing time could be reached by analyzing networking and call data, and 99٪ enhanced accuracy in terms of placing new resources of power generation could be accomplished by analyzing 2.8 petabytes of untapped data. It provides other examples and use cases for big data in the fields of automotive, banking, consumer products, energy and utilities, government, healthcare, insurance, oil and gas, retail, telecommunications, and travel and transportation [13]. The UN published in its Global Pulse that big data is a key change for development in 21st century if it is utilized [14].

Implementation and Results

For majority of the subsections of this part of the paper, Hortonworks sandbox 2.1 is used. Hortonworks sandbox is portable Hadoop environment which is equipped with many Hadoop tutorials and runs in virtual machines. Also, it contains many packages as shown in figure one [15]. Similarly, a Cloudera quick start virtual machine could be used as an alternative [16].

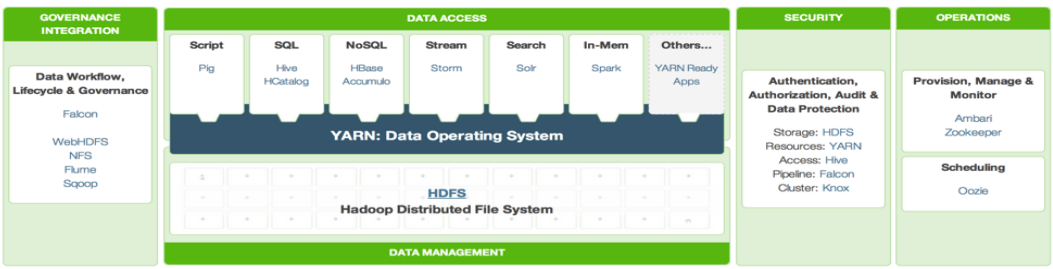

Figure One: Apache Hadoop Environment [17].

Collecting Tweets

There are many ways to collect tweets (data) from Twitter. One good way is done using Spring XD [18]. Spring XD (extreme data) is a "unified, distributed, and extensible system for data ingestion, real time analytics, batch processing, and data export". The goal of Spring XD is to facilitate developing big data applications [19]. In this paper, the set of data (tweets) that are used were collected by Hortonworks for the lunch of the movie Iron Man 3. The tweets were collected using Flume and are provided freely online in the website of Hortonworks [20].

Refining Tweets

In order for the tweets to be refined, they have to be uploaded to the sandbox. Then, a hive script is used to refine the tweets. This hive script is responsible for converting the raw tweets into a tabular format, scoring the sentiment of each tweet by comparing the number of positive and negative words, assigning a neutral, positive, or negative sentiment rate to each tweet, and finally creating a new table which contains the sentiment rate for each Tweet [20].

Visualizing Tweets

In this part, Microsoft Excel Professional Plus 2013 is used to access the refined sentiment data (tweets) generated in the previous step to visualize them depending on their location in the world. Figure two shows a map that presents the refined tweets using orange for positive, blue for negative, and red for neutral sentiment [20].

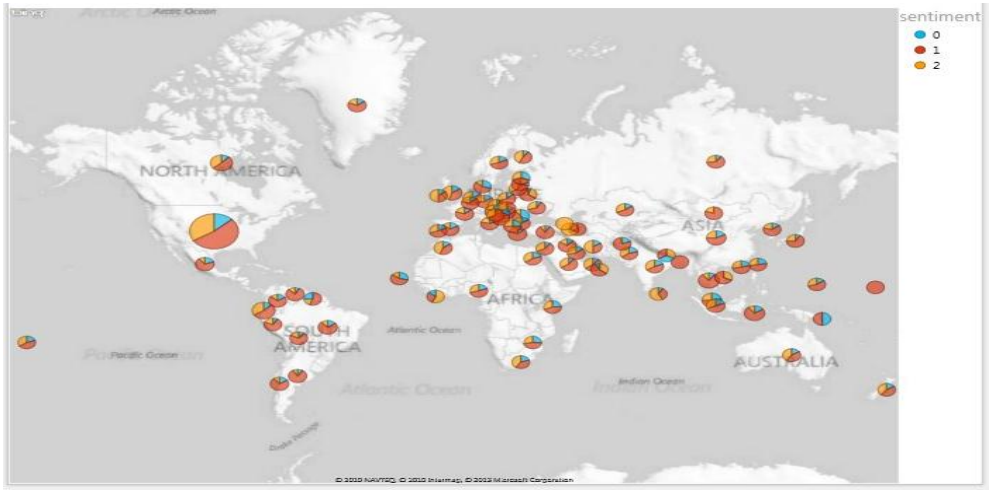

Figure Two: Presenting refined tweets worldwide [20].

Zooming in to any particular country will give more details that help in the analysis. For example, figure three presents the sentiment analysis for Mexico [20].

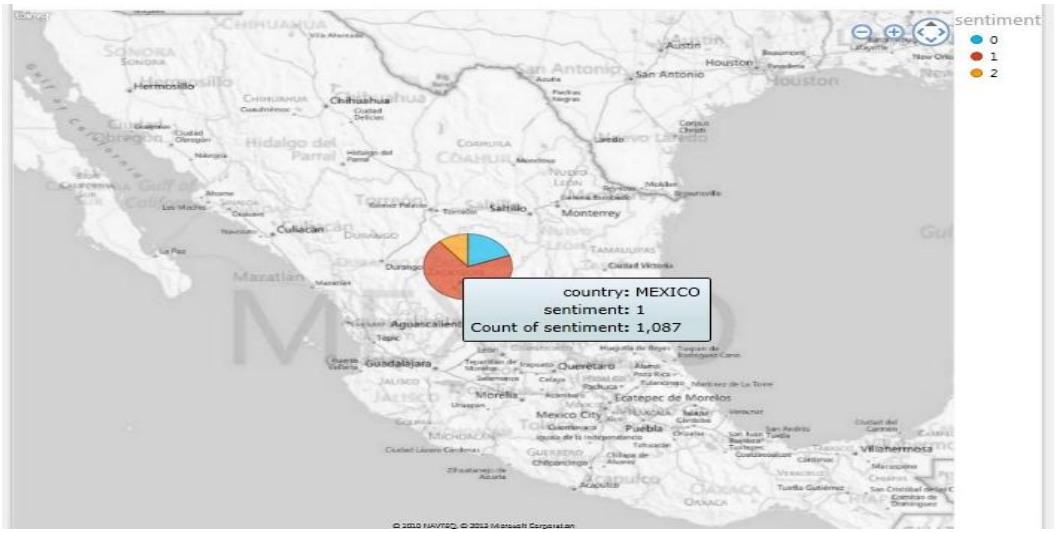

Figure Three: Sentiment analysis for Mexico [20].

Suggested Uses Related to Hajj

Now and after presenting this example of analyzing tweets sentimentally, the paper is going to suggest some useful uses of big data tools and techniques that may be utilized in Hajj to improve services. For example, Al Mashaaer Al Mugaddassah Metro (Arabic: قطار المشاعر المقدسة) could generate a Twitter hashtag that the officials of the metro monitor and analyze as one factor out of many they have already to maintain the quality of the provided services. This hashtag could be publicized quickly and easily using text messages, billboards in airports and streets, in online and TV ads, the metro tickets and cards, and many more. Then, pilgrims would use it to tweet about the metro. Other agencies could replicate the same explained idea. The Saudi Project for Utilization of Hajj Meat could benefit from big data as well by analyzing the website's server log data to increase the revenue and the security of the website [21]. Other organizations might find the same idea very beneficial. It is clear after taking a look at the Descriptive and Cumulative Index of the Studies, Reports, and Researches done by the Custodian of the Two Holy Mosques Institute of Hajj and Umrah Research that many researchers are interested in using sensors in Hajj [22]. Big data tools could be used effectively to analyze sensors' data as described in [23].

