OVERCROWDING
AND
THE HOLY MOSQUE

MAKKAH, SAUDI ARABIA

Thesis Submitted for the Degree of Ph.D.

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إهداء

إلى روح والدي ... ، أهدي هذا العمل
الذي كم تمنيت أن أطلعه على أول نسخة منه .
وللـه ... شكري لمولى العلي القدير أن مكنه
من أن يفرح بحصولي على درجة الدكتوراه في
العمارة من جامعة نيوكاسل بالمملكة المتحدة قبل وفاته
يوم الأحد الموافق ٩ محرم ١٤٢٨ﻫ ، فهذا العمل
قرأت نتاج توجيهاته وتوصياته لي حكم تواصله
جل حياته في خدمة الحج وحجاج بيت الله الحرام .

أستهل يا لمولى عزوجل أن يجعل من هذا العمل علم
نافع ينتفع به ، وأن يرزقنا جميعاً أجره وثوابه ...،
فرحمة الله عليك يا والدي ...، فكم افتقدتك ..
فضرعي إلى الله العلي القدير أن يجمعنا بك في فردوس
الأعلى مع النبيين والصديقين والشهداء والصالحين
وحسن أولئك رفيقاً ...،

ابنكم
وائل ...

بسم الله الرحمن الرحيم

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيمِ

إِنَّ أَوَّلَ بَيْتٍ وُضِعَ لِلنَّاسِ لَلَّذِي بِبَكَّةَ مُبَارَكًا وَهُدًى لِّلْعَالَمِينَ ﴿ ٩٦ ﴾

فِيهِ آيَاتٌ بَيِّنَاتٌ مَّقَامُ إِبْرَاهِيمَ وَمَن دَخَلَهُ كَانَ آمِنًا وَلِلَّهِ عَلَى النَّاسِ حِجُّ الْبَيْتِ مَنِ اسْتَطَاعَ إِلَيْهِ سَبِيلًا وَمَن كَفَرَ فَإِنَّ اللهَ غَنِيٌّ عَنِ الْعَالَمِينَ ﴿ ٩٧ ﴾

"And thus We have revealed to you (O Muhammad, pbuH) a Qur'ân in Arabic that you may warn the Mother of the Towns (Makkah) and all around it, and warn (them) of the Day of Assembling of which there is no doubt: when a party will be in Paradise (those who believed in Allâh and followed what Allâh's Messenger, pbuH, brought them) and a party in the blazing Fire (Hell) (those who disbelieved in Allâh and followed not what Allâh's Messenger, pbuH, brought them). In it are manifest signs (for example), the Maqâm (place) of Ibrâhîm (Abraham); whosoever enters it, he attains security. And Hajj (pilgrimage to Makkah) to the House (Ka'bah) is a duty that mankind owes to Allâh, those who can afford the expenses (for one's conveyance, provision and residence); and whoever disbelieves [i.e. denies Hajj (pilgrimage to Makkah), then he is a disbeliever of Allâh], then Allâh stands not in need of any of the 'Âlamîn (mankind, jinn and all that exists)" [3:96-97]

الملخّص

المسجد الحرام في مكة الإتّجاهَ الذي إليه يُتوجهُ كُلّ المسلمون خمس مراتٍ يومياً في صلَواتهم المفروضـة. بالإضـافة، إلى أن هذا الموقع يزُورهُ سنوياً ملايينَ المسلمين كرحلـة حياتِهم الدينيـةِ، وزيارته إلزامية لكُلّ مسلم كرحلة العمر. لذا يتواجد في هذا المكان الفريدِ خُليطٌ من البشر من كل الجنسياتِ والثقافاتِ المختلفةِ بشكل مستمر. العدد الكبير من الناس الذي يَشغل مبنى المسجدِ الحرامِ في الوقت نفسه له أسبابٍ مثل بَعْض النشاطاتِ والتي يُمْكِنُ فقط أنْ نُؤدّي وبشكل خاص في أماكنَ داخل هذا المبنى، وفي ترتيب معيّن. في الماضي، كان الحَلّ دائماً أنْ يُوسّعَ المبنى حينما تظهر مشكلة إزدِحام. تَحْملُ هذه الإطروحةِ فكرة بأنَّ هذه الممارسةِ التقليديةِ لَمْ تَعُدْ الخيار العملي كلما ظهرت مشكلة إزدحام لاسيما وأن حدود المبنى تَتحد والحدودَ الطبيعية للموقع؛ الفَهْم وإدارة مشكلةِ الإزدِحام بطريقةٍ عاقلة هي الحَلُّ الأكثر ملائمة.

والبحث إستهدفَ تَطوير فَهْم شـامل لمشكلةِ الإزدِحام في المسجدِ الحرام. وهذا يَصِلُ إلى تفسير بخصوص طبيعـةٍ ومدى مشكلةِ الإزدِحـام، ويُميّزُ ويَدْرسُ الأسبابَ المحتملـة وراء هذه المشكلةِ، وتُقيّيمُ النتائجَ المحتملة للإزدحام في حالة المسجدِ الحرام. ويُعْتقدُ بأنَّ مثل هذه المعلوماتِ سَتُساعدُ الجهات المسؤولة عن المبنى لتوفير جوّ مريح وآمن للمُصلّين والزائرين ، ليتمكنوا منْ أن يُؤدّوا واجبـاتِهم الدينيـة بمستوى عـالي مِنْ الإرتباطِ الدينيِ. وللدراسـة أهميـة أوسـع، حيث تتعرض إلى مظاهر السلوك البشري الإجتماعيةِ والثَقافية العامّةِ ضمن الأمـاكن المعماريـةِ التي تُخصصُ لوظيفة خاصّة. ويَتعلّقُ الموضوعُ الآخر للبحثِ بالمعاييرِ الطبيعيةِ التي تُطلَب لحركةِ الحشودِ الكبيرةِ ضمن فراغاتٍ محصورةٍ.

ولكي تجْمعَ البياناتَ وتُلاحظ المشاكلَ المتعلقة بإستعمال المسجدِ الحرام ، ثم إختيار طرق البحث المستخدمة فـي الدراسـة كالإستقـاء، والـذي إستهدفَ الحُصُـول علـى آراء المستعملين، تعليقـات، وإقتراحات للتحسين. وقد أستعمل أيضـاً لِدراسَة السلوك البشري العامّ ولتَحـرّي أنماطِ الحركةِ داخل وحول المسجدِ الحرام في الأوقاتِ المختلفةِ مِنْ العام. بالإضافة إلى تَبَنّى المسحَ الإحصائيَ الآخرَ لِدراسَة أنماطِ السلوكَ (وبمعنى آخر ، تقنية النمط الفراغي ، والتي طوّرَت في مختبر النمط الفراغي في الكليَّةِ الجامعيةِ بلندن) والذي يُستَعملُ لإستيعاب البياناتِ العدديةِ عن حركاتِ الناس لكي تَخْلقَ نماذجَ المحاكاة بالحاسوبِ التي تُزوّدُ فَهْم إحصائي لحالات إحتمال المخاوف. الإختلافاتِ بين نماذج الخَطـوط المحوريةِ، إشـارة إلى نمط إستعمـالٍ مختلفٍ ضـمن الفراغ. وقد وُجِدَ أنه بينمـا مشاكلَ الإزدِحام تَحْدثُ في البعض مِنْ أبوابِ المسجدِ الحرام وفي بعض الأماكن داخل المبنى والتي تَعتمدُ على وقت السّنة. هذا الإزدِحام يُؤثّرُ على بقوة بسلوكِ المُصلّين. وطبقاً لمعاييرِ التصميم الأمريكية والبريطانيةِ فإن مستوى الخدمـة لحالات المسجد الحرام بشكل عـام يمكن تصنيفها ضـمن مستوى

الخدمـة "F"، وأسوأ مِنْ ذلك في الحـالاتِ المعيّنـةِ، التـي تَعْنـي بأنّهـا تُـزدحَمُ بشـكل خطيـر. وتَستمرُّ الدراسةُ لمُنَاقشة أنَّ المسجد كنوع مبنى يَجِبُ أنْ تكونَ لـهُ معاييرُ تصميمِية خاصـة تضْمنُ الشروطَ المثالية للممارسةِ الدينيةِ الآمنةِ بحِساب السلوك البشري في الحالات المزدحمةِ. ترسم الدراسةُ أيضاً خطـة إستراتيجية قصـيرة المـدى والتـي يَجِـبُ أنْ نُطـوّرَ وتُثْلـى بخطـط بعيـدة المـدى لحْـلَّ مشـكلة الإزدِحام في المسجدِ الحرام

الإهداء

بكل سرور يسرني أن أهدي هذا العمل إلى حكومتي، حكومة المملكة العربية السعودية للدعم الذي قدمته لي من خلال بعثة الدراسات العليا . داعياً المولى العلي القدير أن يجعل فيه الفائدة للأمة الإسلامية.

(ترجمة للباب التاسع المحتوي على خلاصة الرسالة والتوصيات)

٩ . ١ خلاصة بحثٍ:

هذه الدراسةِ تُعهّدتْ بتَطوير فَهْم مشكلةِ الإزدِحـام في المسجدِ الحرام. وكَانتْ الأهداف كالتّـالي: لتَحرّي مشكلة الإزدحـام، خلفيتِها، طبيعتِهـا، ومداها، لتَمييـز ودِراسَـة أسبابِها، وذلك لتَقييم النتـائج المحتملةِ لهذه المشكلةِ، ولتَقديم التوصياتِ التي سَتُساهمُ في الإدارةِ الفعّالةِ للمسجدِ الحرام.

الدراسة قُسّمتْ إلى تسعة فصول. الباب الاول "١" قدّمَ مشكلةَ الإزدِحام في المسجدِ الحرام وخلفية هذه المشكلة. إضافة إلى ذلك، صوّرَ أهمية الدراسةِ، ووَصفَ أهدافها، وشكلَ إستراتيجية البحثَ، إضافة إلى أنه وضّحَ تركيبَ الأطروحةِ والنظرة العامّةِ .

الباب الثاني "٢" إختبر وحلل مشكلة الإزدحام فيما يتعلق بالمباني الدينيةِ، وبشكل مُحدّد المساجد. حيث أبرزَ بَعْض الحوادث التاريخيةِ في التاريخ العـالمي وكذلك في تـاريخ مكة المكرمـة ، الذي سَيُزوّدُ وجهة نظر أوسع للمشكلةِ. إضافة إلى أنه حلّلَ التعليمـاتَ الإسلامية ذات العلاقـة بالازدحام والمعاييرَ التصميمَية فيما يتعلق بالإزدِحام في المملكة العربية السعودية وفي بعض البلدان الغربيةِ الأخرى. ويَستنتجُ هذا الباب بأنّ المباني الدينيةِ يَجِبُ أنْ تُبنَى مَع درجة هامّة مِنْ العنايةِ في هندستها المعماريةِ، التي تُساعدُ على خَلق بيئة مريحة للعباد بالإضافة إلى وسائل السيطرةِ لمجهزي الخدمةِ.

الباب الثالث "٣" السلوك البشري حيث نوقشَ كعامل مهم في السَيْطَرَة على حركةِ الحشودِ. فهنـاك العديد مِنْ العوامل التي تُؤثّرُ على السلوك البشري وقد يكون حرجاً في حالةِ ما طبق على الدين الاسلامي، الامر الذي يُؤثّرُ على سلوكِ المسلمين خلال إتبـاع أوامره وتعليمـاتِه. علـى سبيل المثال، طبقاً لبَعْض الدِراسـاتِ النفسيةِ الغربيةِ ، يَجِبُ دائمـاً أنْ تُبقي مسافة تسمى بالفضـاء الشخصـي بين النـاس . بينما الثقافة الإسلامية تُشجّعُ المسلمين لِكي يَكُونوا قريبين من بعضهم البعض، خصوصاً عند الانتظام في الصلاةِ.

مكة المكرمة مجتمع مُخْتَلَط ثقافياً. وبمرور الوقتِ، إضافة إلى الزيارات أثنـاء موسم فريضـة الحجّ طوّرتْ خصائصَ خاصّة في المسجدِ الحرام، الأمر الذي يُميّزُ مكة المكرمة عن المُدن الأخرى؛ هذا الامر أيضاً يُؤثّرُ على سلوكِ الحشودِ. حيث تَخْلقُ الحشودُ قوّةً، ولذا فالإزدِحام يَجِبُ أنْ يتم التعاملَ معـه بعنايـة. هنـاك بَعْض الخصـائص التي عرّفَت مِن قِبِل علمـاء الإجتمـاع التي تتميـز بها أنـواعَ الحشـودِ. وهناك علاقة قوية بين الهندسة المعماريةِ والفراغ الامر الذي لوحظ وسُجّل فـي كافة أنحـاء التـاريخ. حيث يَعْكسُ النـاسُ عاداتِهم دائمـاً وتُثقّفُ في بيئتِهم الأقرب، والعلاقة بين النـاس والمبـاني قويةٌ جداً. إنّ المسجدَ كونه المركز الإجتماعي والديني الرئيسي فـي المجتمعـاتِ الإسلاميةِ لـه مِنْ الأهمية الخاصّةِ.

التاريخ يُرينا بأنّ الإزدِحام لَيسَ ظاهرة جديدة في الإسلامِ. حيث أنه سجل حتى قبل ظهور الاسلام، فمكة المكرمة كَانتْ المركزَ الدينيَ وهو المثالَ الأكثر حدّةً على مثل هذا الإزدِحام. ركزت هذه الدراسةِ على تسجيل الوقائع عند ظهور الإسلام، ودَعوة النبي إبراهيمٍ (عليه السلام)، فإستمرَّ الدين بوصول النبي محمد (عليه السلام)، وإنتهى بالإسلامِ في شكلِه الحالي. والنتائج من ذلك أن السلوك الاجتماعي للحجاج كان له تأثير بعيدِ المدى على العاداتِ والثقافاتِ لمكة المكرمة ، فكون أغلب سكان المدينة هاجرَ أصلاً مِنْ البلدان الأخرى تَجْعلُ هذه الحقيقةِ مجتمعَ مكة المكرمة إستثنائياً قادر على تَلْبية احتياجاتِ الحجاجِ.

الباب الرابع "٤" رَكَّز على المسجدِ الحرام في مكة المكرمة كدراسة حالة. بالرغم من أن بنايته فريدة ما زال المسجد الحرام يَعمل كمسجد وفي حد ذاته يَتوافقُ مع الخصائص الأساسيةِ لهذا النوع من البنايات. الدراسة حللت المسجدَ، وهو البناية الدينية للدين الإسلامي. حيث طوّرَ هذا النوع مِنْ البناياتِ تصميمِه الخاص وتخطيطه لمعايير إستهدفت تَأثيث جوّ روحي مريح للمُصلّين. إنَّ المسجدَ الحرام مكان خاصّ جداً لجالياتَ إسلامية في جميع أنحاء العالم. ثَبّتَ ان هناك بعض العناصر داخل هذا المبنى تَعتبرُ مقدّسة ومُرتَبِطة بالمناسكِ الدينيةِ المعيّنةِ التي لا يُمْكِن أنْ تُؤدّي في أيّ مكان آخر سوى المسجد الحرام. فعمل التوسّعَ وإعادة البناء الذي نُقلا على المسجدِ الحرام ومحتوياته يَشْهدان بمرور الوقت إلى الجديةِ، الامر الذي به واجبِ الحمايةِ المُعتَّبَرُ مِن قِبل المسلمين وزعمائِهم على مر الأزمان، فالمواقع البؤريةِ (الدينية) داخل المسجدِ الحرام تجَذبَ المُصلّين والزوّارَ، فيُولِّدُ إزدِحام غير متوقّعَ عند هذه المواقع. بالإضافة إلى سلسلة النشاطاتِ المؤداة مِن قِبل المُصلّين والتي تُؤسّسُ نمط حركةِ فريدِ داخل المبنى.

مكة المكرمة ، المدينة القديمة التي تَأوي المسجدَ الحرام مدينة تقع في وادي إبراهيم. ومؤخراً، طوّرتْ مكة المكرمة إلى مركز حضاري دولي مثالي مَع أكثر مِنْ مليون شخص يَعِيشونَ ضمن حدودِ المدينةِ. دُعِيتْ هذه المدينة بأسماء مختلفةٍ بمرور الوقت؛ تَصِفُ البعضُ مِنْ هذه الأسماء الحالة السياسية أو الإجتماعية في ذلك الوقت وآخرى تَحتوي تضمينَ دينيَ. وكانَ الاسم المعروف دائماً بمدينةِ الحَشرَ التي عكستُ في البعض مِنْ الأسماءِ. البيئة المعمارية للمدينةِ شُكّلتْ بصلاتِها الدوليةِ والكميةِ الكبيرةِ من المهاجرين إليها مِنْ جميع أنحاء العالم.

باب ٥ يشرح طرق البحث المُخْتَلِفةِ والتي ثَبّتتْ لتَحليل السماتِ المميزة لهذا المبنى الفريد. النظرة وُصِفتْ كبحث متعدّد الطرق والتي تَستخدمُ التقنياتَ الإستقصائية المختلفة ليضمن ذلك تحليل مكاني. البيانات جُمِعتْ بإستعمال آخر الطرق العلميةِ، فزوّدَ دليلَ معيّنَ والذي يَدعمُ البياناتَ الأخرى فتم الحَصول عليها خلال الإستطلاعاتِ الإجتماعيةِ والتاريخيةِ. باعداد نمذجة حاسوبية لهذه الدراسةِ لتَوَقُّع نمطِ حركةِ المُصلّين داخل مبنى المسجدِ الحرام والمناطق المحيطةِ. هذه المعلوماتِ حُلّلتْ

إستعمال الحركةِ المكانيةِ للنـاس داخل المبنى. عندما قُورنتْ نتائجـه بالبياناتِ التـي جُمعتْ خـلال الإستقصاء، فأكتملت صورة أكمل مِنْ طبيعةِ الإستعمالِ تُزخرفُ وعوامل التَكيّف في المسجدِ الحرام أُسّسَ بهذه الطريقة.

الباب السادس "٦" قدّمَ نتائجَ الدراسةِ التي تم الحصول عليها مِنْ المسـح والمقابلاتِ البحثية. هذا التحليل ساعدَ لفَهْم السلوكِ وموقفِ المُصلّين في المسجدِ الحرام والإختلافاتِ المنزّلةِ. حلل هذا الباب ملاحظات أبواب المسجدِ الحرام في المواسم التي تحَدث ثلاث مراتٍ على السَنَةِ. هذه الملاحظاتِ كَانت فريدة؛ فكانت المرّة الأولى التي يُكمِلُ إستقصاءَ كُلّ أبوابِ المسجدِ الحرام. إضافة إلى ذلك، تم دْمجُ المقابلاتَ للدراسةِ كتجربة الإختصاصيين والخبراء ورَدِّودهم على مشكلةِ الإزدِحام في المسجدِ الحرام.

الباب السابع "٧" قدم التحليلَ المكانيَ للمسجدِ الحرام المبني بتحليلِ طرق النمط الفراغي، ليضمن ذلك تحليـل الخطـوط المحوريـة وتحليـل تقنيـة الأيزوفسـت "Isovist" البيـاني البصـري. وقدّمَت الحسـاباتَ أيضـاً للعمليـة الإخـلاء التي تُعـالجُ بالحالـةِ الطبيعيـةِ الحاليـةِ للبنايـةِ. أخيراً، صـوّرَ الباب حساباتَ الحركة التي ساعدتْ لتَمييز مستوى خدمةٍ مبنى المسجدِ الحرام وأبوابه.

الباب الثامن "٨" حلل نتـائجَ البحثَ فيما يتعلق ببعضها البعض وضمن المجـال الأوسع للمراجع. إضافة إلى ذلك، أجابَ على تساؤلات الدراسةِ. وميّزَ هذا الباب الإزدِحام كمشكلةِ في المسجدِ الحرام وخاصة في الأماكن المعيّنةِ وأوقاته التي يَحْدثُ بها وناقشَ أسبابَه. إضافة إلى الاستناد على النتـائج وتحليلِها فيما يتعلق بالمراجع العلمية.

تَبَيَّن أن الإزدِحام في المسجدِ الحرام كَانَ سببه العوامل التي تصنف ضمن أحد الأصنافِ الرئيسيةِ الأربعة وهي كالتّالي: إزدِحام سببه تصميم المسجدِ الحرام وعناصره، إزدحام سببه التعليماتِ الصادرة من قبل الوكالةِ الحكوميةِ التي تُشرفُ على الخدماتِ في المسجدِ الحرام، إزدحام سببه الأوامر والفكر الدينيِّ، وإزدحام سببه سلوكِ المُصلّين واسلوبِهم. الجدول ٩-١ يَصِفُ هذه العوامل بالتفصيل.

٩ . ٢ محددات الدراسةِ

تَتطلّبُ بَعْض القضايا التوضيحَ الآخرَ لكي يُمكِنَ لفَهْم مشكلةِ الإزدِحام في المسجدِ الحرام بالكامل. حيث تَتجـاوزُ هذه التفسيراتِ مجـالَ هذه الدراسةِ. هذه ليس بسبب قلة كفاءةِ الباحثِ، لكن بسبب طبيعةِ حالةِ البحثَ. هذه القضايا كالتّالي:

حقيقة البياناتِ: كما هو مذكور قبل ذلك، فالبيانات التي إستعملتْ في هذه الدراسةِ جُمعتْ بين عامي ٢٠٠١ و ٢٠٠٢. ومنذ ذلك الوقت هناك عِدّة مشاريع صيانةٍ طُوّرتْ وأُدركتْ في مبنى المسجدِ

الحرام التي لرُبَّما لها بَعْض التأثير المحدودِ على نَتائِجِنا. على سبيل المثال، إغلاق مدخل بئر زمزم في منطقةِ المطاف داخل المبنى سَيُؤثِّرُ على نمطِ الحركة بقوة في منطقةِ المطاف وسلوك المُصلّين في كافة أنحاء المسجدِ الحرام.

البياناتِ المدخلة: إنّ القضية الثانية هي صعوبةُ الوصول إلى البياناتِ ذات العلاقةِ، التي حدّدتْ مجالَ الدراسةِ لإفتراض السماتِ الوظيفيةِ والإجتماعيةِ والطبيعيةِ لإستعمال المسجدِ الحرام. حيث كَانَ من مستحيلَ على حد سواء دِراسَة قضايا إدارةَ هذا المبنى لِكي تَكُونَ عواملَ مهمة للتحليل والتُحقّقَ فيها.

حسّاسية جسمِ البحثَ: إنّ القضية الأخيرةَ قداسةُ المسجدِ الحرام، التي سبّبتْ لأغلب المقابَلين (المحاورين) الحذر في محادثاتِهم. علاوة على ذلك، البعض مِنْ أولئك المقابَلين فضّلوا إبْقاء هويتِهم مخفية بينما آخرون رَفضوا الكَلام معنا جملةً.

فالباحث حاول أنْ يُعوّض عن هذه النقائص بتَحقيق النَتائِج حَصل عليها مِنْ تحليل البياناتِ لكي تَعْكسَ الوضعِ الراهنَ على الأرض. قضايا الإدارةَ عولجتْ بمُرَاجَعَة التوثيق المتوفر بقسمِ أدلَةِ العملياتِ في المسجدِ الحرام. كُلّ القضايا التي تَبْدو مهمة سَتُساعدُ لإكْمال فَهْم مشكلةِ الإزدِحام في موقع الحجِّ المحتمل لأكْثر مِنْ بليون مسلم حول العالمِ. بالرغم مِنْ التقييداتِ، الإستنتاجات التالية يُمْكِنُ أنْ تُسْتنتج.

٩ . ٣ الخاتمة:

كَشفتْ المراجعةُ السياقيةُ للنتائِجِ التاريخيةِ لمبنى المسجدِ الحرام الرئيسي والمباني المحيطةِ تطور مشكلةِ الإزدِحام والأسبابَ الدينية وراء الظاهرةَ.

المسجد الحرام، الذي يُمْكِنُ أنْ يتيح المكان لأكْثر مِنْ ٥٠٠,٠٠٠ مُصلّي، وُجِدَ أنه في مستوى الخدمةِ ' F' لتدفق متوسطٍ مِنْ الناس الذين يَتطلّبونَ وصولاً إلى وخروج مِنْ المبنى بينما هو أسوأُ حتى مِنْ المستوى ' F' في بَعْض الأماكن والمواقع بؤريةٍ، فإبْتداءً مِنْ المستوى "A"، الذي عِنْدَهُ يُحرّرُ التدفقاً، ' B' عِنْدَهُ نزاع بسيط، 'C' عِنْدَهُ بَعْض القيودِ للإسْراع، ' D' يحدّدَ الحركةَ أكثر، ' E' حيث حدّدتْ الحركةَ للكُلّ ومستوى ' F' الذي عِنْدَهُ خَلط الحركةِ للكُلّ.

في أغلب أوقات السَنَةِ، وبإستثناء الفترات البالغة الذروةِ، بمعنى آخر، وقت الصلاةَ أثناء رمضان وفريضة الحجّ وصلاة الجمعة، مشكلة الإزدِحام وُجِدتْ الحَدَث في عِدّة أماكن معيّنة. عدد مِنْ هذه مواقعَ بؤرية داخل المسجدِ الحرام نفسه؛ وليسَ كُلّ النقاط المركزية أماكنَ إزدِحام.

يَدُورُ تركيزنا في الفتراتِ البالغة الذروةِ، يعني أثناء فريضةِ الحجّ وشهر رمضان ولدرجة أقل أثناء صلاةِ ظهر الجمعةِ، مشكلة الإزدِحام وُجِدتْ الحَدَث في العديد مِنْ الأماكن الأمر الملاحظ عن بقيّة السَنَةِ.

وقت ومكان مشاكل الإزدِحام داخل المسجدِ الحرام وُجِدَت مَتَفَاوُتة على مواسم السّنة. على سبيل المثال، المُصلّون فضّلوا زيَارَة الحجر الأسود أثناء موسم الحجّ أكثر من أي وقت آخر. فيما فضّلوا زيَارَة مقام إبراهيم (عليه السلام) أثناء موسم رمضان.

هذه نُوضّحُ بأنّ هناك إعتبارا للأهمية الدينية التي تَلعبُ دورا في سلوكِ المُصلّين والإزدِحام. وهناك، بالطبع، عوامل أخرى تَضمّنتْ الميزّات السكانية والخصائص الإجتماعية، مثل جنس المُصلّين، عُمرهم، حالتهم الإجتماعية، ومستواهم التعليمي. على سبيل المثال، إستعمالات الأراضَي داخل المسجدِ الحرام وتوزيع منطقةِ الصلاةَ يَميلان إلى التَأثير على المُصلّين الذكور أكثر مِنْ الإناث، خصوصاً موقع صلاة الإناث. الإستِعْداد للإزدِحام والإدارةِ الجيدةِ لمشاكل الإزدِحام المُمَيّزةِ سَيُخَفّضان خطرَ الاصابةِ لملايين المُصلّين حول العالم الذي يَستعملون هذه المبنى.

تخطيط المسجدِ الحرام الطبيعي لا يساند النشاطاتِ التي مَنْ الضَّرُوري أنْ تُؤدّي داخل المبنى. فعند التخطيط المكاني يحلّلَ فيما يتعلق بالنشاطاتِ المؤداة ونمط الحركةِ المطلوبِ، فهناك تداخل في نمطِ الحركة في بَعْض المناطق فأدت إلى مشكلةِ إزدِحام.

كُنّا قادرون على إستِنْتاج ذلك من أن تطبيق معايير التصميمِ الغربيةِ على المبنى سوف لَنْ تَكُونَ مناسبة بالضرورة للمسجدِ الحرام. فإكتشفَنا العديد مِنْ التشابهاتِ في تاريخ مثل المباني حول العالم. في الحقيقة، عِدّة إشخاص ماتوا بسبب حوادثِ الإزْحام ومن ضمنهم البعض المباني الدينيةِ، وهذه الأحداثِ يُمْكِنُ أنْ تَحْدثَ في المسجدِ الحرام إذا المشاكل لَمْ تدرس بشكل كافي.

إنّ التحليلَ المكانيَ للمسجدِ الحرام وحساباتِ النقلَ مِن قِبل الإختصاصيين يُشيران بأنّ مستوه في الخدمةِ مُصَنَّفُ كـ'E' حيث حركات الناس مقيّدة لكُلّ الأفراد على الموقع. نُصبحُ الحالة أسوأ مستوى في بَعْض الأبوابِ المعيّنةِ التي لها شعبية لدى الحجاجِ.

مفهوم الأمان في المباني العامّةِ في البلدان الغربيةِ وُجِدتْ لَتَزويد نموذج مناسب للإتّباع في هذه الحالةِ. وهو أنه يجب أنْ تُفْهَمَ تلك المعايير المُفصّلةِ قابلة للتطبيق إلى الأمان فيُكَيّفُ في الغربِ، ومَنْ الضَّرُوري أنْ يُعدّلَ لكي يُلائمَ المتطلباتَ المعيّنة للمباني الدينيةِ مثل المسجدِ الحرام.

البيئة المحيطةِ وُجدتْ للتَأثير على أزماتِ الإزدِحام بقوة في المسجدِ الحرام عند نقاط الدخول. التطوير الآخر وإعادة بناء المباني يُحيطان المبني الرئيسي سَتُساعدُ لإعادة صياغة نمطِ الحركةِ المكاني في المسجدِ الحرام وتُساعدُ المُصلّين لتُأدّية واجباتهم الدينية أكثر بكثير باعثة على الجوِّ الطمأنينة والراحة.

مستوى الخدمةِ "F" يُعتَبرُ أسوأ مستوى خدمةٍ، ويُشيرُ إلى مشاكلة إزدِحام. ففي حالة مثل المسجدِ الحرام وفي الحالاتِ المماثلةِ مثل جسر الجمرات في مشعر منى، يُمْكِنُنا أنْ نُميّزَ مستوى الخدمة

بشكل واضح ليكون الخدمةِ "F" ويزيد عن مستوى الخدمةِ "G" بحوالي ٢٢ شخص/متر/دقيقة وهو أقل مِنْ الذي وَجدنَا في المسجدِ الحرام.

٩ . ٤ التوصيات:

٩ . ٤ . ١ التوصيات العامة:

تَقترحُ الإستنتاجاتُ أعلاهُ بَعْض التوصياتِ، إنشاء إستراتيجية عامّة مستندة على نتائِج هذه الدراسةِ. هذه التوصياتِ يُمْكِنُ أَنْ تُساعدَ على تَخفيض خطر إزدِحام المُصلّين في المسجدِ الحرام. سَيُساعد على خَلَق جوّ ديني مريح الامر الذي يَعطي المُصلّين أقصى مستوى للإرتباطِ في واجباتِهم الدينية. تَهدّفُ هذه الخطةِ الإستراتيجيةِ إلى مُسَاعَدَة مقدمي الخدمة في المسجدِ الحرام لحل مشكلة الإزدِحام والتي يجب أن تؤخذ في الإعتبار. والهدفِ يُمْكِنُ أَنْ يُنجَزَ طالما أن بَعْض المتطلباتِ قد أكملتْ.

كما أن هناك عِدّة مشاريع قد صرح لها للبناء في المنطقةِ المركزيةِ لمكة المكرمة ، مثل مشروع الشامية في الجهة الشمالية للمسجدِ الحرام (بمساحة إجمالية حولي ٧٧٥.٠٠٠م٢)، ومشروع جبل عمر الواقع على الجهة الغربية للمسجدِ الحرام (بمساحة إجمالية حوالي ٢٣٠.٠٠٠م٢)، ومشروع جبل خندمة الواقع شرق المسجد الحرام (بمساحة إجمالية حوالي ٥٧٨.٠٠٠م٢). كُلّ هذه المشاريع سَتُوازنُ تدفقَ المُصلّين نحو المسجدِ الحرام، الامر الذي سَيُشجّعُ المصلّين لإسْتِعْمال كُلّ أبواب المسجدِ الحرام. ولكي يُنجزَ أفضل إستعمال لقدرةِ الأبواب يجب ربط الساحة الشمالية للمسجد الحرام بمشروعِ الشامية، والإختلاف الموجود بين المستويين يَجِبُ أَنْ يسوى. من ناحية أخرى فإن عرض الأبواب يَجِبُ أَنْ يُمثّلَ إحتياجَ المُصلّين وإستعمالِهم. فعلى سبيل المثال: باب السلام يَجِبُ أَنْ يَكونَ باب رئيسي مكون من ثلاثة أبواب نظرا للخلفية الدينية لهذا الباب وكون العديد مِنْ المُصلّين يُفضّلونَ إسْتِعْماله بينما نقطة الدخول التي تَثليه هي باب النبي (عليه السلام).

جميع برامج التوعية الجديدةِ يَجِبُ أَنْ تُزودَ لَتركيز المُصلّين على التوصياتِ الدينيةِ وكَمْ أن المسلمين يَجِبُ أَنْ يَتصرّفوا في مثل هذا الموقع المقدس. ويَجِبُ أَنْ يُحدّروا بالأوامر والمتطلباتِ الدينيةِ التي سَتُؤثّر على اسلوبهم في بيئةٍ شديدةِ الإزدحام. ويَجِبُ أَنْ يُطوّرَ هذا الامر ويأخْذ بالإعتبار الخلفياتِ الدينيةِ والثقافيةِ المختلفةِ للزوّار لإيجاد طريقة فعّالة لتَشكيل سلوكِهم بطريقة مناسبة.

المراقبة الإلكترونية والوعي بين الزوّار وهو نظام مراقبة فعّال يُخبرُ الناس عن إستعمالِ دائرة تلفزيونية مغلقة (CCTV) بالموقع وإعادة تركيبِ نظام تلفزيون يُمْكِنُ أَنْ يُساعد على انقاص مستوى الجريمة. بالإضافة الى نظام معلوماتٍ مركزٍ حول المسجدِ الحرام يَجِبُ أَنْ يُقدّمَ إلى المُصلّين لمُسَاعَدَتهم بينما هم في تلك المناطق. هذا النظام يَجِبُ أَنْ يرتَبِطَ بنظامِ الدائرة التلفزيونية المغلقة للمسجدِ الحرام ويَكُونُ مُدَاراً مِن قِبل مختصين بغرفة سيطرةٍ وتحكم وذلك سيُساعدُ المُصلّين

في بحثِهم عن المكان المناسب والمريح في المسجدِ الحرام لمُزَاوَلَة واجباتِهم الدينية. فاللونان الأحمر والأخضر يَجِبُ أنْ يُستَخدمَا لعَكس حالةِ الإزدِحام في كلّ باب.

والنظام اللوني قد يُستَعملُ للإشارةِ إلى حالةِ الإزدِحام في المسجدِ الحرام فيستعملُ اللونَ الأحمر والأخضرَ لعَكس الحالةِ في نقطةِ الدخول. فاللون الأحمر سَيُشيرُ بأنّ بابَ الدخولِ شديد الإزدحام، بينما اللون الأخضر سَيُشيرُ بأنّ باب الدخول ممكن إستخدامه، كما هو موضح بالشكل ٩-١. هذا سَيُساعد المُصلّين لاختيار بابَ وصولِهم بينما هم في الساحات الخارجية المحيطة بالمسجد الحرام. إضافة إلى أن هذا النظامِ سَيُساعدُ على تَخفيض مستوى الإزدِحام في نقاطِ الدخولَ ولتَوزيع الإستعمالِ على كلّ الأبواب طبقاً للقدرةِ الإستيعابية المصمم من أجلها. الحرّاس عند الأبواب يُمْكِنُ أنْ يشغلوا هذا النظام بالتنسيق مع غرفة المراقبة والتحكم لتَقرير متى يُوقفُ تدفق المُصلّين خلال بابٍ شديدة الإزدحامٍ.