The author would love to collaborate with any innovative and useful ideas that use big data to facilitate Hajj since big data is gaining popularity in many countries all over the world as could be seen in figure four, so are we ready to benefit from it to improve the provided services in Hajj?

Figure Four: Trends of the keyword "Big data" from Google [24].

Future Work

Although this paper talks about sentiment analysis for tweets, this choice does not mean that it is the only social networks to analyze. Analyzing many social networks reaches more people who do not necessarily use Twitter and provides more data. The book in [25] covers how to analyze many social networks and email clients.

Arabic sentiment analysis could be added to this work easily as a future work. The author is not going to reinvent the wheel, but rather he may use an Arabic Twitter corpus for subjectivity and sentiment analysis that has been developed by Eshrag Refaee and Verena Rieser [26].

Conclusion

This paper presents a proof of concept for the importance of using big data tools and techniques to analyze tweets related to Hajj sentimentally to improve the provided services. The proposed concept is suitable to implement by various agencies, organizations, and individuals. Also, it could be expanded in many ways and directions.

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Simulation of people entering and exiting the public Utilities (Washrooms) at Al-Masjid An-Nabawi

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Abstract

Millions of Muslims visit Al-Masjid An-Nabawi throughout the year especially during the seasons of Ummrah and Hajj. The main purpose of their visit is to visit the graveyard of the Prophet Mohammed peace be upon him and pray the five daily prayers at this specific mosque due to the special rewards. The prayers require Muslims to be in a clean (ablution) state. Hence, the washroom (public utility) is essential beside the mosque. Many visitors require using these facilities before the prayer. Given the huge number of visitors, the washroom units are extremely congested with people performing ablution. Real data of the number of people entering and exiting the four level washroom units are gathered to model the flow of people in and out of the washroom units. The purpose of this work is to assess the circulation of people within the washroom units during normal and emergency situations using crowd simulation software *buildingEXODUS*. Finally, the results from this work provide recommendations for the new expansion of the mosque.

Introduction

Developing accurate representations of crowd-dynamics and behavior analysis presents one of the most challenging research issues in crowd management today. Crowd simulation is a powerful technique for analyzing crowds and observing (anticipated) human behavior and interaction in order to replicate the collective crowd-behavior [1] for a given population, environment and under various hazard scenarios. From the literature, three approaches are used to simulate crowds: fluids, cellular automata and particles. A brief literature survey on crowd simulation is presented in Table 1.

Table 1: Literature Survey on Crowd Management and Simulation

Citation	Key Features	Comments
[1, 2]	social behavior of crowds at social gatherings, concerts, sports events and religious ceremonies	Crowd simulation in different gatherings
[3]	the flow of people in/out of the washroom units was modeled	only sampled data were gathered to get estimated number of people entering each level of washroom unit levels and model was not validated
[4]	simulation of building escape panic	a social force model and allows for fluctuations in behavior
[5]	modelled virtual humans	uses perception, emotion and behavior
[6]	Probabilistic modelling of pedestrians	Particle-based and finite state machines based on decision-making and movement
[7]	Scalable approach for simulating large-crowds	uses discrete agents and a continuous system
[8]	simulates non-uniform pedestrian movements	DES to exploit the system's spatial-temporal heterogeneity
[9]	Evaluates 55 different crowd simulation software	Provides recommendation for this study

The system being modeled in this study relates to the washroom/ablution units located in the underground area of the piazza surrounding the grand mosque of the Prophet Muhammad, Al-Masjid An-Nabawi. Real data is used to support the simulation, and commercial software is used to simulate the crowds using the washroom units. The crowds/worshippers usage of the washroom/ablution facilities needs to be efficiently and safely controlled and managed during daily prayers. Hence, a model for the flow of people in and out of the washroom areas is proposed and simulated using MATLAB. Therefore, the main objectives of this work are:

Provide an estimation of the number of people entering and exiting the washroom units.

Propose solutions/scenarios for dealing with the crowd situation in the washroom areas.

Estimate the capacity of the washrooms during peak times.

Provide recommendations on crowd management for the underground washroom areas.

The rest of the paper is organized as follows: section 2 presents the system description; section 3 explains the methodology; section 4 provides the data collection and analysis; section 5 presents the proposed crowd flow behavior model; section 6 provides a case study of an evacuation simulation using buildingEXODUS, section 7 states the recommendations and concludes this paper.

2- System Description

This paper is concerned with crowd study and simulation for the underground washroom units of Al-Masjid An-Nabawi. The washroom/ablution units are all located below the open piazza surrounding the mosque. Each unit occupies four underground levels below the mosque, each of which can be accessed using the staircases, while only two levels can be accessed using escalators. Escalators tend to be more appealing to users due to the less effort required during use. On the contrary, stairs are preferred when escalators are heavily crowded. Worshippers from the car-parks at each side of the washroom areas serve as a second input feeding into the system from two levels which generate less flow than those

entering from the mosque. The percentage of people arriving from the parking areas that use the washroom/ablution facilities is very low since most people come from their homes ready for the prayers. Traffic within the washroom/ablution areas at each level is bidirectional and can become very crowded due to the lack of a traffic-flow policy/discipline. Traffic congestion is particularly problematic at the more-easily accessible higher levels. The flow of crowd is noticed to increase before the prayer time until the Athan (call for prayers) after which the number of people in the washroom units starts to decrease gradually to almost zero at the end of the prayer. Additionally, during the seasons of Umrrah and Hajj the significant buildup of crowds is observed in these facilities. People who use the washrooms must make the ablution. The rest of the people only use ablution area. On an average, a person requires 3-5 minutes to use washroom and 2 minutes to perform ablution. Ideally, after entering the unit, a person tends to look for the empty washroom (ablution seat) first or the one with the shortest queue. After performing ablution, the person leaves the unit using either the staircases or the escalators depending on the level and the crowd. Generally, it was noted that more people wait for washrooms than for the ablution areas since the number of water taps for ablution is significantly larger than the number of available washrooms. This shows that the number of people performing ablution is usually higher than those who use the toilets before making ablution. Peak time is determined to be during evening prayers due to the fact that this time allows locals to join the prayers together with the other mosque visitors.

Methodology

The methodology of modeling and simulation of crowds at Al-Masjid An-Nabawi's washroom units was carried out using to the following steps:

1. Data Collection: Ten students helped in the process of collecting data, from the busiest washroom unit, no. 9, closest to King Fahd door. Using handheld counters, the number of people at different entry/exit points in the washroom unit was counted.

2. Model Construction: A mathematical model is proposed and constructed providing a practical solution to the real problem.

3. Parameter Tuning and Model Validation: The model parameters are fine-tuned such that the deviation between the sampled output and the model output is minimized. The correctness of the model and the accuracy of the parameters are evaluated based on the model fit with the experimental data and physical ranges of parameters.

The simulation of this model was carried out using MATLAB. This was done to validate the proposed model and compare the results. In addition, buildingEXODUS was used to simulate a scenario of crowd evacuation. Finally, simulation results of the flow of people in the washroom units can be used to investigate the safety aspects of the nature of exits/entrances and provide recommendations for better arrangements.

Data collection and Analysis

The data collection process was planned by deciding on the dates to collect the data needed. A data collection form was designed. The data collection dates were decided to be few days before and after Hajj days. Four days before Hajj were 1 – 4 of Thul-Hijjah, 1434H and two days after Hajj on 18-19 Thul-Hijjah. This was done for the Isha prayer only. The data analysis is explained below for the two days after Hajj. Fig. 1 shows the 12 points at which data was collected.

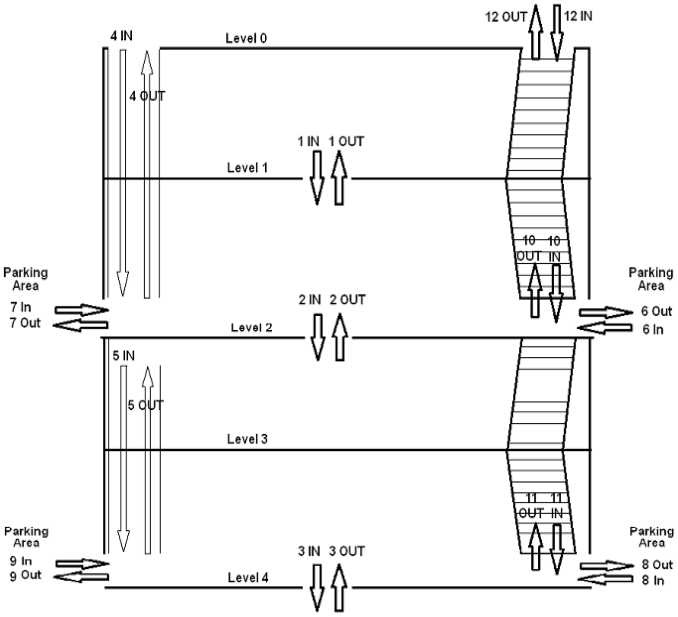


Fig. 1: Washroom Unit Elevation diagram

The graphs in Fig. 2 show the flow of people going into the washroom area and out to the piazza (points 4 and 12 of Fig. 1). Fig. 2 replicates the cumulative crowd flow behavior from all the levels below, since these are the entry/exit points to the washroom unit. It can be concluded that more people use escalators than staircases.

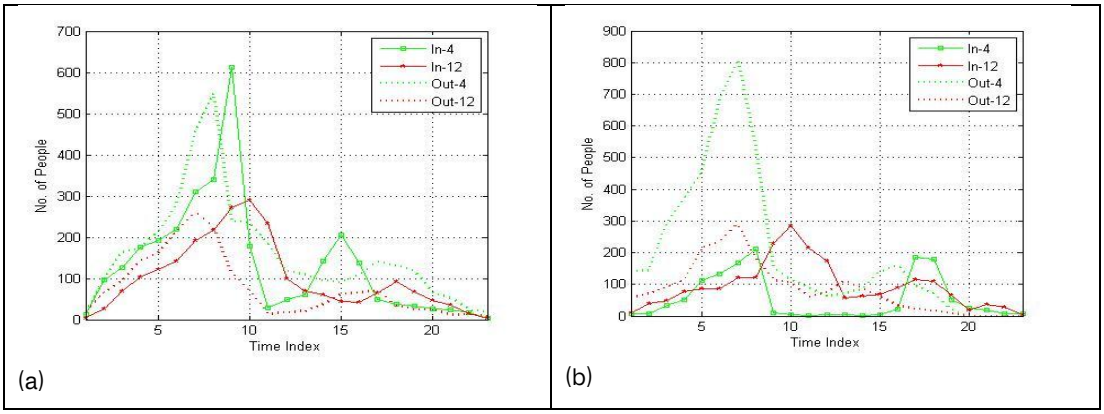


Fig. 2: The flow of people in and out of the washroom unit (point 4 and 12 of Fig. 1)

Proposed model and simulation results

To build the model of the flow behaviour of the people at all the levels of a washroom unit, we need to consider the access characteristics of all levels. People entering the washrooms prefer to choose the closest and easily accessed levels, i.e., levels 1 and 2. Level 1 is connected by stairs and is the closest to the ground level. Since level 2 is connected by escalators with the ground level, it is most preferred by people. Level 4 which is connected by escalators with level 2 and connected by stairs with level 3 experiences less crowd-flow than level 1 and 2. level 3 is closed and it is only connected by stairs with level 2.

Since we consider a measurement time of period T during which people are entering washroom and aim to develop the discrete event model, T is discretized in n uniform grid of time steps {0, h, 2h, ..., nh} with a step size h for a corresponding set of iteration steps {0, 1, ..., n} as shown in Figure 13.

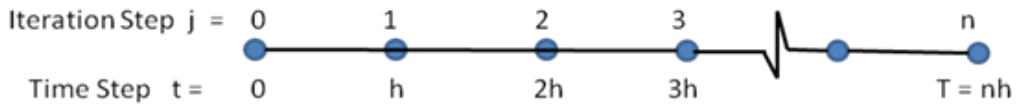


Fig. 3: Uniform grid of time steps for corresponding iteration steps

Suppose that Pi(t) indicates the number of people entering Level unit i at time t, which is in the small interval [t1 , t2]. For discrete event, we consider that tj = jh is the time step in that j ∈ {0, 1, ⋯, n} is an iteration step. Then, we compute Pi(t) for any t ∈ [0, T] by interpolating the nearest data points Pi(t1) and Pi(t2) where t is in the time interval [t1 , t2].

Now, we consider that the washroom Level has limited capacity which restricts the people to get in the washroom Level making the rest of the people queue. People who enter a Level to use toilets or to make ablution are chosen randomly. People are assumed to use the nearest available toilet and ablution seat. The subscript v is used to denote the toilets and w to denote ablution places. We assume that a person requires tV minutes in toilet and tW minutes in ablution. Toilet users must use ablution places, where ablution is required before performing prayers. Toilet users will be queued if toilets are occupied. Assume that a maximum of qV people can stay in the queue for toilets. Similarly, a maximum of qW people can stand in the queue for ablution. Once the system is full, they start lining up in front of these places and use it in a systematic manner (first come, first in). When all places along with queue are filled, then the remaining people ei wait to get in the queue. However, a number of people go to the next Level to find less crowded areas.

The number of people ei waiting to get in the queue at time step jh can be calculated by equation (1):

$$e_i(jh) \approx \max(0, \quad d_i(jh) - P_{i,\max}), \qquad (1)$$

where

$$d_i(jh) = P_i(jh) - G_i(jh).$$

Note that Gi(jh) is the number of people exiting the facility. This is calculated by checking whether a person completes his/her required time in the facility. Suppose that a person wants to use the toilet then he/she will check whether any toilet is free. If there is none available then the person is required to stay in queue until a toilet is available for use; the toilet use requires, tV minutes. After the use of toilet the person must look for an ablution place. If none is available, he/she must stand in queue. When a seat is available, the person takes tW minutes to perform ablution then he/she exits the facility. Now we summarize the above discrete event model in the form of an algorithm in Algorithm 1. This algorithm requires the numerical values of step size h, number of time steps, n. This algorithm provides the numbers of people Pi staying at all levels i = 1 to 3 at time steps 0, h, ..., nh. First the queue ei of the people remaining outside each Level i is set to zero. Then for each iteration step the following operations are performed.

Algorithm 1: Discrete event algorithm for computing inflow and outflow of the washroom

Input: Step size *h*, number of time steps *n*.

Output: Number of people P_i staying at level *i* at time steps 0, *h*, ..., *nh* for *i* = 1 to 3.