نظام الألوان هذا يُمْكِنُ أنْ يُطوّرَ كنظام معلوماتٍ داخل المسجدِ الحرام أيضاً. فعلى سبيل المثال: كلّ مدخل يُمْكِنُ أنْ يُميّزَ بلون معيّن. هذا اللون يَجِبُ أنْ يتمدَ مِنْ المدخلِ إلى منطقة المطاف. فالعديد مِنْ العناصرِ يُمْكِنُ أنْ تُصبَغَ بإستعمال ذلك اللون، مثل جزء نظامِ الإضاءة، السجاد، وأقسام الأعمدةِ. إضافة إلى إمكانية أن تُخطّطُ كلّ الإشارات والمعلومات مستعملةً ذلك اللون نفسهِ.

خَلَق مناطق ممنوع الصلاة بها عند أبواب المسجد الحرام أمام كلّ باب سَيُساعدُ على زيادة تدفق المُصلّين عند مُغَادَرَة المبنى وتُخفّضُ مستوى الإزدِحام عند الأبوابِ.

عِدّة نقاط في الساحات الخارجية المحيطةِ يَجِبُ أنْ تنشأ لجَذب المُصلّين الذين ينتظرون عوائلُهم ورفاقُهم بجانب أبوابِ المسجدِ الحرام. هذه النقاطِ يُمْكِنُ أنْ تُستَعملَ كمراكز استعلامات أيضاً أو في بعض الإستعمالات الأخرى. كـ أن هذه النقاط ستكون مساعدة إذا المصلين مُمَيَّزها بالصور أو الألوان بدلاً من الأعداد.

سلالم الطوارئ الخارجية يَجِبُ أنْ تُبْنَى خارج المبنى ويَجِبُ أنْ تُوصلَ إلى الطابق العلوي وسطح المسجد الحرام اللذان سَيُستَعملان كوسائل الخروج عندما يَخلي المُصلّين مِنْ هذان المستويان إلى الساحات المحيطة.

تَقديم نظام جدولة سيُساعدُ لتَوزيع الطائفين في منطقة المطاف والمُصلّون الذي يُؤدّونَ نسك السعي في المسعى على الطوابق الثلاثة، الطابق الأرضي، الطابق العلوي وسطح المسجد الحرام. و بمراعاة اختيارات المُصلّين، إعتباراتهم الدينية، المتطلبات طبيعية، والخلفيات الثقافية التي سَتَسْمحُ للإستعمالات القصوى لكلّ فراغاتِ المسجدِ الحرام.

الممر الرابط منطقة المطاف بالمسعى لوحظ أنه يستخدم أكثر من باقي الممرات في المبنى، الامر الذي يَجِبُ أنْ يُميّزَ بشكل واضح لكي يُساعد المُصلّين الذي يَنتقلونَ مِن منطقة المطاف إلى

المسعى. إضافة إلى أنه يَجِبُ أَنْ يُوصِّلَ بطريقة ما لِيَأْخُذُهم إلى نقطةِ بدايةِ السعي لكي تُخَفِّضَ الحركة الغير ضرورية وتُساعِدُ المُصلين لمُزاولةِ واجباتِهم الدينية.

يَجِبُ تطوير برنامج تدريبي خاصّ لكُلّ مستخدمي المسجدِ الحرام والذين يُعلّمونَهم كَيفَ يَتعامِلونَ مع المُصلين في الحالاتِ المختلفةِ ويُحَسِّنونَ مهاراتَ إتصالهم.

يَجِبُ تُطويرَ نظام لتَغْطِية منطقة المطاف والساحات الخارجية المحيطة بمبنى المسجد الحرام ، الامر الذي سَيُمكِّن المُصلين من إسْتِعْمال هذه المناطق في أيِّ وقتٍ من اليومَ. إضافة إلى أنـه سَيُخَفِّضُ مشكلة الوهجَ التي تُسبّبُ الصعوباتَ لكل من المصلين والعاملين. إ إلى كونه سيمنع تواد مياه الأمطار على الأسطح التي تتسبب في مشكلة الإنزلاق وعى الأخص بمنطقة المطاف.

حيث أن الوظيفةِ الرئيسيةِ للمسجدِ الحرام هي الطواف، وكون أن عدد كبير من علماء المسلمين أكدوا على أن الصلاة في أي مكان بمكة المكرمة لها نفس الأجر والثواب من الله سبحانه وتعالى فيجب تشجيع المصلين على إستعمال أي مسجد للصلا بدلاً من الإزدحام في المسجد الحرام.

منطقة صلاةٍ يَجِبُ أَنْ تجهز للمُصلين لاداء صلاةِ الإنتهاء من الطواف كبديل للصَلاةِ بجانب مقام إبراهيم (عليه السلام). هذا سَيُساعِدُ لإزالةِ الإزدحام في منطقةِ المقام. هذه منطقةِ الصلاةِ الجديدةِ يُمْكِنُ أَنْ تبْدَأ داخل المسجدِ الحرام وراء مقام إبراهيم.

كُلّ الأبواب في منطقةِ المسعى يَجِبُ أَنْ تُغْلقَ في الوقتِ المحددِ لتَجَنُّب إختلاط المصلين أثناء الدخول أو الخروج بالساعين المؤدين لنسك السعي بمنطقة المسعى .

التعليمات يَجِبُ أَنْ تحث المصلين على إبقاء الممرات خالية من المصلين في أي وقت. كما أن أية خطط مستقبلية لمشاريع تطويرية يجب أن تأخذ بالإعتبار المناطق البؤرية المزدحمة التي استنتجتها هذه الدراسة.

ينخفّضُ خطرُ الإزدِحام في مناطق بعض مِنْ العناصر البؤرية الثابتةِ في المسجدِ الحرام ويُمْكِنُ أَنْ ينخفّضَ خطرَ الإزدِحام بالنظام بالكامل وهو ما يمكن بلوغه بنقل أو إزالة البعض مِنْ هذه العناصرَ التي ليْسَ لها أهميةٌ أو خلفية دينيةٌ أو التي يُمْكِنُ أَنْ تدْخَلَ مع النقاطِ الأخرى. هذا الاجراء يَجِبُ أَنْ يكتملَ مِن قِبل المسئولين بعناية وبإعتِبار سلوكِ المُصلين.

عِدَّة مفاهيم يُمْكِنُ أَنْ تُقدّمَ للمُسَاعَدَة على تَخفيض حالةِ الإزدِحام عند العناصرِ الثابتةِ ولتحسين مستوى الخدمة الامر الذي سَيساعِدُ المُصلين لتَحسين أوضاع ممارسةِ واجباتِهم الدينية. فعلى سبيل المثال، عند الحجر الاسود يتم الانتظار في صفّ ويُمْكِنُ أَنْ يبدأ عند الحجر الاسود إلى الركن اليماني. هذا الطابورِ يَجِبُ أَنْ يُعدَّ بالتناوب مِنَ المُصلين الذكورِ والنساء لإعْطاء كُلّ الحضورِ القدرة لتَقبيل الحجر. إضافة إلى ذلك هناك أوقات معيّنة مِنْ اليوم يَجِبُ أَنْ تخصص للمُصلين ذوي الاحتياجاتِ الخاصة ومرافقيهم.

عدد كبير مِنْ المُصلّين يَزُورون بئر زمزم في عدد من المناسبات المختلفة فمدخل البئر في منطقة المطاف يَجِبُ أَنْ يُدْرَسَ بعناية ومدخل آخر يَجِبُ أَنْ ينشأ بالمنطقةِ الشماليةِ للمطاف أو من خارج المبنى في منطقة الساحة الشرقيةِ. قصّة البئر يُمْكِنُ أَنْ تسجل على جدران المسار المؤدي إلى البئر. يجب أن يتم توعية المصلين حول سلوكِهم بينما هم في المسجدِ الحرام ، هذا البرنامج التوعوي يَجِبُ أَنْ يُدْعَمَ بالأوامر الدينيةِ، طالما هم بالموقع الديني الأكثر أهميةً عند المسلمين. هذا العاملُ المهمُ يُمْكِنُ أَنْ يَحْلَّ العديد مِنْ المشاكل الحاليةِ داخل المسجدِ الحرام. ومثل هذا التوجه يَجِبُ أَنْ يَحْدثَ قَبْلَ أَنْ يَصِلُ الناسُ إلى مدينةِ مكة المكرمة امّا في بلدانهم او أثناء انتقالهم إلى مكة المكرمة.

كما ان هناك أيضاً العديد مِنْ المتطلباتِ الخاصّةِ للمُصلّين المُعوّقين التي يَجِبُ أَنْ تنفذ فعلى سبيل المثال تَمْكينهم من مُزَاوَلَة واجباتهم الدينية بدون أيّ عقبات طبيعية أو مخفية فالجو العامّ للمسجدِ الحرام يَجِبُ أَنْ يكون مريح لهم لهذا العمل الديني وهذا يَجِبُ أَنْ يَتضمّنَ فراغ وابعاد مناسبة بمعنى ان وقت معيّن يَجِبُ أَنْ يُخصّصَ فقط للمُصلّين ذوي الاحتياجـات الخاصّةِ لزيَـارَة المواقـع فـي المسجدِ الحرام وهذا الوقتِ يُمْكِنُ أَنْ يَتضمّنَ المُصلّين النساء أيضاً. كما انهم لا يَستطيعونَ الانشغال في المواقع المزدحمة مَع المُصلّين الذكور بسبب التعليماتِ الدينيةِ والثقافيةِ.

تُشكّلُ التوصياتُ المذكورة أعلاهُ المحاور الرئيسية للخطةُ الإستراتيجيةِ لإزالة مشكلةِ الإزدِحـام في المسجدِ الحرام. على أية حال فان فصّلَ الخطة الإستراتيجية يَجِبُ أَنْ يُطوّرَ سويّة مع خطة رئيسية للمسجدِ الحرام وعناصرها التي لها أهميةٌ دينيةٌ ولا يُمْكن أَنْ تزال مِنْ أماكِنها.

٩ . ٤ . ٢ توصيات لدراسات لأخرى:

استناداً الى هذه الإطروحةِ إلى حدٍ كبيرٍ يُوصى بأنّ تكون هناك دراسة أخرى لدراسة قلة المعلوماتِ عن القضايا المهمةِ جداً ضمن نظام الإدارةَ. خصوصاً انه يَجِبُ أَنْ يَكُونَ هناك تحقيقاتَ تُسلّطُ على نتائجِ المسجدِ الحرام عن مواقفِ المُصلّين وأنماطِ الحركةِ، العلاقة بين أنماطِ حركةِ المسجدِ الحرام والمباني المحيطةِ، ومستويات الخدمةِ بالمسجد الحرام. هذه المواضيع سَتُساعدُ لإبْقاء هذا الموقع الحرام للمُصلّين الحاليين وللأجيال القادمةِ.

٩ . ٥ الخاتمة:

إنّ تفردية هذه الدراسةِ تُوْجَدُ في الطرق المختلفةِ المستعملة لعَرْض مشكلةِ الإزدِحام في المسجدِ الحرام. وهي الدراسةُ الأولى مِنْ نوعِها لمُلاحَظَة ودِراسَة كُلّ منافذ الدخول إلى المسجدِ الحرام ويُشيرُ في نفس الوقت إلى أكثر من ثلاثة مواسم لتغطّي كامل السَّنَةِ الهجريـة. عموماً، هذه الدراسةِ سـوف لـنْ نُزوّدَ فقط لفَهْم أفضل لمشكلةِ الإزدِحـام ، الامـر الـذي سَيُسـاعدُ فريقَ الإدارةَ لتقديم إجراءاتَ تسكين لكن أيضاً سَيُزوّد صورة للسلوك البشري تحت مثل هذه الظروف.

البعض مِنْ هذه التوصياتِ التي خَرجتْ مِنْ هذه الاطروحةِ طُبّقتْ بنجاح، في ضوء التعاون بين معهدِ خادم الحرمين الشريفينَ لابحاث الحجّ ورئاسة شئون المسجدِ الحرام والمسجد النبوي ومن بين هذه التوصياتِ كَانتْ إزالة الخَطِّ الرخامي المحدد لبداية الطواف المشكل لعَرْقَلة الحركةِ فيما الإزالة تجعل المصلين يؤدون نسك الطواف بسهولة ويسر، وبنفس الطريقة وعلى ضوء توصية هذه الاطروحةِ فان المنطقة المخصصة لصلاةِ النساء في المطاف قريباً سَنُحوّلُ إلى الجانبِ الشمالي الشرقي وتطبيق هذه الأفكار يَجِبُ أنْ تُساعدَ لتَمييز هذه الإطروحةِ التي أنجزتْ البعض مِنْ أهدافِها بتَمييز أسبابِ الإزِدِحام في المسجدِ الحرام. علاوة على ذلك، مثل هذه التحسيناتِ يَجِبُ أنْ تَعطينا اهمية لعَكْس بعض التوصياتِ الأخرى لهذا البحثِ ويُمْكِنُ أنْ تلزم حيث يعطىَ الحقائقَ البيئية والمكانية والسياسية والإقتصادية والإجتماعية الحالية في هذا التركيبِ الفريدِ، البناية الدينية الأكبر في العالم.

ان النماذج المعمارية لوحدها لا تَستطيعُ حَلّ مشاكل الإزِدِحام في المسجدِ الحرام وعلى حد سواء تكاملُ الأنماطِ السلوكية للمستعملين بالهندسية المعماريةِ قَدْ تُساعدُ لحل مثل هذه المشاكل، لكنّه لَيسَ الشيءَ الوحيدَ الضروريَ لهذا الغرض. إذا ان الهدفِ النهائي للمُصمّمين والمخطّطون أنْ تُحسّنَ شروطَ الحياةِ، ماذا لديهم من أدوات لكي يَنَالوا أهدافَهم وأغراضَهم؟ في العديد مِنْ الحالاتِ، تَجِدُ مثل هذه الأفكار والأدواتِ على الورق، لكن مِنْ وجهة نظر عملية هناك إدارة غير كافية لفَرْضهم عملياً. لذا فالمُصمّمون والمحترفون الآخرون يَجِبُ أنْ يَدْمجوا في عملِهم بَعْض الآلياتِ لتطبيق هذه الأفكار بالطريقة التي تَرضي أهدافَهم بينما تُساهمُ في تحسين نوعيةِ الحياةِ.

Abstract

The Holy Mosque in Makkah determines the direction in which all Muslims face five times daily in their "*obligatory prayers*." In addition, millions of Muslims visit this site annually as the culmination of their religious life; it is obligatory for every Muslim to visit the *Holy Lands* as a lifetime journey. Therefore, people of different nationalities and cultures mix continuously in this unique place. The large number of people who would occupy the Holy Mosque building at the same time, however, causes overcrowding since some activities can only be performed in particular places in this building, and in a specific sequence. In the past, the solution was to expand the building complex whenever the problem of overcrowding arose. This thesis holds that this traditional practice is no longer a feasible option as the building has reached vast proportions that challenge the natural physical boundaries of the site; understanding and managing the overcrowding problem in a sensible manner is the most appropriate solution.

The research was aimed at developing a comprehensive understanding of the overcrowding problem at the Holy Mosque. This was achieved through gaining an understanding of the context and background of the overcrowding problem, arriving at an explanation regarding the nature and extent of the overcrowding problem, identifying and studying the possible reasons behind this problem, and assessing the likely implications of overcrowding in the case of the Holy Mosque. It is believed that such knowledge will help those in charge of the building to provide a comfortable and safe atmosphere for worshippers so they can perform their ritual duties with an optimum level of religious engagement. However, the study has a broader significance. It enquired into the general social and cultural aspects of human behaviour within architectural settings that are dedicated to a special function. Another research theme relates to the physical standards required for the movement of large crowds within confined spaces.

In order to collect data and observe problems related to the use of the Holy Mosque, a variety of research methods were employed. A study questionnaire was organized, which was aimed at obtaining user opinions, feedback, and suggestions for improvement. This was also used to study general human behaviour and to investigate movement patterns inside and around the Holy Mosque building at different times of the year. In addition, the other statistical survey adopted to study the behaviour patterns (i.e., the Space Syntax

method, developed at the Space Syntax Laboratory at the University College of London) has been used to assimilate numerical data on people's movements in order to create computer simulation models that provide a statistical understanding of the safety concerns of the case. This revealed differences between the Axial Line Models, indicating a varying usage pattern within the space and at the gates, with unpredictable consequences. It was found that while the overcrowding problems that occur at some of the Holy Mosque gates and at places inside the building depend on the time of the year. This overcrowding is strongly affected by worshippers' behaviour. According to American and British design standards, the current overcrowding situation at the Holy Mosque falls into the *"Level of Service F"* category in general, and worse than that in specific cases, which means that it is dangerously overcrowded. The study goes on to argue that the mosque as a building type ought to have official design standards that would ensure the optimal conditions for safe religious practice by taking account of human behaviour in crowded conditions. The study also draws on a brief strategic plan that should be developed and followed in order to resolve the overcrowding problem at the Holy Mosque.

Acknowledgements

Dedication

I would like to dedicate this work with great pleasure to my government, The Saudi Arabian government, for its support of my scholarship with prayers to Allah, the almighty, to make it useful to the Islamic nation.

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PART II: The Case Study

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1 Introduction

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1 Introduction

1.1. Background to the study

T his study was undertaken to gain an understanding of the problems of overcrowding in the Holy Mosque of Makkah. The Holy Mosque is the centre for Muslims all over the world. Hundreds of years ago Allah, the Almighty, commanded His prophet Abraham (pbuH)[1] to call for pilgrimage to the Holy Mosque when he had finished building the Sacred Ka'bah as He, the Almighty, said in the Holy Quran:

> *"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)."* [22:27][2]

As a confirmation of this saying, over time, this building became a pilgrimage site for more than a billion people from all over the world. Today more than twenty million Muslims visit this building annually[3] in order to obey the commands of Allah the Almighty, and answer his prophet's (pbuH) call. In the course of time The Holy Mosque otherwise known as 'the Ancient House' grew into a building that allows more than five hundred thousand people simultaneously to practice their rites of prayer, Tawaf, Sai' , and other activities. These visitors come to Makkah, the Holy Land, from Saudi Arabia as well as from all over the world. About two million pilgrims come during the Hajj season alone and this number is increasing every year.

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[1]. (pbuH): peace be upon Him.
[2]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.956-7
[3]. The Custodian of the Two Holy Mosque Institute of Hajj Research

The worshippers have to perform prayers and most of them prefer to pray at the Holy Mosque five times daily. However, some of them have to do further rites. These last mentioned practices have to be performed at particular places within the mosque, some of them at a particular time.

This annual inflow of pilgrims creates mass movement problems daily inside the Holy Mosque building and in the surrounding open areas. This seasonal overcrowding could lead to disasters similar to those which have been recorded in history, for example, in Kerala in India Pak incident, Patten in Pakistan[4] and several incidents in Makkah itself (see Chapter 2.) In addition, the Holy Mosque, within its walls, contains the most important pilgrimage sites to Muslims, such as the Sacred Ka'bah, Zamzam well, the Black Stone and other places that demand the attention of all worshippers who visit. There are risks of overcrowding at each place that visitors wish to attend.

As a result of this ever increasing pressure for access from a growing body of pilgrims, from its early history onwards, the Holy Mosque building has had to expand continuously through time, as is shown in Figure 1-1. Moreover, records show that most of the expansion projects of the Holy Mosque in the past were necessitated by an overcrowding incident at this sanctified building during one of the main Islamic seasons, Hajj or Ramadan.[5] Reducing the risk of overcrowding will therefore increase the safety levels of this unique place which, in turn, will help to provide the required peaceful atmosphere for worshippers to achieve the optimum level of engagement with their religious duties. The overcrowding problem seems to be one of the most important issues facing the Islamic community with respect to this Holy site.

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[4]. http://www.crowddynamics.com/Main/Crowddisasters.htm, 12 Feb. 2005.
[5]. Abass, H., *Story of theGreat Expansion*, 1996.
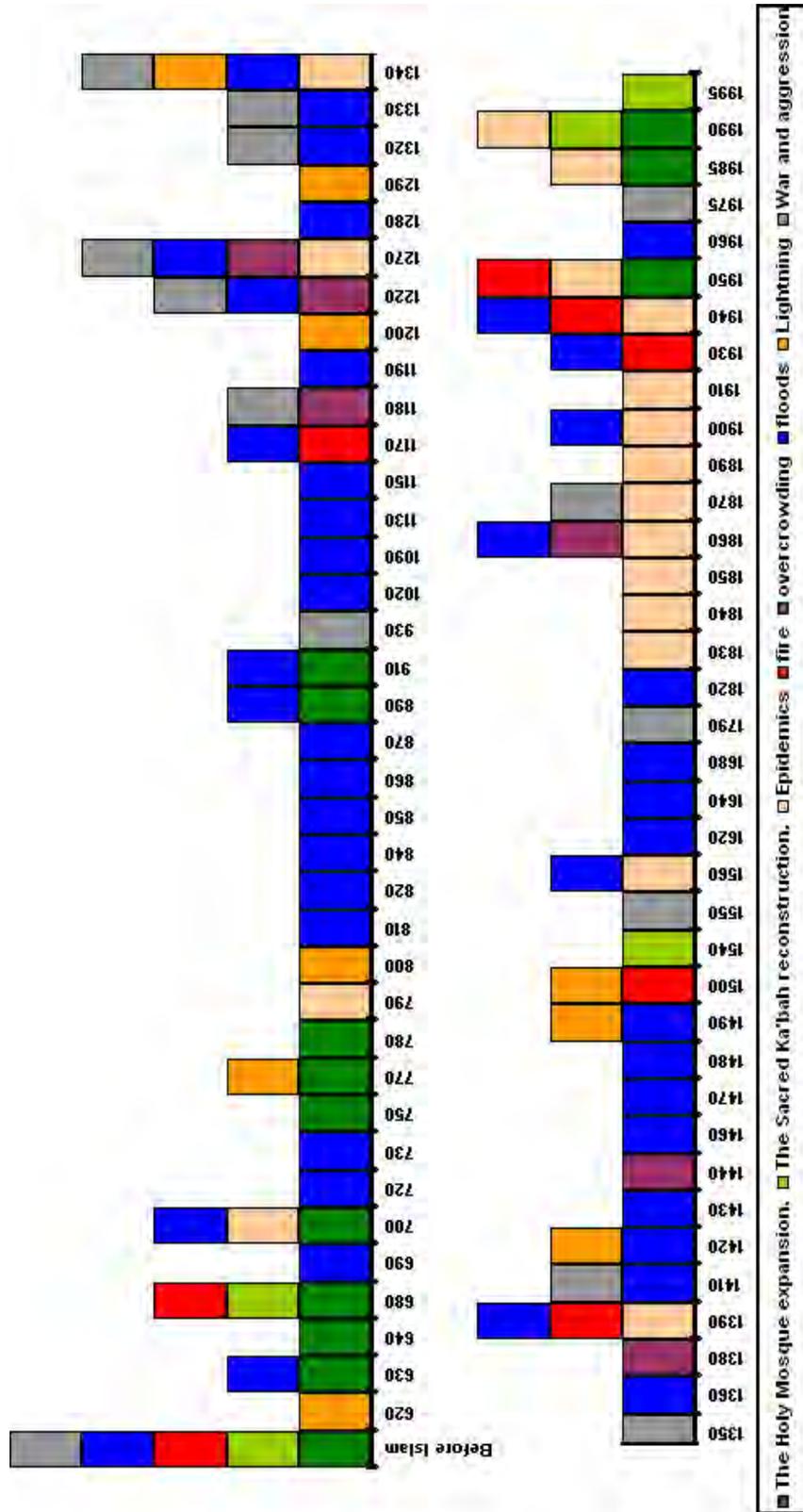
1-1: A chronicle of all events and incidents in the Holy Mosque history.

1.1.1. Crowds and overcrowding in buildings.

Crowding, which obviously affects personal behaviour,[6] means a gathering of individuals[7]. Crowds and overcrowding in buildings is an important issue which needs to be studied in order to establish the criteria for creating suitable conditions of use. Buildings generally are designed to accommodate a certain number of people allowing them to conduct their activities efficiently and in safety and comfort. However, there are some reasons that cause overcrowding of places in certain circumstances, with serious consequences.

A crowd which is strongly affecting personal behaviour is likely to cause unpredictable behaviour. Such gatherings of people create a power source that is difficult to control. Specialists have defined several factors that could affect this behaviour, Religion being one of these factors.[8]

Crowding is a common issue in religions over the world.[9] Pilgrimage sites create religious crowds. Over the world, there are several pilgrimage sites; the Ganges River for Hindus,[10] Santiago della Compostela, Spain, for Christians,[11] and Makkah for Muslims are some examples of these sites. A mass of people gather in each of one of these sites to practice their religious ritual duties. In each religion, there is a place of worship where believers practice this obligation.

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[6]. Freedman, Jonathan L., *Crowding*, 1975,p.103-105
[7]. Le Bon, Gustave, *The Crowd*, 1982, p.2
[8]. Hostede, G., *Culture*, 1991.
[9]. Fairchild, H. P., *Dictionary of Sociology*, 1973, p. 21
[10]. http://www.cnn.com, http://www.bbc.co.uk.
[11]. Levinson, David, *Religion Across-Cultural Encyclopedia*, Pub. ABC-CLIO, Inc. 1996.

However, not all religious sites are pilgrimage destinations.[12] Each religion has major building, dedicated solely to its rituals. Some of these could be very big, accommodating large numbers of people at any time, for Islam it is the Holy Mosque.

The Mosque, as a particular type of religious building,[13] like other public buildings, has its own design standards which allow it to accommodate worshippers in safe and comfortable conditions. This accommodation is met by providing suitable places to perform ritual duties. There are some physical elements that distinguish this type of building from others.[14] Those elements have their own functions that are related to some religious issues.

Each culture creates design standards which could be applied to buildings for that culture in order to ensure the desired user environment. Religion could affect those standards in some cultures. For religious buildings in Muslim states, for example, religious commands must be considered in the application of such criteria in all types of religious building. Mosques, like multi-activity halls and public spaces in Western countries, have their own design standards but to the nature Islamic worship. This type of building has traditionally been designed to accommodate large numbers of people in a confined space. In order to avoid the attendant risks, the highest level of care is needed in planning such buildings.

Through history, many crowd-related incidents have been reported all over the world. These have occurred mostly in buildings that were designed especially for public use.[15] The reported incidents relate not only to Arabic or Islamic countries, but also to western

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[12]. Fairchild, H. P., *Dictionary of Sociology*, 1973, p. 21.

[13]. AlZarkashi, Mohammed., *Informing the Prayer about Mosque Commands*, Ed. Abu AlWafa M. AlMraghi, Fourth Edition, 1996. p.26-7.

[14]. Abass, Hamed. *Story of the Great Expansion*, 1996, p.171-90.

countries that have created and developed more specific design standards to ensure the highest level of safety for the performance of public activities. Many of those incidents were caused by overcrowding and led to the death of many people whose numbers were increased due to the enlarged gathering of people. The behaviour of people on these occasions, where incidents were reported, was different during the incidents which encourages us to try and understand this human behaviour to be able to better deal with an overcrowding event.

However, as mentioned before overcrowding can be noted as the main historic problem at the Holy Mosque as several incidents have been reported in the Holy Mosque's history.

1.1.2. Social and Human Behaviour

Human behaviour is an important factor in the analysis of problems related to overcrowding. People act differently in overcrowding situations.[16] These actions and behaviours are affected by several factors such as culture and customs.[17] However, at religious sites, the affect of religion is dominant. Between cultures sharing a faith there is a particular relation and this kinship can be seen very clearly in Makkah residents, as they are a mix of cultures from all over the world. Crowds have a strong psychological power that has been confirmed by research. This kind of power is not easy to control and needs special ways of handling.

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[15]. As in reported incidents in Moscow in Russia, Lima in Peru, Glasgow in UK, the Ellis Park stadium in Johannesburg in South Africa and some others, see the full list in Chapter 2.
[16]. Freedman, J., *Crowding*, 1975.
[17]. Edward, H., *The Hidden Dimension*, 1982.

Social and human behaviour affects the surrounding environments. The architectural environment is also affected by society and its culture.[18] Spatial organisation is a simple reflection of the architectural environment. The architectural space is different from one culture to another. The cultural effects apply not only to a single space, its size, shape and other characteristics, but also to its relationship with other surrounding spaces, as for example in urban situation.[19]

The social behaviour in the Hajj cities is an aspect of the human behaviour at those cities that shows the impact of religion on the people who live there. Events involving large gatherings are found in all religions. Islamic gatherings may be used as a case-study of overcrowding concerns, as they are frequently repeated every year in the same place, the Holy Mosque, Makkah. The place of worship is the best place to study an overcrowding aspect of Muslim behaviour as conditioned by religious considerations.

Makkah's residents have created their own unique culture over time from different people who immigrated into the city since the first caravans settled there long time ago. This culture is, however, continuously influenced by visitors from other cultures during the annual religious events hosted by the city. Makkah in turn, influences and controls the way in which those religious ceremonies are conducted.

It is important to understand this special culture in order to gain a full understanding of the overcrowding problems at the Holy Mosque during different times throughout the year.

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[18]. Edward, H., *The Hidden Dimension*, 1982.
[19]. Heine, J. Steven et al, *What's Wrong with Cross-Cultural Comparisons of Subjective Likert Scales?: The Reference-Group Effect,* Journal of Personality and Social Psychology, 2002, 82:6, p.903-918

1.1.3. The Holy Mosque and the Sacred City

The mosque, the place of worship in the Islamic religion, is identified by a combination of different physical elements. This type of building is different from others due to these components and special activities that occur there for religious reasons. The Mosque has a strong emotional relationship to Muslim life. Islamic societies use this building, the mosque, for most of their social life.[20] Over time, as shall be explained later, Islamic society has developed design standards aimed at creating an appropriate setting for worshippers to perform their ritual duties in the mosque.[21] In addition to those design standards there are some religious commands that strongly affect the behaviour inside these building.[22]

Makkah, the *Sacred City*, the place where the Holy Mosque is located, has itself acquired special importance to Islam over time.[23] This standard was given to the city as the site of the Holy Mosque. It became the ambition of Muslims from all over the world to settle in this city as close as possible to the Holy Mosque. This factor explains the rapid growth of the city. Overcrowding in this city is, therefore, an historic problem, as reflected in some of the names given to it over time.[24]

Since the building of the Sacred Ka'bah by Prophet Abraham (pbuH), millions of pilgrims have attended the journey of pilgrimage to the Sacred Ka'bah and the Holy Mosque. As will be described in Chapter 4, many incidents of overcrowding have been

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[20]. Abass, Hamed. *Story of the Great Expansion*, 1996, p.144-156.

[21]. Ibrahim, Hazem, *the Mosques' Planning Standards*, Ministry of Municipalities, 1979.

[22]. Hakim, B., *Arabic-Islamic Cities*, 1986, p.33.

[23]. Bin Dehaish, AbdulMalik, *The boundaries of the Haram*, 1995.

[24]. AsSudais, A., 'Overcrowding at the Holy Mosque,' *Crowding in Hajj Symposium*, 2003.

reported over history that have required successive government to find solutions which usually meant expanding the building, as shown in Figure 1-1.

The first leader who expanded the Holy Mosque building, when he found that the Holy Mosque was no longer able to contain all worshippers at that time, was the leader of the faithful Omar Ibn AlKhatab (mAbpwh) in 638 A.D.[25] He increased the built up area of the building from 2126 m^2 to 3613 m^2. Ottoman Ibn Affan, the Second Islamic leader, expanded the mosque by a further 24% when the residents of Makkah city increased and the Holy Mosque could no longer provide a space for all worshippers to perform their ritual duties. Thirty eight years later, Abdullah Ibn AlZubair expanded the building after he had finished his reconstruction of the Sacred Ka'bah. Following this expansion, the Holy Mosque was expanded nine more times, The last one by Fahad AlSaud in 1992 when the built up area reached 560,720 m^2, as shown in Figure 1-2.[26]

In addition, there are some unique features and relics at the Holy Mosque site that attract worshippers.[27] Their specific locations have been assigned according to religious commands which mean that they cannot be moved from those places. Moreover, many activities there have a special association with the site of the Holy Mosque and cannot be performed at any other place. Some activities have special rituals to be followed such as Tawaf, prayers at Maqam Abraham and Sai'.[28]

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[25]. AlKurdi, Mohammed Taher. *The History of Makkah and the Holy Mosque*, AlNahdah AlHadetha Press, 1965.
[26]. Abass, Hamed. *Story of the Great Expansion*, 1996, p.206.
[27]. Kurdi, Obeid Allah Muhammad Amin. *The Holy Ka'bah and the Two Holy Mosques: Construction and History*, The Saudi Bin Ladin Group, 1999.
[28]. Abass, Hamed. *Story of the Great Expansion*, 1996, AlEdhaiml, Abdulla. 'Religious activities that causing the overcrowding at the Holy Mosque,' *Crowding in Hajj Symposium*, 2003 and Mubarakpour, *History of Makkah*, p.61.

There special relics and the activities associated with them have given the Holy Mosque great importance and distinction from other Muslim religious sites, but their presence has also placed several restrictions on the spatial organisation of the site to accommodate the large number of visitors it attracts.
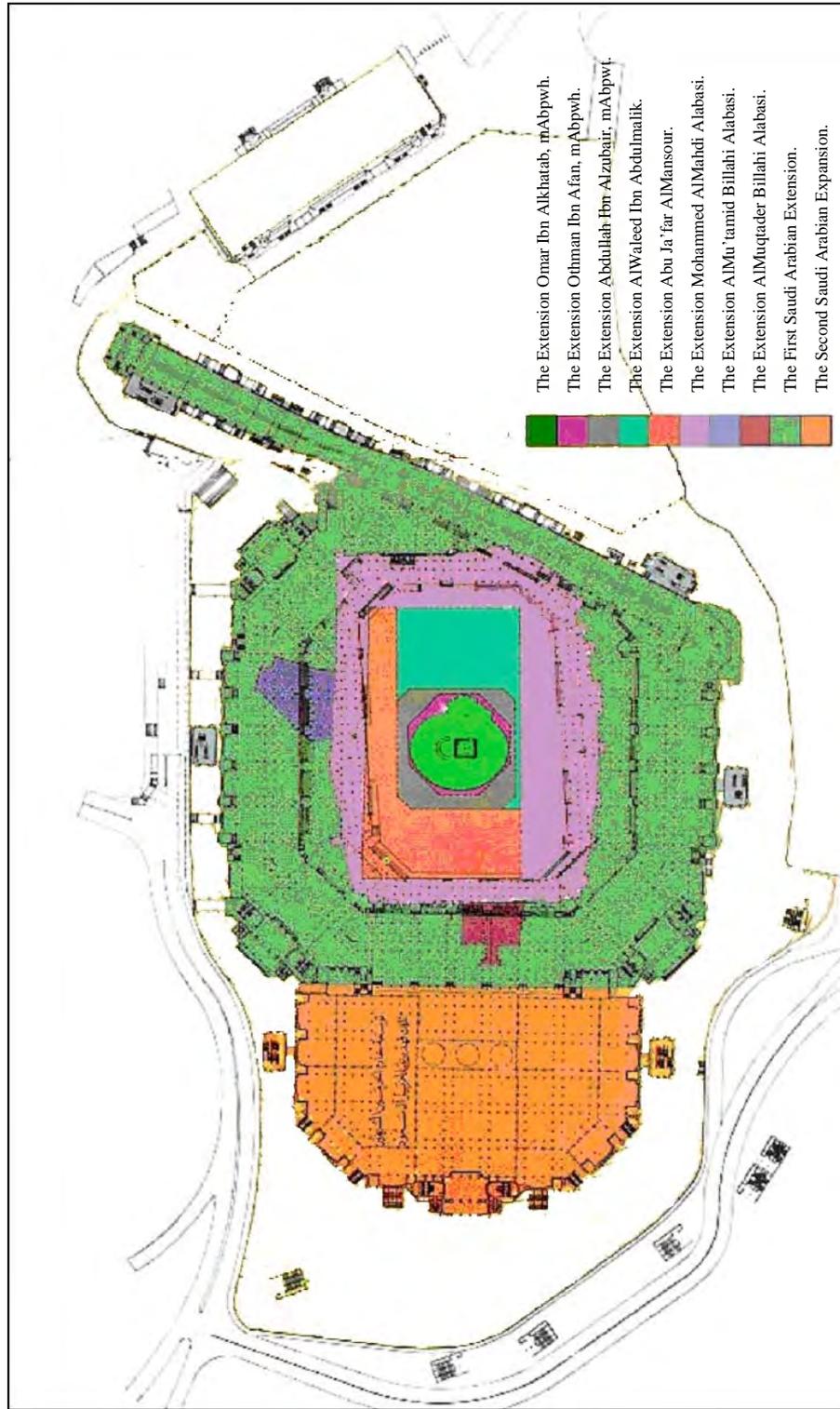
Figure 1-2: A plan showing the Extension of the Holy Mosque through history. (Source: Saudi Bin Ladin Group)

The Extension Omar Ibn Alkhatab, mAbpwh.
The Extension Othman Ibn Afan, mAbpwh.
The Extension Abdullah Ibn Alzubair, mAbpwl.
The Extension AlWaleed Ibn Abdulmalik.
The Extension Abu Ja'far AlMansour.
The Extension Mohammed AlMahdi Alabasi.
The Extension AlMu'tamid Billahi Alabasi.
The Extension AlMuqtader Billahi Alabasi.
The First Saudi Arabian Extension.
The Second Saudi Arabian Expansion.

1.2. Defining the Problem

Since millions of people gather at the Holy Mosque several times during the year, as shown in Figure 1-3, overcrowding conditions which need to be investigated, occur frequently. In the past, whenever an overcrowding situation arose, an expansion project was instigated for the building to avoid the risk at that time. However, today the Holy Mosque building covers a huge area and further expansion is constrained which means that the expansion solution for any overcrowding problem is no longer a feasible solution in this case. It has become clear that this ad-hoc response to the ever growing demand as the Holy site can not be sustained forever due to the limitations of the topography and the proximity of relics to each other. The situation has reached a critical level which requires a thoughtful and scientific analysis of the problem and its potential long term implications.
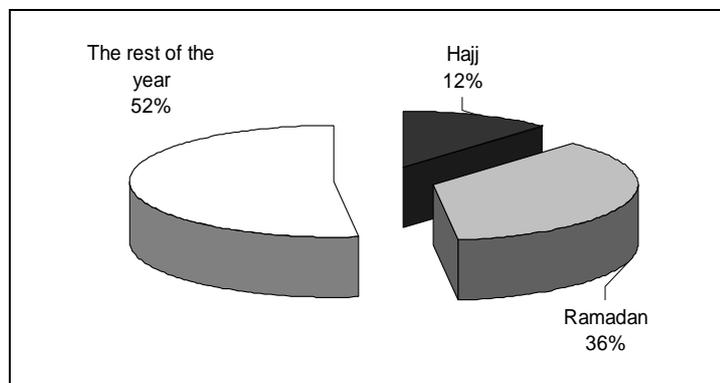
Figure 1-3: A graph showing the total percentage of the Holy Mosque visitors over the year.

A gathering of such a huge number of people in one building to perform several activities simultaneously is unique to the Holy Mosque and it is necessary to explore the reasons and factors that affect worshippers' actions.

Several issues have arisen that make these particular overcrowding events different from others in the Islamic world. The mass gathering at the Holy Mosque by people originating

from different cultures, places and educational backgrounds creates a special kind of gathering. In addition, these worshippers' varying social backgrounds strongly affect human behaviour in this overcrowded event. The multifunctional activities which cause local overcrowding hotspots within the complex is another issue that make this site's overall overcrowding conditions so different from the norm in other mosques. The last factor concerns the different local points of overcrowding inside the Holy Mosque building and its surrounding free area, which will be discussed in more detail in Chapter 3.

The overcrowding issue at the Holy Mosque is an every day event in the Islamic religious Ramadan and Hajj seasons, repeated every year, and on normal Friday events. During the pilgrim seasons, this overcrowding reaches crisis point every prayer time, five times a day. It could be considered as a problem because of the large number of people - more than four hundred thousand worshippers at a time - leaving and returning at each prayer time. In addition to the overcrowding inside the building, congestion problems are created at the Holy Mosque's gates and in the surrounding urban area.

The overcrowding crisis at the Holy Mosque building is an immediate safety issue that needs to be addressed and understood clearly in order to find an appropriate long term solution to avoid any incidents causing death for visitors and worshippers in this religious site. It also presents a unique case-study of overcrowding as a human behavioural phenomenon, its causes and implications for the planning of public buildings in Islamic countries and elsewhere.

The study is trying to answer several questions, some of these questions are:

- What is the background of the overcrowding problem at the Holy Mosque?

- What are the nature and the extent of the overcrowding problem?

- What are the possible reasons behind the problem?

- Do Human Behaviour affec the overcrowding problem at the Holy Mosque, if yes, How?

- What are the likely implications of overcrowding in the case of the Holy Mosque?

1.3. Aims and Objectives

The immediate aim of the study is to develop an understanding of the overcrowding problem at the Holy Mosque building. However, behind this research goal lie broader objectives that should be addressed. It is not enough simply to know the measurable facts about the situation. Investigating and understanding the worshippers' attitude and crowd behaviour inside and outside this unique building is a further aim of this study, so as to establish a proper socio-cultural framework for the discussion of the relevant overcrowding issues. This dissertation therefore seeks to reach the following objectives:

1. To investigate the context and background of the overcrowding problem at the Holy Mosque.

2. To investigate the nature and extent of the overcrowding problem.

3. To identify and study the possible reasons behind the problem.

4. To assess the likely implications of the overcrowding in the case of the Holy Mosque.

5. To make recommendations that will contribute to the effective management of the Holy Mosque building.

In order to achieve those objectives, several research methods have been employed as discussed in more detail in Chapter 5.

1.4.   Research Strategy

Social research has three common approaches. However, these approaches are titled differently by sociologists, psychologists and historians. These approaches are:

1.4.1. *Historical or Theoretical Approach*: John Zeisel described this as a form of study that tests some hypothesis which was discovered through previous research. It being understood that Historical Research mainly discover facts which help to illuminate the past and condition the future. The Historical Approach is a practical approach for this dissertation. As J. Mordaunt Crook pointed out with respect to architecture history, it could be identified simply as: "the study of our built environment in its historic context,"[29] and, therefore, gave direction to the investigation of the general and historical background of the Holy Mosque and the surrounding built environment in the Makkah area.

1.4.2. *Experimental Approach:* Cohen and Manion described the experimental approach as follows: "The essential feature of experimental research is that the investigators deliberately control the conditions which determine the events in which they are interested. At its simplest, an experiment involves making a change in the value of one variable – called the independent variable – and observing the effect of that change on another variable – called the dependent variable."[30]

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[29]. Crook, M., *Architecture and History*, 1984, p. 555.
[30]. Cohen and Manion, p. 164

This kind of approach is suitable where the variables are controllable under certain conditions applied to them.

1.4.3. *Descriptive Approach*: the descriptive approach is used in order give a full description of the current issues of the case that is under investigation.

The Holy Mosque is a huge building with a complicated history and its various problems, components and situations acquire a varied approach.

This study therefore employs several types of approaches which will give more breadth as well as depth since it investigated the case-study from different perspectives and through using several scientific tools and methods.

The study adopted a case-study approach, which gave the ability to better understand, analyse and study the case in question.[31] The research strategy and framework is designed to support the collection of evidence that will help to understand the nature and scale of the overcrowding issue at the Holy Mosque. A specific framework has been established for the research project to ensure that the topic was explored from different perspectives.

Historical and religious textual evidence was accessed at several resource bases. Universities, Public and private libraries are the main sources for this evidence. In addition, interviewees gave the researcher some useful references which led to compilation of a file of recorded information on historical and religious setting, complementing the book references. It helped in creating suitable background knowledge to provide a thoughtful review of the case undertaken.

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[31]. Yin, R., *Case Study Research: Design and Methods*, 2003.

Observation of the site was found to be necessary so as to gain a full understanding of the human behaviour at the Holy Mosque. A detailed observation process was planned to measure human traffic at the Holy Mosque access gates. This evidence provided major information that helped us to understand the overcrowding situation at the gate points of the Holy Mosque.

It addition, simulation models provide some useful and supportive evidence which predict the expected overcrowding spots at the site to avoid any further risk for worshippers at the Holy Mosque. However, these models provide a useful information for further studies to improve the accessibility of the mosque and develop the surrounding urban system to provide a better architectural built environment, providing usable spaces for practicing religious duties as well as a more comfortable life style.

Interviews with some specialists and experienced people regarding the subjects of history, religion and overcrowding at the Mosque provided important background information to the problems with overcrowding and the understanding of people's behaviour at the Holy Mosque. As stated above, it was helpful to establish a full historical list of incidents which provides a deeper understanding of the nature of these historical and religious issues.

This strategy supported the research and helped the author gain information and data which is necessary to gain a deeper understanding of the case undertaken within the context of the surrounding built environment. However, it also gave a wider view of the users of this religious building and helps to understand their social and behavioural manner.

The study framework was built based on the study's objectives as creating sub objectives, as shown in Table 1-1, that help to answer the research questions. In addition, several sources of evidence will be introduced which will help to gain and analyse the needed information in order to develop an understanding of the overcrowding problem at the Holy Mosque building.

Table 1-1: Study aim and objectives.

Main Aim	Main objectives	Sub objectives	Source of evidences
To develop an understanding of the overcrowding problem at the Holy Mosque building.	▪ To investigate the context and background of the overcrowding problem.	▪ To identify contextual and historical factors that have a bearing on the problem of overcrowding.	▪ Literature review. ▪ Interview.
	▪ To investigate the nature and extent of the overcrowding problem.	▪ To identify the places where the overcrowding problem occurs. ▪ To identify the time the problem occurs (time of year, time of day, etc.).	▪ Literature review. ▪ Interview. ▪ Survey. ▪ Space Syntax.
	▪ To identify and study the possible reasons behind the problem.	▪ To investigate possible causes relating to human behaviour. o To investigate the worshippers' attitudes towards the Holy Mosque. o To discuss the main factors those affect the worshippers' choices at the Holy Mosque. o To find out the similarities and differences between individual and group behaviour at the Holy Mosque. o To find how nationality /sex/education affect the worshippers' behaviour. o To find out the similarities and differences of the worshippers' behaviour at the Holy Mosque in different season. ▪ To investigate possible causes related to the spatial configuration of the Holy Mosque ▪ To analyse the spatial configurations of the Holy mosque spaces. o To locate the possibility of applying the existing standards to the Holy Mosque.	▪ Literature review. ▪ Interview. ▪ Survey. ▪ Space syntax
	▪ To assess the likely implication of the overcrowding in the case of the Holy Mosque.	▪ Analyse these specific places at the Holy Mosque site. ▪ To analyse the likely implications on the ability of worshippers to perform their religious duties	▪ Literature review. ▪ Survey. ▪ Space Syntax.
	▪ To make recommendations that will contribute to the effective management of the Holy Mosque building.		Pervious: ▪ Literature review. ▪ Interview. ▪ Survey. ▪ Space Syntax.

1.5. Significance of the Research

Praying in a place of worship should be safe and the worshipper should feel comfortable and at peace in the environment. Moreover, according to Muslim law the highest degree of reward is obtained when the worshipper is completely engaged in prayer. Allah, the Almighty, says this in the Holy Qura'n when He describes the characteristics of Muslim believers, He said:

> *"Successful indeed are the believers. Those who offer their Salat*
> *(prayers) with all solemnity and full submissiveness."* [23:1-2][32]

The architectural setting should therefore provide the conditions for achieving these objectives. But buildings have physical limits which determine their specific capacity to fulfil these requirements. If these are transgressed, as happens with overcrowding, the functional arrangement breaks down and a negative situation develops, as is currently the case at the Holy Mosque, Makkah.

The situation is further aggravated by the apparent deficiency regarding research into the overcrowding problems of public buildings, especially Mosques in Saudi Arabia. AbdulRahman AsSudais, the Holy Mosque' Imam and a professor in Umm AlQura University, acknowledges that there is a lack of research in this area and stresses in particular the issue of overcrowding at the Holy Mosque as being seriously problematic[33]. Although, the Saudi Arabian government, ever since it came to power (1925 A.D.), has acted in a responsible manner to protect the Holy Mosque, to keep it safe, secure, and comfortable for worshippers to practise their rites, it can nevertheless be argued that more

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[32]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.977.
[33]. AsSudais, A., *Overcrowding at the Holy Mosque,* 2003, v.1, p.12

could be done to provide a rational basis for safety policy and practice in the future. This study seeks to contribute towards filling this gap.

The lack of such basic research on the functional aspects of the Holy Mosque building in itself gives significance to this study. In addition, since this study is the first research project which investigates the problem of overcrowding in this unique and sacred building, the information collected for this dissertation will provide a useful knowledge base for further studies. For example, no scientific research has yet been done to observe the flow of people within the building. This study seeks to do so by concentrating on all the numerous entrances of the Holy Mosque, their respective roles in controlling the movement of people in and out of the complex. The data obtained through questionnaires about these entrances is vital for a full analysis of the overcrowding problem of this very special building. This study will use the information obtained by the analysis of the data to show in several respects how to improve the current situation as well as provide a framework for future development. In addition, it introduces and tests the application of a new analytical technique (Space Syntax), to the most important building in the Islamic world. The benefits of using such research techniques are not yet fully understood in Saudi Arabia.

In addition, the significance of the research is increased by the importance of the Holy Mosque to Muslims all over the world since its findings and recommendations may affect more than a billion Muslims over the world.

1.6. Scope and Limitations of the Research

To understand an architectural case-study, several aspects should be investigated. These include the physical, social use, functional and management demands of the building. The researcher, with support from his sponsor, The Custodian of the Two Holy Mosque Institute of Hajj Research, has investigated three of those subjects and concentrated on two of these, the social and functional, in so far as they concern the movement of people about the complex. In other words, its immediate public face as a pilgrimage site. The importance of this site to Muslims and the secrecy surrounding the building and its relics due to the concerns regarding their sacredness have prevented the researcher from studying the management aspect in any detail, while issues related to the maintenance of the fabric of the building are essentially of a technical nature, which would have required a different approach and methodology. This too would have had implications for access due to the sacredness of the site.

The confidentiality matter has, therefore, strongly affected the research process and limited the scope of what the researcher could readily gain access to. The Holy Mosque is, however, of such significance as a Muslim cultural subject, and so far known beyond that world, that every aspect of the building can be a rich source material for research. The historical review of the Holy Mosque building that has been undertaken in this research is meant to serve as a general background needed to help the reader to understand the building within its historic setting. The social aspect focuses on the *users,* normally worshippers, mainly pilgrims, who are using this building. It has been investigated from different perspectives so as to provide a fuller understanding. Serving

as a destination for pilgrims is a primary *function* of the Holy Mosque and like all buildings its formal layout reflects the use patterns appropriate to that purpose.

All those aspects together provide a wide overview of the Holy Mosque that helps to investigate the exact nature of overcrowding problems at this unique building.

1.7.   Overview of the thesis

The study material has been organized so as to first establish a solid contextual base supporting the arguments for an urgent reassessment of the overcrowded environment within the Holy Mosque. Therefore, the thesis design will comprise two parts with three link sections that will structure the argument, illuminate the problems and give the reader a good understanding of the case-study and its parameters.

As shown in Figure 1-3, the first link section, the Introduction (Chapter 1) is concerned with defining the research objectives and establishing the importance of the research questions. In addition, it will give brief information about the case-study undertaken. This will prepare the reader for the first part, Theoretical Framework (Chapter 2,3 and 4) is aimed at giving a complete understanding of some contextual factors that support the understanding of the overcrowding situation in general and particular including the related social and behavioural criteria. In addition, it will describe the relevant design safety standards for overcrowding conditions in Saudi Arabia, with reference to those in western societies, in particular the USA and Britain. The full description of the case-study and its setting will also be covered in this section.

The second link section of the thesis, Research Methodology and Field work (Chapter 5) addresses the research methods that have been used to study the case.

The second part, the Case Study (Chapter 6, 7 and 8) will describe the research analysis process and the findings derived from the application of the various methods and techniques, such as qualitative research methods, quantitative research methods, questionnaires, interviews and Space Syntax technique. Finally, the last link section, Summary and Conclusions (Chapter 9) gives the final thoughts, conclusions and recommendations stemming from the research project.
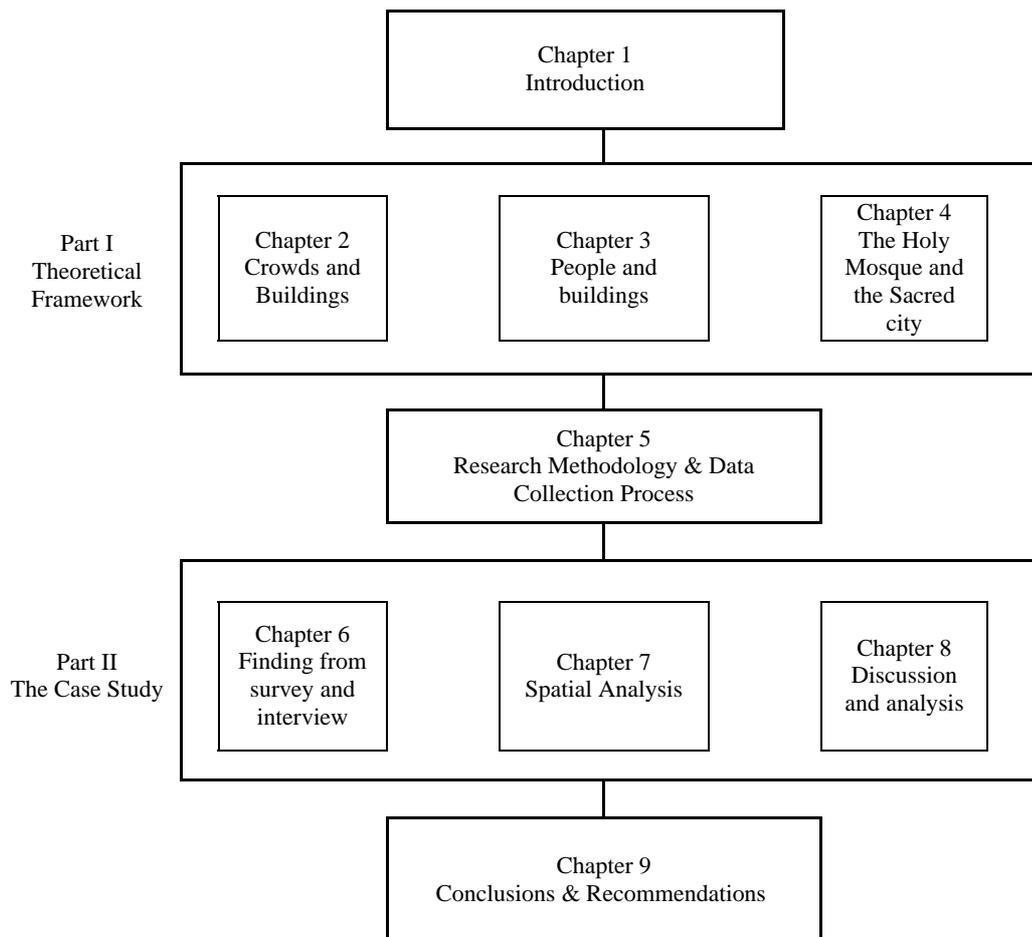
Figure 1-4: A graph showing the organization of the study.

However the Holy Mosque building is located at the central area of the city of Makkah and been surrounded by services the help visitor to reach their final destination, the mosque, as it shown in Figure 1-5.
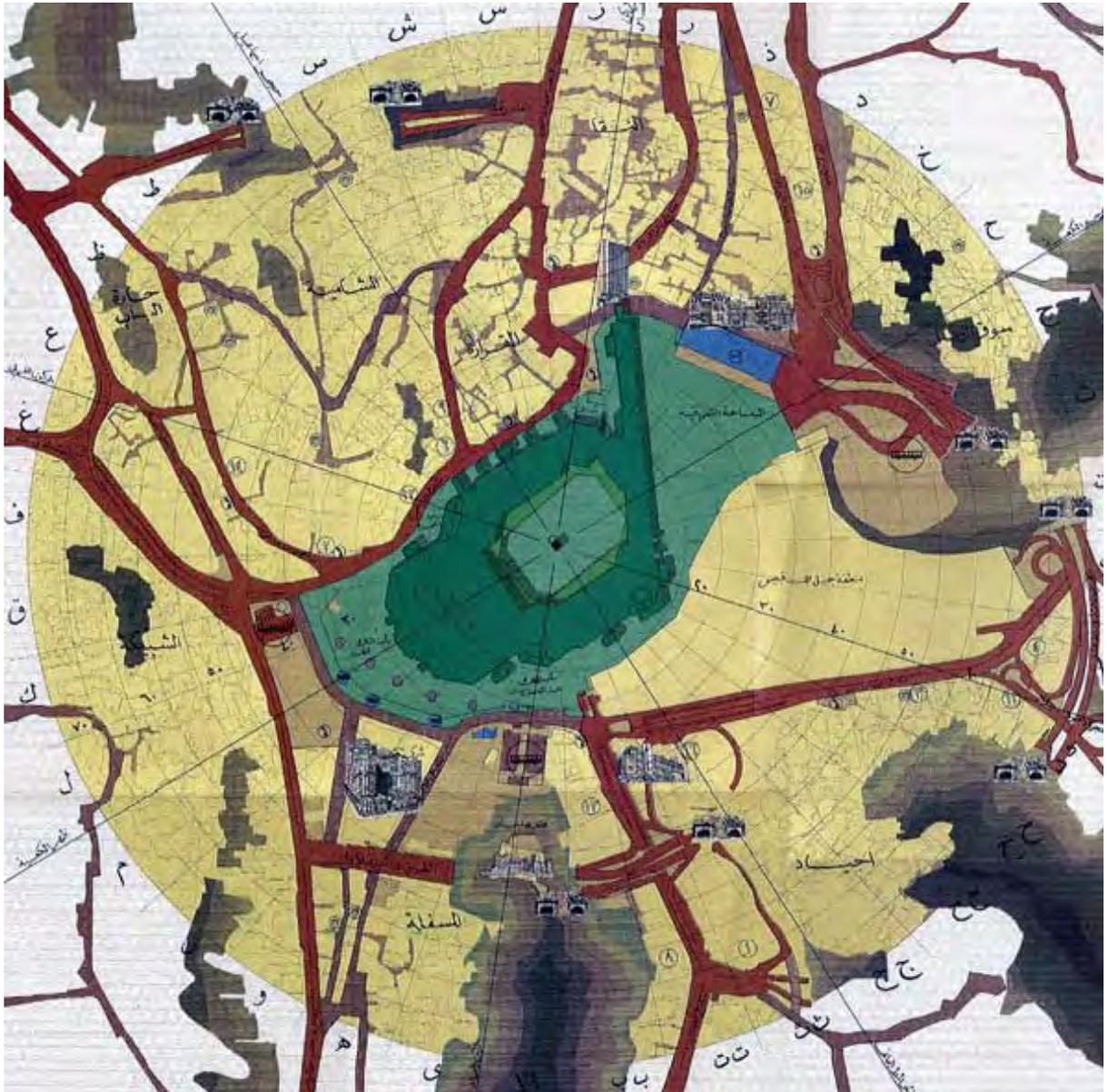
Figure 1-5: The Holy Mosque and it surround built environment.

2 Crowds and Buildings

2.1. Introduction

2.2. Crowds and Overcrowding

2.3. Comparison of Space Standards for Public Places.

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2 Crowds and Buildings

2.1. Introduction

This chapter will introduce the reader to the crowds issues and standards for religious buildings in Saudi Arabia. Then, in the context of the history of Makkah and the Holy Mosque, it will conclude with a comparative analysis of design building standards, concerned about safety and people flow, in Saudi Arabia and two Western countries, the USA and Great Britain, so as to establish a base-line for the study of overcrowding issues related to the Holy Mosque.

2.2. Crowds and overcrowding

The crowd as a phenomenon of a human behaviour presents a challenge and causes problems for individuals as Jonathan Freedman, an American social psychologist, pointed out when he said: "They [psychological researchers] assert that crowding causes tension, anxiety, family troubles, divorce, aggressiveness, neurosis, schizophrenia, rape, murder, and even war."[1]

The early 20th century psychologist Gustave LeBon said "The word crowd means a gathering of individuals of whatever nationality, profession, or sex, and whatever be the chances that have brought them together"[2], and Serge Moscovici, a French writer

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[1]. Freedman, Jonathan L., *Crowding and Behavior* , 1975, p.1
[2]. Le Bon, Gustave, *The Crowd*, 1982, p.2

who discussed LeBon's work on mass psychology, added: "Crowds are collections of individuals who temporarily come together outside and in opposition to institutions."[3] Freedman described overcrowding as being a problem of distribution. The Italian writer Elias Canetti, a Nobel Prize winner for literature in 1981, said much the same in his book *Crowds and Power* (2000) but he went beyond that when he divided the phenomenon into "open and closed crowds". According to Canetti the "open crowd" is that which enables the numbers to grow and could absorb more individuals. On the other hand, the "closed crowd" is that unable to grow and to absorb more people. He concluded that the open crowd is the true crowd.

Irwin Altman's definition of a crowded place is: "where people want more physical space."[4] The individual measurement of crowds is different from one person to another. It is as Altman, added on crowd definition, "a psychological concept with experimental motivational base".[5]

According to *the design guide for interiors* (1997), "Crowding occurs when personal space and territoriality mechanisms function ineffectively, resulting in an excess of undesired external social contact."[6] This military design guide, moreover, divided the space into four different categories: Intimate space, which is the immediate surrounding space; Personal space, that is the closest space surrounding a person where only selected people are allowed in; Social space, which is the space the person can have a full contact with people in, and Public space, which is the space that the person does not have a social contact with people in as it shown in Figure 2-1.

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[3]. Moscovici, Serge, *The Age of the Crowd*, 1985, p. 71
[4]. Altman, Irwin, *the environment and social behaviour: Privacy, Personal, Space. Territory. Crowding*, 1975, p.149.
[5]. *Ibid,* p. 150.
[6]. US army Corp of Engineers, *Design Guide for Interior,* 1997, p.2.2.
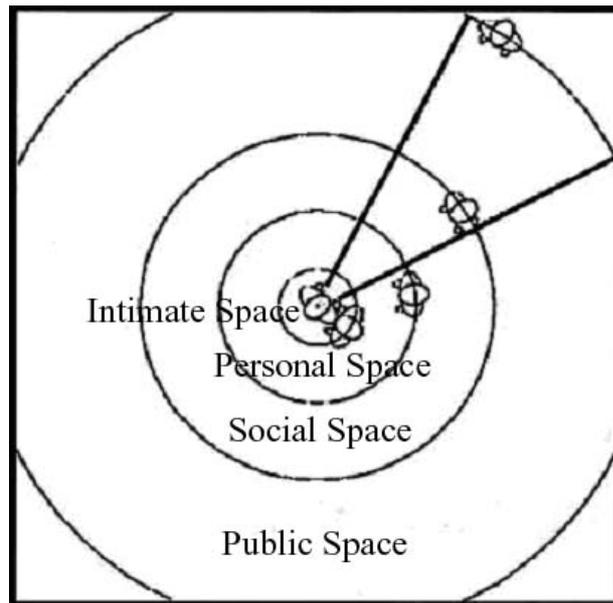
Figure 2-1: Level of space: intimate, personal, social and public. (Source: US army Corp of Engineers, Design Guide for Interior, 1997, p.2.2)

On the other hand, Arabian linguists identify a crowd with a single word, *Zeham*, as Ibn Faris explains: "It is affiliated with forcefulness." AlFairozAbadi, on the other hand, said: "A crowd is becoming narrow. It is dreariness. Furthermore, Makkah is named Umm-Zaham[7] which means the mother of crowds."[8]

It has been found that crowds actually affect human behaviour in very specific ways, as Freedman pointed out:

> "Research on personal space is important from two points of view. First, it demonstrates that people do respond to variations in the space around them and have rules about what is appropriate. This makes it even more likely that population density affects people's bahavior in some way. Second, it shows that there are no absolutes involving this space. There is no "right" distance; there is no automatic negative or aggressive response when someone is close. Instead, the appropriate distance depends almost entirely on such

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[7] Zeham is the Arabic word for crowd.
[8]. AlFasi, TaqiUldin M., *Shefaa AlGharam Be Akhbar AlBalad AlHaram*, 1999, p.93.

factors as the relationship among the people, the setting, and the personal characteristics of those people." [9]

According to Canetti there are four important defining characteristics about a crowd:[10]

1. There are no natural boundaries which could stop the growth of the crowd, whereas it is possible that artificial boundaries might be made to stop growth.

2. A crowd is an absolute state of equality. All members are equal within the crowd. There are no differences between individuals.

3. Crowds and density go together and the strongest moment for feelings of density is the moment of discharge.

4. Crowds are always looking for a direction because they are always in movement and that movement is always forwards to a goal outside the crowd.

Crowds obviously affect personal behaviour and that effect depends on factors such as density. Freedman noted that research on the effects of crowding on humans indicate two major influences. "First, high density does not generally have negative effects on people. Second, high density makes other people a more important stimulus and thereby intensifies the typical reaction to them."[11]

Individuals within a crowd mostly prefer being controlled. LeBon wrote that "as soon as a certain number of living beings are gathered together, whether they be animals or men, they place themselves instinctively under the authority of a chief."[12] This social

[9]. Freedman, Jonathan L., *Crowding and Behavior*, 1975, p. 73
[10]. Canetti, Elias, *Crowds and Power*, 2000,p.29
[11]. Freedman, Jonathan L., *Crowding*, 1975,p.103-105
[12]. Le Bon, Gustave, *The Crowd*, 1985, p.112

tendency reflects their behaviour. Human behaviour cannot always be predicted. It has also been found in psychological research that individuals do not respond to crowding in a particular way. Freedman wrote that under certain situations, people can act well even when the situation is overcrowded for long periods of time. These periods will be different depending on the gender of individuals.[13] This means, crowd as well as individual behaviour can be controlled for a period of time, but this control will be lost and cannot be resumed after that period. However, it is important to consider what Freedman said regarding the high density force of certain types of interaction. He added that

> "Naturally all of the participants should find the positive situation more pleasant than the negative situation regardless of the size of the room. The key point is that the reactions – whether pleasant or unpleasant – will be more intense in the small rooms than in the large rooms." [15]

Which means, as the crowd affecting human behaviour, the size of the architectural setting will affect it as well within that setting.

2.3. Comparison of Space Standards for Public Places.

Design standards are a big issue that should be considered in order to create a comfortable and secure environment for people to go about their business. Moreover, this issue is of special importance where a mass of people meet at the same place, such as public buildings and mosques. Traditionally, Western cultures gave this issue some

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[13]. Freedman, Jonathan L., *Crowding*, 1975, p.89
[15]. *ibid,* p.100
[19]. *ibid,* p.82

priority and it receives much attention. In the Arabian countries, on the other hand, this issue does not seem to have had the same importance attached to it. However, the issue of safety has some importance in the Islamic religion as is stressed in several places in the Holy Quran and should, therefore, not be neglected, especially in that most sacred of all Islamic sites, the Holy Mosque. This section will deal with standards of safety. Such wisdom on the topic as can be deduced from Islamic religious codes will be looked at in the light of Western standards in order to establish a framework for a discussion of codes of practice that would be appropriate for public buildings in Saudi Arabia, as well as in mosques. Public buildings in Western societies are the buildings most similar to the mosques in the Islamic culture where a mass of people gather for some events.

2.3.1. Islamic Commands and regulations from the Holy Quran :

Safety and security, especially in crowded situations, receive special consideration in the Islamic religion as in some other religions. There are several specific references on this matter in the Holy Quran, which fall into three main categories. The first one concerns human safety in general as believers have been asked not to harm themselves and crowds and overcrowding could harm its individuals, as in the following verse:

> *"And spend in the Cause of Allah and do not throw yourselves into destruction, and do good……"* [2:195][19]

The second category concerns safety at a specific moment in time, as in the following verse:

"They ask you concerning fighting in the Sacred Months[20]. Say Fighting therein is a great but a greater with Allah is to prevent mankind from following the Way of Allah to prevent access to Al-Masjid-Al-Harâm, and to drive out its inhabitants…………" [2:217][21]

The last category is where safety is mentioned with regard to a particular place in considerations of crowds. This category could be divided into two subcategories. The first of which concerns the Holy Lands of Makkah as in the following verse:

"And (remember) when Abraham said, "My Lord, make this city (Makkah) a place of security and provide its people with fruits, such of them as believe in Allâh and the Last Day……………" [2:126][22]

The second subcategory is concerned with the Holy Mosque itself as in the following verses:

"Have they not seen that We have made (Makkah) a secure sanctuary, while men are being snatched away from all around them? …" [29:67][23]

"In it are manifest signs, the Maqam of Abraham ; whosoever enters it, he attains security. And Hajj to the House (Ka'bah) is a duty that mankind owes to Allah, those who can afford the expenses; …" [3:97][24]

The religious command in these verses encourage followers to make and keep the city of Makkah and the Holy Mosque safe for people to live and overcrowding could cause death and injury which will at the end will make these places unsafe.

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[20]. The 1st, 7th, 11th and 12th months of the Islamic calendar.
[21]. The Holy Mosque Qur-an: English translation of the meanings and Commentary, 1990, p.91-2
[22]. *ibid*, p.51
[23]. *ibid*, p.1172
[24]. *ibid*, p.169

Moreover, the Almighty, Allah, commanded that in order to show his forgivingness and his care for all people. It also confirmed His power. Even though these verses have no specific detail this is clear enough to form the basis for the creation of several rules regarding safety in a Muslim religious building.

2.3.2.   Design standards regarding crowds in Saudi Arabia.

The Saudi Arabian Standards Organization, which is considered as the department of the government that issues new codes and regulations for everything, did not consider religious buildings as one of the buildings in its building codes handbook. This is a serious omission for a religious centre like Makkah where, according to data collected by Kutbi[25], it was found that religious buildings occupy about 6,068 hectares of the total area of the city of Makkah, (39,000 hectares), a proportion of 17% of the total land use (see below, Chapter 4). However, some of the terms that apply to Saudi public buildings in general could be used for religious buildings as well. The following two basic safety rules would seem to be applicable for mosques and religious buildings, because they apply to social activities and concern buildings providing for crowds, such as conference halls, exhibition show rooms, sport stadiums, etc. The principal rules for safety in Saudi public buildings, as set out in the governmental publications, are as follows:

- A minimum of two means of egress should be found in every building (religious) except in those spaces with a travel distance of less than of 15 meters.

- Side exits to an open area should have a minimum width of 130 centimetres.

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[25]. Kutbi, Z., *The Vestige of the religious function*, p.114

In addition, on behalf of the City Master Planning Department of the Makkah Municipality, Adnan Adas and Mohammed AlJared, professors at King AbdulAziz University (2002), created a new design buildings code especially for the city of Makkah, based on the American Uniform Building Codes (UBC). In consideration of the mosques and religious buildings, they added some conditions not previously demanded for Saudi buildings[26]:

- The application of these codes and safety regulations depends on having enough means of egress from any particular space.

- An occupancy area factor of 1.5 square meters per person.

- The means of egress with a width factor of 150 cm/person.

- Two exits are the minimum number for means of egress if the building capacity is 50 people or more.

- The maximum travel length allowed in religious buildings is 40 meters from the closest means of egress.

In all the non-residential buildings:

- The stair riser should be more than 10 cm and less than 17.50 centimetres.

- The stair going have to be more than 28 centimetres.

- Side corridors should apply for a minimum capacity of one third of the total number of occupiers of the space.

- The minimum width of the means of egress is 180 centimetres.

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[26]. Adas, Adnan and AlJared, Mohammed, *The new safety buildings' codes for the city of Makkah that depend on the American Uniform Building Codes (UBC),* 2002.