1. Initialization; $e_i(0) = 0$, *for i* = 1 to 3

2. **for *j* = 1 to *n***

Calculate P_1 at time step *jh* from measurement data

Distribute P_1 to toilet/ablution places randomly. Set the people in the queue of the toilet/ablution places according to the availability. If a person has spent the required time in the toilet/ ablution, the person can get out and is added to $G_1(jh)$.

Calculate $e_1(jh)$ using equation (1)

Calculate P_2 at time step *jh* from measurement data

Distribute P_2 to toilet/ablution places randomly. Set the people in the queue of the toilet/ablution places according to the availability. If a person has spent the required time in the toilet/ ablution, the person can get out and is added to $G_2(jh)$.

Calculate e_2 using equation (1)

Estimate P_3 at *jh* from measurement data

Distribute P_3 to toilet/ablution places randomly. Set the people in the queue of the toilet/ablution places according to the availability. If a person has spent the required time in the toilet/ ablution, the person can get out and is added to $G_3(jh)$.

Calculate (e_3) using equation (1)

end (For).

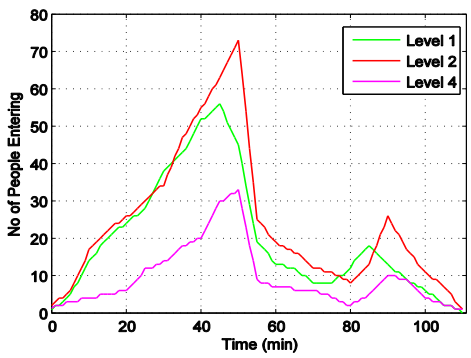
The number of people Pi is computed sequentially for all levels i = 1 to 3 from measurement data. Whether a person uses a toilet or ablution place is determined randomly for all levels i = 1 to 3. The people in the queue of the toilet/ablution places are set according to the availability of the places in the queues which are limited in sizes as qV, qW, respectively. If a person has spent the required time in the toilet/ ablution, the person can get out and is added to G1(jh). Then ei is updated using equation (1).

Algorithm 1 is used to simulate the flow of people in and out of the washroom areas and the movement of people from different levels. The next section presents the experimental results using the proposed model above.

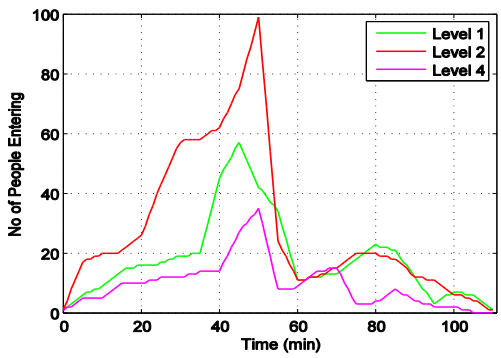
Our objective is to simulate the crowd scenario in the unique structure of the washroom units. To achieve this objective, a multi-queue model is constructed and Discrete Event Simulation (DES) algorithm is used to compute the flow of people. Furthermore, the model provides the flow behavior of people at all the levels of a washroom unit. It considers the actual inflow of people inside each level of washroom unit and the interflow between each level. The queuing system inside each level has a complex pattern due to the many toilets and ablution places available in each level of the washroom units. To the best knowledge of the authors, such model or algorithm has not been explored in the literature which deals with such a unique problem with different levels, access characteristics and the multi-queues.

The total number of toilets is 42 and the number of ablution places is 128. The following values/assumptions are used for our simulation: The inflow/outflow of people in/from the washroom unit was measured. The measurement time is T = 120 minutes. The step size h = 1 minute. Hence, the number of steps n = 120. The time to move from a level to the next is 1 minute using either the stairs or the escalators. A person requires tV = 5 minutes in toilet and tW = 2 minutes in ablution. The size of the queue for toilet qV = 4, and for ablution qW = 2.

Fig. 4 shows the measured number of people entering the washroom levels 1, 2 and 4 during time T = 120 minutes. Note that the flow of people is increasing from the initial time t=0. Visitors increase until t = 45 to 55 min when the prayer starts. After the prayer completes at t = 75, the number of people increases showing that people tend to use washrooms after the prayer. Observe that more people use the washroom Level 2 since it is connected by escalator making the level more convenient to reach. This level is also connected by staircases with Level 1.



Day 1



Day 2

Fig. 4: Measured number of the people entering the washroom levels 1, 2 and 4 during the experiment time T = 120 minutes

The simulation of the model was carried out using the number of people over the period T. The simulated results of the number of visitors staying inside the washroom units during T = 120 minutes are shown In Fig. 5. Notice that the behaviour of the plots is the same as that in Fig. 6. The graphs in Fig. 5 follow the trajectory of the plots in Fig.4.

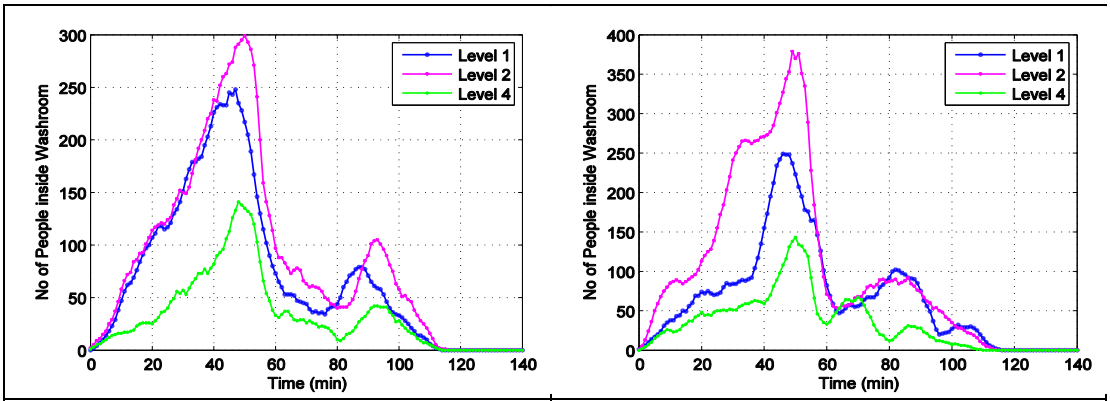


Fig. 5: Simulated result of the number of people staying inside the washroom units during the experiment time

The simulation of the model provides the outflow of the people from each washroom unit (Fig. 6). The measured number of people is also combined in the plots for comparison. Observe that the difference between the inflow and outflow of visitors occurred due to the short stay of visitors inside washrooms. Hence, the outflow tends to follow the inflow trajectory with some delay. This delay is due to the waiting time inside the unit.