The adoption of these codes occurred after a full investigation into the design standards of several countries such as Germany, Great Britain and the United States. The UBC was found, by Adas and AlJared, as the one most appropriate for the Saudi Arabian environment, with some modifications. It is strongly believed that if such Western standards and codes are to qualify for the Saudi Arabian environment they need to be modified. The western standards could, therefore, only be used as a base point from which to study how the Western communities dealt with similar situations.

In addition, The Civil Defence department, the Fire-fighting Department, had published a range of standards of safety which are considered to be compatible with the Saudi Arabian built environment and should be applied to all buildings. Yet, currently it does not have the power to enforce these – as pointed out by Salem Alhazmi[27].

It would seem sensible for the government of Saudi Arabia to establish an appropriate department that has the ability to study this issue and formulate such rules. Such a step is necessary in order to apply the full power of the government to all buildings, to ensure a high level of safety in the built environment.

2.3.3.   Design standards regarding crowds in the USA and Britain

American and British design standards have been addressed and discussed in this section for several reasons. Language is one of the reasons that have affected this decision. On the other hand, some other countries, such as Germany and France as well as others, have useful design standards in this regard but due to the language

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[27]. a Colonel at the Makkah fire-fighter department.

difficulties the research has been limited to the design standards of the two selected countries.

According to the NFPA[28] the safety standards put to use should be of an assigned nature which reflects the selected environment[29]. This section will discuss some Western design standards that could be considered relevant to the type of overcrowded situations found at the Holy Mosque. The standards of the Safety and Environment Advisory Services at the University of York, and those of the Health and Safety Commission for Standards at the Home Office have been selected as representative for British standards. The NFPA standards have been selected to represent the American standards. In addition, some western design guide books have been used in this section e.g. The *Guide to Safety at Sport Grounds,* which was published by Department of National Heritage, The Scottish Office, in 1997, and The *Guide to Safety at Sports Grounds*, published by the Home Office in 1990. *The building Regulations for 1991*, published by the Welsh office of the Department of Environment in 1992, and the *Guidelines For: Urban Safety Management,* which has been published by The Institution of Highways and Transportation in 1990. As the Saudi Arabian departments have translated and adopted most of these standards it is not worth repeating the listing of those terms. However, some relevant to this study, regulations that were not selected, are discussed below.

A closer analysis of the application of the western regulations on the Saudi, and particularly the Makkah situation, reveals some interesting commands. For example; when considering the issue of rapid egress, the travel distance between the farthest

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[28]. the National Fire Protection Association in the USA.
[29]. NFPA, *Life Safety Code Handbook*, 1997, p.ix

evacuation point and the closest means of egress that leads to a safe place is different from one situation to another depending on the building type. As an example, the number of the means of egress is assigned depending on the number of the people that use the building as shown in Table 2-1. In addition, this distance in Public buildings such as theatres is a distance of 30 meters as shown in Table 2-3. However, the width of these egresses should be assigned carefully depending on the number of people that use the building as is described in Table 2-2.

Table 2-1: Minimum numbers of exits from large spaces.

No. of people	No. of exits
1-50	1
51-500	2
501-1000	3
1001-2000	4
2001-4000	5
4001-8000	6
8001-12000	7
Each 500 extra	1

(Source: Stolard, P. *et al, Fire from First*, 1999, p. 63)

Table 2-2: Minimum total widths of escape routes and exits.

No. of people	Total width of exit (mm)
1-50	800
51-100	900
101-180	1000
181-200	1100
201-220	1200
221-240	1300
241-260	1400
261-280	1500
281-300	1600
301-320	1700

(Source: Stolard, P. *et al, Fire from First*, 1999, p. 63)

Table 2-3: Building type and travel distances.

Building type	Maximum travel distance (m)		
	Stage 1+2	Stage 1	Stage 2
1. Houses	30	15	15
2. Flats and marionettes	30	15	15
3. Residential institute (hospitals, prisons, etc.)	20	10	10
4. hotels and boarding-houses	30	15	15
5. Offices, commercial, schools	40	20	20
6. Shops	30	15	15
7. Assembly and recreation (theatres, cinema, etc.)	30	15	15
8. industrial			
a. high ignition hazard(oil, furniture, plastics)	40	20	20
b. medium ignition hazard (garages, printing, textiles)	50	25	25
c. low ignition hazard (metal working, electrical, cement)	50	25	25
9. Storage			
a. high fuel hazard	40	20	20
b. medium fuel hazard	50	25	25
c. low fuel hazard	50	25	25
10. Car-parking	50	25	25

(Source: Stolard, P. *et al, Fire from First Principle*, 1999, p. 61)

In addition, six levels of services have been identified by transportation science specialists and it had been represented in the Highway capacity manual, the most authoritative reference on highway design practice,[30] these *level of services* are based on, as Fruin stated, "the freedom to select normal locomotion speed, the ability to bypass slow-moving pedestrians, and the relative ease of cross-and reverse-flow movement at various pedestrian traffic concentrations." [31] that reflect the density of the place and the movement of people in their surrounding environment. From "A" to "F" each level of service indicates the average density of allocated area as shown in Figure 2-2. From level "A", which has a free flow, 'B' has a minor conflict, 'C' has some restrictions to speed, 'D' has restricted movement for most, 'E' has restricted

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[30]. Fruin, John. *Pedestrian: planning and design,* revised edition, Elevator world inc., Mobile, Alabama: USA, 1987. p.71.
[31]. *Ibid*, p.71.

movement for all and level 'F' which has shuffling movement for all.[32] Each level of service provides a walking area for people on that area as shown in Figure 2-3. On the highest density level of service "F", people have the lowest moving area which is needed as shown in Figure 2-4.
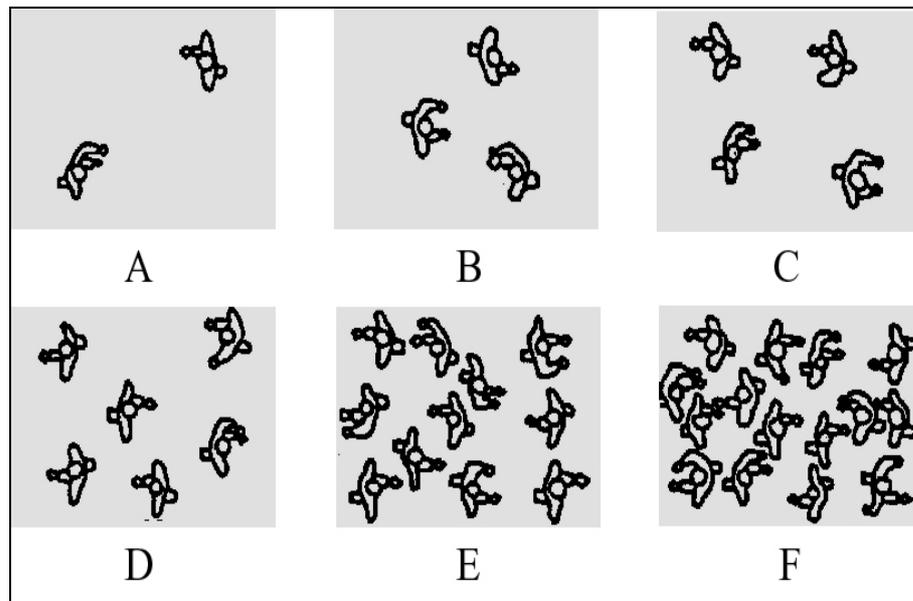
Figure 2-2: The density of each level of service "A" to "F". (Source: *Traffic Engineer Handbook*, p. 148-149)
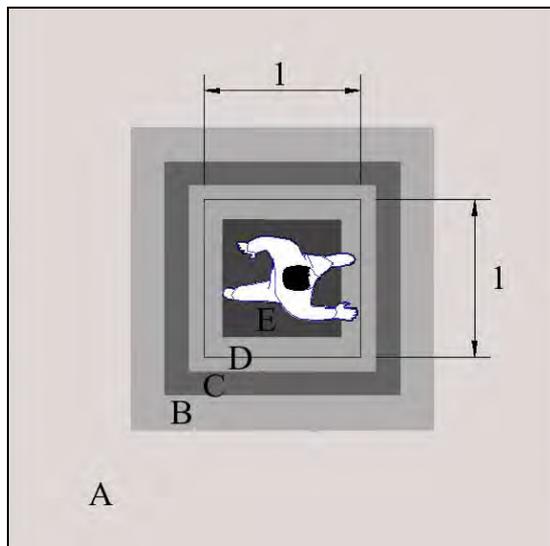
Figure 2-3: Walking space that been provided in each level of service. (Source: *Traffic Engineer Handbook*, p. 148-149)
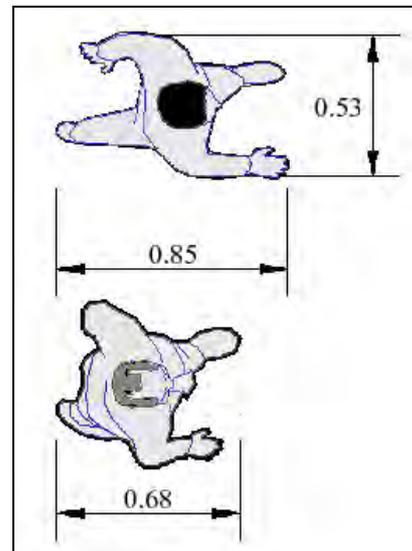
Figure 2-4: The needed walking area. (Source: *Traffic Engineer Handbook*, p. 148-149)

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[32]. Still, G. Keith, *Crowd Dynamic*, Ph.D. thesis, University of Warwick, Department of Mathematics, August 2000. p.3-2.

Depending on the walking space provided and the density, the average of people's walking speed and the average of people flow are various from one level of service to another as shown in Figure 2-5. The level "F" is the most overcrowded environment and has the lowest speed and highest average flow. On the other hand, level "A" reflects the highest average walking speed and the lowest average of area density as shown in Figure 2-5. However, Peter Tregenza stated "…, walking being reduced to a shuffle at a mean density of 3 p/m^2 and forward movement halted at about 5 p/m^2. The capacity of a corridor, the product of speed and density, is at a maximum just before movement is halted,…"[33]

According to Peter A. Thompson, the relationship between walking speed and density[34] which is shown in Figure 2-6, means the highest walking speed is found at the lowest density area. However, the walking speed is decreased as the density increased. He added that the concentration and the average people flow is decreased as the people density increased as shown in Figure 2-7. In addition, several factors affect walking speed. Age and gender are the factors most likely to affect this speed. The highest speed in both sexes is about the age of the late 20s, males being faster than females as shown in Figure 2-8. On the other hand, Tregenza pointed out the other factor which is the difference in speed of groups of people,[35] as shown in Table 2-6. He stated the walking speed of people in groups is lower than the individual in shopping from 1.0 for a group and 1.3 for an individual on free flow density and from 0.8 m/s for a group and 0.6 m/s for an individual on full capacity.

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[33] . Tregenza, P., *The Design of Interior Circulation: People and Buildings*, Granada Publishing Limited, 1976, p.95-6.

[34] . Peter A. Thompson, *Developing new techniques modelling crowd movement*, Ph.D. thesis, University of Edinburgh, 1994. p.39.

[35] . Tregenza, P., *The Design of Interior Circulation: People and Buildings*, Granada Publishing Limited, 1976, p 97

In addition to the average of density, the shape of the entrance strongly affects the average of flow of people as has been quoted by Peter Thompson and shown in Figure 2-9. Curving the wall toward the entrance will direct the movement flow to the doorway which will increase the average of the flow which could help in overcrowding situation.
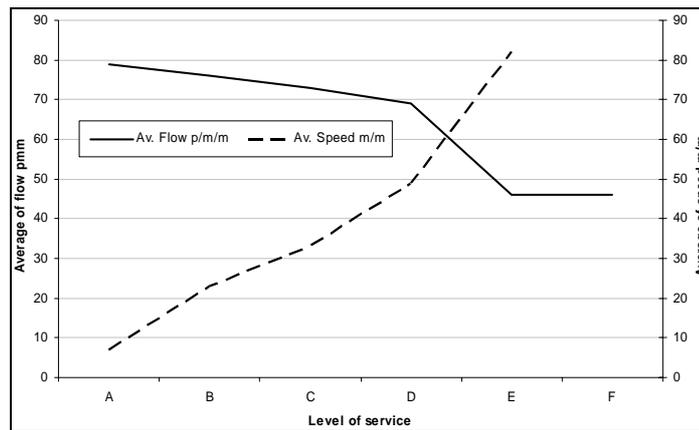
Figure 2-5: the flow average and the speed average of the six Level of services. (Source: *Traffic Engineer Handbook***, p. 148-149)**
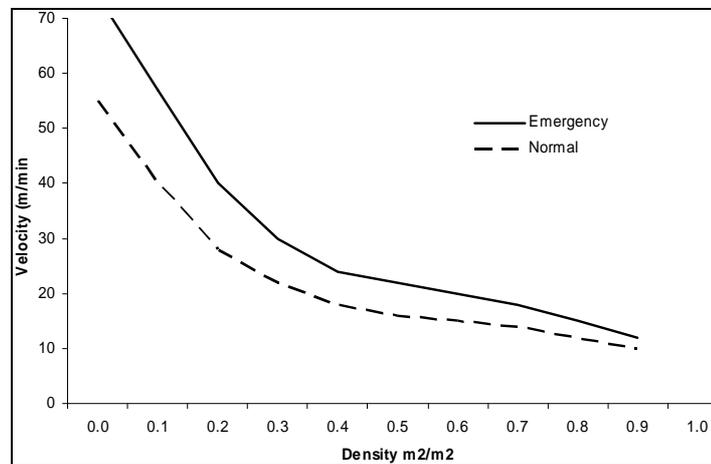
Figure 2-6: The relation between velocity and density. (Source: P. Thompson, *Developing new techniques*, 1994. p.30)
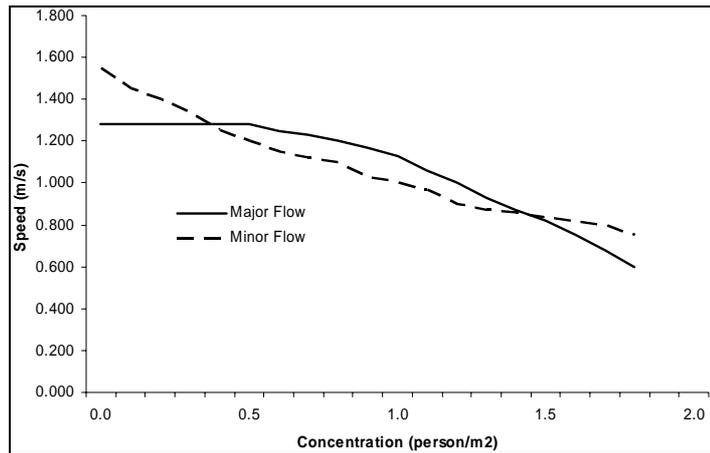
Figure 2-7: The relation between people speed and their concentration. (Source: P. Thompson, *Developing new techniques*, 1994. p.39)
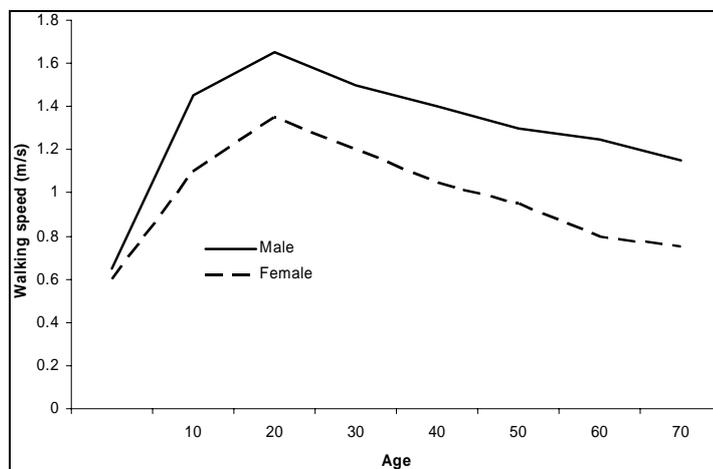
Figure 2-8: A graph showing the relation between the walking speed and the age for each gender. (Source: P. Thompson, *Developing new techniques*, 1994. p.45)

Table 2-4: Approximate walking speed.

	Free flow: mean density 0.3 p/m^2 or less		Full design capacity: 1.4 p/m^2	
	Walking speed (m/s)	Limit of corridor capacity with free flow p/min per meter width	Walking speed (m/s)	Corridor capacity p/min per meter (m/s) width
Commuters, working population	1.5	27	1.0	84
Individual shoppers	1.3	23	0.8	67
Family groups: shoppers with a high proportion of young children or with bulky packages; tourists in circulation area indoors, or outside near places of interest.	1.0	18	0.6	50
School children	1.1-1.8 increasing with age	18-32	0.7-1.1	59-92

(Source: Tregenza, P., *The Design of Interior Circulation*, 1976, p.97)
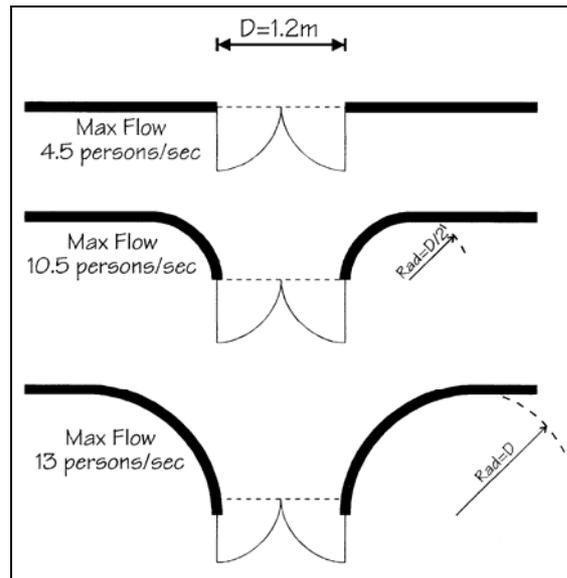
Figure 2-9: the effect of the different shape of entrances on the flow of people. (Source: P. Thompson, *Developing new techniques*, 1994. p.41)

2.4. Overcrowding Disasters in History.

In the course of human history, hundreds of overcrowding crises have been reported. Most of those crises caused death to some of the attendees. These incidents have been reported in different societies including Islamic and western societies.

2.4.1. In World History.

Overcrowding in buildings is a specific problem that will be discussed later, in chapter 3. People use buildings for protection from hostile surroundings. The issue of safety in buildings has been a big concern in Western culture where it is studied and identified and given specified criteria to help make the built environment safer. Each country creates its own building standards which help designers to create a comfortable and secure environment. Shields and Silcock consider human action as the main reason for fire in buildings.[36] In order to put this in context it is necessary to look at the events

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[36]. Shields, T.I. and G.W.H. Silcock, *Building and Fire*, 1987, p.1.

and catastrophes that have affected the Holy Mosque and the city of Makkah throughout history as well as the international incidents which give a wider view of the overcrowding problem.

It has been reported throughout the history of Makkah that overcrowding has caused death. However, although the issue was raised every season, overcrowding only came to be regarded as a crisis of some proportion after 1864 A.D. A distinction was drawn between death caused by overcrowding and death resulting from acts of war and aggression, which will be discussed later in this chapter.

Depending on the purpose of the gathering, hundreds of fatalities due to overcrowding have been reported in history, as stated in the Emergency Planning College report[37] and these overcrowding disasters throughout the world fall into four categories. These categories are: religious festivals, sports events, music festivals and other general festivals such as cultural festivals, fire-work shows etc.

1. Religious Festivals: Several incidents were reported for festivals of this category. The worst recorded one was in 1999 at Kerala, India, where about fifty people died and more than a hundred were injured as they stampeded after a collapse of a part of a shrine. In addition, in 2001, in Pak Patten, Pakistan, about thirty six people died and about a hundred and fifty were injured while worshipers waited for about three hours to practice their ritual duties. The worshippers stampeded into a narrow street. Annually, this type of incident is reported all over the world.

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[37] .1- http://www.crowddynamics.com/Main/Crowddisasters.html, 9 Sep. 2004, 2- The Final report on "*The Hillsborough Stadium Disaster*", published by the Home Office, 1990, p.1.

2. Sport Events: Many incidents in this category occurred all over the world. The worst disaster in this category was recorded in 1964 in Lima, Peru, where about 300 people were killed in a stampede after a goal was disallowed in an Olympic qualifying match. Another disaster of the kind was reported in 1982 in Moscow, Russia, where about 340 people died at the European Cup Match. The incident occurred when fans leaving the stadium tried to re-enter after a last minute goal. Moreover, in 2001 in Ghana at a sport event about 126 people died as the Police fired on a crowd who had started a fire at the end of the game. In British history, the worst reported incident was in 1989 at Hillsborough stadium in Sheffield where about 95 people died and more than 400 people were injured when police opened gates to alleviate crowding that had exceeded the stadium capacity. The same situation occurred at some other reported incidents in other areas of the world. For example, in 1985 in Mexico City about ten people died and twenty nine people were injured as the fans tried to force their way into a stadium. And, in 2001 at the Ellis Park stadium in Johannesburg, South Africa, about forty seven people died and an innumerable number of people were injured at the stadium which exceeded its legal capacity of 68,000 people to accommodate about 120,000 fans. Many other similar incidents that caused death due mainly to an overcrowding problem have been recorded.

3. Music Festivals: In this category some incidents were reported that seem to have been caused by the condition of the place and by the organisation rather than simply overcrowding. For example, in 2000 an incident was reported at Roskilde Festival, Denmark. About nine people died and about twenty six were injured when crowds of people slipped and fell in mud at the front of the stage. In addition, in 2003 at the

Friendship Stadium in Cotonou, Benin, about fifteen people died as a crowd rushed toward the front of the stage during a pop concert.

4. Other festivals and events: several incidents were reported which can not be categorised into one of the above categories as cultural festivals and fire shows. As examples; in June, 1883, an incident occurred in the Victoria Hall disaster in Sunderland, UK, where more than 180 children were killed and more than a hundred were injured when they were offered sweets at the stage. Many rushed down from the upper floor and were crushed when they all fell on the steps.[38] Also, in 1986 an incident was reported in Buenos Aires as seventy four people died when a crowd stampeded after burning paper was thrown onto terraces; the fans headed towards a closed exit and were crushed against the doors. Also in 1999 in Minsk, Belarus, fifty three died and about a hundred and fifty people were injured when a crowd of 2,500 rushed to get out of the rain at the railway station. In addition, in 2002 in Western Ukraine, about seventy eight people died and a hundred and fifteen people were injured when a military aircraft crashed into a crowd of spectators at an air show. Moreover, in 2003 in Chicago, USA, more than twenty people died and several were injured in a scramble to flee a crowded Chicago nightclub after someone released pepper spray or mace. People were reportedly trampled in a rush for the door at the two storey Epitome Night Club as there were more than 1,500 people.

Most of these disasters were caused by overcrowding and bad management and the deaths were a result of the panic reportedly due to the limited number of access points available during the entering or exiting time. However, the number of the people killed

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[38] . http://www.bbc.co.uk/dna/getwriting/A874172, 8 Feb. 2005.

is increased at accidents throughout the world whenever incidents especially happen at overcrowding points.

2.4.2.   In Saudi Arabian History.

Many overcrowding incidents have been reported in Saudi Arabian history since millions of people visit this country, especially the Hajj cities, for religious reasons. Most of the overcrowding incidents that occurred during the Islamic seasons of Ramadan and Hajj, were reported in Mina at the Jamarat area, where people were taking part in the Stoning of the Devil. Some of these incidents follow in Table 2-5.

On the other hand, at the Holy Mosque, the Saudi Arabian government is aware of the overcrowding problem and several departments and agencies have been established to deal with the issue. The Presidency of the Two Holy Mosques is the main department charged with related problems at the Holy Mosque. It is an independent authority which has supporting departments. Moreover, all other ministries and departments in the government are briefed to support its custodianship of the worshippers at this holy site. The Ministry of Interior has established a separate force for the security of the Holy Mosque. Additionally, as was stated by a former commander of the Holy Mosque Force Department, "an operation room had been created in 1996 that has a CCTV system to watch the Holy Mosque."[41] This system helps to get immediate action in case of trouble in the Holy Mosque. As it was stated before, the Custodian of the Two Holy Mosques Institute of Hajj Research was established in 1975 to study the problems of Hajj cities on a continuous basis.

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[41]. An interview with a former Commander of the Holy Mosque Force Department.

Several reasons could be drawn out from these incidents which might be the main cause of those incidents. Human behaviour, unsuccessful management and physical building and surrounding environment are some of these causes. In the Holy Mosque cases, Muslims leaders over time have understood these causes and tried to alleviate them to keep the Holy Mosque comfortable and safe for pilgrims.

Table 2-5: Overcrowding disasters in Saudi Arabian History.

Year	Dead	Injury	Notes
1185	34		The death was inside the Sacred Ka'bah because of the overcrowding.
1222			A group of people died at the Masa'a because of the large number of pilgrims.
1278	8		While they are exiting from AlUmrah gate when a camel blocked their way out.
1382	40		At AsSalam gate.
1441	7		At the Mataf area.
1864	3		Next to the biggest pillar at Mina because of the crowding.
1990	1426		In stampede in overcrowded pedestrian tunnel. Mina.
1994	270		In a stampede during "stoning the Devil" ritual. Mina.
1997	24		Muslim pilgrims crushed. Mina.
1998	118		Muslim pilgrims crushed. Mina.
2001	21		Muslim pilgrims crushed. Mina.
2001	50	unknown	Stoning of the Devil – Mina.
2003	14		Muslim pilgrims crushed. Mina.
2004	251	unknown	Mina Valley - Jamarat Bridge, The victims, mainly from Indonesia, Pakistan and other Asian nations, were trampled to death at the climax of the hajj during a devil-stoning ritual that has in the past witnessed similar disasters. The tragedy occurred after some people collapsed as a two-million strong crowd surged towards the Jamarat Bridge in Mina to throw stones at pillars representing the devil.
2004	2	16	In IKEA, Jeddah, stampede. Hundreds of people gather at the new IKEA store.

(Source: 1. the Custodian of the Two Holy Mosque Institute of Hajj Research. 2. Ghabash, A., *The Historical Aspect*, Safety at the Sacred Lands Symposium, v.1 p. 197. 3. http://www.Crowddynamics. com/Main/Crowddisasters.html, 9 Sep. 2004)

2.5. Architecture and Social Order

Social and cultural behaviour affects architecture generally as is clearly shown in the infinite variety of buildings and man-made open spaces all over the world. This section, which on the face of it might seem to be less relevant to the main subject of

the study will nevertheless help to build an understanding of how the setting of the built environment interact with the users.

2.5.1. Architecture and Space

In modern architectural theory a strong relation has been drawn between the concept of architecture and the concept of space. This relationship has best been described by Louis I. Khan who said in 1957: "Architecture is the thoughtful making of spaces. The continual renewal of architecture comes from changing concept of space."[42] Architecture is a technique that serves to create a comfortable environment for humans to live in. Bruno Zevi discussed the issue of space and architecture in his book *Architecture as Space* (1957). He defined space as "the protagonist of Architecture."[43] The fourth dimension of "movement" is needed to comprehend and identify space. Architecture always has two or three dimension in all drawings, as Zevi notes, it is different from fine art in this respect. The fourth dimension in painting, he argued,

> "is a quality inherent in the representation of an object, ………….
> The same thing is true of sculpture. In sculpture, the 'movement' of a
> form is a quality inherent in the statue we are looking at, which we
> must relive visually and psychologically. But in architecture …….
> the fourth dimension, giving the space an integrated reality."[44]

On the other hand, the concept of Space has been identified by physiologists as

> "an extended manifold of several dimensions, where the number of
> dimensions corresponds to the number of variable magnitudes
> needed to specify a location in the manifold; in particular, the three-

[42]. Norberg-Schulz, C., *Meaning in Western Architecture* , 1974, p.XI
[43]. Zevi, B., *Architecture as Space*, Horizon Press, NewYork,1957, p24.
[44]. *ibid,* p27

dimensional manifold in which physical objects are situated and with respect to which their mutual positions and distances are defined."[45]

The composition of spaces could create an architectural environment which will form a habitable setting. The home is the best example that reflects the most important human artificial liveable environment. The importance of this space combination is reflected in Dom H. Van Der Laan's "*Architectonic Space*" (1983), translated by Richard Padovan. He starts his book with the sentence that points out the importance of the house: "The house is among the first things man needs to maintain his existence in nature."[46] Moreover, it is the place where people could practice their own life-style.

A strong relationship has been established between architecture and space, where the order of space would affect the architecture from which it has been created. The order of spaces and its importance will be discussed below.

2.5.2. Order of Space

In architecture space is organized and shaped in different forms that help users to be comfortable with it. However, those shapes and organisations will be different from one place to another and one culture to another depending on factors that affect the architectural environment. In addition to the self evident differences there are also some similarities between most architectural environments throughout the world. The composition of spatial order, which guides people from the public to the private domain, could be found in all environments with some differences that reflect the cultural effects on the surrounding environment.

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[45]. *The Cambridge Dictionary of Philosophy*, Ed. by Robert Audi, 1999, p.866.
[46]. Van Der Laan, Dom H., *Architectonic Space*, 1983, p.1.

Kaplan, in a wonderful statement, sets up the relationship between people and the order of places by describing the invisible map that has been created in people's minds. This is worth quoting at length,:

> "People carry many internal maps in their minds. Some of these correspond to places and store spatial facts, but mental maps are not limited to geographic information. They relate to events, activities, people, big issues, and trivial things. Such maps are the way that knowledge is stored in the head, and as such, we have maps for just about everything we know. The process of exchanging information is closely linked to these maps. The maps were not placed in our heads by inserting floppy disks. The only maps each of us has are ones that we construct ourselves, and none sprout in an instant. They take not only time to develop, but a great deal of experience. Through many repetitions of similar circumstances, we construct these mental or cognitive maps. Information that did not recur in our experience is less likely to become part of the specific map. Contradictory information, especially if there had been few instances, is also likely to be excluded. These mental maps not only store our experiences in some organized fashion, they also are the basis for the way we receive information."[47]

The psychological personal map that has been explained by Kaplan will be helpful as Piaget pointed out: "Mental assimilation is thus the incorporation of objects into patterns of behaviour."[48] This internalized map could be affected by many factors since it is connected and continually updated with information. Visual sources are the most effective way. However, Norberg-Schulz's concept of this relationship is as he describes it, by the relation of the distribution of spaces with the action of people and

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[47]. Rachel Kaplan, Stephen Kaplan, Robert L. Ryan, *With People in Mind*, 1998, P23
[48]. Piaget, J., *The Psychology of Intelligence*, 1950, p.8

their relation with spatial aspects.[49] Where each and every place creates a reflecting image in the human mind which will produce, finally, a complete invisible mental map that is carried in every persons mind. This map could be different from one person to another in some aspects where the difference in the image that was created reflect the place they inhabit.

The Malaysian government training program has built on this phenomenon in order to prepare pilgrims for the trip to the Holy Lands. So as to help people with overtaken they have introduced intensive training course for people who wish to perform their pilgrimage duty. They simulate with models, maps and computer simulation of the Holy Mosque building and other important pilgrimage areas such as the Jamarat as well as real life exercise in stadium. This course helps worshippers to orientate themselves in real map which could help them while they are in the actual site.[50]

In Islamic religion, location has some importance, for example, the City of Makkah's boundaries should be identified due to the higher priority and special religious importance of that city (as it will be discussed in Chapter 6.) Moreover, the identified places of each activity inside any mosque building such as prayer hall, studying area, ablution place, etc. and the Tawaf and Sai' areas at the Holy Mosque building will reflect this importance.

The relationship between people and space is similar to the relationship between people and buildings, which will be discussed below.

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[49]. Norberg-Schulz, C., *Meaning*, 1974, p.9
[50]. the interview with Tabog Haji manager.

2.5.3. Buildings and People

People always imprint their culture on their closest immediate environment including the architectural environment. As Habraken observed: "We are so conditioned to label every room by function, in conversations and floor plans alike, that it has become difficult to understand that people instinctively settle built space. Yet inhabitation remains fundamentally territorial, not functional."[51] In addition, Kent Bloomer and Charles Moore described the notion of memorising buildings and how human bodies considere the surrounding buildings environment. They stated,

> "No matter how spectacular the forms of the buildings within the city may be to the eyes of its citizens, the meanings and feelings that the buildings give will be diminished if those buildings cannot be 'possessed.' It is not difficult to imagine the sense of disenfranchisement of a city dweller who gazes at the silhouettes of objects within a great city while he is kept back with de facto 'keep off the grass' signs."[52]

On the other hand, for some creative individuals this is a very personal issue. *Oskar Schlemmer*, a German artist who wrote ballets, observed in his book *Oeuvre on the Notion of Merging the Human Body with the Space*, (2002), that Architectural space was "less a container for the body than an aspect of the body transformed."[53]

These statements would seem to summarize those universal aspects of the relationship between people and buildings that have been established throughout history. It could be asked, how do the differences between buildings and the inhabitation of the buildings in different cultures and environments then occur?

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[51]. Habraken, N.J., *The Structure of the Ordinary*, 1998, p.132
[52]. Bloomer, K. C. and Moore, C. W. , *Body, Memory, and Architecture*, 1977, p.55
[53]. Dodds, G. and Tavernor, R., *Body and Building*, 2002, p.229

The American architect Charles Moore explains how, in his view, a comfortable relationship can be established between the environment and the human. He wrote, "For many years now it has seemed to me that buildings need to be designed by more than just their architects."[54] with help by others such as, sociologists and psychologists who understand the needs of people. This statement clearly reflects the strong relationship that always exists clearly between people and buildings. However, it could be equally understood from those statements that when people are not comfortable with their architectural environment it could cause strange side effects in their social life.

A strong relationship has been established between humans and buildings through time. This relationship has led to buildings reflecting human personality in micro scale and culture in macro scale. Moreover, Islam directs people to the main principle for building. It could be found in the Holy Qura'n verse where Allah, the Almighty, said:

> *" Is it then he who laid the foundation of his building on piety to Allah and His Good Pleasure better, or he who laid the foundation of his building on the brink of an undetermined precipice ready to crumble down, so that it crumbled to pieces with him into the Fire of Hell. ………"* [9:109][55]

2.5.4. Design Standards

Design standards have been created and developed for several reasons. According to Whitefish architectural standards committee, the design standards provide

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[54]. Farmer, B. & Louw, H., *Companion to Contemporary Architectural Thought*, 1993 ,p.431

[55] . The Holy Mosque Qur-an: English translation of the meanings and Commentary, 1990, p.535.

guidelines,[56] which are as Winter & Company stated that "the design standards provide a basis for making decisions"[57] that could be used to develop and create satisfactory user requirements. Many factors affect these standards; such as, climate, topography and building function.

Moreover, Mosque buildings contain the same building components (see Chapter 4 for details) even if the built form of the mosques are different from one region to another, reflecting the culture of the country or region and the architectural characteristics in the mosque architectural form that will give an identity to these mosques in addition to their religious function. The development of design standards for mosques should be aimed at building criteria to develop a comfortable space for worshippers to practice their duties. However, if the building is overwhelmed, an overcrowding condition may occur which will deter the users or worshippers, from practicing their duties in comfortable conditions. However, in some cases, overcrowding problems were reported in buildings that were designed based on appropriate standards but which seem to be caused by human factors such as panic, stampede or poor management, etc.

The following Chapter will discuss issues related to human behaviour which could help to understand the movement pattern in the built environment and so could help to reduce the overcrowding in high demand areas.

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[56]. Whitefish Architectural Standards Committee, *City of Whitefish Architectural Review Standards, 2003*, p.5.
[57]. Winter & Company, *City Center Design Standards*, 2002, p.1.