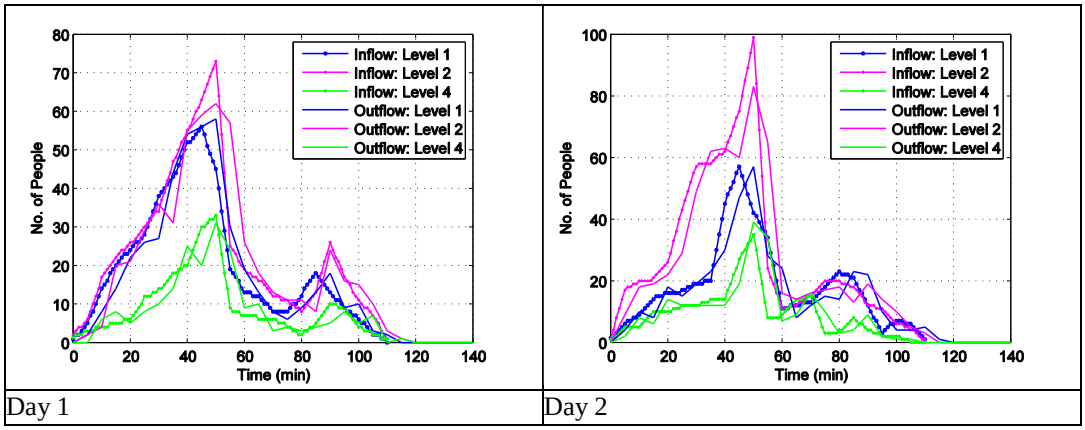


Fig. 6: Measured number of people entering each washroom level and the simulated result of the number of people exiting the washroom level during the experiment time

The total inflow and outflow of the people must be the same. This can be noticed in Fig. 7 where the total number of visitors getting in and out is plotted over period t =140 minutes. Note that after t > T, the total

inflow and outflow are the same. Fig. 7 provides the total number of visitors served using all 3 levels. At time t = 55 when the prayer starts, it is interesting to note that the total number of visitors who used the washroom units is 4014 with the data of Day 1, where unit 1 serves 1580 persons, unit 2, 1822 persons and unit 3, 612 persons. At time t > 120 min, the number of visitors using level 1 is 2215 persons, by level 2, 2756 persons and by level 4, 1082 persons, with a total of 6053 persons served by all 3 levels.

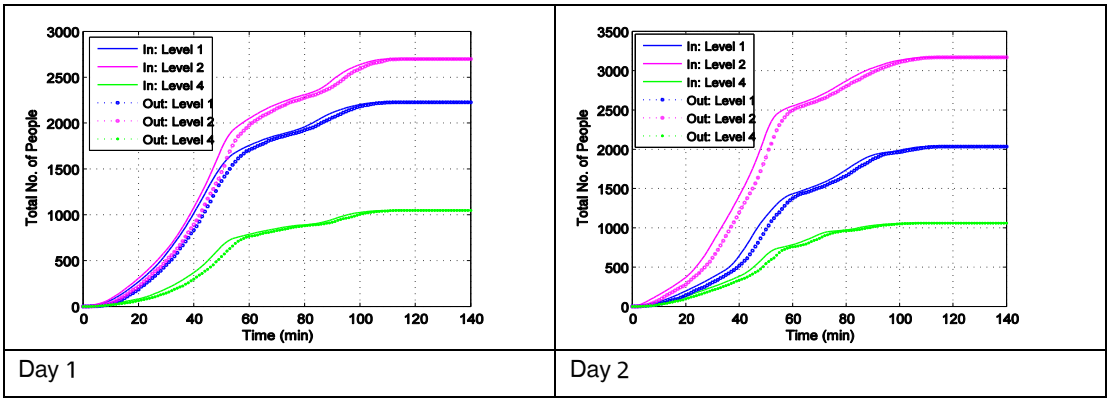


Fig. 7: Measured total number of people entered the washroom and the simulated result of total number of people exited from the washroom units

Case study: Evacuation simulation using buildingEXODUS

The following are required in order to carry the simulation using buildingEXODUS: CAD diagram for the washroom layout (Fig.8), response time, speed and approximate distribution of people according to age. In addition to the data collection carried out, the authors realized the need for statistics of people according to their age and since this information is not available from the Saudi Dept. of Statistics and information or other organization such as the General Agency of the presidency of Al-Masjid An-Nabawi Affairs. The project team members decided to randomly select different groups of people in the mosque and estimate their age range. From this study, the authors estimated the rough percentage for different age groups to be as follows, with a ±10% error:

Males' ages: 5 – 15 → 10%

Males' ages: 16 – 30 → 20%

Males' ages: 31 – 55 → 50%

Males' ages: 56 – 80 → 20%

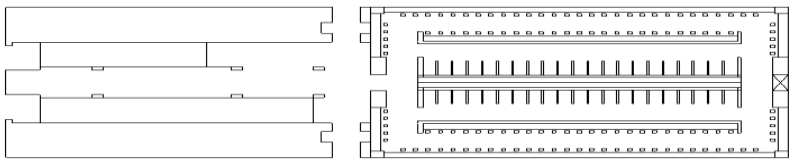


Fig.8: Washroom Layout Designed in AUTOCAD.

The estimated response time ranges are given in Table 2 below.

Table 2: Estimated Response time

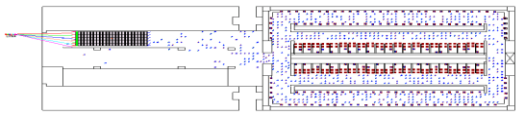
Age (years)	Estimated Response Time Range (sec)
5 – 15	100 – 225
16 – 30	110 – 275
31- 55	120 – 300
56 – 80	175 – 355

For the travel speed, the standard travel speeds provided by buildingEXODUS were used: Fast walk = 1.2 m/s – 1.5 m/s, Walk speed = 1.08 m/s – 1.35 m/s, Stairs up = 0.510, and Escalators up = 0.320 – 1.510. From the data collection process, the total number of people in each level was estimated to be between (770 ~ 850), which does not include the people close to the staircases and escalators. This number was estimated according the following distribution, assuming that all washrooms and ablution seats are occupied: 42 people using toilets, 128 are performing ablution, (3 – 5) people queuing for toilets ~ (4 x 50) = 200 people, and (2 – 3) people queuing for ablution ~ (2 x 128) = 248. In addition to about (180 – 210) people distributed mainly at the entrance of the washroom/ablution area at each washroom level, from which few people are moving around the washroom area looking for a smaller queue or moving around in the system. Then, according to the above calculations and estimations, the number of people in each level except level 3 were estimated at 770 – 800, while the number of people in Level 3 is zero.

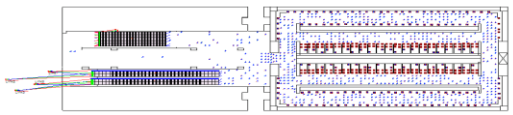
6.1 Evacuation simulation results for all levels connected:

Fig. 9 shows the initial distribution of people in the system. Fig. 10 shows the status of the system time = 1 min, with the number of people exiting the system being 48. Fig. 11 shows the status of the system at time 5 mins, and the number of people exiting the system equals 856.

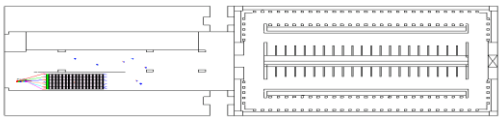
Level 0



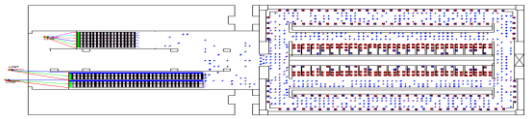
Level 1



Level 2



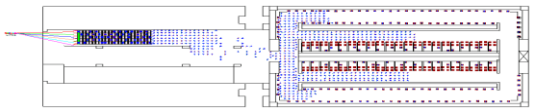
Level 3



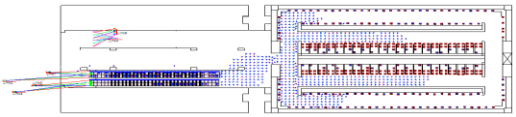
Level 4

Fig.9: Simulation status at time = 0.