2.6. Summary.

This chapter discussed the issue of overcrowding in relation to religious buildings, specifically mosques. In addition, it described global building environment types in relation to overcrowding incidents so as to put incidents at the Holy Mosque in a broader context. It concluded with a comparative analysis of the Islamic regulations and the design standards regarding overcrowding in Saudi Arabia and in some western countries (USA, UK). Regarding the efficiency of the Saudi Arabian standards, these Western standards, as has been shown, will not necessarily be directly applicable to the Holy Mosque. Nevertheless, religious buildings should show a significant degree of care on the architectural side with means of control for service providers, which would help to create a comfortable and safe environment for people to perform their duties.

The standards regarding movement and design provided in this chapter will be tested in later chapters to asses their appropriate verse for application in the Holy Mosque case as protective measures in the context of the building complex being a vehicle for processing large number of worshippers aiming to completion a set of specific religious duties.

3   Crowds and People

3.1.   **Introduction**

3.2.   **Human and Social Relations**

    3.2.1. Human Behaviour

    3.2.2. Cultural Communication

    3.2.3. Crowds and Power

    3.2.4. Causes of overcrowding

3.3.   **Religion and crowds**

3.4.   **Social Behaviour in the Hajj Cities**

    3.4.1. Crowds in Islam

    3.4.2. The Social Behaviour of Pilgrims

    3.4.3.   Mosques and Muslims (the Place of Worship)

    3.4.4. The Customs of Makkah Residents

3.5.   **Summary**

3 Crowds and People

3.1. **Introduction**

Human and social behaviour is important in helping to give a better understanding of the patterns of human movement and in overcrowding crises. The matter of human and social behaviour in relation to the aspect of overcrowding will be discussed in this chapter. This chapter is divided into three sections. The first section will focus on social and psychological aspects such as Human Behaviour which could affect overcrowding in public places. Later in this section the guidance and commands for Islamic believers to follow in an overcrowding situation will be described. The second section goes on to describe the relations between humans and physical objects in the context of an architectural environment. The final section focuses on the human and social aspects of the Hajj cities, Makkah and Madinah, and the social characteristics of pilgrims who come to the *Sacred* city.

3.2. **Human and Social Relations**

3.2.1. Human Behaviour

According to Henry Pratt Fairchild (1973) Human behaviour is "the acquired manner in which a human being acts in a given situation as a result of his previous human association. Contrasted with any innate activity which is common to other forms of

animal life."[1] Allan Johnson adds that "it is anything that we do, from scratching our nose or yawning to saying something or driving a car. Action is a type of behaviour that takes into account social expectations or how we think other people will interpret and respond to what we do..... The choice of behaviour depends in some way on what we think of it." [2]

Roger Ulrich *et al* offer some arguments against causality in human behaviour when they write that human behaviour is not amenable to causal description and that the behaviour of every person is unique and very complex and not predictable. [3] However, David Canter stated that age, sex, and social class are important knowledge to have in order to predict human behaviour.[4]

Psychological research has established that one characteristic of human behaviour is that people prefer to maintain a certain distance from other people. They create their own personal space. The size of this invisible sphere will be different from one person to another. Culture, behaviour, sex and other factors may affect this critical distance. Arab behaviour in public places can be mainly summarized, according to the American anthropologist Edward Hall, in two words, "pushing" and "shoving." They behave in this way to keep their invisible distance from other individuals. Hall pointed out some characteristics of this space when he said "The size of the sphere varies with degree of crowding. The age, sex and the importance of the person, as well as the general surroundings."[5] He also observed that when Arabs meet others, they keep

[1]. Fairchild, H. P., *Dictionary of Sociology*, 1973, p. 21
[2]. Johnson, A., *The Blackwell Dictionary of Sociology*,1999, p. 4
[3]. Ulrich, R. et al, *Control of Human Behavior* , 1966, p. 4
[4]. Canter, D., *Psychology for Architects*, 1974 p. 96
[5]. Hall, Edward T. , *The Hidden Dimension* , 1982, p. 155

their distance from them for the reason of smell.[6] This issue of social behaviour is reflected in Arab homes as well. They often dream of having a lot of space in their homes. Hall noted another important issue, when he referred to findings by the Chambart de Lauwes, a French husband-and-wife team, in their work on the consequences of crowding in urban housing in France. They found that when the space available fell below eight to ten square metres per person per unit the social and physical problems doubled. On the other hand, the incidence of pathology decreased if the space available rose to above fourteen square metres per person. Thus, there appears to be a strong relation between illness, crime and crowding in western societies.[7] There is no equivalent study for Arab countries.

Islam moved beyond that and went on to teach the Muslims which foods were lawful for them. Allah, the Almighty, said in the Holy Quran:

> *"O you who believe, Eat of the lawful things that We have provided you with, and be grateful to Allah, if it is indeed He Whom you worship. He has forbidden you only the Maitah (dead animals), and blood, and the flesh of swine, and that which is slaughtered as a sacrifice for others than ..."* [2:172-173][12]

It was narrated by Jabir, (mAbpwh), that Allah's messenger (pbuH) said: "If anyone eats of this offensive tree (onion and garlic) he must not approach our mosque, for the angels are harmed by the same things as human beings."[13] Islam understood this situation as it was told that Allah's messenger (pbuH) said: "To the fasting mouth

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[6]. *ibid,* p.159-160
[7]. *ibid,* p. 172
[12]. The Holy Mosque Qur-an: English translation of the meanings and Commentary, 1990, p.69.
[13]. Alavi, Khalid, *Role of the Mosque in the Muslim Community*, 1990, p. 6

smell a more pleasant at the God from the musk smell." Islam also encourages its believers to use Siwak [a piece of a root of a tree called Al-Arak, as a tooth brush] in order to clean the teeth and thus change the smell of the mouth. It was narrated by Hudhaifa, (mAbpwh): Whenever the Prophet (pbuH) got up at night, he used to clean his mouth with Siwak."[14] It is also noted that Allah's messenger (pbuH) said: "If it weren't difficult to do, I would tell my nation to use the stick, Siwak, at each prayer." Islam's aim was to build a complete and harmonized community. It was narrated by An-Numan bin Bashir, (mAbpwh) that The Prophet(pbuH)said, "You see the believers as regards their being merciful among themselves and showing love among themselves and being kind among themselves resembling one body, so that, if any part of the body is not well then the whole body shares the sleeplessness (insomnia) and fever with it."[15] Which is shown at any mosque as Muslims stand close to each other and practice their ritual duties as one body.

Islam therefore issued some directives intended to change the behaviour of the Arabs in order to form a peaceful community. It was narrated that the Prophet Mohammed (pbuH) said: "Centre the Imam and fill the gaps." This instruction has the effect of destroying the personal sphere for a brief period while the group is engaged in prayer and thus individual egos are broken down and a sense of being one with the community is created. It was narrated that Prophet Mohammed (pbuH) said: "Muslim to Muslim as a building." This example can best be seen at the Holy Mosque where Muslims from the whole world stand together in lines radiating out from around the Sacred Ka'bah as shown in Figure 3-1. It can also be seen on a smaller scale at mosques all over the world, where the worshippers stand together in straight lines

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[14]. Az-Zubadi,Zain-ud-Din A., *Translation*, 1994, p.134
[15]. *ibid,* p.955

facing towards the Sacred Ka'bah at Makkah. Another example of this unity could be seen in families of Muslims, especially in Makkah, where residents were mixed in nationalities and places of origin. As an example, some families have an Indian father and a Yemeni mother; others have a Syrian father and an Egyptian mother, and so on. On the other hand, many have a father and a mother from the same place. The conception of personal space in such circumstances changed when a new combined generation is created.

Figure 3-1: A picture showing the prayers in circular rows at the Holy Mosque, circulating the Sacred Ka'bah, the worshippers in black dress in the bottom left are in the female praying area. (Source: The Custodian of the Two Holy Mosque Institute of Hajj Research.)

3.2.2. Cultural Communication

Culture has been understood for a long time as including the way of life of a people and their manners and thought.[16] However, it is best described by the Dutch anthropologist, Geert Hofstede, "Culture is always a collective phenomenon, because it is at least partly shared with people who live or lived within the same social environment, which is where it was learned. It is the collective programming of the mind which distinguishes the members of one group or category of people from

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[16]. Hall, Edward, *The Silent Language*, 1990,p.20

another."[17] As the British sinologist Chris Jenks noted, it derives from our traditions and the way of life of people, their beliefs and customs.[18] Culture is therefore learned knowledge and cannot be inherited. Hofstede shows that region, ethnicity, and religion all effect culture.[19]

Steven J. Heine *et al* pointed out that there are several ways by which differences between cultures can be measured. The most widely used categories to contrast cultures are *cultural syndromes*, that is the patterns of attitudes, beliefs or values that are shared between cultural members.[20] The architectural environment can be affected by various aspects of humanity, and geography can have an effect on the surrounding environment as well. The architectural environment provides the best example for that. Architectural differences can be seen clearly as reflecting differences in culture.

As with other cultures, Islamic culture has specific characteristics that identify it. Islamic culture is formed by rules issued by Allah, the Almighty, through the Holy Qura'n and His messenger, (pbuH). The cultures of Islamic countries and regions have both similarities and differences. The similarities reflect Islamic rules and commands. Some examples of what this means in practice can be seen during the month of Ramadan and the season of Hajj, when Muslims came to the Holy Land, Makkah. They come from all over the world in order to perform the same rituals and worship and yet they dress in many different styles.

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[17]. Hofstede, Geert, *Culture and Organizations*, 1991, p.5
[18]. Jenks, Chris, *Culture*, 1993, p. 10
[19]. Hofstede, Geert, *Culture*, 1991, p.15-18
[20]. Heine, J. Steven et al, *What's Wrong with Cross-Cultural Comparisons of Subjective Likert Scales?: The Reference-Group Effect,* Journal of Personality and Social Psychology, 2002, 82:6, p.903-918

3.2.3. Crowds and Power

Crowding creates power, as an illusion and in reality. According to McClelland this power depends on several characteristics such as the crowd's volume and individuals' attitude, personality and gender. This power will be given to the crowd's leader.[21] Moscovici discussed the power that was created and controlled by crowds when he wrote that whenever one is faced by the masses there are two things to do, in order: first, find the leaders then, rule them as individuals by appealing to their passions to control the crowd.[22] The Saudi Arabian government has understood this concept clearly and applies it in most situations during Ramadan and the Hajj seasons. Each year several meetings with group leaders take place before the Hajj season to inform them of the updated arrangements. A useful example of this application would be in the Year 2000's Hajj season, when the Saudi Arabian government wanted to apply a new method of sending pilgrims to the Jamarat Area, to avoid any crowd and panic, in order to perform their Hajj duty on the 12th of Dul-Hijja. The Ministry of Hajj, on behalf of the Saudi Arabian government, had a lot of meetings with the Pilgrims groups' leaders to inform them of the new method and got them to agree with it. The method works by sending a group of people to the Pillar area in Mina frequently, starting from late morning until late afternoon. Those leaders have an influence over their group members and know how to teach and inform them. This kind of power has been mentioned in the Holy Quran, as Allah, the Almighty, said:

> *"And hold fast, all of you together, to the Rope of Allah, and be not divided among yourselves, and remember Allah's Favour on you, for you were enemies one to another but He joined your hearts together, so that, by His Grace, you became brethren, and*

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[21]. McClelland,J.C., *The Crowd and the Mob*, 1989 ,p.297
[22]. Moscovici, Serge, *The Age of the Crowd*, 1985, p.34-39

> *you were on the brink of a pit of Fire, and He saved you from it.*
> *……."* [3:103]

Mosovici in his book, *The Age of the Crowd*, (1985) reflected on the negative aspect of the power of crowds when he observed: "Crowds are criminal. They are mobs, scum, made up of angry men (individuals) attacking, injuring and destroying anything."[23] Psychologists have found that crowds often destroy objects, when these become obstacles which try to stop them and this reflects the crowd's power to act.

As relationships exist between humans and others so they also exist with the surrounding architectural environment. This will be described in the following section.

3.2.4. Causes of overcrowding

Le Bon stated that: "It cannot absolutely be said that crowds do not reason and are not to be influenced by reasoning."[24] In fact, several reasons cause people to gather in a crowd. They could crowd on different occasions for different reasons. These reasons have been identified differently. According to Hedy Brown people crowd for different psychological reasons such as: if the person seeks to lose their inhibition or desires to emerge with a new personality or individuality.[25]

On the other hand, Elias Canetti has suggested another set of causes for people to crowd or '*Pack*' in four different reasons. These reasons are lamenting, war, hunting and communion.[26]

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[23]. *ibid,* p.72
[24]. Le Bon, Gustave, *The Crowd*, 1982, p.51.
[25]. Brown, Hedy, *People, Group and Society*, Open University Press, Philadelphia, 1985, p.131.
[26]. Canetti, Elias, *Crowds and Power*, 2000,p.91-124

However, according to the categories of crowding events, it could be said that people crowd for different reasons. Several motivations might be found and may be identified as social and cultural reasons, national reasons and religious reasons of. In fact, each reason affects form, numbers and human behaviour within the crowd.

In social and cultural crowds people gather to celebrate festivals such as firework displays, sporting matches and music festivals.

In a national crowd, people gather to celebrate an event according to their national calendar, such as the celebration of national days and during the election process.

In religious crowds, people gather to celebrate an event that has some religious significance. Each religion has its own celebration days where worshippers gather to commemorate it. Christmas in Christianity and *Eid AlFetr* in Islam are some of these days. The behaviour of people in this type of event has been formulated and is affected by religious commands and it will be shown how Islam formulates Muslims behaviour later in this Chapter.

Several incidents could occur where mass numbers of people gather. The following section will point out some of the reported incidents in history where problems occurred on a crowded celebration site.

3.3.   Religion and crowds

Le Bon pointed out that religious sentiment is formed by individual worshipper's attitude to the characteristics of the divinity,.[27] He described the importance of religion for the masses as religion and religious considerations help to avoid the dangers when believers are massed together.[29]

Religion seems to be an important factor which could affect the behaviour of large sections of humanity and this can be seen in the impact of Islam. The coming of Islam formed and affected human behaviour through the role allocated to believers, and behavioural commands given by the Prophet Mohammed (pbuH) for every aspect of human life. Islam encourages the use of certain glorifying phrases before or after an action. It was narrated by Abu Musa (mAbpwh) that The Prophet (pbuH) said, "The example of the one who remembers (glorifies the Praises of) his Lord (Allah), the Almighty, in comparison to the one who does not remember (glorifies the Praises of) his Lord, is that of a living creature compared to a dead one."[30] As an example: it was narrated by Hudhaifa Ibin Al-Yaman (mAbpwh) that: When the Prophet (pbuH) went to bed at night, he would put his hand below his cheek and would say: "Bismika Allahuma amutu wa ahya"[31] and when he got up he would say: "Al-hamdu lillahil-ladhi ahyana ba'da ma amatana wa ilaihinnushur."[32/ 33]

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[27]. Le Bon, G., *The Crowd*, 1982, p.59.

[29]. Le Bon, G., *The Crowd*, 1982, p.64.

[30]. Az-Zubadi,Zain-ud-Din A. , *The Translation of the Meanings of Summarized Sahih Al-Bukhari*, 1994, p. 979

[31.] literally translated as: with Your Name I die and live.

[32]. literally translated as: All thanks and praises be to Allah, Who has given us life after causing us to die (i.e., sleep); and unto Him is the Resurrection.

[33]. Az-Zubadi,Zain-ud-Din A., *Translation*, 1994, p. 973

Religion is a cause that gathers the largest numbers of people in the same place for the same purpose and time. The Pilgrimage process was established by the founders of religions[34] and is aimed at taking people to their religions sacred sites; Benares, India is the sacred site for Hindus; Jerusalem, Israel for Jewish, Christian, Muslim; Makkah, Saudi Arabia for Muslims; or one of many hundred thousand others over the world.[35] Some religions have more than one sacred site where followers congregate. David Levinson stated that: "The Shrines, places that are frequently visited by large numbers of pilgrims became pilgrimage centers."[36]

For Christian followers, several places over the world could be pilgrimage sites. Millions of visitors attending ceremonies during each year; for example[37], about three millions people visit a place in Lourdes, about two million visits Fatima, and more than one million pilgrims annually visit each of the following places: the Chapel of the Miraculous Medallion at the rue de Bac in Paris, the Lady of Rocamadour, the Lady of Scherpenheuvel in Belgium, the Sacre-Coeure at Montmartre in Paris and Mont-Saint-Michel in France, however, the greatest number of pilgrims in Christianity go to Rome.[38] In addition to all those sites, there are some other pilgrimage sites in Christianity throughout the world in Asia, Africa and North and South America.

For Hindu followers, the Ganges River in India is the most sacred pilgrimage site in the world. More than seventy million Hindu pilgrims attend the pilgrimage ceremony every twelve years.[39] Along the river Ganges, the pilgrims practice their Hindu

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[34]. Eliade, Mircea, *Ed.*, *The Encyclopedia of Religion*, Collier Macmillan Publishers, London, 1987, p.329.
[35]. Eliade, Mircea, *Ed.*, *Encyclopedia of Religion*, Collier Macmillan Publishers, London, 1987, p.328.
[36]. Levinson, David, *Religion Across-Cultural Encyclopedia*, Pub. ABC-CLIO, Inc. 1996. p. 157
[37]. Levinson, David, *Religion Across-Cultural Encyclopedia*, Pub. ABC-CLIO, Inc. 1996, p.328.
[38]. *ibid,* p.331/2.
[39]. http://www.cnn.com, http://www.bbc.co.uk.

religious duties by washing themselves and reading their religious words. The pilgrimage ceremony lasts for more than forty days. However, the pilgrims do not stay for all of those days, which means that not all the seventy million gather together in this ceremonial place. Millions of Hindu devotees gather in the holy town of Nasik and neighbouring Trimbakeshwar for one of the most auspicious days of the Kumbh Mela, or Grand Pitcher festival, which comes to the towns only once every 12 years. The tragedy at Nasik, about 200 km (125 miles) northeast of Bombay, is celebrating the biggest religious event in Hindu religion. The Hindu people live in tent camps during these festival days.[40]

In the Islamic religion, Makkah, Saudi Arabia, is widely known as the pilgrimage city, however, Arafat, Muzdalifh and Mina are pilgrimage cities too. In addition, the Prophet city, AlMadina, is also a pilgrimage city as Muslims visit the Prophet's (pbuH) mosque and his burial. In the Islamic religion, Hajj is one of the biggest religious overcrowding events as more than a million Muslims from all over the world gather in Makkah and in other villages close to this *Sacred* city. In addition, in Islamic religion, the festival of Sheia in Najaf and Karbela is a recognisable event where millions of people gather in the month of Muharam, the first month in the Arabic calendar, mostly in those two cities celebrating the event of A'ashora, the tenth of Muharam.

A crowd could be found in each religion in some specific sites as mentioned above. The human behaviour seem to be different from the usual at these sites. In the Islamic religion, Muslims behave differently in the Hajj cities which are the most religious sites for them.

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[40] . http://www.crowddynamics.com/Main/Crowddisasters.html, 9 Sep. 2004

3.4.   Social Behaviour in the Hajj Cities

The Hajj cities are those cities that complete the rhythm of the Hajj. Makkah is the most important one. Muslims, who come to Makkah, have special characteristics that have been formed by their religion and through their cultures. This part of the chapter will discuss this issue in order to discover those special behavioural characteristics.

3.4.1. Crowds in Islam

The phenomenon of the Crowd in Islamic history started with the prophet Ibrahim's (pbuH) call for *Hajj*. Believers shall answer this call from all over the world and perform Hajj at least once in their entire life. As a consequence, millions of people visit the Holy Mosque in Makkah, the Prophet Mohammed (pbuH) mosque in Madinah, Arafat, Mina and some other places from time to time for the reason of worshipping Allah, the Almighty. Previous chapters focused on and showed the focal points at the Holy Mosque.

In this respect it is interesting to note that one of the City of Makkah's names which was recorded in history is *Umm Zaham* : which translates as 'the mother of crowds', and the meaning is that it is the most crowded place on earth. It reflects the situation of this city before Islam.

 The Crowd is a big issue in Islam. It has been recorded that one hundred and fourteen thousand Muslims performed *Hajj* with the Prophet Mohammed (pbuH) in his

pilgrimage journey fourteen hundreds years ago.[41] Moreover, Islam seeks to form a believers' behaviour, to ensure the highest degree of protection for their livelihood and the most congenial condition for worship. This issue could be clearly found in His sayings. As narrated by Abdullah Ibn Abaas, mAbpwT: when the Prophet Mohammed (pbuH) heard a shout after him and the hitting of camels, he (pbuH) told them: "Oh people, be patient." which reflect a moral order to the believers to act patiently in a crowd condition that should be followed and applied. Pilgrims' numbers have increased continually for more than fourteen centuries. More than two million pilgrims performed Hajj last season (1423 A.H.) as is shown in Figure 3-2, which also shows the increase in the numbers of pilgrims through time.

Elias Canetti raised some issues about crowds in the Islamic religion. For example, he wrote: "As in all religion, invisible crowds are of the greatest importance, but in Islam, more than in any of the other world religions, these are invisible *double* crowds. Standing in opposition to each other."[42] He continued to deal with Islam and described Muslims belief about this issue. He pointed out the believers thought about the Day of Judgment and the crowd on that day where each person faces their only Judge.

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[41] . The ministry of Finance in Saudi Arabia, *A report of the Expansion of the Holy Mosque by King AbdulAziz.*

[42] . Canetti, E., *Crowds and Power*, 1988, p.141.
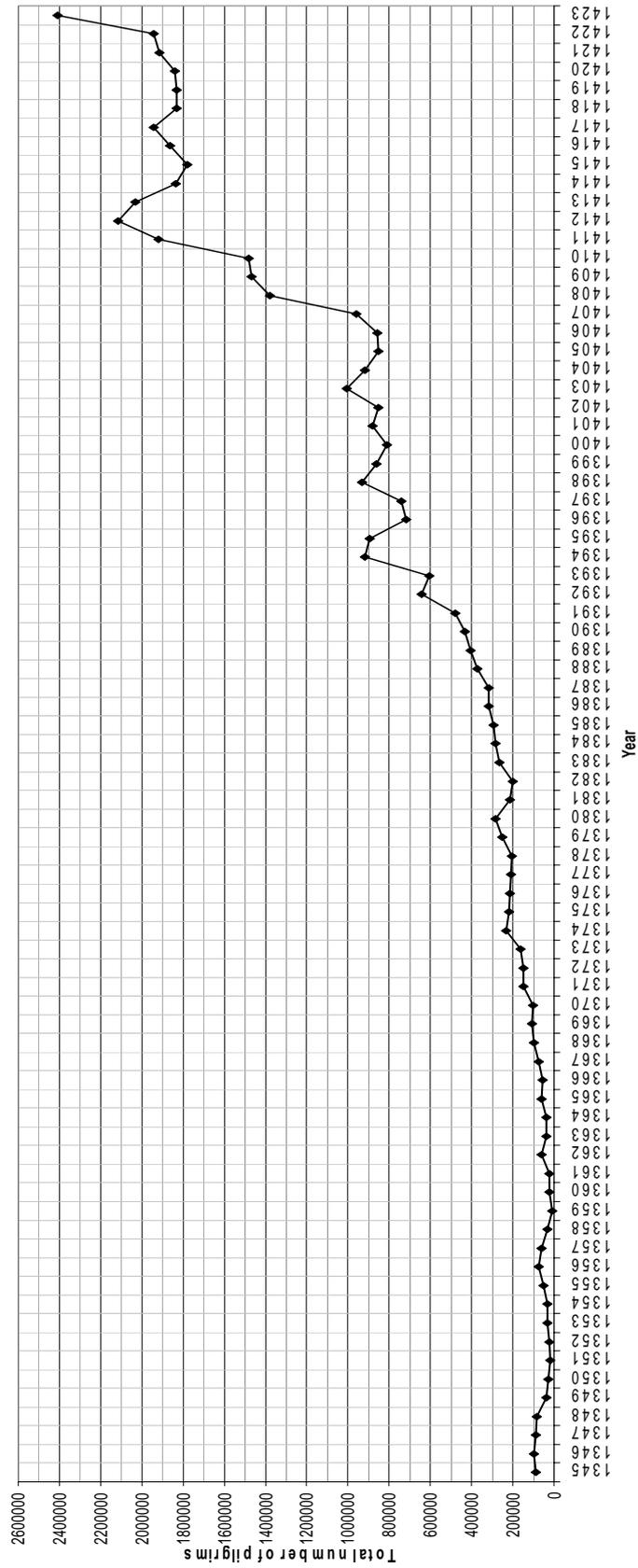
Figure 3-2: A graph showing the total Numbers of Pilgrims from 1345 until 1423 (A.H.), (from 1965 until 2003 A.D). *Source: The Custodian of the Two Holy Mosques Institute of Hajj Research.*

The religion of Islam forms and shapes the behaviour of believers in a way that reflects the rules and commands of the religion. It has been narrated that the Prophet (pbuH) said: "I have been sent to complete the good manners." This saying reflects that there are some changes which occurred in people's behaviour through the coming of Islam. The following section will focus on this point.

3.4.2.   The Social Behaviour of Pilgrims

Pilgrims have special characteristics that are due to religious customs. Basim Hakim observed that "The Qura'n teaches the virtues and importance of privacy, and respect of it."[43] However, reflecting on the creation of the new culture and customs established hundreds of years ago and affected by Islamic commands; he concluded:

> "With reference to the continuity of the design language across time and place, the Middle East has an established tradition of over 3,000 years of town building and an associated building design language which has been adopted and modified by the Arabs who also added new elements designed to suit the values and social requirements of an Islamic community."[44]

However, Muslims have a very special attitude towards being human on the earth. As this opinion is stated in the Holy Qura'n by the words of Allah, the Almighty, when He said:

> "............................. *Say (O Muhammad, pbuH): "Verily, my prayer, my sacrifice, my living, and my dying are for Allah, the Lord of the 'Âlamîn."*   [6:161-165][45]

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[43]. Hakim, B., *Arabic-Islamic Cities*, 1986, p.33
[44]. *ibid,* p.55
[45] . The Holy Mosque Qur-an: English translation of the meanings and Commentary, 1990, p.394/5.

The Two Holy Mosques Institute of Hajj Research in Makkah, have done much research into the behaviour of pilgrims. One of its departments is dedicated to studying the demography of these people. As a result the *Social Structure of pilgrims* has been initiated. According to the regular study of General Statistics of Pilgrims in Makkah and Madinah that was done regularly every Ramadan and Hajj seasons of each year at the Custodian of the Two Holy Mosques Institute of Hajj Research, since 1996.

3.4.3. Mosques and Muslims (the Place of Worship)

As it will be described in chapter 4, the Mosque is an important element in Muslim lives. It moves beyond being simply a place of worship. It acts simultaneously as a social, religious, and administrative place. The importance of the mosque to Islam could be clearly shown by the Prophets (pbuH) sayings: for instance, when he said, "The preparation for a pilgrimage could only be done to three places: The Sacred Mosque, My mosque, and Jerusalem mosque." The issue of the Mosque and its relationship with the surrounding environment and Islamic society has been discussed in previous chapters.

However, the mosque can be used for several social events. It is stated that when the Prophet (pbuH) emigrated from Makkah to Medina and built the first mosque in Islam, the *Qubaa* Mosque, he used it for several social activities. Studying is one of many events to take place in most mosques in Islamic societies. The Holy Mosque in Makkah is one of those mosques where studying *Halaqa* (circles) take place at many points inside. Most of the best scholars in Saudi Arabia teach in those circles which give it a higher importance than the Halaqa in other mosques. In addition, there are many Qura'n learning circles in the Holy Mosque as well as in other mosques where

the Holy Qura'n is taught, mostly by the Imam of the mosque, as will be discussed later in Chapter 7. Moreover, most of the male engagement ceremonies take place at the Holy Mosque, for Makkah residents, which will add more religious meaning to the wedding party. These examples show the special relationship between Muslims and mosques, which reflects the relation between people and the building. The location of the Holy Mosque in Makkah gives the site some differences as well as the residents of that city who acquired some differences in their customs from the pilgrimages.

3.4.4.   The Customs of Makkah Residents

Makkah was started as a city of different tribes, as will be described in next Chapter, who immigrated and were settled next to the Sacred Ka'bah because of the Zamzam well and since it is located on the caravan route between AshSham (Syria today) and Al-Yemen. Before Islam, because they lived next to the Holy Mosque, they were known as Allah's people. Due to this varied origin, Makkain people or Makkah residents have very different customs and characters from other Saudi Arabian residents, or from Muslims elsewhere in the world. This difference confirmed the importance of their city as the Mecca or capital city for Muslims all over the world. The Muslim people thus inherited their customs from different nations and these have been developed through time. Most of them (originally) stayed after they finished their moral journey to achieve the virtues of living and dying in this sacred city. This combination of nationalities created not only new customs, but also a new Arabian dialect. Makkah residents are regarded as friendly, because of the high number of visitors they have to communicate with; kind and helpful, since they have to help the

visitors even though they get little money; knowledgeable, especially in religious sciences, because they have to answer the pilgrims' questions.

Since Makkah became the mecca city for all Muslims after the call of the prophet Abraham (pbuH), which gave its residents some duty of hospitality to serve the visitors seeking high reward from Allah, the almighty, and finding a way of life. *Motawef* is the word used to name the person who is in charge of serving the pilgrims during Hajj seasons. AbdulRahman Faqih described the origin of this word in his book *Alhajj Wa AlUmra* (Hajj and Umra), (1997), as: *Motawef* is the noun for the verb Tawaf, which is circumambulating the Sacred Ka'bah (see section 7.4.1). In addition, the action Tawaf takes place at the *Mataf* area inside the Holy Mosque. *Motawef*, as described in the Hajj system, published on 20/03/1345A.H, is a person from Makkah employed by the king, chosen from scholars and honest people in order to serve pilgrims. Each *motawef* is assigned for a group of pilgrims from a different place in the world. In addition, the *Motawef* should teach the pilgrims their Hajj duties. This factor led to Makkah residents acquiring a special character such as that found in other tourist cities. The Makkah residents' customs add to the special atmosphere of the religious city.

3.5.   Summary

The understanding of human behaviour is an important factor in controlling the movement of masses. There are many factors that affect human behaviour. Islamic religion forms and affects Muslims behaviour through its commands and regulations. According to Western psychological studies certain distances should always be kept between people in order to preserve privets space. On the other hand, Islam encourages Muslims to be close to each other especially in prayer. The society of Makkah residents is a mixed cultural society. Hajj cities have established a special kind of characteristic which distinguishes them from other cities.

Crowds create power and should be dealt with carefully. There are some characteristics that identify the crowd as quantified by sociologists. There is a strong relationship between architecture and space which has been noticed and recorded throughout history. An invisible map is carried within the human mind which could be different from one person to another, and this too should be taken account of by planning authorities.

People always reflect their customs and culture in their closest environment. The relationship between people and buildings is very strong. The mosque as a social and religious centre in Muslim societies is therefore the place where important social activities take place, and of special importance.

The crowd is not a new issue to Islam. It started from the calling of the Prophet Abraham (pbuH) even before the coming of Islam. Makkah is the best example of

such overcrowding in Islam. The social behaviour of pilgrims has influenced the customs and culture of Makkah residents, since most of those residents have emigrated from other countries.

 The crowd is found to be a socio-physical concept. Socially, it seems to be a gathering of people under certain circumstances of time, place, area and cause. On the other hand, physically, when an individual is crowded and lose the control are the selection of people allowed within his/her personal space. He/she needs more physical space and the design standards is exceed and the people density on the gathering area is became high. Moreover, as the situation go beyond this point it will be an overcrowding as the definition of the level of spaces is destroyed and the person has no longer control on any space, even the intimate space. It is noted that there are variations in the social definition of crowd from person to another, also between cultures.

4 The Holy Mosque and the Sacred City

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4.2.   The Mosque in Islam

4.3.   The Physical Components of a Mosque

    4.3.1.   *Sahn* (Central courtyard)

    4.3.2.   *Bayt Al-Salat* (the house of prayer)

    4.3.3.   *Al-Mehrab* (niche)

    4.3.4.   *Al-Minbar* (pulpit)

    4.3.5.   *Al-Mi'dhana* (Minaret)

    4.3.6.   *Al-Qubba* (the Dome)

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    4.3.8.   *Al-Suddah*

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4.4.   The Spatial Organisation of a mosque.

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4.7.   The Holy Mosque

    4.7.1.   The Development of the Holy Mosque.

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4.7.3.1. The Sacred *Ka'bah*

4.7.3.2. The *Maqam* Abraham (the place where Abraham stood.)

4.7.3.3. The *Hijr* Ismai'l

4.7.3.4. The Zamzam Well

4.7.3.5. The Black Stone

4.7.3.6. Al-*Safa* & Al-*Marwa*

4.7.3.7. The *Multazam*

4.7.3.8. Al-Rukn Al-Ymani (the Yemenis Corner)

4.7.3.9. The Mizab AlKa'bah (The Ka'bah's Waterspout)

4.7.3.10. The Dark Marble line. (which indicate the *Tawaf* starting point)

4.8.   Major Activities at the Holy Mosque

4.8.1. *Tawaf* (*circumambulate*)

4.8.2. *I'tekaf*

4.8.3. Praying

4.8.4. *Sa'i*

4.8.5. Drinking Zamzam

4.8.6. Kissing the Black Stone

4.8.7. Making *Doa'a* (Begging Allah, the Almighty for His blessing /invocation)

4.8.8. Studying

4.9.   Summary

4 The Holy Mosque and the Sacred City

4.1. Introduction

The Holy Mosque and its surrounding environment need to be introduced as well as the mosque as a building type. This chapter aims to help the reader understand the context in which the case study has been undertaken. In addition, it will describe the architectural components typical of a mosque. Some verses of the Holy Quran and sayings of the Prophet have been added to show how the architectural setting reflects the religion. It will also discuss the design standards and the planning regulations specifically related to mosques and describe *Makkah city* and the *Holy Mosque* in detail.

4.2. The Mosque in Islam

Allah, the Almighty, said in the Holy Quran:

> *"Say (O Muhammad, pbuH): My Lord has commanded justice and (said) that you should face Him only (i.e. worship none but Allah and face the Qiblah, i.e. the Ka'bah at Makkah during prayers) in every place of worship, in prayers (and not to face other false deities and idols), and invoke Him only making your religion sincere to Him (by not joining in worship any partner with Him and with the intention that you are doing your deeds for Allah's sake only)..."* [7:29][1]

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[1]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.404

Moreover, He said:

> *"Do you consider the providing of drinking water to the pilgrims and the maintenance of Al-Masjidal-Harâm (at Makkah) as equal to the worth of those who believe in Allah and the Last Day, and strive hard and fight in the Cause of Allah? ..."* [9:19][2]

According to Imam AzZarkashi (died in 794), a famous scholar, in his book *E'lam AsSajid*, "The Mosque (Masjid) is the place of Sjood.[3] In addition, (Masjad) is a man's forehead, as linguistics describes it. Scholars describe it as every piece of land."[4] It is told that Abo Umama, (mAbpwh), said: the Prophet Mohammed (pbuH) said: "I was better than others by four things: (He said one of them) it had been preferred to my followers that the land is a mosque and clean."

The word Masjid is derived from *Sjood*: that is the nobler activity between a believer and Allah. Now, the word for mosque, *masjid*, is known as the place which has been prepared for daily prayers. As Allah, the Almighty, said in the Holy Quran: *"And I (Allah) created not the jinn and mankind except that they should worship Me (Alone)."* [51:56]

The first mosque on the earth is the Holy Mosque in Makkah. As Allah, the Almighty, said in the Holy Quran:

> *"The first house put to the people to Bbka Mbarkan's and Huda to the peoples"* [3:96][5]

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2. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.502/3
3. Prostrate.
4. AlZarkashi, Mohammed., *Informing the prayer about mosque commands*, Ed. Abu AlWafa M. AlMraghi, Fourth Edition, 1996. p.26-7.
5. *The Holy Mosque Qur-an: English translation of the meanings and Commentary,* 1990, p.169.

In addition, it is narrated by Abu Dhar, (mAbpwh), "I said, O Allah's Messenger! Which mosque was first built on the surface of the earth" He said, "Al-Masjid-al-Harām (at Makkah)." I said, "Which (was built) next" He replied, "Al-Masjid-al-Aqsā (at Jerusalem)." I said, "What was the period of construction between the two" He said, "Forty years." He added, "Wherever (you may be, and) the Salāt (prayer) time becomes due, perform the Salāt there, for the best thing is to do so [i.e., to offer the Salāt (prayer) in time]."

Mosques were not known before Islam, but when Prophet Mohammed (pbuH) was sent as a messenger and started preaching his religion in Makkah, the new faith was not in control of the Ka'bah but the Prophet prayed in front of it, and Quraish persecuted him. The early Muslims prayed in any place. The Prophet had told his followers that prayers can be held at any place on earth, (see Abo Dhar narration). When the Prophet migrated to Madinah, he built the first mosque in Islam, after the Prophet (pbuH) had been sent there. It was the *Qubaa'* Mosque, which will be described later in this chapter. The Prophet built it in the middle of a village named Qubaa'. The early mosques were simple, low-lying and uncomplicated structures. When the Prophet migrated to Madinah he found that every tribe used to have its own meeting place where they held their social activities such as weddings and entertainments in addition to buying and selling. He sought to unite the various tribes by building a mosque to be a place of worship for Muslims, and called it the ''House of Allah''.

4.3.   The Physical Components of a Mosque[6]:

Mosques have changed over time since the first mosque was built over 1400 years ago, but certain components have come to be seen as inherent to what constitute the physical entity of the mosque as a religious site.

According to Muslim customs each mosque throughout the world should be formed of the same physical components. Those physical components may be shaped in different ways that work with the site conditions and cultural requirements. The components are as follows:

4.3.1. *Sahn* (Central courtyard): It is the uncovered part of the mosque and an additional prayer place as shown in Figure 4-1. It is an area of seclusion from the outside tumult, which could distract worshippers from their prayers, especially since the early mosques did not have windows or balconies. The tradition of keeping a courtyard was copied from the Prophet's mosque, which had a courtyard between two shaded areas, the first at the *Qibla* side (South), and the other at the Northern side.

4.3.2. *Bayt Al-Salat* (the house of prayer): This is the roofed section of the mosque on the *Qibla* side, pointing in the direction of prayer. The *Bayt Al-Salat*, which contains the *Qibla*, *Mehrab*, *Menbar*, and *Maqsura*, is usually a domed structure as shown in Figure 4-1. The structure is usually erected upon arcades of columns supporting semicircular arches. These arcades divide the prayer house into vertical aisles, starting from the main

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[6]. Abass, Hamed. *Story of the Great Expansion*, 1996, p.171-90.

entrance and ending at the *Qibla* wall. They also divide it into other horizontal aisles

parallel to the *Qibla* wall. The space surrounded by any four columns is called Balatah.

4.3.3. *Al-Mehrab* (niche): This is an essential component of any mosque. It is the

concave niche in the *Qibla* sidewall and indicates the direction of the Holy Ka'bah in

Makkah as shown in Figure 4-1. It is not important for the mehrab to be concave but it is

important to identify its place on the *Qibla* wall.
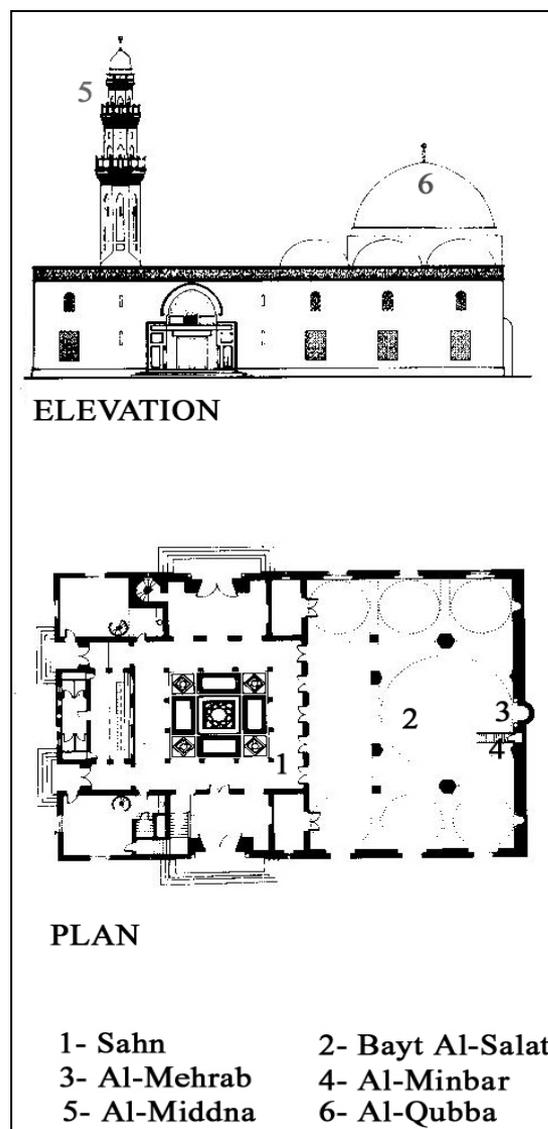
Figure 4-1: The typical mosque components on AsSulaiman Mosque in Jeddah, Saudi Arabia.
(Source: Khelosi, M., The Mosque,1998, p.334)

4.3.4. *Al-Minbar* (pulpit): This is an elevated platform used by the Al-Khatib (preacher) for addressing worshippers, as shown in Figure 4-1. The Prophet Mohammed (pbuH) used to stand on a tree trunk to deliver speeches. His companions suggested an elevated platform so that he could be heard and viewed by the people and He (pbuH) agreed to it. They made him a minbar with two staircases.

4.3.5. *Al-Mi'dhana* (Minaret): It is an elevated structure which the caller of prayer ascends to announce the calls for five daily prayers. Hamed Abbas pointed out that the minaret was not known either during the lifetime of the Prophet (pbuH), or during the reigns of the four caliphs, and he added: Caliph Mu'awiya was the first to erect one.[7]

Ever since the minaret has become a complementary component of the mosque. It has a diversity of geometrical shapes and is decorated heavily by motifs and inscriptions as shown in Figure 4-1.

4.3.6. *Al-Qubba* (the Dome): This is a semi-spherical object. It could be oval, cylindrical, spiral or bulbous, as shown in Figure 4-1. The first dome to be erected in Islam was the dome of the Rock in Al-Quds (Jerusalem).

4.3.7. *Al-Maqsura*: The first of these was known to be built by Caliph Uthman Bin 'Affan, the first who prayed in Al-Maqsura.[8] It is an open room in the foreground of the mosque, to the right or left of the *Qibla*.

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7. Abbas, H., *Story of the Great Expansion*, 1996, p.176.
8. *ibid*, p.177.
10. Ibrahim, Hazem, *the Mosques' Planning Standards*, Ministry of Municipalities, 1979, p.8.

4.3.8. *Al-Suddah*: This is a roofed wooden structure built opposite to the mehrab and the minbar. It is raised above the mosque's ground on tall fixed columns. The purpose of building a suddah is to enable Al-Muadhen (the caller of prayers) to make his voice heard by worshippers.

4.3.9. *Al-Mayda'a* (Ablutionary): Since ablutions are necessary before prayer, a place for ablutions has become an essential component of any mosque. In early mosques the ablution place was located at one side of the courtyard, away from the prayer house. It consisted of a round basin around which worshippers sat to perform their ablutions.

4.4. The Spatial Organisation of a mosque.

The spatial movement of a mosque is simple, if isolated, with only one entrance. However, when linked with an urban built environment the many entrances to the compound complicate movement patterns inside a mosque. The spatial organisation of a mosque interior has been kept simple due to the limited number of its components in relation to its size. There are, however, some factors that could affect spatial organisation. These are: the *Qibla* direction and the above mentioned impact of the surrounding environment. Moreover, the overriding importance of the *Qibla* within the plan derives from the position of the mosque components that identify the *Qibla*, e.g. *Mehrab* and *Minbar*. The movement pattern inside a mosque is quite straight forward since worshippers enter the *Bayt Al-Salat* and exit through, usually, several gates which will distribute the mass quickly and help to evacuate the mosque safely. Moreover, the unified direction, entering before prayers and exiting after prayers, is the main factor helping to establish that pattern, as shown in Figure 4-2. In addition, the open-ended arrival sequence of worshippers helps to reduce the overcrowding upon entering. Moreover, the

main activity, the prayer ritual, dictates the positioning of people inside the mosque where they stand in rows if they pray in groups or take up an informal pattern in individual prayer facing the *Qibla* as shown in Figure 4-3.
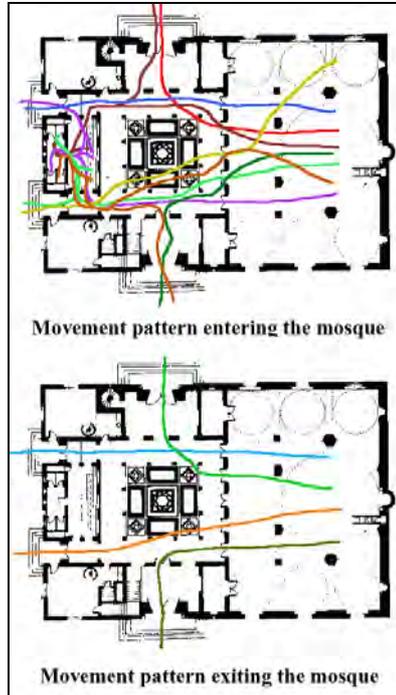
Figure 4-2: A diagram showing the movement patterns inside a typical mosque during ordinary prayer, within the individual prayers indicated in different colours.
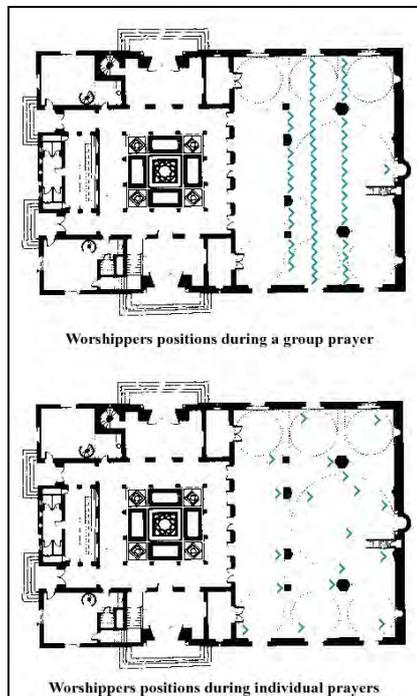
Figure 4-3: A diagram showing the positions taken up by worshippers during a prayer session in a typical mosque, the blue arrow indicates the individual worshippers.

4.5.   Design and Planning Standards for Mosques

According to Islamic planning regulations, the Mosque should be considered as the most important element in planning a residential area. These allow for three categories of mosque as follows:[10]

4.5.1. The *Mahali* mosque (the Local): It represents the nucleus of housing groups or residential clusters whose population ranges between 500 and 1,500 inhabitants. The recommended walking distance from the dwelling to the mosque is between 150 to 200 metres.

4.5.2. The *Game'* mosque (the Great): This is located in the centre of neighbourhoods where the population ranges between 3,000 and 8,000 inhabitants. The recommended walking distance to a *Game'* mosque is between 250 to 300 metres.

4.5.3. The *Eid* mosque (Holy Day): It is only used for prayer on *Eid Alfetr* and *Eid AlAdha*. It serves the whole town. A *Game'* mosque could be use for *Eid* prayers also. If the town exceeds 100,000 inhabitants, there might be more than one *Eid* mosque.

The ergonomic requirements are also specified: The area required for a prayer is different in each kind of mosque, as shown in Table 4-1. In addition, to find out the spatial requirements for each different kind of mosque, Figure 4-4 should be considered because it shows the service zone of the different mosques. In order to calculate the space needed for each mosque, it is assumed that each worshipper will occupy a rectangular space of 1.2 metre long by 80 centimetres wide allowing for the typical prostrating movement (as shown in Figure 4-5.)

Likewise, provision has to be made in terms of height for the sitting and standing positions (Figure 4-6)

Table 4-1 : The recommended area requirements per person in different kinds of mosque.

	Local Mosque	Game' Mosque	*Eid* Mosque
Net area	1m2	1 m2	1 m2
% for ancillary and	20%	30% to 40%	5%
services Gross Area	1.20m2	1.30 to 1.40 m2	1.05 m2

(Source: Ibrahim, Hazem, *the Mosques' Planning Standards*, 1979, p.8)
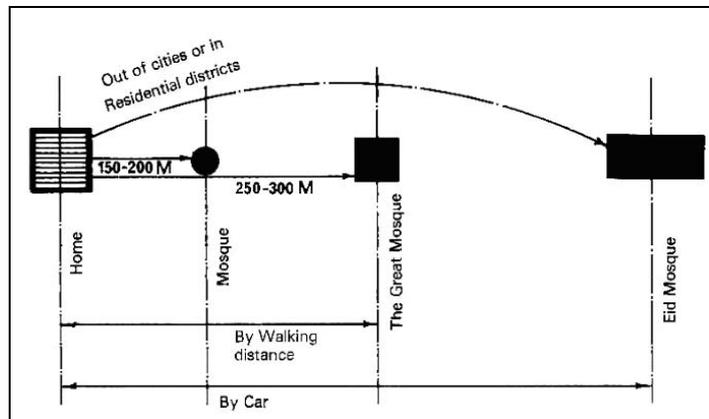
Figure 4-4: A diagram showing the zones served by different types of mosques. (Source: Ibrahim, Hazem, *the Mosques' Planning Standards*, 1979, p.6)
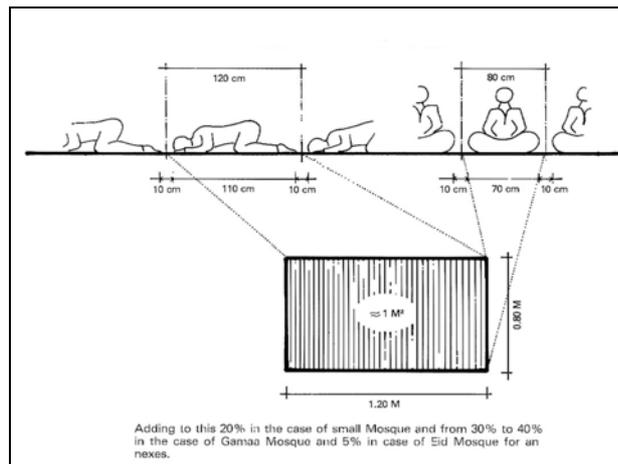
Figure 4-5: A diagram showing the space requirements for prayers in a mosque. (Source: Ibrahim, Hazem, *the Mosques' Planning Standards*, 1979, p.9)
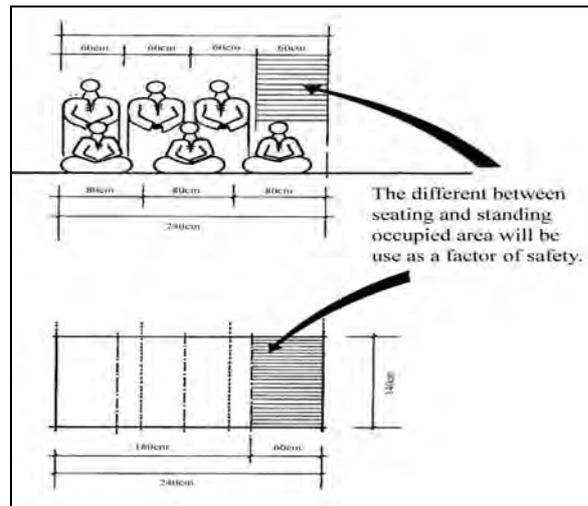
Figure 4-6: A diagram showing the spatial differentials between seating and standing areas. (Source: Ibrahim, Hazem, *the Mosques' Planning Standards*, 1979, p.16)

The city of Makkah has more than eight hundred small mosques and more than three hundred *Game'* mosques distributed throughout its district, as shown in Figure 4-7 and Table 4-2 (the significance of this point will be discussed in later chapters). Zuhair Kutbi, A Saudi Arabian geographer and writer, stated that the average of the floor area of the local mosque is about 250 square metres, and for a *Game'* mosque, 450 square metres.[11] Based on these criteria, the total floor area of the Local mosques in the districts that are close to the Holy Mosque is 55,500 m², while, the total area of the *Game'* mosques in the districts that are located close to the Holy Mosque is 22,050m². According to Table 4-2 the Makkah mosques could allow more than 67 thousand worshippers to perform their prayers at any given point in time.

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11. Kutbi, Zuhair, *the Vestige of the religious function on the Land use of Makkah*, 2001, p.114.
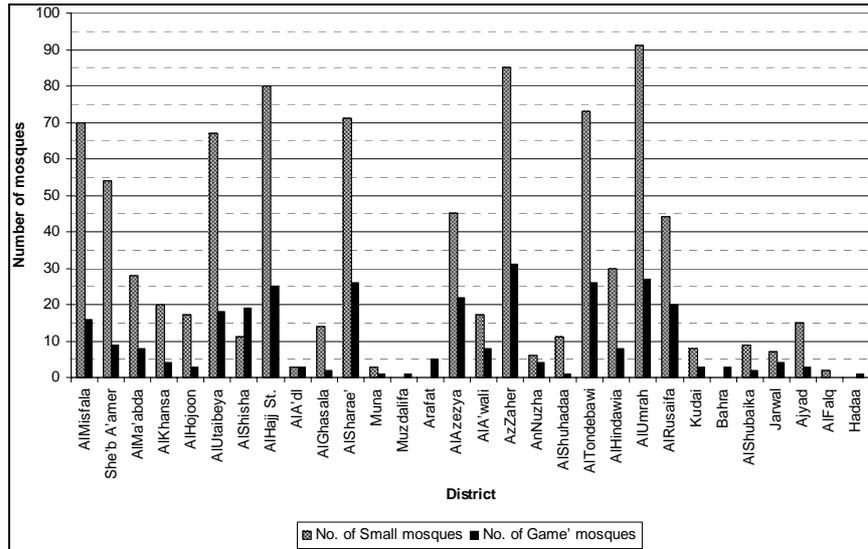
Figure 4-7: A graph showing the Local and Game' mosques in Makkah districts.

Table 4-2: Numbers of Local and Game' mosques in Makkah districts
(The highlighted rows reflect the districts close to the Holy Mosque).

No.	District	Number of Local mosques	Number of Game' mosques
1	**AlMisfala**	**70**	**16**
2	**She'b A'amer**	**54**	**9**
3	**AlMa'abda**	**28**	**8**
4	**AlKhansa**	**20**	**4**
5	**AlHojoon**	**17**	**3**
6	AlUtaibeya	67	18
7	AlShisha	11	19
8	AlHajj St.	80	25
9	AlA'dl	3	3
10	AlGhasala	14	2
11	AlSharae'	71	26
12	Muna	3	1
13	Muzdalifa	0	1
14	Arafat	0	5
15	AlAzezya	45	22
16	AlA'wali	17	8
17	AzZaher	85	31
18	AnNuzha	6	4
19	AlShuhadaa	11	1
20	AlTondebawi	73	26
21	AlHindawia	30	8
22	AlUmrah	91	27
23	AlRusaifa	44	20
24	Kudai	8	3
25	Bahra	0	3
26	**AlShubaika**	**9**	**2**
27	**Jarwal**	**7**	**4**
28	**Ajyad**	**15**	**3**
29	**AlFalq**	**2**	**0**
30	Hadaa	0	1
Total		881	303

(Source: Kutbi, Zuhair, *the Vestige of the religious function on the Land use of Makkah*, 2001, p.113)

4.6.   Makkah the Sacred City

4.6.1. Geography, Climate and Population of the Makkah region

Makkah, the Sacred Ka'bah, is located in the west region of the Arabian peninsula as shown in Figure 4-8. Hills and valleys dominate the landscape of Makkah, making for unusual but interesting scenery different from the rest of Saudi Arabia. The hills, especially, form the most striking features around the city centre, although being an impediment to its development and expansion. This type of topography has restricted urban expansion in a number of horizontal directions, on the plain or up the lower slopes of the mountains. The city centre is constrained by four mountains. This physical setting, coupled with the desire of residents and pilgrims alike to be accommodated near the *Haram*, the Holy Mosque, has led to intensive development of the adjacent hilly area, which is extremely difficult to service especially with the high number of visitors during pilgrim seasons. In the past the desire for close proximity to the Holy Mosque has over-ridden the importance of essential utilities such as water and sewerage. In order for the city's residents and visitors to obtain access to the central area it has been necessary to construct tunnels and subways in recent years. The total area of Makkah City today is more than 39.000 hectares[12] as shown in Figure 4-9.

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12. Kutbi, Zuhair, *the Vestige of the religious function on the Land use of Makkah*, 2001, p95.
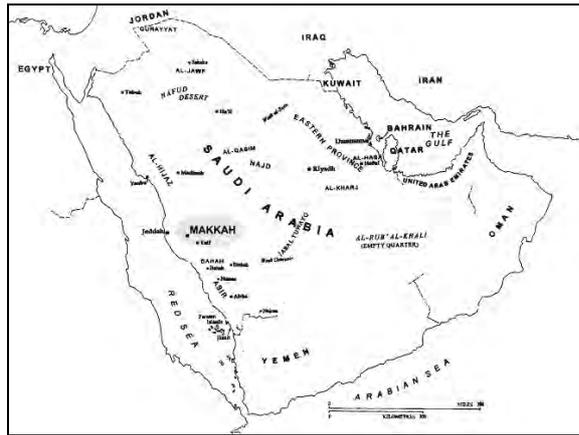
Figure 4-8 Kingdom of Saudi Arabia map.
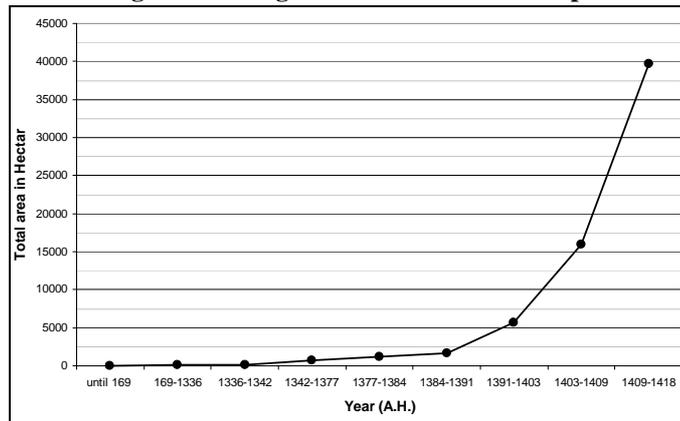
Figure 4-9 A graph showing the historical growth of the Makkah area in hectares. (Source: Kutbi, Zuhair, *the Vestige of the religious function on the Land use of Makkah*, 2001, p.95)

Makkah lies in the hot tropical zone. Summer is very hot and dry, especially the months of June, July and August. Average summer temperature ranges between 35° and 45°C, with an absolute maximum temperature of 48°C. The intensive heat in Makkah seems to be partly due to the surrounding hills creating a wind free zone. Winter is generally relatively warm with an absolute minimum temperature of 16°C as it shown in Figure 4-10.

The relative closeness to the Red Sea and the surrounding *Hijaz* escarpments modifies the climate in the city, resulting in low relative humidity, ranging from 45-55 throughout the year. However, short periods of higher humidity also occur in the summer.

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15 . Interview with AshShareef, M., an urban planning professor at College of Eng. And Islamic Arch. in Umm Al-Qura University.
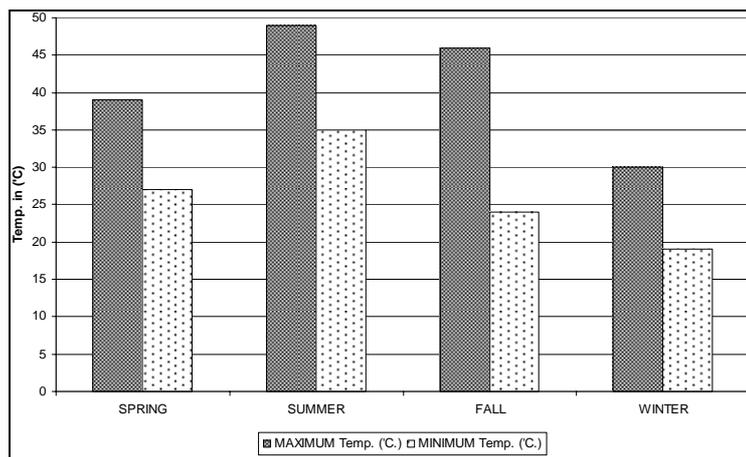
Figure 4-10 A graph indicated the seasonal minimum and maximum temperature. (Source: Kutbi, Zuhair, *the Vestige of the religious function on the Land use of Makkah*, 2001, p.26)

Rainfall is scarce, occurring during the winter months with an annual average of less than 100 mm, and usually results in flooding, particularly on the low-lying sandy plains. Runoff is also high and dramatic within the Wadi (valley), though most of the water infiltrates underground.

Makkah as a city is located in a valley between some mountains, the wind reaching Makkah from the North and North-West sides. Moreover, the implication of floods, heat, humidity etc. and the Holy Mosque site conditions for pilgrims could impact on crowd behaviour.

Since Makkah has always been an administrative and religious centre, it has naturally attracted more immigrants than other Saudi cities. For this reason, the Emirate, state or district, of Makkah currently contains the largest immigrant population in the Kingdom of Saudi Arabia, comprising about 25% of the total immigrant population of Saudi Arabia[15]. The population of the City of Makkah has increased considerably over the last two centuries. The accuracy and reliability of such data vary considerably. Figure 4-11 shows the population of Makkah in 1843 was estimated at about 18,000 persons, which had increased in 1871 to 25,000 persons. Makkah citizens consist of groups from different

countries and cultures from all over the world, as shown in Chapter 3. More than

1,242,200 people live in Makkah today (Figure 4-11.) However, there are no means of

judging the accuracy of these two estimations. The estimates for 1902 and 1911 are

somewhat exaggerated. The former was not based on any reliable information as Zuhair

Kutbi stated, whereas the latter, though lower than the former, was also rather high. The

population of Makkah now is increasing at 5.20% per year[16]. This increase in population

is considered by the authorities as a problem since the prediction of the population of

Makkah in year the 2020 is about 5 million persons.
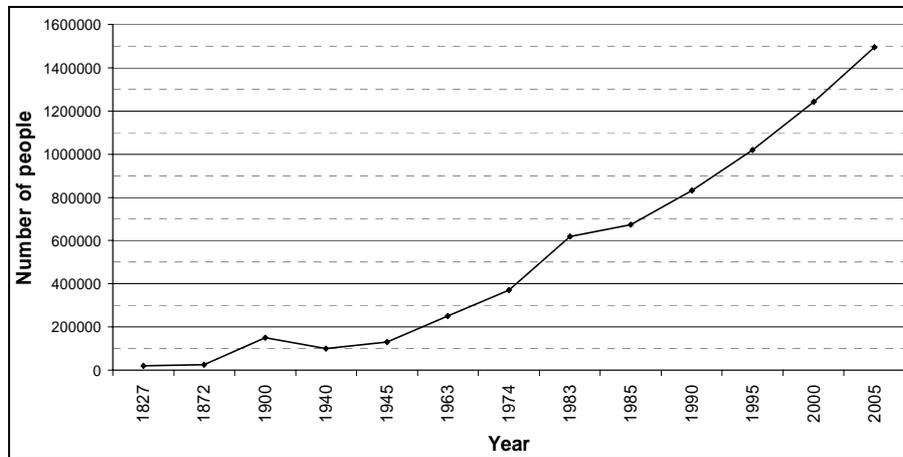
Figure 4-11: A graph shows the population growth of the city of Makkah over the time. (Source: Kutbi, Z., *Location analysis of fire accedents in Makkah,* 1994, p.80)

As the population increases, there is an equal increase in the built up area of the city of

Makkah. The built up areas of Makkah City are now estimated at about 8400 hectares.

The average population density is about 570.2 persons per hectare. Population densities

among various districts of the city vary considerably due to several factors such as the

topography of the city, and variation in the layout, type and design of traditional and

modern buildings. For instance, while the population density in the Al-Qushasheyah, a

central area district, is estimated at 4,164 persons per hectare, it is about 102 in the Al-

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16 . Abo Rayash, *AlNadwah Newspaper*, 13299, 6/5/1432, p.11

Azizyah, a suburban newly developed district[17]. The estimated average of the density of the city, which is 570.2 persons per hectare, is high. In addition, the estimated density of the central districts in particular, which is 4,164 persons per hectare, is very high compared with other Saudi Arabian cities.

4.6.2. The Historical development of the city

It is not as any other Arabian city, as Abdullah Ibn Abbas, mAbpwt, narrated: The Prophet said, "Allah has made Makkah a sanctuary (sacred place) and it was a sanctuary before me and will be so after me. It was made legal for me (to fight in it) for a few hours of the day. None is allowed to uproot its thorny shrubs, or to cut its trees, or to chase its game, or to pick up its fallen things except a person who announces it publicly."

Muslims believe that a prayer in the Holy Mosque at Makkah is equivalent to one hundred thousand prayers in any other mosque. In every city there is more than one religion embraced by the inhabitants except in Makkah and Al-Madinah. Makkah is the focus for all the great religious rituals. Every Muslim has to turn his face towards it in prayer. Entering it with Ihram is essential, and a ritual bath is prescribed. It has been a sanctified and secure place since before Islam. Allah, the all mighty, said in the Holy Quran:

> "*for the protection of the Quraish, the (Quraish) caravans to set forth safe in winter (to the south) and in summer (to the north without any fear),So let them worship (Allah) the Lord of this House (the Ka'bah in Makkah), (He) Who has fed them against hunger, and has made them safe from fear.*" [106:1-4][18]

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17. Kutbi, Z., *Location analysis of fire accedents in Makkah,* 1994, p.80
18. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.2015.

According to Muslim belief, the importance of Makkah can be shown from early history. Allah selected this isolated and lonely place in the middle of the barren foothills of the Arabian peninsula to be a new residence for Prophet Abraham's family, his wife Hajer and his son Isma'il (pbuH) and eventually to be the cradle of His heavenly Islamic message to humanity and the centre of the Islamic religion for all Muslim nations of the world. Since before that, the history books indicate that Makkah was a pilgrimage city before Islam as Abdullah Ibn AzZobair, mAbpwt, said: "Seven hundred thousands of Bani Israiel performed Hajj to this House. They took off their shoes at Tane'm then entered."

The number of pilgrims that expands the number of visitors in one season, the Hajj season, has increased dramatically as shown in Figure 3-2.

These virtues are not attributed only to the building of the Holy Mosque itself, but are also bestowed to all sites within the boundary of the *Haram* land. As it was narrated by Atta'a when he said: while Ibn AlZubair was giving his speech he said: Prophet Mohammed (pbuH) said: "A prayer at My mosque this is better than a thousand prayers any where except the Holy Mosque and a prayer at the Holy Mosque better a hundred. Atta'a said: As if one hundred thousands. I asked: Oh, Mohammed's father, this virtue you said for the Holy Mosque or all over the Haram of Makkah. He - Ibn AzZubair - answered: No, it is for all over the Haram of Makkah."

This is an important point that will be discussed later in this study. AbdulMalik Bin Dehaish (1995) is the first person to have studied the boundaries of the Haram, the Holy

area[19]. He stated that the Haram circle is about 127 kilometres long and that the total area included in the Haram circle is about 550.30 square kilometres. Bin Dehaish, concludes that the Haram circle relates directly to the Holy Mosque as shown in Figure 4-12. Knowing these boundaries is important, since this site has special virtues to Muslims, as was discussed above.

1 AlSafraa mountain	2 AlSetar mountain	5 Sotair mountain	6 Asla'a mountain
7 AlTareqi mountain	9 AlSetar mountain	10 Thaniyat AlMustawferah	11 AlNagwaa mountain
12 Thaniyat AlNagwaa	13 Umm AlSalam mountain	15 Yaj mountain	16 Hejli mountain
17 Abu Haya mountain	18 Shurfat Yaj	19 Alwogair mountain	20 Saif mountain
21 Numaan mountain	26 AlTaneem Valley	28 AlWated mountain	30 Rahaa mountain
33 Umm AlQezaz	34 Umm AlShubrum	36 AbuBagar	39 AlNasereya
43 AlA'shash	47 Adhlam mountain	53 AlNoairat mountain	58 The Black Dawmah
60 Nuailah mountain	61 Red Dawmah mountain	63 Bushaim mountain	65 Abu Sawaeeg mountain
66 Laban mountain	70 Eastern Nuailah mountain	71 Ghurab mountain	72 AlKhaserah mountain
77 Suwaifah mountain	76 AlMadhalef mountain	79 Seefah mountain	81 Qarn A'far
83 A'red mountain	85 Qarn AlA'abdeya	86 Namirah mountain	87 AlTaif Road from
88Alkhatm mountain			

Figure 4-12: The Holy Land Boundaries with the site of the Holy Mosque indicated in black in the centre. (Source: Bin Dehaish, AbdulMalik, *The boundaries of the Haram*, 1995, p. 499)

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19. Bin Dehaish, AbdulMalik, *The boundaries of the Haram*, 1995.

Mohammed AlAzraqi, a famous historian in Makkah and the author of one of the most famous books in the History of Makkah, stated that it is believed by Muslims that Makkah was the first place created by Allah, the Almighty[21]. As He, the Almighty named it *The Mother of Towns* in his saying in the Holy Quran :

> *"And thus We have revealed to you (O Muhammad, pbuH) a Qura'n in Arabic that you may warn the Mother of the Towns (Makkah) and all around it,…"* [42:7][22]

After the settling of Abraham's family (pbuT) and the start of the new city, the Arabian tribes started building their houses around the Sacred House. *Qurysh*, the Arabian tribe, settled Makkah, and built a town around the Sacred House where the Sacred Ka'bah was respected so much that no one was permitted to raise his house roof more than the Sacred Ka'bah.

It was circular in shape. However, it been built with mud and natural stones, perhaps with branches of trees. This type of house could psychologically reflect the highest degree of respect given to the Sacred House. Later, the shape of the houses was changed to square and it is recorded that Humaid Ibn Zuhayr was the first who changed the pattern of building from circle to square shape where people consider that as a shame for him and the God will punish him.[24] It changed the architectural environment to the Arabic building forms as in other Arabic cities at that time, where square houses were typical building forms that created the shape of the architectural environment. The houses were

21. AlAzraqi, M., *Makkah News*, 2001, p.17.

[22]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.1474.

[24]. Angawi, S., *Makkan Architectue*, 1988, p. 219.

built of stones with a number of rooms. Other people considered that as not respecting the Sacred Ka'bah.[25]

The scale of the Sacred Ka'bah has been respected where no one could build his house higher than it. Thus, when the Sacred Ka'bah was rebuilt, its height was raised, which gave people the ability to add one more floor to their houses.