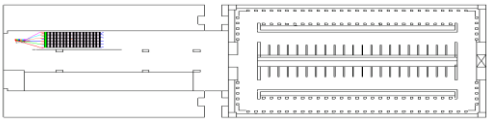
Level 0



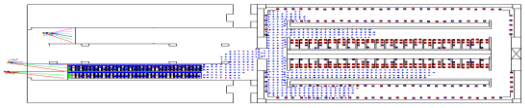
Level 1



Level 2



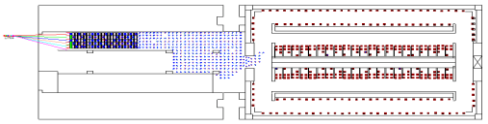
Level 3



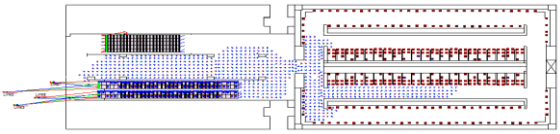
Level 4

Fig.10: Simulation status at 1 min.

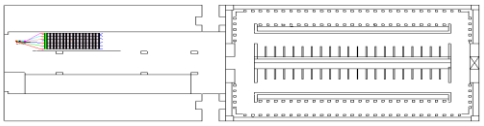
Level 0



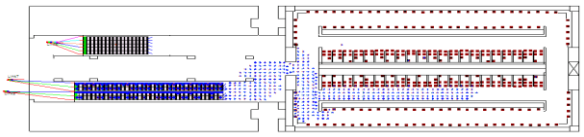
Level 1



Level 2



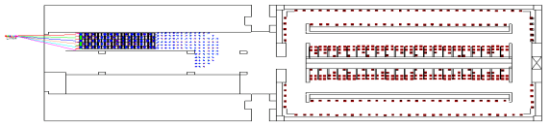
Level 3



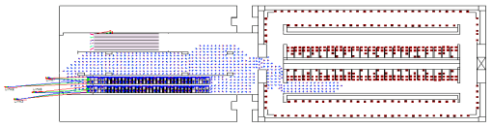
Level 4

Fig. 11: Simulation status at 5 mins.

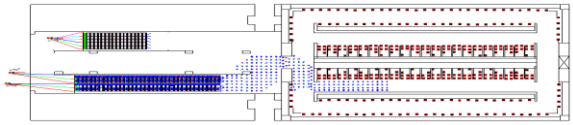
Fig. 12 shows the status of the system at time 7 mins, where the total number of people exiting the system equals 1290. Level 3 is not shown since no people were moving through this level.



Level l



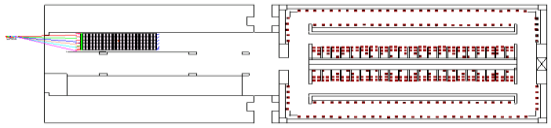
Level 2



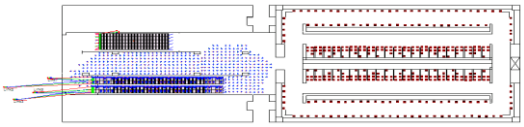
Level 4

Fig.12: Simulation status at 7 mins

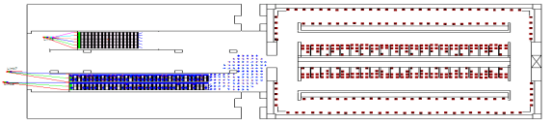
Progressing through the simulation, at 8 mins and 55 secs, Level 1 was vacant and the total number of people evacuated was 1660 people. Additionally, at time 10 mins. and 10 secs., the total number of people exiting the system was 1798 people where all toilets/ablutions areas in all levels were vacant and the only people left in the system are those on the escalators or waiting to get on the escalators with no queues seen at the staircases since all people in level 1 had already evacuated. Fig. 13 shows the simulation status at time 10 mins. and 10 secs.



Level 1



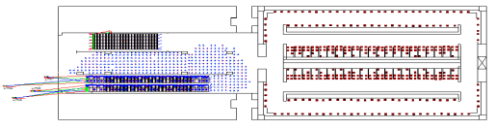
Level 2



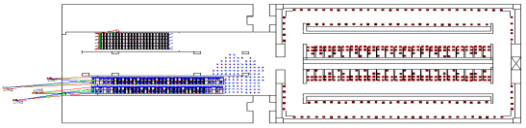
Level 4

Fig. 13: Simulation status at 10 min and 10 sec

At time 12 minutes and 23 seconds, Level 4 was evacuated and the lower escalator delivered the last person to Level 2 since no people were noticed to use the staircases between levels 4 and level 3. Thus, the total number of visitors who left the system was 2029 people. At this point only Level 2 is noticed to have people queuing at the escalator to exit the washroom system Fig. 14.



Level 2 (time = 12 minutes and 23 seconds)

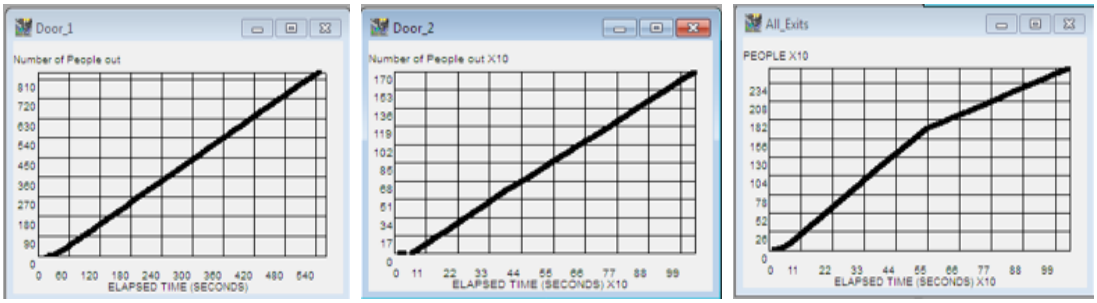


Level 2 (at time = 15 minutes)

Fig. 14: Simulation status for Level 2

At 15 minutes, the simulation results show that less people are queuing at the bottom of the escalator on Level 2, and the total number of people who evacuated the system was 2308. Finally, at 17 mins. and 6

secs., the washroom units were completely empty and the number of people out of the system was 2529 with an average of 833 people on each level except Level 3 which had no one using the washrooms. Fig. 15 shows the graphs of visitors exiting with time for each exit and Fig. 16 shows 3D views of the washroom unit.



Stairs Escalator Both

Fig. 15: No. of people vs. time for the whole washroom unit.

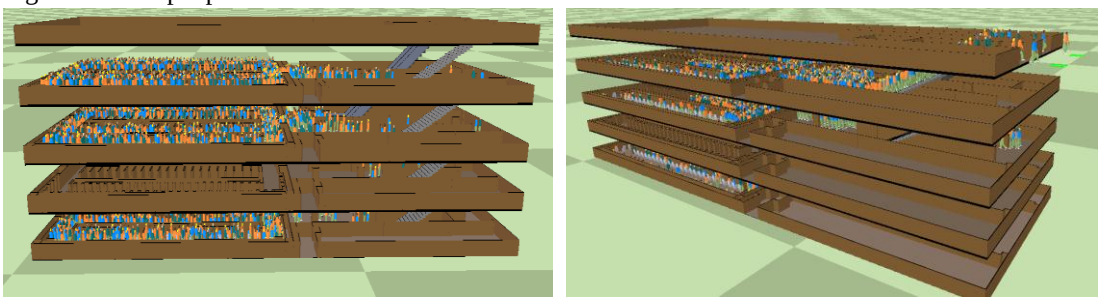


Fig. 16: Simulation Results: 3D view showing the connection of the four levels.

Conclusion

From the data collection, observations and simulations, this study provides the following recommendations:

Use signage to warn and direct people away from overcrowded areas.

Provide emergency exits.

Reduce capacity to guarantee the safety of people during crowded and emergency situations.

Train staff during emergencies in the underground washroom facilities, which is essential in accordance to an evacuation plan.

Support the development of standards, such as building standards. The multicultural and diversity of people provides a fertile area of research especially in the development of standard, such as building, social … etc.

In conclusion, a proposed model for the flow of people in and out of washroom unit 9 at Al-Masjid An-Nabawi was implemented and simulated. The simulation provides the nature of flow of the people in and out of the washroom unit during peak times. The proposed model was simulated using MATLAB and validated against the data collected. The model provided a close resemblance to the real data collected.

In addition, a case study for simulating an evacuation scenario was done using buildingEXODUS simulation software. From the evacuation simulation results, it is observed that more investigation is needed for an evacuation plan to guarantee the safety of crowds and to provide recommendations for better layout arrangements. Future work on simulating different scenarios must be done in order to provide an optimized toilet/ablution layout for the washroom units. Finally, this work recommends the need for an evacuation plan of crowded washroom units as well suggests rearrangement of toilets/ablutions areas in order to avoid any catastrophe for any unexpected situation.

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Evaluation of Services Offered to the Pilgrims in the Airports: a Comparative Study

Sameer Sha'rawi , Mahmood Al-Jamal , Rami Almwari , Abdullah Al-Hawsawi
The Custodian of the Two Holy Mosques Institute for Research of Hajj and Umrah

Abstract

Airlines are considered as the primary ways of access for Hajj, where pilgrims coming by airlines represent more than 93٪ of the total pilgrims from abroad. These vast numbers of aboard pilgrims arrive into two main Airports, King Abdul Aziz International Airport in Jeddah and Prince Mohammad Bin Abdul Aziz International Airport in Madinah. Both airports receive approximately 25 flight per hour, which means a flight every 2:30 Minutes. This is a bottleneck in the influx of pilgrims to Saudi Arabia and gives a great importance to the need for efficiency and speed in the procedures in both airports. This study aims to achieve several objectives :

- Study of the times it takes pilgrims to finish all the procedures from the moment of arrival till departure by bus, by studying a large random sample of pilgrims .
- Present the different times that were obtained from the two airports in the frequency distributions and offer a graphic form of data in order to verify whether Outliers time and ratios of pilgrims in these periods are normal.
- Compare the results obtained from both airports in order to determine the efficiency and speed of services to pilgrims.
- Evaluate the procedures in King Abdul Aziz Airports in Jeddah by comparing the results from the last three years.
- Show all the results using what has been known as Information Visualization, using the latest software package in order to help and support the decision making.

Full text is available in Arabic section under this title

تقييم الخدمات التي تقدم للحجاج في المنافذ الجوية
دراسة مقارنة

Experience of public administration for the Hajj and Umrah and Visit in applying Business Intelligence Technology

Majed Al-Bejawi

Principality of Madinah Region

Abstract

General administration for Hajj and Umrah and visit is concerned with the operation and follow up with government, private and Voluntary agencies in order to help complete their tasks as required and work to raise the level of services provided for pilgrims and visitors in Madinah .

Therefore, the General administration for Hajj and Umrah and visit felt that working in line with their procedures is achieved by using the "business Intelligence approach" and becoming a leader in developing their services and procedures and initiatives to overcome the real challenges to achieve optimum utilization of the raw data available to it or to other clients. This can be obtained for the (administration) in order to turn it into valuable knowledge to support decision making..

Full text is available in Arabic section under this title

تجربة الإدارة العامة للحج والعمرة والزيارة في تطبيق تقنية

Business intelligence - ذكاء الأعمال

Sixth theme:

Papers on the Role of Efforts and Experience in Service Development

The Pilgrim's Gift

Mansour Al-Amer

Haji and Mu'tamer's Gift

Abstract

The Pilgrim's Gift Charity Association is a non-profit association established in 22/6/1430AH under the supervision of the Ministry of Social Affairs. Its main objective is to provide charity services free of charge to the pilgrims (of Hajj and Umrah) and visitors, including providing and distributing meals to feed the pilgrims and visitors.

Each year, the association provides more than 15 million different services to over 3 million guests of Allah (May all the pr and thanks be to Allah).

The association has concluded several innovative programs that assist Hajj and Umrah pilgrims and visitors in performing the required rituals comfortably both at the spiritual and physical level. More than 85 different service programs have been implemented so far, divided into five main categories: "Nourishment for the Soul", "Nourishment for the Body", "Care Programs", "Hospitality Programs" and "Deputisation Programs".

The submitted paper aims to demonstrate the extraordinary services provided by the Pilgrim's Gift Charity Association which are related to the "Nourishment for the Body" Program, which consists of providing meals to the pilgrims and visitors.

This paper is comprised of seven main elements:

The First: Stating the objective of the "Nourishment for the Body" Program and what the Association seeks to achieve by implementing it.

The Second: Mentioning the branches of the program and its requirements, as well as the strategies and steps taken to implement it and the attributes of those working in it. In short, presenting the plan for "Nourishment for the Body" and giving a brief overview of it and of the services provided through it, in addition to, a short description of a number of products related to the program.

The Third: Demonstrating the successful experience of serving the pilgrims and visitors through the "Nourishment for the Body" Program during the last ten years.

The Forth: Presenting a set of innovative and creative ideas and unique products that were provided by the Association to serve the guests of Allah, as well as giving a brief overview of some of the Association's products during the last ten years.

The Fifth: Presenting comparison tables to show the differences between using traditional methods and innovative methods in providing meals for the guests of Allah, based on the Association's experience with both methods and the effectiveness of each method on the recipients.

The Sixth: The verified statistics of the Association's study centre, which shows the number of services provided in relation to the number of recipients.

The Seventh: Citing the major problems and threats posed by food safety and hygiene of the food provided to the guests of Allah, then proposing several solutions to address future challenges.

With this, the paper seeks to highlight the positive results acquired from combining between both the theoretical and practical aspect of providing services which the Association has spent the last ten years implementing. Thus, gaining experience and knowledge that combines history with modernity, and heritage with civilization though which the Association aims to design exceptional food programs and unique services that can be applied on a mass scale within several organizations working in the field of serving the guests of Allah.

With this presentation and discussion, clear and common goals are achieved with the other cooperating organizations working in the field of providing food and hospitality to the pilgrims and visitors,

and thus proving to be one of the successful, innovative initiatives, verified both academically and on the ground in research studies of Hajj, Umrah and Visitors of Medina, by the will of Allah.

Full text is available in Arabic section under this title

هدية الحاج والمعتمر

The Efforts of the Medina Centre for Research and Studies in Hajj and Umrah and visit seasons

Saleh Salamah

The Medina Centre for Research and Studies

Abstract

The Medina Center for research and studies is keen to achieve a number of objectives that serve the visitors to the city of Medina who come to the Hajj and Umrah seasons, through a variety of means for the establishment of specialized exhibitions and the issuance of scientific books. The center issued a Book titled, "Medina History and Landmarks" in different languages: Arabic, English, French, Turkish, Urdu, Indonesian, and Persian, taking the reader on a tour of Medina by words and images.

This is meant to be the trip's high point, tracing events back to ancient times, so as to read a brief history of the city from its inception to the modern-day, in order to familiarize the reader with names, virtues and boundaries .