The Caliph of faithful, Omer Ibn Al-Khatab bought many of those buildings that surrounding the Holy Mosque when he was about to expand the Mosque in 17 A.H., about (638 A.D.) In 7 A.H., about (648 A.D.), Ottoman Ibin Affan expanded the Mosque which affects the size of the city of Makkah so that it had grown to about sixteen hectares by the end of 40 A.H., (661 A.D.)[26] Figure 4-9 describes the growth of the city of Makkah from early twentieth century until the later part of the century. During the first century in the Arabian calendar (the eighth century A.D.) the houses around the Holy Mosque were starting to be higher than the Sacred Ka'bah. As *Sami Engawi* noted, it is recorded that a man called Shaybah Ibn Ottoman used to demolish houses that were taller than the Sacred Ka'bah.[27]

Ghazi Makay pointed out that, until 1100 A.H., (1689 A.D.); Makkah could still be considered as a good example of an Arabian Muslim city, where the Mosque and the surrounding districts embodied the concept of the Islamic city centre. This remains the case until the early 20th century. The city of Makkah like other cities of the Ottoman Empire adopted the Turkish style for some of the buildings. However, the building

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[25]. Angawi, S., *Makkan Architectue*, 1988, p.221.
[26]. Makky, Ghazy Abdul Wahed. *Mecca the Pilgrimage City*, 1978, p.24
[27]. Angawi, S., *Makkan Architectue*, 1988, p.227.
[30]. Engawi, Sami M., *Makkan Architecture*, 1988, p.71, and Kurdi, Obeid Allah. *The Holy Ka'bah and the Two Holy* Mosques, 1999 p. 179.

materials remained the same, (stone, wood, and mud.) and the city kept the layout the

Arabian Islamic city, where the mosque was located at the centre as shown in Figures 4-

13 and 4-14.
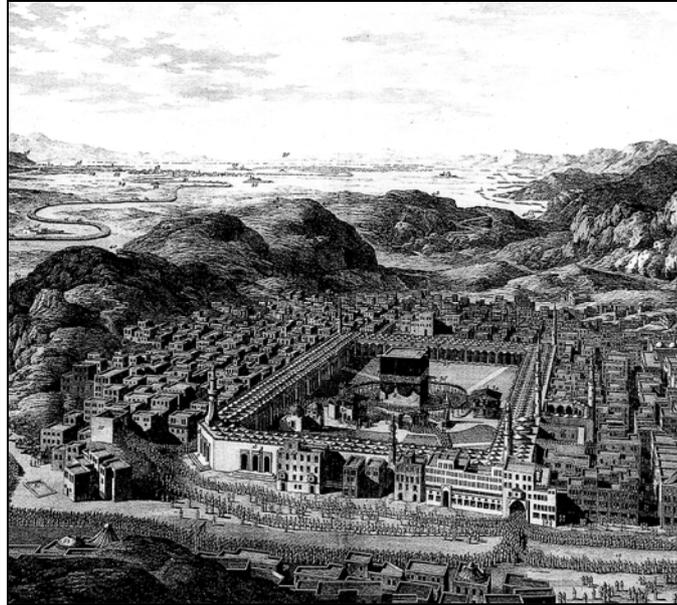
Figure 4-13: An engraving of Makkah in 1740 A.D. illustrating how the Holy Mosque
site is configured by topography. **(Source: C. Searight M. de M. D'ohsson[30])**
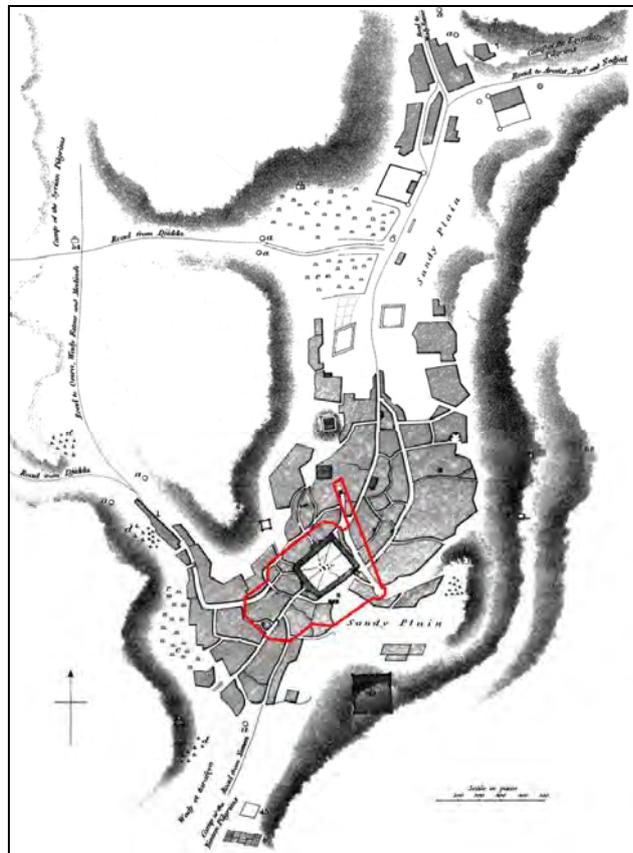
**Figure 4-14: A map showing the city of Makkah in 1814 A.D with the current site of the Holy Mosque
in red.** (Source: Burckhardt, J., *Travels in Arabia*, 1829, p. 103)

The Ottoman leaders gave the Holy Mosque their special attention. The Holy Mosque building was repaired and facilities for pilgrims improved. The leader *Mohammed Ali Bash* also built some administration buildings in Makkah, for example the *Egyptian Takeya* (1238 A.H.), where the poor people could find free food, as well as *Banaja Home* to serve as a Capital building for Makkah's leader.[31]

In 1906, the Ottoman leaders established the first Town Council which issued building codes and acted as the controlling office for their implementation. The total number of the population of the city of Makkah was generally increased by the Turkish employees who came with the Ottoman's leaders and settled there, but it was the completion of the Hejaz railway connecting Syria with Medina, that stimulated the rapid growth of the city, reaching fourteen hundred hectares[32] in the mid twentieth century as shown in Figure 4-9.

During the Saudi government (1924 onward), Makkah continued to expand along traditional lines with stone and wood construction being the norm. On the other hand, as Figures 4-15 and 4-16 show, by the middle of the century buildings in excess of four storeys were already common in the centre. The late 1960s saw the discovery of oil in Saudi Arabia followed by a boom period in construction with the introduction of new materials like cement and concrete, new building styles (e.g. the replacement of traditional Makkah features like the *Roshan* with balconies and the *Mashrabeia* with regular windows.)

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[31]. AsSebae'e, A., *History of Makkah*, 1979, p.526.
[32]. Makky, Ghazy Abdul Wahed. *Mecca the Pilgrimage City*, 1978, p.5
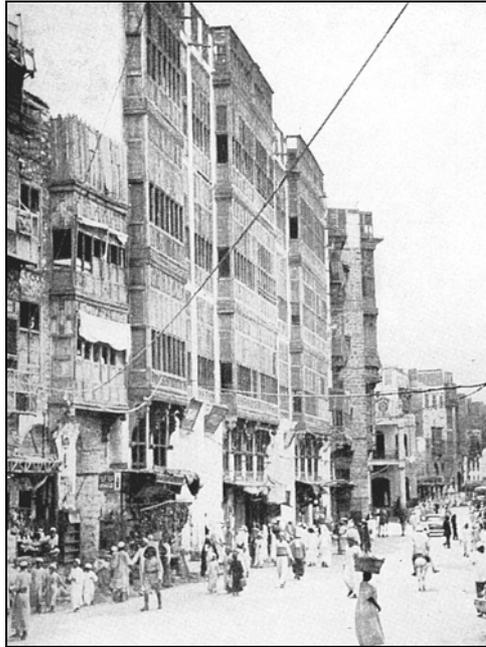
Figure 4-15: A typical market street in the centre of Makkah in the 1950s. (Source: Shah, S., *Destination Makkah*, 1957, p.85)
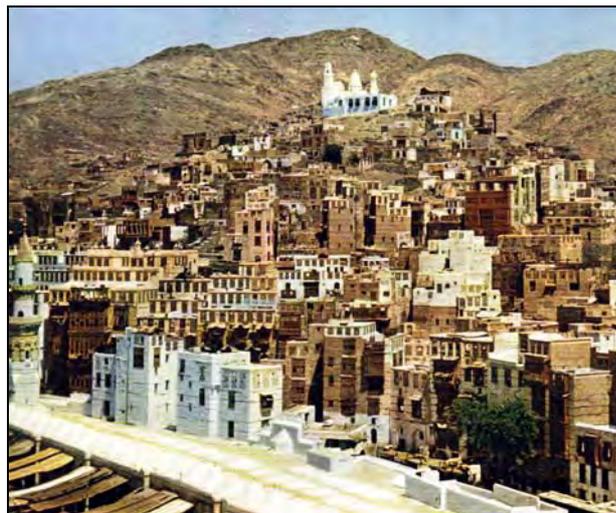
Figure 4-16: A picture of Qubais Mountain in 1953 A.D. showing the style of Makken houses; Bilal mosque is shown on the top of the mountain; A part of the Holy Mosque's dome is shown at the botom of the picture. (Source: National Geographic Magazine, July 1953, p.24)

In addition, these changes had a cultural impact on the residents. The use of air-conditioning, for example, stopped the Makkah custom of sleeping on the roof. Makkah residents or Makkans also began living in small apartments, whereas before a multi-storied house served for the whole family. As a result of the expansion of the Holy Mosque during the 1970s Makkah residents started moving to new suburbs (*harat*) from

their old residences that were close to the Holy Mosque. These were bought up by the Saudi Arabian government for the expansion of the Holy Mosque. Houses became more modern in shape and floor plan, adopting western styles instead of keeping their traditional regional character.

Today Makkah is a very big city and its architecture reflects the latest international technologies and stylistic fashions. On the other hand, recently, the reappearance of traditional built forms identified with Makkah has been noted, but, as *Sami Angawi* has shown in his Ph.D. thesis, *"Makkan Architecture"*, the influence of international architectural trends is still dominant.[33]

An overall view of Makkah today could be described as a mixture of building styles that reflect the mixed identity of the people living in the city. The picture of the city that emerges from any entrance point has a backdrop of unorganized and unplanned shelters and small buildings that cover large parts of the mountains where most of the foreigners live, and in front of that, a mixture of modern buildings which comprise houses and other buildings. The horizon of that picture is drawn with modern high-rise buildings, used mostly for pilgrims and visitors during the Hajj and other seasons as shown in Figure 4-17.

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[33]. Angawi, S., *Makkan Architectue*, 1988, p.214

Figure 4-17: An overview picture shows the Holy Mosque with the surrounding architectural environment in late 1999.

4.7.   The Holy Mosque

4.7.1. The Development of the Holy Mosque

Al-Masjid Al-Haram, the Sacred Mosque or the Holy Mosque means it is the mosque of the Holy Ka'bah. It is said that Al-Masjid Al-Haram is the Haram which means all the area of the city of Makkah. Al-Nisa'I, a narrator of the Prophet's sayings, relates on the authority of Abu Hurairah (mAbpwh) that the Prophet (pbuH) said: "a prayer at the Holy Mosque is better than a prayer in my mosque by a hundred times". Table 4-3 and Figure 4-18 summarize the expansions of the Holy Mosque in the course of history.

Most historians described the Holy Mosque during the *Quraish* tribe time as an open space around the Sacred Ka'bah. It was surrounded by secular buildings. Hassan Basalama, an Arabian historian who was born in 1881 A.D., wrote that, "the orbits of the circumambulation area used to be known as the Holy Mosque before the expansion of the Leader of the faithful, Omar Ibn Al-Khatab (mabpwh), is the area around the Holy

Ka'bah up to the Zamzam well and Bab *Shaibah* in the east and the lamp pillars in all other sides."[34] It was not necessary to have an expansion since it was enough to accommodate Makkah's residents for prayer at that time. However, it has been reported that more than one hundred thousand Muslims performed the Hajj journey with the Prophet Mohammed (pbuH) in His journey on the 9th year after his immigration to Medina. [35]

In 17 A.H. (638 A.D.), Makkah had a great flood called, Umm Nahshl (Nahshl mother – because she died in that flood), which removed the *Maqam* Abraham from its place to the bottom of the Abraham Valley. Omar Ibn Al-Khatab came to Makkah and restored the stone of Abraham's Station to its original place (as discussed above). According to AlAzraqi, who died in the second Arabian century, Omar found that the Holy Mosque could no longer accommodate all pilgrims. He, therefore, bought some of the houses adjacent to the Holy Mosque and demolished them and added their area to the mosque. Then he built a wall less than two meters high around the Mosque and made doors in it. They put the lamps which they used to illuminate the mosque on this wall. He covered all the area with gravel. The area which was added to the mosque was estimated at about 1400 square meters.[36]

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[34]. Basalamah, H., *History of the Holy Mosque Architecture*, 1980, p.12-4/18
[35]. Associated Constructing Engineers, *Extension and Construction*, p.30.
[36]. AlAzraqi, M., *Makkah News*, 2001, p.2/69

Table 4-3: The expansions of the Holy Mosque.

Leader Name	Year		Expansion in m.	Expansion %	Area after expansion in m2.	Capacity (worship pers)
	A.H.	A.D.				
1. During Quraish Era.					2126	3324
2. Leader of the faithful, Omar Ibn Al-Khattab (mAbpwh).	17	638	1487	70%	3613	5650
3. the Leader of the faithful, Othman Ibn Affan (mAbpwh).	26	646	869	24%	4482	7008
4. Abdullah Ibn Al-Zubair (mAbpwh).	65	684	2983	67%	7465	11673
5. Al-Waleed Ibn Abdul Malik Ibn Marawan	91	709	2805	38%	10270	16059
6. Abu Ja'far Al-Mansour	137	754	5221	51%	15491	24223
7. Mohammed Al-Mahdi Al-Abbasi	160-176	776-783	12512	81%	28003	43788
8. Al-Mu'tamid Billahi Al-Abbasi	284	897	1340	5%	29343	45882
9. Al-Muqtadir Billahi Al-Abbasi	306-307	918-919	715	2%	30058	47000
10. The First Saudi Extension made by King Abdul Aziz Aal Saud	1375	1955	13104	436%	161099	313000
11. The Great Expansion made by King Fahad Ibn	1406-1412	1986-1992	206000	128%	319,800	560,720

(Source: The Custodian of the Two Holy Mosques Institute of Hajj Research)

The Extension Omar Ibn Alkhatab; mAbpwh.

The Extension Othman Ibn Afan, mAbpwh.

The Extension Abdullah Ibn Alzubair, mAbpwt.

The Extension AlWaleed Ibn Abdulmalik.

The Extension Abu Ja'far AlMansour.

The Extension Mohammed AlMahdi Alabasi.

The Extension AlMu'tamid Billahi Alabasi.

The Extension AlMuqtader Billahi Alabasi.

The First Saudi Arabian Extension.

The Second Saudi Arabian Expansion.
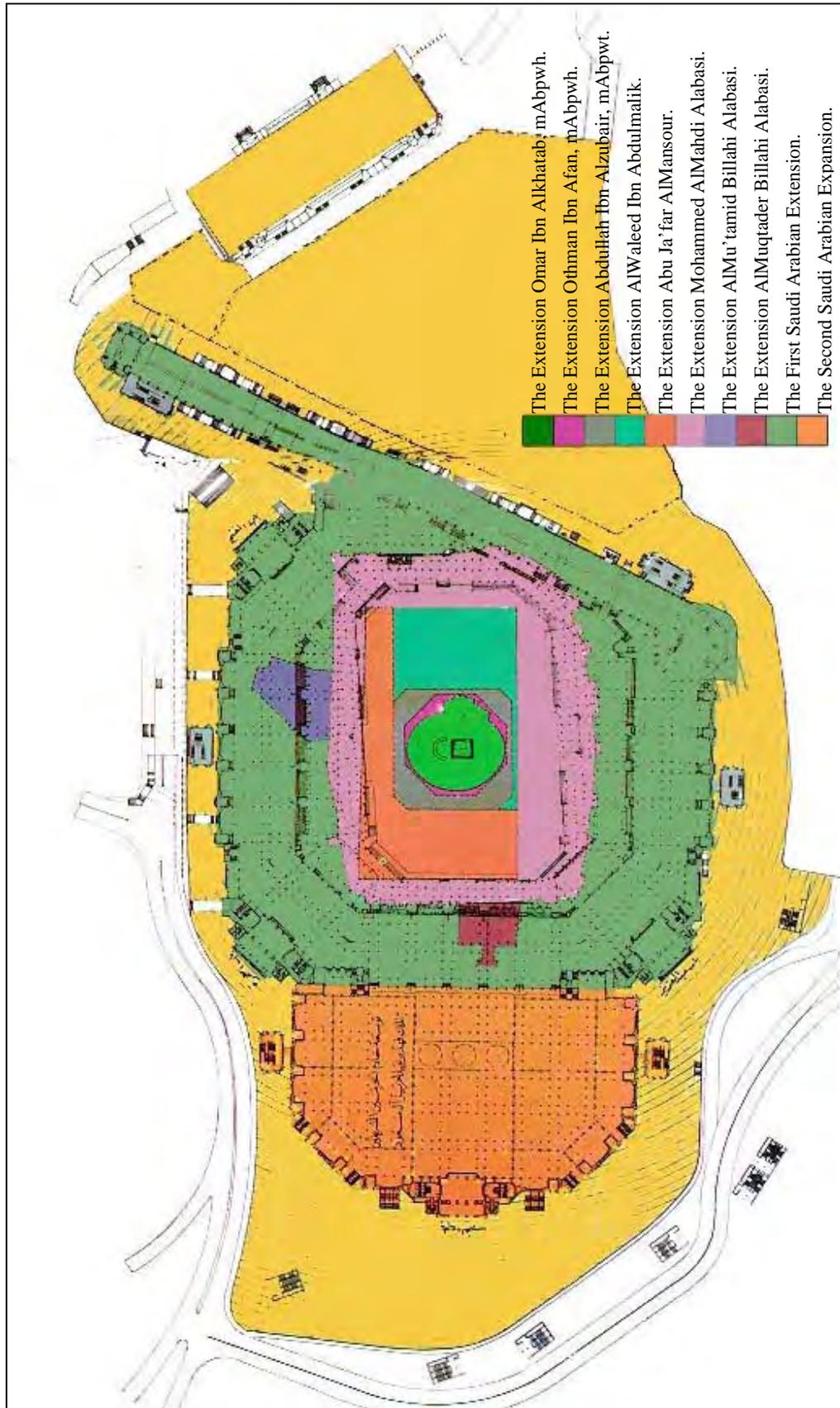
Figure 4-18: A plan showing the Extension of the Holy Mosque through the history . (Source: Bin Ladin Saudi Group)

In the year 26A.H. (646 A.D.), the leader of the faithful, Othman Ibn Affan (mAbpwh) came to Makkah for Umrah. Hamid Abbas pointed out this expansion when he wrote that Othoman found that the residents of Makkah had become very numerous and that the Holy Mosque could not accommodate all of them when they were performing their prayers. He bought up some of the houses adjacent to the Holy Mosque and had them demolished to add to the space. He was the first to set up corridors (arcades) sheltering worshippers from the sun. The total area added to the Holy Mosque was 1475 square meters.[37] (See Figure 4-19)
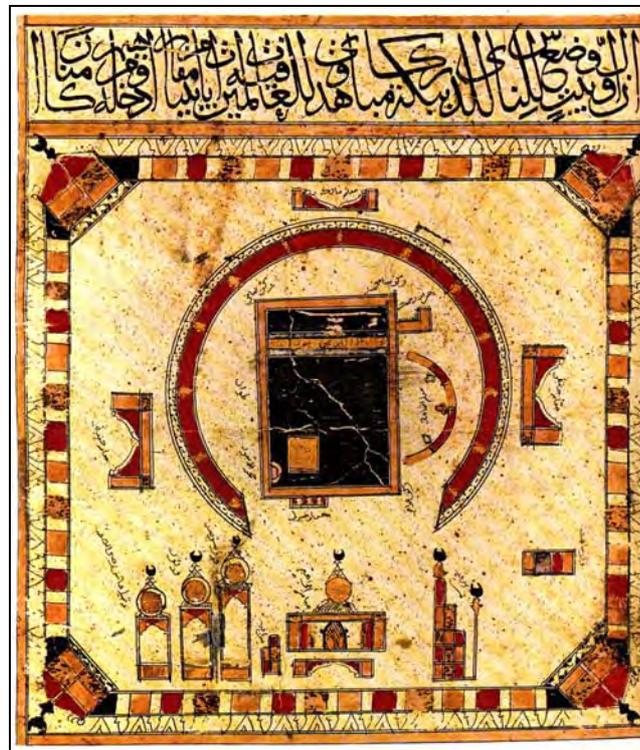
Figure 4-19: An old drawing showing the Holy Mosque after the expansion of Othman Ibn Affan (mAbpwh). (Source: Stewart, D., *Mecca*, 1980, p.21)

According to H. Abbas, in 65H. 684 A.D., after Abdullah Ibn Al-Zubair had completed the building of the Holy Ka'bah (see above), he found that the mosque was not large enough for prayers. He bought the houses adjacent to the Holy Mosque and pulled them down and incorporated their area into the Mosque. He covered some parts of the Holy

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[37]. Abbas, H., *Story of the Great Expansion*, 1996, p.208.

Mosque. He greatly expanded the Holy Mosque at that time. He built marble pillars. The total area of the Holy Mosque was 3225 square meters.[38]

As was pointed out by Basalamah, in 75 A.H. (694 A.D.), a year after Al-*Hajjaj* finished the construction work of the Holy Ka'bah, it was found that the Holy Mosque needed some maintenance and construction work. Abdul Malik ordered the repair of the whole building. The walls were raised and the Holy Mosque was lined with the best kind of wood decorated with gold. However, the Holy Mosque building did not expand at this time.[39]

AlAzraqi described this expansion. In 91 AH., (709 A.D.), Al-Waleed Ibn Abdul Malik Ibn Marwan expanded the eastern side of the Holy Mosque. Marble pillars were brought from Egypt and Al-Sham (Syria). The capitals of the pillars were coated with sheets of gold. He roofed the Mosque with decorated teak wood. He set up battlements and made windows in the walls and covered their upper sides with mosaics. This expansion was estimated at about 1725 square meters.[40]

According to Basalamah, the work on this extension was started in Muharram in 137 A.H. (753 A.D.) The expanded area was on the northern side of the Holy Mosque. Houses in that area were demolished to increase the area of the Holy Mosque. They started near Dar Al-Nadwa, and continued up to the minaret of Al-Umrah's door. The mosque was decorated with gold and mosaic and *Hijr* Ismai'l overlaid with marble. The work continued for three full years and it was finished on Dhu Al-Hijjah 140H. Al-

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[38]. *ibid*, p.209.
[39]. Basalamah, H., *History of the Holy Mosque Architecture*, 1980, p.23-6
[40]. AlAzraqi, M., *Makkah News*, 2001, p.2/71-2

Mansour ordered a minaret to be built at the end of his expansion. The increase of area was estimated at 4950 square meters.[41]

Hamed Abbas summarized the expansion work: Mohammed Al-Mahdi Al-Abbasi made two expansions. He made the first one when he came for hajj for the first time in his life in the year 160 A.H. (776 A.D.) He brought with him large sums of money (estimated at thirty millions dirham.) and got permission from the chief judge of Makkah to buy some houses at the top end of the mosque. These were demolished and incorporated into the mosque. Houses between the Holy Mosque and Al-Mas'a were demolished as well as houses on the northern, western and southern sides. The total addition of this area was estimated at 8,383 square meters.

When Mohammed Al-Mahdi came for Hajj for the second time in 164 A.H. (780 A.D.), he found that the Holy Mosque was not in a square form and that the Holy Ka'bah was not in the centre of the mosque. He held a conference and ordered the engineers and skilled builders to make the Mosque in the shape of a square so that the Holy Ka'bah could be located in its centre. This proved to be impossible as the southern side of the mosque could not expand due to the course of the flood plains of *Wadi* Abraham – the Abraham Valley - and, also because behind there were houses and shops. The leader of the faithful insisted on carrying out this plan. The engineers set their minds to perform this work as best they could and when Al-Mahdi was satisfied that his wish would be fulfilled, he returned to Iraq leaving behind him large sums of money for buying up the houses, demolishing them and adding their areas to the Holy Mosque. This expansion

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[41]. Basalamah, H., *History of the Holy Mosque Architecture*, 1980, p.28-30

was the greatest expansion up to that time and the increase of area was estimated at 6560 square meters.[42]

Al-Mu'tamid Billahi Al-Abbasi's expansion was made in the year 271 A.H. (884 A.D.) when a small building collapsed on the Holy Mosque and destroyed two domes decorated with wood. Al-Mu'tamid Billahi ordered a complete refurbishment of all the Holy Mosque's buildings. In 281 A.H. (894 A.D.) he constructed all the Holy Mosque with pillars, windows and corridors, and roofed it with ornamental teak wood. Twelve doors were set up with six big arches and between them six smaller ones. He built a minaret as well. The work was completed in three years. This increase of area was estimated at 2500 square meters.

This expansion was summarized by Haned Abbas; it was done in the year 306 A.H., (919 A.D.) Al-Muqtadir Billahi expanded the western side of the Holy Mosque. He also renovated the pillars of the mosque. The increase of area was estimated at 980 square meters as shown in Figure 4-20.

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[42]. Abbas, H., *Story of the Great Expansion*, 1996, p.211.

Figure 4-20: A print on ceramic showing the Holy Mosque after Al-Muqtadir Billahi's expansion, dated 1774 A.D. (Source: Ali, A., *The Holy Mosque in Makkah*, 1996, Figure 49)

It was reported by Hamed Abbas that during the eighth century, following Al-Mahdi's expansion, no major reconstruction took place only maintenance and repair, as when a great fire happened on the Mosque in 802 AH and the woodwork had to be restored. In the year 979 A.H., however, cracks appeared in the walls and the corridors visibly began to lean towards the courtyard of the mosque. This led Sultan Salem to embark on the complete reconstruction of the Holy Mosque. With great care the wooden roof was replaced with domes. Many new marble columns were created plus the pillars that remained from Al-Mahdi's construction and pillars made from stones brought from Al-Shumaisi. It also recorded that, in total, 589 pillars were employed to form the colonnade on all sides of the mosque supporting 881 arches and 152 domes with 26 new doors which are shown in Figure 4-22. The Ottoman expansion added 28,003 square meters to the area of the Holy Mosque. In addition, it has wonderful decorative work, as shown in Figure 4-21.

Abaid Allah Kurdi explains this expansion: early in 1344A.H. (1926AD.) King Abdul

Aziz had issued an order to repair all parts of the Holy Mosque. They started the work in

Jumada Al-Awwal, the third month in the Arabic calendar, with the tiling of all the floor

area of the Holy Mosque with marble. Much more repair work was necessary to restore

the Holy Mosque's dilapidated walls, floors and columns, and the walkways.[43]
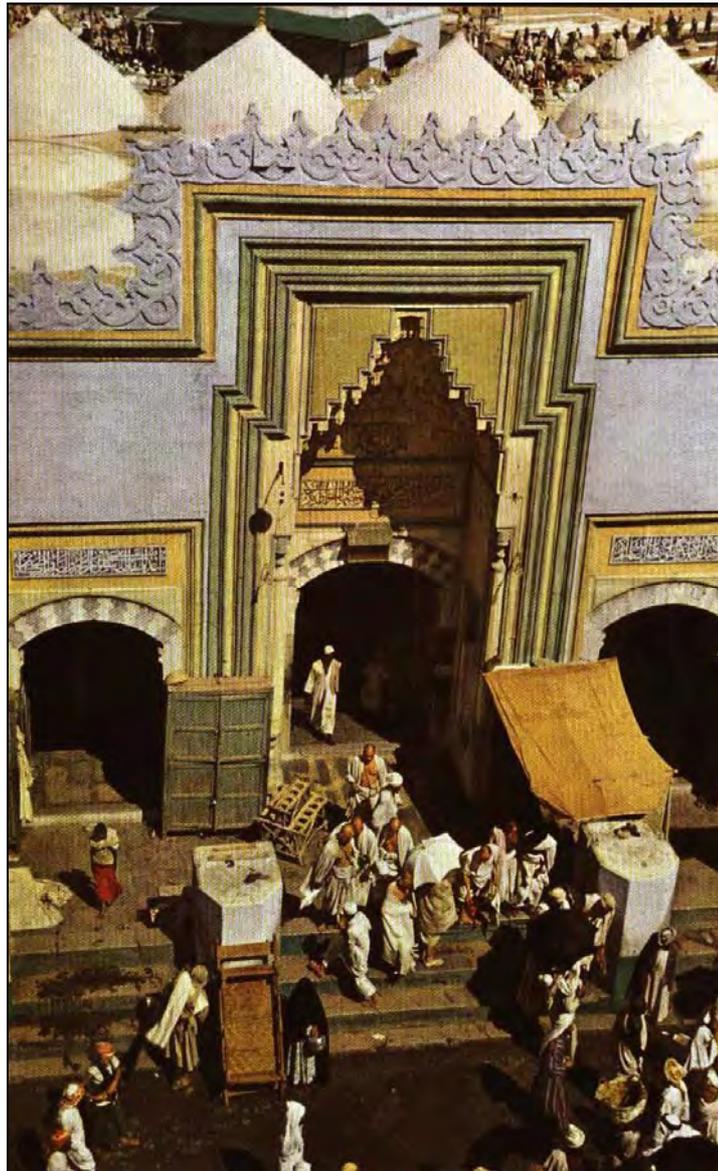
Figure 4-21: A picture showing the Safa gate before the first Saudi expansion.
(Source: *National Geographic Magazine*, July 1953, p.23)

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[43]. Abbas, H., *Story of the Great Expansion*, 1996, p.245-74.

Figure 4-22: An old picture shows the Mataf in early twentieth century where the Ottoman buildings of the Holy Mosque can be seen surrounding the Mataf area. (Source: Abass, H., *Story of the Great Expansion*, 1996, p.13)

He added, in 1346H., (1928 A.D.) King Abdul Aziz issued orders for the complete reconstruction of the interior and exterior of the Holy Mosque. This repair work included extensions to Dar Al-Nadwa and Abraham gates. It also included repairing the stone which covered the four Maqamat around the Holy Ka'bah, all the external and internal walls and staircases leading to the Mosque's gate. All domes were cleaned externally and internally and repairs made to all broken doors. The Engineer Mohammed Taher Al-Jewainim, who was responsible for the design, created a new look for the Holy Mosque upon King AbdulAziz's command.[44] The work on the expansion started with the first phase of the expansion in 1375-1381 when they built the two floors of the Masa'a, with a length of 394.5 meters and width of 20 meters. The first floor was 12 meters high and the second floor 9 meters. A low partition was erected in the middle to divide the Masa'a into two lanes, one going to Safa and the other to Marwa. They built two staircases, one for Safa and the other for Marwa. Eight gates were opened on the eastern side of the first

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[44]. Ministry of Finance in Saudi Arabia, *A report of the Expansion of the Holy Mosque by King AbdulAziz*, p. 45.

floor. Two gates were opened to the second floor, one at al-Safa and the other at al-Marwa. They installed two elevators, one on each side of the Masa'a.

Phase two (1383-1389 A.H.), of the work involved the old part of the Holy Mosque being renovated and the construction work on the exterior part of the new building started. The expansion on the Mataf (courtyard) was completed. A staircase leading to Zamzam well was completed. During phase three (1393-1396 A.H.) the interior work was done on the *Mukabbiriyah* platform. The work outside the Holy Mosque included open spaces and road works which were completed during this phase. Phase four (1393-1396 A.H.) included the renovation work on the old mosque (Ottoman mosque) and the four corners were restored for the building of the three main gates. Figure 4-23 is an aerial photograph showing the first Saudi Arabian expansion.

Figure 4-23: An aerial photograph of the Holy Mosque after the first Saudi Arabian expansion.
(Source: The Custodian of the Two Holy Mosques Institute of Hajj Research)

The most important results of this expansion are:

▪ Removal of residential buildings, schools and shops adjacent and surrounding the Holy Mosque.

▪ More open spaces to accommodate greater numbers of worshippers during the Hajj and Ramadan season.

▪ Incorporation of the Mas'a area into the Holy Mosque in one building.

▪ Encircling the newly constructed parts of the Holy Mosque with wide streets and open spaces.

▪ The creation of 64 gates for the Holy Mosque (three are main gates).

▪ As a part of the expansion, seven minarets were built at a height of 89 meters each.

This expansion made the built up area of the Holy Mosque 131,041 square meters in total.

As Hamed Abbas wrote in his book, *The Story of the Great Expansion*[45], in 1403 A.H., (1983 A.D.), only seven years after the previous expansion by the Custodian of the Two Holy Mosques, King Fahad Ibn Abdul Aziz, it was found that the Holy Mosque area was not enough to accommodate the pilgrims and visitors during the whole year. King Fahad, therefore, took the following steps to relieve the situation:

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[45]. Which been published to record the expansion work.

▪ He issued an order in 1403 A.H. to expand the Holy Mosque by the removal of all buildings in Al-Souq Al-Saghir (little market, at the west area of the Holy Mosque) and to set aside 31,000 square meters for an extension to provide space for worshippers.

▪ He issued another order in 1406 A.H. to rebuild the roof surface of the first Saudi expansion and assigned it for worshippers. This created enough space for ninety thousand worshippers to pray at peak time. Also added was the area at Souq Al-Dhahab (Gold Market at the east side of the Holy Mosque) by a total area of 46,000 square meters.

▪ In 1409 A.H. (1989 A.D.) the great expansion of the Holy Mosque was started. A three floor air-conditioned building with a reinforced concrete framework was added to the existing one. The ceilings were made in one piece of reinforced concrete on side beams and cross beams. The building of this extension was divided into fifteen independent units. A plant room was built close to the Holy Mosque for the air-conditioning system and other services.

King Fahad's expansion, that shown in Figure 4-24, followed the style of the first Saudi expansion. Two more minarets were added making a total of nine. More entrances were provided to the main building, to make a total of 95 gates. The total worshipping area after this expansion became 160,168 square meters. Now the Holy Mosque could accommodate more than half a million worshippers at peak time.[46]

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[46]. A figure of ″*more than a million*″ has been recorded in the media, which could not be.

Figure 4-24: An aerial photograph of the Holy Mosque after King Fahad's expansion.
(Source: Abass, H., *Story of the Great Expansion*, 1996, p.456)

4.7.2.   The Importance of the Holy Mosque

The *Qibla* or the prayer direction was toward the Jerusalem Mosque before Islam but during early Islamic times the Prophet Mohammed changed this to The Sacred Ka'bah at Makkah. According to the command of Allah, the Almighty, since then, the Holy Mosque has become the most important building for Muslims from all over the world. It contains the Sacred Ka'bah which is the direction for prayer. As Allah, the Almighty, said in the Holy Quran:

> *"Verily! We have seen the turning of your face towards the heaven. Surely, We shall turn you to a Qiblah (prayer direction) that shall please you, so turn your face in the direction of Al-Masjid-al-Haram (at Makkah). And wheresoever you people are, turn your faces (in prayer) in that direction ....."* [2:144][47]

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[47]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.58.

The Holy Mosque, which contains the Ka'bah, has twelve places where the Doa'a, invocation, is acceptable and answerable as will be discussed later in this chapter. Every year, more than twenty million Muslims visit this building in order to perform Hajj or Umrah. It is the place where Islam started. Moreover, it is the favourite place of Allah, the Almighty, as it has been narrated that Prophet Mohammed (pbuH) said: "The best place on the earth to Allah, the Almighty, is Makkah." And He (pbuH) said: "The only place on the earth where Allah, the Almighty, multiplies the reward to one hundred thousand rewards except Makkah." Moreover, He (pbuH) added: "Whoever prays a single prayer in Makkah, Allah, the Almighty, will multiply it to one hundred thousand prayers."

In addition, Allah, the Almighty, made it a special city when he said, in the Holy Quran:

> *"Verily, those who disbelieved and hinder from the Path of Allah, and from Al-Masjid-al-Haram which We have made (open) to (all) men, the dweller in it and the visitor from the country are equal there and whoever inclines to evil actions therein or to do wrong (i.e. practise polytheism and leave Islamic Monotheism), ..."* [22:25][48]

These are the virtues of the Holy land and its sacred relics which confirm the importance of Makkah and the Holy Mosque to Islam.

4.7.3. Fixed Elements at the Holy Mosque

In the Holy Mosque there are some fixed elements which no one can remove from there original places, as shown in Figure 4-25. Those places were selected in the first place by Allah, the Almighty, Himself as communicated by his Prophets (pbuT).

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[48]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.956.