It is also meant to familiarize him with the city's shrines and famous historical places: The Prophet's Mosque and the Mosque of Quba, Baqi and the martyrs of Uhod; and to present their historical and associated events, thereby showing in the review, the reality of conspicuous aspects of a life of faith, from a cultural, social, economic and physical standpoints, so as to draw a true image of the city in the past and present, and the evolution of its civilization.

Full text is available in Arabic section under this title

جهود مركز بحوث ودراسات المدينة المنورة في موسمي الحج والعمرة والزيارة

Waste management in Madinah and its relationship with Hajj and Umrah seasons

Fawaz Al Marwani

Al Madinah Regional Municipality

Abstract

This paper addresses waste management in the city of Medina, intended to combine the treatment and disposal of waste, in order to reduce the negative impact of waste on the environment and society. It explains the integrated waste management stages and services for the process of combining "hygiene", as well as transportation and assembly phases of the mediator, sorting and recycling; and shows that final disposal of waste is recyclable.

Through the application of integrated waste management systems, projects are working together to achieve the maximum benefit from the process of waste management, such as the establishment of waste disposal sites (Maradim) and engineering cells - transfer stations - sorting stations - Investment construction waste projects and demolition - incinerators stations for safe disposal of the bodies of dead animals or important and confidential papers - gas investment projects - processing - tire washing stations.

The area covered by the contract consists of 7 sub-municipalities and 6 municipalities of the suburbs. It appeared from the qualitative and quantitative analysis of the data on weights generated by Medina waste during the period from 2008 to 2013, that the total amount of waste contained in the general disposal area during this period in tons is (4,585,991), which means an annual average of (764,331 tons) each year and an average daily rate of approximately (2,100 tons), and noting that the population of the city of Medina is (1,200,000) people, according to the latest statistics, this translates into a daily average per capita production of (1.6) kg of waste.

The rise in the number of pilgrims and Umrah performers during the seasons of Hajj and Umrah throughout the year, increases the preparations and logistics regarding hygiene services, with an average of 15٪ of employment and 12٪ of the mechanisms to do cleaning services, so as to raise the performance of cleaning operations on all levels of service, and confront the increase of population during that time of the year. The number of working hours is increased by 13٪ during the period of intensification of Ramadan, and 17٪ during the period of the intensification of the pilgrimage. Also, the

percentages increase for the number of large compressors, with an average of 22٪ in Ramadan, and 31٪ in the pilgrimage season, while the preparation of small compressors by 46٪ in Ramadan rate rise, and 23٪ in the pilgrimage, as well as the high numbers of impellers and vacuum ratios, to do various services to the process of cleaning to raise the overall performance of the cleaning process.

Full text is available in Arabic section under this title

إدارة المخلفات بالمدينة المنورة و علاقتها
بموسمي الحج و العمرة

Community Participation and Contribution in the Promotion of Public safety for the Visitors of the Two Holy Mosques

Abdullah Al-Qahtani

General Directorate of Civil Defense

Abstract

Community participation is the most important image of members' participation in achieving public safety, value, security, and the prevention of risks from all other sources of threats to humans and property, whereby this value becomes with the other values of citizenship, an impregnable wall to protect the five basic necessities of man, and achieve prosperity and development in all areas of life.

However, the contemporary reality finds that the practice of values in the Arab and Muslim countries in general, especially in the Arabic Gulf suffers from this crisis as a result of the spread of the values and behaviors that result from a breach of security that impedes development in all its dimensions, including: failure to comply with the system, dependency and lack of participation, negativism and defeatism, indifference and other (Ghaban 2009, p. 58). Othaimeen points out that Saudi society was known to volunteer, and believe in the sterling values of religious, humanitarian, social and cultural perspectives, but it is still an individual, spontaneous approach. Nevertheless, these are qualities, significant for the sake of organized volunteer efforts. (Uthaymeen 1428.(

It was also noted that with respect to social responsibility, the literature addresses the meaning of the public-private sector partnership only as it focuses on aspects of security. This is a narrow concept. Social participation is a combination of all the efforts of government and civil society, in addition to State agencies and relevant establishments for the prevention of various risks. This enhances the safety and security of society and sustains it, in what might be called the institutional integration .

The loss of this integration, albeit unintentionally, undermines and hampers efforts carried out by educational institutions and other organs of the state in all areas, and may be the cause of the spread of chaos and instability and public safety "(Al-Baz 2007.(

A doctoral study identified the level of the values of citizenry among young people and their contribution to the strengthening of Preventive Security, and significant results were obtained, including the fact that the levels of social participation and value systems of a sample taken were weak (Al-Aboud 2011.(

In spite of this fact, the researcher believes that the basis of this value system is rooted in the hearts of the sons of this beloved country. Investing in this system requires all the components of citizenry (all state entities and institutions, private sector organizations, citizens) to work together to create the right climate to make this value harmonize with the rest of the system and with other values practiced on the ground motivated by self-censorship. All of this is undergirded by a sense of pride while doing service to the nation for the public's interest .

There is an honorable model of participation practiced on the ground in order welcome guests and visitors of the Two Holy Mosques throughout the year, such as a project to maximize the House of God based upon a constellation of youth of this country, volunteers with agencies and state institutions, civil defense, and the Ministry of Health and various other charities.

Therefore, the problem of this research is illustrated by answering the following main question: What is the extent of the value of social participation in the promotion of public safety for the guests of the Two Holy Mosques?

Full text is available in Arabic section under this title

المشاركة المجتمعية وإسهامها في تعزيز السلامة العامة لضيوف الحرمين الشريفين

Study of beneficiary satisfaction measurement of Saudi Red Crescent authority services during the pilgrimage season 1435h

Hasan Nafea , Mohammed Al-Harim , Hashim Baunes , Ibrahim Alyamani
Ahmed Alkhorisi , Khaled Al Hobshi , Rasheed Al-Eid
Saudi Red Crescent authority

Abstract

Study Objective:

Researcher team aims to measure the degree of satisfaction of the Saudi Red Crescent Authority services during the pilgrimage season in 1435H. Those who required medical help from dispatching operations which at Makkah city and holy places, in order to know the level of beneficiary satisfaction. Also, to identify his opinion about positive and negative aspects.

Method:

A qualitative study based on the investigative method by using innovative tool to make phone interviews with emergency medical services seekers during pilgrimage season within the holy city and holy places region. It started at 1-12-1435H. Moreover, the research team could not finish the study at the third period at 8/12, also, all periods at 12/12.

Results:

Research team could measure 10٪ (1125 beneficiary) of 11156 beneficiary. These who needed for medical help thought dispatching operations of Saudi Red Crescent Authority at Makkah city that know holy city. The studied data shows that some of them could measure their opinion about satisfaction. Therefore, they had the acceptance to participate in the phone interviews that was 56٪ (302) which very satisfied of the serveries. There were not satisfied about 26٪ (139), while 6٪ (34) could not specify their opinion. On the other side also 6٪ (30) were dissatisfy. Moreover, there were 6٪ (32) very dissatisfy. Therefore, the researcher team were trying to know beneficiary's opinion about all different work circles of emergency medical dispatching operations, which starting from the moment of receiving the call until the arrival of the patient to the hospital.

Conclusion:

The result appears from the study consider was good. In addition, the results gathered were very important. Therefore, we can be use it to comparing for feature studies.

Recommendations:

Increase the effectiveness and improving dispatching operation program, In addition, initializing strict operational system for data.

Increasing the study sample consider this study to will be continues for several more years to get distinct results.

Full text is available in Arabic section under this title

دراسة قياس رضا المستفيدين من خدمات هيئة الهلال الأحمر السعودي - دراسة أجريت خلال موسم حج ١٤٣٥هـ