1   **The Sacred Ka'bah.**
2   **Maqam Abraham**
3   **Zamzam Well**
4   *Hijr* **Ismai'l**
5   **The Black Stone**
6   **AsSafa Hill**
7   **AlMarwa Hill**
8   **Multazam**
9   **AlRukn Al Yemeni**
10   **Mizab Al Ka'bah at**
     no. 1
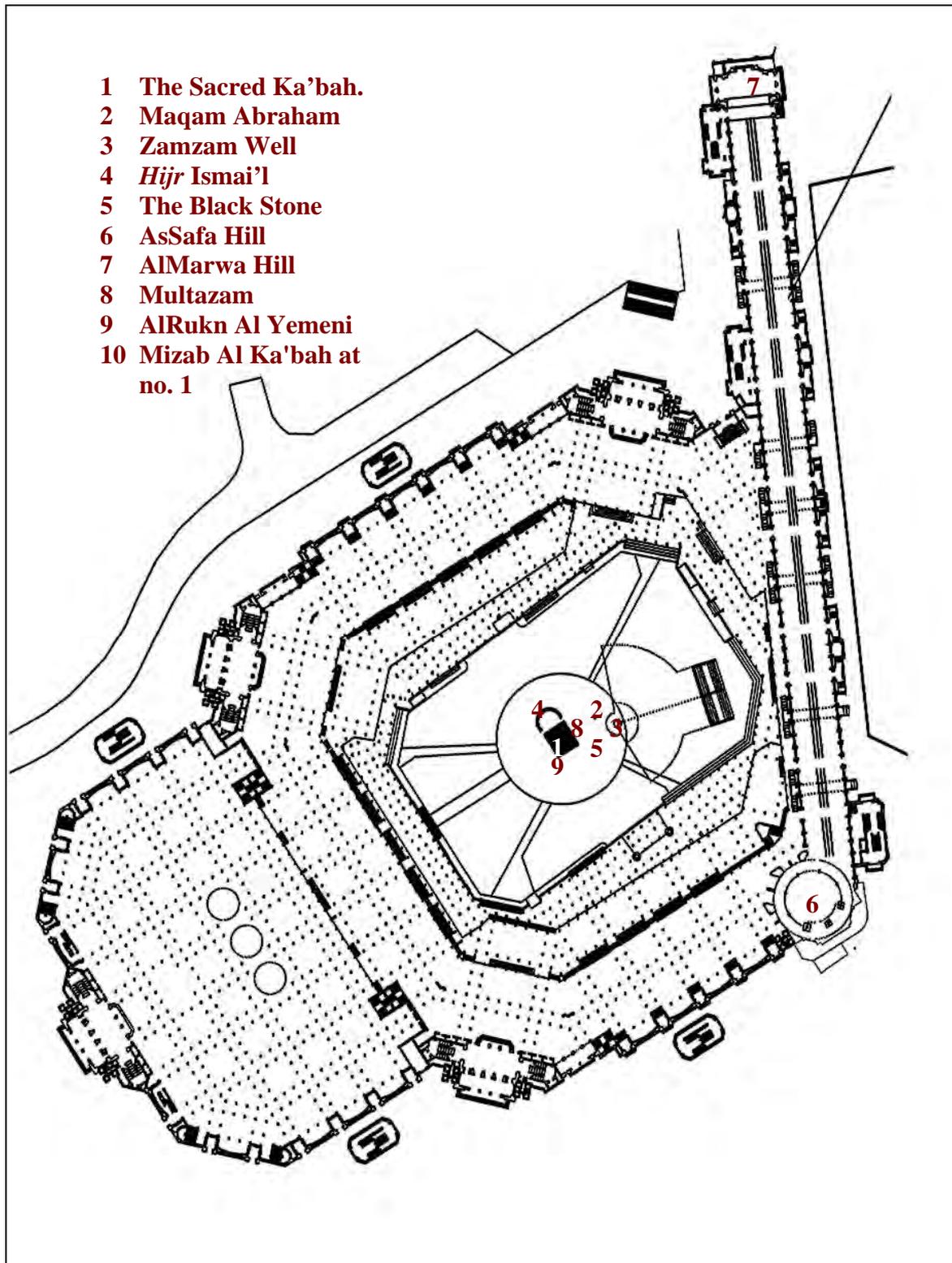
Figure 4-25: The ground floor plan of the Holy Mosque showing the fixed elements.
(Source: The Custodian of the Two Holy Mosques Institute of Hajj Research)

Those elements which are foci for pilgrims can be visited individually or together. These elements are as follows:

4.7.3.1.   The Sacred Ka'bah

The Sacred Ka'bah is the black cube at the centre of the circum-ambulation area, the Holy Mosque's courtyard. It was called the Ka'bah because of its cubic shape and the word *Ka'bah* in the Arabic language came from *Moka'b* which means cube. Muslims believe that the Sacred Ka'bah is the first place of worship for people on earth. It is also the first house built by the Angels, Adam and Abraham (pbuT). It is furthermore the first house on earth circum-ambulated after the Great Flood. It is also believed that those who circum-ambulate the Holy Ka'bah in difficult climatic conditions such as storms or extreme heat will receive a greater reward. All Muslims throughout the world should direct their prayers to the Holy Ka'bah as Allah, the Almighty, commanded in the Holy Quran.

4.7.3.2.   The Maqam Abraham (the place where Abraham stood.)

The Maqam Abraham is the stone where it is believed that the Prophet Abraham (pbuH) stood while he was building the Holy Ka'bah. He (pbuH) also used it to call people for Hajj. It is the stone located next to the Holy Ka'bah where people used to pray the two *Rak'at* after *Tawaf*. As Allah, the Almighty, Said in The Holy Quran:

> *"And (remember) when We made the House (the Ka'bah at Makkah) a place of resort for mankind and a place of safety. And take you (people) the Maqam (place) of Abraham (Abraham) [or*

the stone on which Abraham (Abraham) (pbuH) stood while he was building the Ka'bah] as a place of prayer (for some of your prayers, e.g. two Rak'at after the Tawaf of the Ka'bahat Makkah..." [2:125][49]

The Maqam Abraham is a small semi cubic stone. It is twenty centimetres high, thirty six centimetres long on three sides and thirty eight on the fourth side. The impression of the Prophet Abraham's (pbuH) feet on the stone is ten centimetres depth in one print and nine centimetres in the other as shown in Figure 4-26.

The stone has been at the same place from the time that the Prophet Abraham stored it after he had finished building the Holy Ka'bah, as most historians indicated, except during the time of *Omar Ibn Al-Khatb* when a strong flood came over the Holy Mosque and swept The *Maqam* from its place and deposited it at the southern part of Makkah. Omar, the Caliph of the faithful, consulted the Prophet Mohammed's (pbuH) friends and found one of them had previously measured its distance to the Holy Ka'bah and to the Black Stone. They then returned it to its original position. Today, the stone is fully covered today with silver plate except for the foot prints. It is kept inside a clear crystal dome as shown in Figure 4-27.

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[49]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.50/1.

Figure 4-26: The Maqam Abraham.(Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.185)
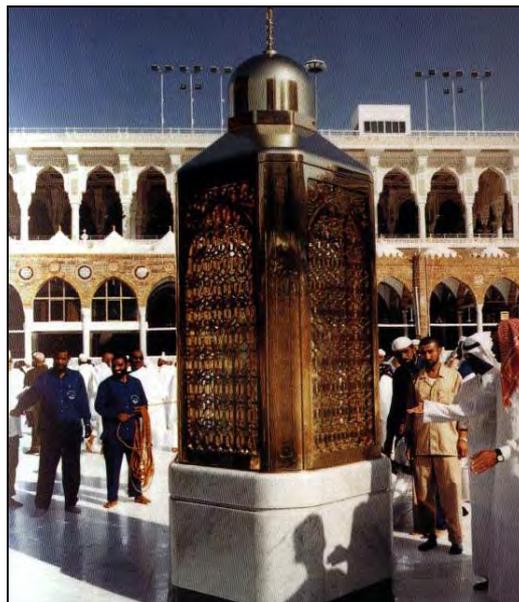
Figure 4-27: Abraham's (pbuH) footprint under the crystal dome. (Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.188)

4.7.3.3.   The Hijr Ismai'l

The Hijr Ismai'l is the place where Abraham (pbuH) settled his family - *Hajir* and her son – near the Sacred Ka'bah[50]. It is the semi-circular wall on the north western side of the Holy Ka'bah. One of its sides faces the western corner and the second side faces the northern corner as shown in picture 4-28. A part of it, amounting to three cubits and a hand span, is considered a part of the Holy Ka'bah itself. It is known that when the Quraish tribe rebuilt the Holy Ka'bah they did not have enough money to complete that part, leaving the *Hijr* out of the Holy Ka'bah. It is revealed that Aishah (mAbpwh) – one of Prophet Mohammed's wives – said: "I wanted to enter the Holy Ka'bah to pray inside it but I couldn't, the Prophet Mohammed (pbuH) took me to *Hijr* Ismai'l and said: 'If you want to go inside the Holy Ka'bah, and then enter this place, Quraish didn't have enough money to build the whole Holy Ka'bah so they didn't include *Hijr* Ismai'l in the building."

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[50]. Mubarakpour, *History of Makkah*, p. 61

Figure 4-28: The *Hijr* Ismai'l (pbuH) next to the Sacred Ka'bah. (Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.65)

4.7.3.4. The Zamzam Well

The Zamzam well is a sacred water well. It was about five thousand years ago when Zamzam sprang for the first time. It is known that Allah, the Almighty, sent the Angel Jebrail to the land. He hit the land under Ismai'l's feet and then Zamzam's water appeared. Hajer, Ismai'l's mother, at that time was running between Al-Safa and Al-Marwa looking for some water for her son. When she got tired, she saw that water flowed under her son's feet. She came back and it was springing when Hajer said to it "zam zam", which means in the Arabic language "do not spread; don't go away", while she was heaping sands around it. Ibn Abass narrated that prophet Mohammed (pbuH) had said: "May Allah be pleased with Ismai'l's mother, if she had left Zamzam alone, it would have been the source of a river not only a single fountain."

From then the name for this particular spring became *ZAMZAM*. It became the main source of water for people living in Makkah at that time. Hajer and her son Ismail (pbuT) stayed in this place until a caravan stopped for rest at the southern part of the valley in which Makkah lies. They saw a bird flying about the watering place. They sent some one

to find out why, because they knew that there was no water in that area. They found

Ismai'l's mother with her son at the watering place and asked her for permission to settle.

She granted them permission to use the fountain. This *Jurhum* tribe became the first

settled in Makkah. For a long time after the death of *Hajer* and her son (pbuT), the

Jurhum did not admire the sacred place, but nevertheless continued to take the offerings

of pilgrims. Eventually Zamzam spring stopped flowing. Over time, because of various

floods, the location was lost. The *Jurhum* tribe's people were killed in their war with the

Khoza'a tribe. The *Khoza'a* tribe became the governors of Makkah. *Zamzam's* position

became unknown to all people. Abdul Mutalib- prophet Mohammed's grand father- saw

it in a dream when he was sleeping inside *Hijr* Ismai'l (see Figure 4-29). He saw the

place of Zamzam and dug a hole and found the Zamzam spring.
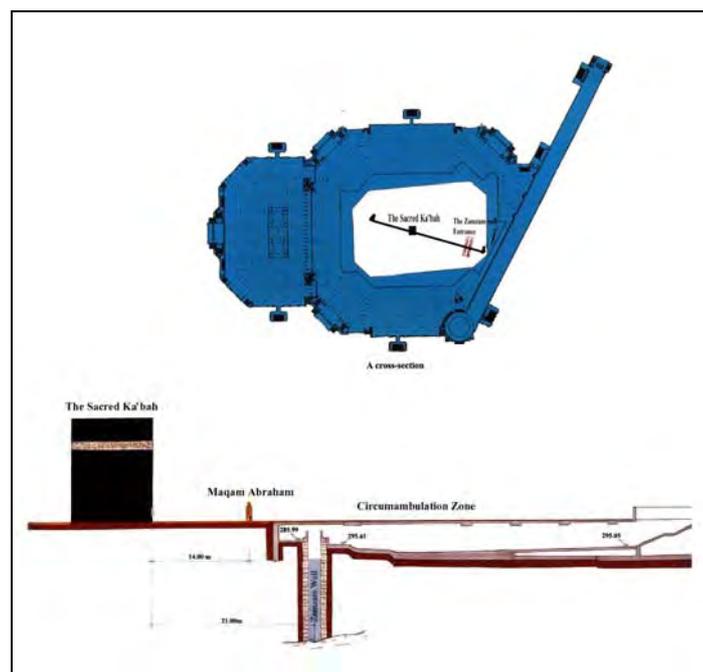
Figure 4-29: A cross section drawing of the Mataf area that shows the Zamzam well subway and its relationship with some other important elements. (Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.105)

Zamzam well is located close to the Holy Ka'bah. The entrance of the well is 1.56 meters

below the level of the circum-ambulation area. The water level is about four meters

below the hole. The springs of the well are located thirteen meters below the well hole.

The well depth is thirty meters. The diameter of the well is different depending on the depth. It is between 1.5 – 2.5 meters. There are three major sources for the well as Yahya Koshak described in his book "Zamzam" (1983). The first one is located on the Holy Ka'bah side – in the direction of the Black Stone – and it is 45 centimetres in length and 30 centimetres height. It is the main and strongest source for the well's water. The second source is located in the direction of Abi Qubais Mountain. It is 70 centimetres long and 30 centimetres high. The last source is a group of twenty one small holes in the area between the two main sources. Muslims from all ages used to take Zamzam water as a gift for their friends and families when they made a journey to Makkah. Most Muslims all over the world use Zamzam as a medicine for all diseases. There is a strong relationship with other elements in the Holy Mosque, especially those which are located within the Mataf area as shown in Figure 4-25.

4.7.3.5. The Black Stone

The Black Stone, shown in Figure 4-30, is the black stone on the eastern corner of the Holy Ka'bah, the first original corner of the Sacred Ka'bah, where Muslims should start *Tawaf*. The Prophet's sayings recorded words that encourage Muslims to give space and not to push each other in order to see, touch or kiss this stone. This will be discussed in the following Chapter.

AlKurdi, an Arabic historian and the author of *AlTareekh AlQawim*, recorded that the Black Stone is 150 centimetres above the Mataf surface.

The *Qaramita* incident is the most important incident related to the Sacred Stone. This occurred when The *Qaramita* took the Black Stone to their land, *Hajar* (the eastern region of the Arabian peninsula), for about twenty-one years.

Figure 4-30: The Black Stone covered with silver plate. (Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.67)

4.7.3.6. *Al-Safa & Al-Marwa*

The hill of As-Safa lies at the bottom of Abu Qubais Mountain, facing the Black Stone. Al-Marwah hill is linked to the mountain of Qoaiqean. As-Sai' is to run between As-Safa and Al-Marwah seven times. It is one of the religious rites enjoined on Muslims by Allah, the Almighty, and Muslims have to perform it at the same place where Hajer (pbuH) once did. It is a religious act, not to be debated. Allah, the Almighty, wanted to symbolise the unshaken faith in the mother of Ismai'l (pbuT) so that we might remember her story, and aspire to her faith as shown in her famous dialogue, when Abraham (pbuH) left them at Makkah- and Allah, the Almighty, helped them. During the Prophet Mohammed's time,

(pbuH) Al-Mas'a[51] was wide. It is a distance of 375 metres from As-Safa to Al-Marwah. Later, some houses were built in some parts of the area of the old Mas'a which is shown in Figure 4-31. During the expansions which occurred at the Holy Mosque, those houses were demolished and the area was added to the Holy Mosque. Until 1341 A.H., *Al-Mas'a* was not covered and A*l-Shareef Hussain Ibn Ali Ibn Muhammad Ibn Oun* ordered the covering of most of it. In 1345 A.H., (1925 A.D.) King Abdul Aziz ordered that the surface of Al-Mas'a be covered with stone in order to protect the people and the shops around it from dust. In 1366 A.H. King Abdul Aziz ordered that the corridor of Al-Mas'a should be covered for a width of 20.5 meters. During the reign of King Saud Ibn Abdul Aziz, Al-Mas'a was beautifully renovated from the floor to the ceiling with reinforced concrete.
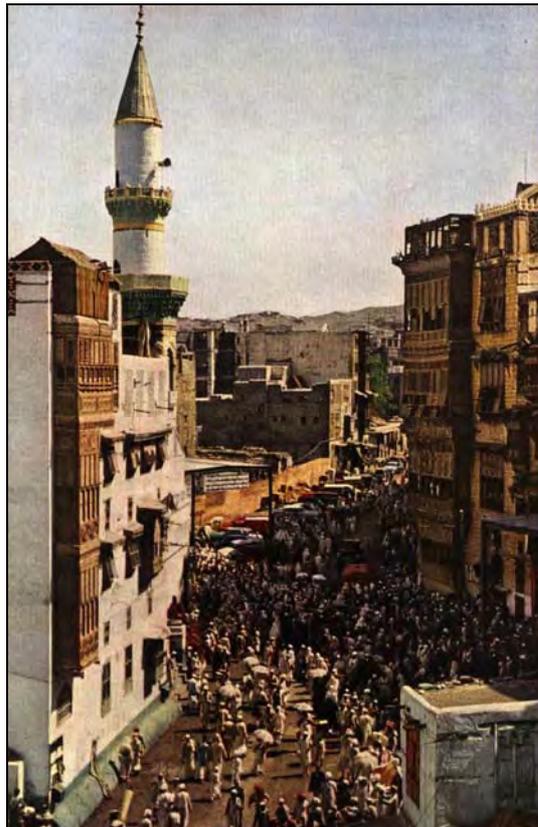
Figure 4-31: A picture showing the old Mas'a before the first Saudi Arabian expansion. (Source: *National Geographic Magazine*, July 1953, p.56)

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[51].the place where Muslims perform *Sai'* between *As-Safa* and *Al-Marwah.*

4.7.3.7.   The Multazam

This is the part of the wall of the Holy Ka'bah that is located between the Black Stone and

its Gate as shown in the circle in Figure 4-32.
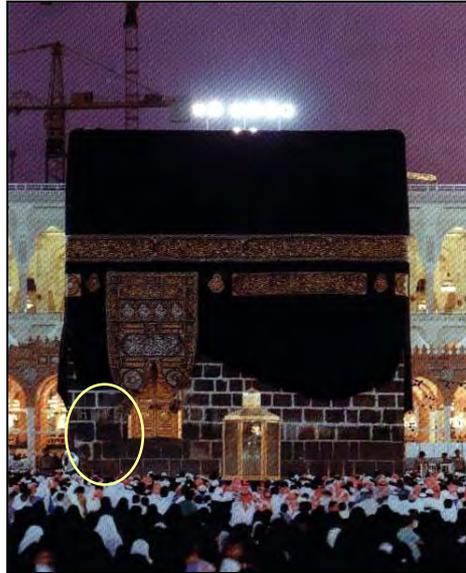
**Figure 4-32: The Sacred Ka'bah and the Multazam could be seen as
marked.** (Source: Kurdi, A., *The Holy Ka'bah*, 1999, p.108)

4.7.3.8.   Al-Rukn Al-Yemeni (the Yemenis Corner)

The Yemeni Corner is the second original corner of the Holy Ka'bah. It was named

Yemeni because it faced the southern direction toward Yemen. In addition, some

worshippers prefer to touch it while they are circum-ambulating the Sacred Ka'bah. The

Yemeni Corner faces one of the important entrances at the Holy Mosque, which is the

King Abdul-Aziz gate.

4.7.3.9.   The Mizab of the Ka'bah (The Ka'ba's Waterspout)

The Ka'bah's Waterspout, shown in Figure 4-33, is located on the top centre of the north-western wall of the Sacred Ka'bah. The Quraish tribe was the first to place the water spout there after they reconstructed the Sacred Ka'bah and roofed it with a flat roof. It is 250cm long, 26cm wide and 23cm deep. The water spout extended from the Holy Ka'bah toward the *Hijr* Ismai'l. Today, it is made of wood covered with golden plate on the outside and silver inside. It is decorated with beautiful Arabic calligraphy. The area at the *Hijr* Ismai'l, where the water falls from the water spout, has a special meaning.
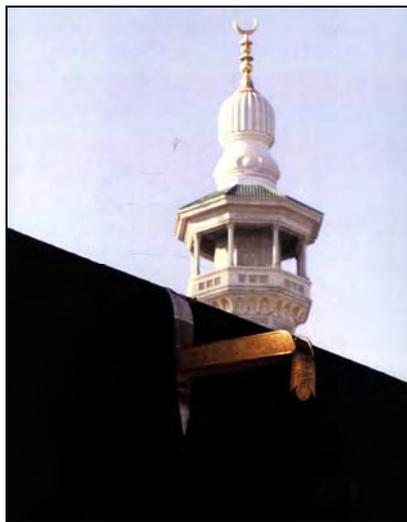
Figure 4-33: A picture showing the new waterspout of the Sacred Ka'bah and its calligraphy. (Source: Amin, Mohamed. *Journey of a Life Time: Pilgrimage to Makkah*, 2000, p.79)

4.7.3.10. The Dark Marble line. (which indicates the Tawaf starting point)

The dark brown marble line, as shown in Figure 4-35, is the line created after the First Saudi Arabian expansion of the Holy Mosque as shown in Figure 4-34. Here the construction work can be seen in the background of the photograph; whereas, in the foreground of the picture it can be clearly seen that the dark marble line of today is not

present. According to Imam *Mohammed Ibn Sobail*, The Holy Mosque Imam and a member of staff of the Senior Committee in Saudi Arabia, "The black was placed to make *Tawaf* easy because people should start and end at the Black Stone as Imam Nawawi said: "……..If he started not at the Black Stone it would not be acceptable ……." He added: "Even it, the dark marble line, causes some crowding but it is because people want to make sure about the place. It was agreed to place that line by the Imams High Authority on 11th, Jumad Awal 1405 (1985)."[52]

Figure 4-34: An old photo of the Holy Mosque's Mataf during the first Saudi Arabia expansion, where the dark marble line area can be seen without the line. (Source: Abass, H., *Story of the Great Expansion*, 1996, p.169)
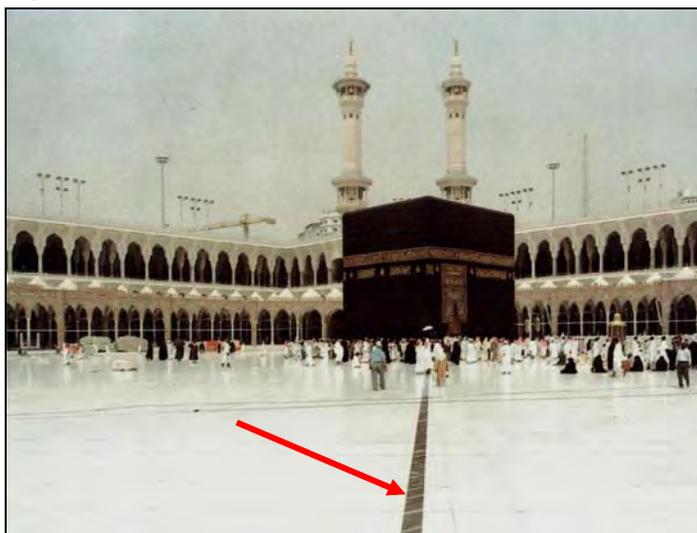
Figure 4-35: A picture showing the Black Marble line shown toward the Holy Ka'bah. (Source: Abass, H., *Story of the Great Expansion*, 1996, p.180)

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[52] . *AlMadinah Newspaper*, 1417 A.H.

It causes many problems. *Professor. Abo Solaiman[53]*, *Shaikh Dr. Yousof AlQaradawi[54]* and *Professor. Abo Rzazah[55]* all agree that: "The Black Line was put there to make *Tawaf* easier by letting people identify the Black Stone easily. However, people that circumambulate the Sacred Ka'bah do not have to commit with it." Moreover, it was agreed at meetings of members of the Senior Committee (The Highest religious authority in Saudi Arabia) to remove this line[56], because of the overcrowding caused in Mataf. The dark marble line was damming the flow of people as it causes them to stop on the line at the start of, or during their *Tawaf* which will be discussed later in Chapter 6. However, the reaction of the people who look after the line should be considered.

During the performance of *Tawaf*, people stop at this marble line for a time of up to three minutes for a single worshipper and up to five minutes for groups of worshippers in the Ramadan season as shown in Figure 4-36. This stopping causes some problems such as overcrowding at Yemenis corner as well increasing the overcrowding at the Black Stone.
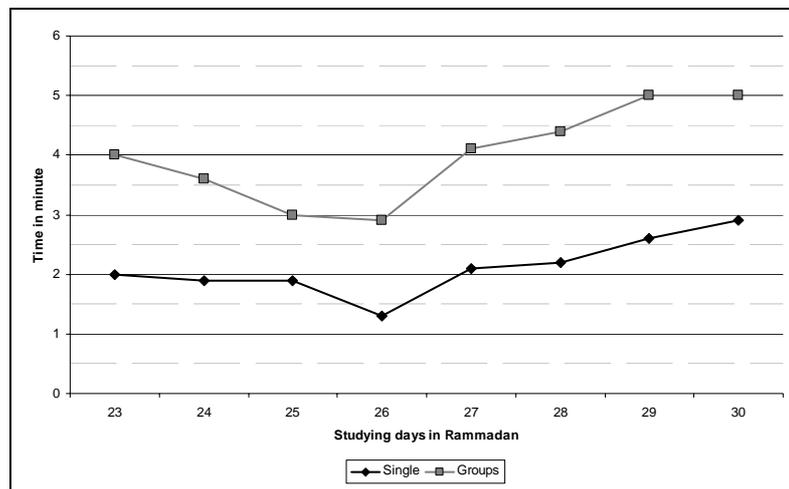
Figure 4-36: The average time in minutes that people stopped on the Dark marble line in Ramadan season. (Source: Enqawi, S. et al, Crowd at the Mataf, 1987)

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[53]. a professor at Umm Al Qura University and a member of staff of senior committee in Saudi Arabia
[54]. The dean of AlSharea'a College at Qatar University and the Mufti of the State of Qatar
[55]. A professor at King Abdull Aziz University
[56]. An interview with Prof. A. Abo Solaiman.

A clear line should be drawn between the natural objects which have some religious references or relations such as the Sacred Ka'bah, and with other artificial objects where the objects is man-made and has no religious relations or references, such as the Dark Marble Line. In addition, a hierarchy of the importance of objects within the mosque should be considered based on religious relevance specially those which have some activities based upon them as will be shown in the following part.

4.8.   Major Activities at the Holy Mosque

Allah, the Almighty, commanded Prophet Abraham and his son Isma'il (pbuT) to purge The Holy Mosque, as He said in the Holy Quran:

> *"And (remember) when We made the House (the Ka'bah at Makkah) a place of resort for mankind and a place of safety. And take you (people) the Maqam (place) of Abraham (Abraham) [or the stone on which Abraham (Abraham) (pbuH) stood while he was building the Ka'bah] as a place of prayer (for some of your prayers, e.g. two Rak'at after the Tawaf of the Ka'bah Makkah), and We commanded Abraham (Abraham) and Ismaiʾ l (Ishmael) that they should purify My House (the Ka'bah at Makkah) for those who are circum-ambulating it, or staying (I'tikaf), or bowing or prostrating themselves (there, in prayer)."* [2:125][57]

4.8.1. *Tawaf* (circumambulate)

Tawaf is the circumambulation of the Holy Ka'bah. It is recognised as the circumambulation of the Holy Ka'bah seven times anti-clock wise. Therefore, Muslims perform *Tawaf*. Moreover, *Attaa* narrated that prophet Mohammed (pbuH) circum-

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[57]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p50/1.

ambulated while He was on his camel. This action gives an option to those who cannot circum-ambulate on their feet. In addition, performing this activity in difficult weather conditions, such as a rain storm or a high degree of heat, has a high reward.

4.8.2. *I'tekaf*

I'tekaf is going into retreat at any mosque. This involves staying inside the mosque for a time. Normally this activity is carried out during the month of Ramadan, especially on the last ten days, but it could be done at any time of the year.

4.8.3. Praying

Praying is the second pillar of the Islamic religion. The high value of the prayer at the Holy Mosque could be understood from what was narrated by Abu *Hurairah* (mAbpwh). That the Prophet (pbuH) said: "a prayer at the Holy Mosque is better than a prayer in my mosque by a hundred times and a prayer in my mosque, the Prophet Mosque in Medina, is better than a prayer in any other place by a thousand times".

A prayer in the Holy Mosque is regarded as better than a prayer anywhere else in the world. People used to come from outside the Holy area to perform prayers in order to get high rewards from Allah, the Almighty. Today, the approximate maximum capacity of the Holy Mosque is more than 560 thousand pilgrims, as shown in Table 4-4. The total area of the Holy Mosque has been subdivided in order to allocate some particular places for each of the sexes because of the religious commands to segregate male and female. The allocation process for those places has been done under criteria such as, "male lines in front and female lines at the back, keep the females as separate as possible which gives

them more privacy." About 65% of total space in the basement, ground floor and upper

level are identified as an area for male prayers. However, the roof terrace has been

identified as a male prayer area for security reasons[58]. Figures 4-37, 4-38, 4-39 and 4-40

show the distribution of use of space at the Holy Mosque where the male and female

praying areas are indicated as the majority usage of space. The Holy Mosque

Administration Department uses partitions to identify the female areas and to give more

privacy to the users of these spaces in compliance with the Holy Scriptures. However,

some difficulties have been found in keeping this usage of spaces during the Hajj season,

because of the mixed culture of the users and their misunderstanding of the controlling

system at the Holy Mosque.

Table 4-4: The distribution of space for praying at the Holy Mosque.

Level		Total area in square meters	Approximate no. of worshippers	
			Average	Maximum
Basement		30,000	24,000	52,800
Ground	Mataf	17,000	28,220	29,920
	Masa'a	7,800	11,700	15,600
	The Building	56,000	59,360	85,740
	Subtotal	80,800	99,280	142,160
Upper		52,000	60,840	89,440
Roof terrace		55,000	91,300	96,800
Subtotal of the Building		217,800	275,420	381,200
Free surrounding areas		102,000	169,320	179,320
The total		319,800	333,740	560,720

(Source: Fouda, A., *The appraising of prayers at the Holy Mosque*, 1996)

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[58]. As it been identified by the Holy Mosque's Force Department.
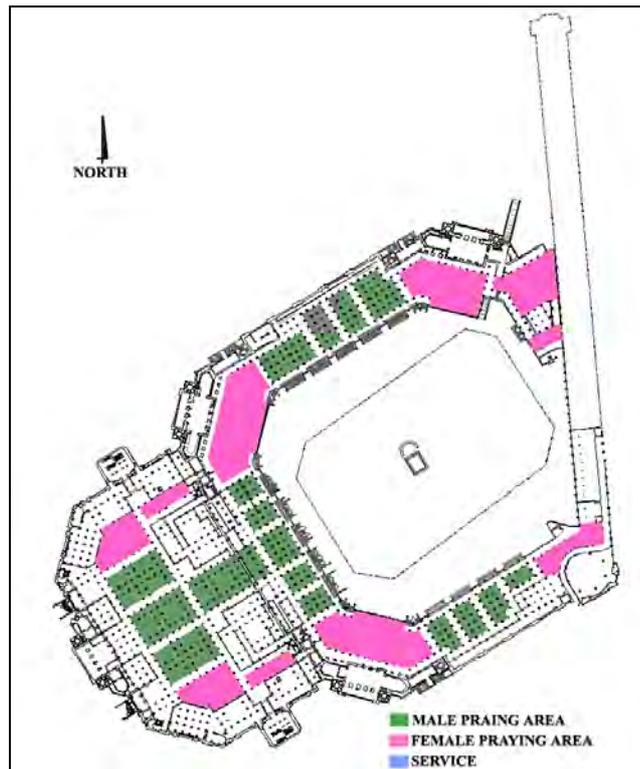
Figure 4-37: The plan layout of the Holy Mosque showing the distribution of the space between male and female worshippers on the basement level. (Source: The Custodian of the Two Holy Mosques Institute of Hajj Research.)
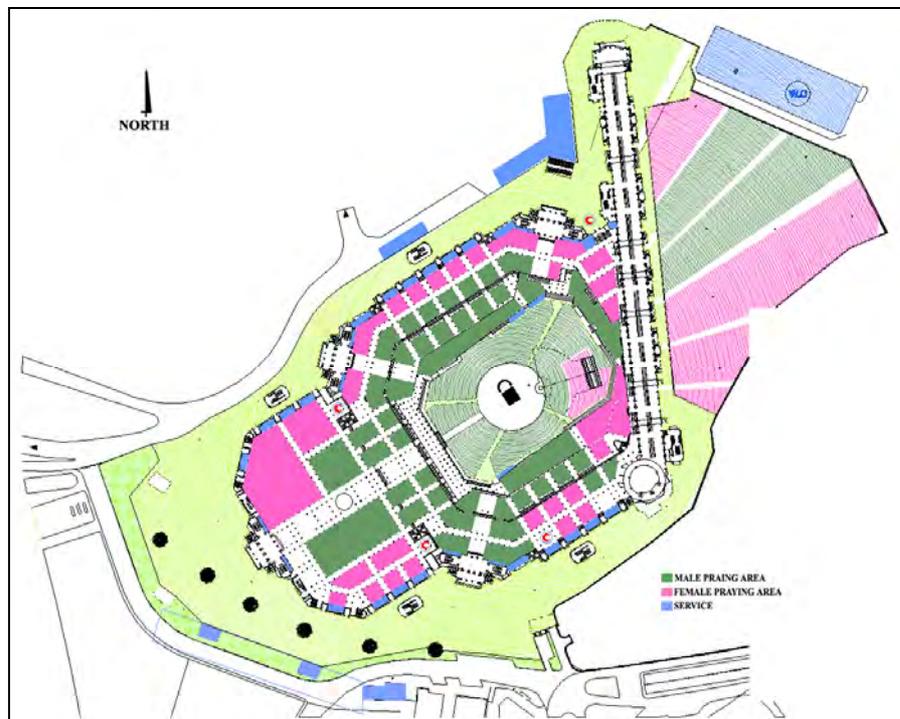
Figure 4-38: The plan layout of the Holy Mosque showing the distribution of the space between male and female prayers on the ground level. (Source: The Custodian of the Two Holy Mosques Institute of Hajj Research.)
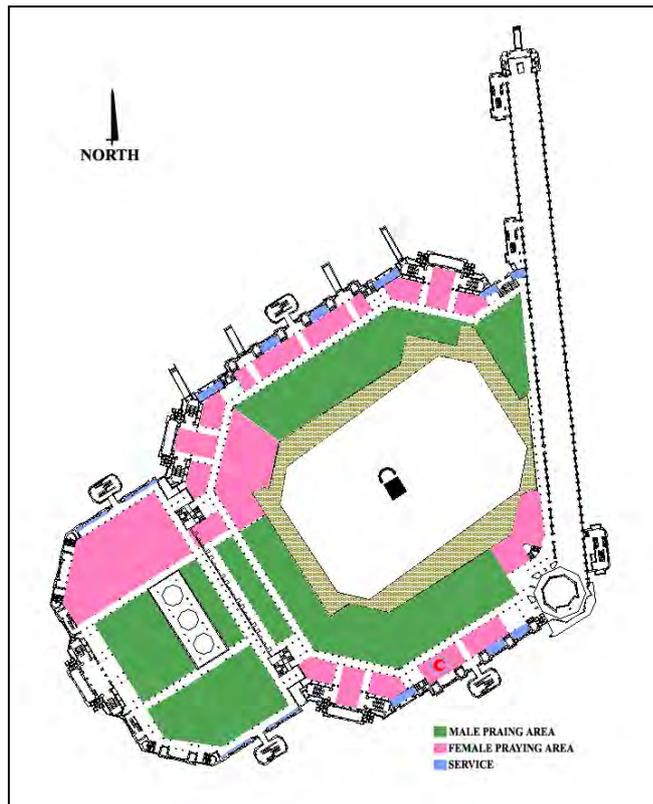
Figure 4-39: The plan layout of the Holy Mosque showing the distribution of the space between male and female worshippers on the upper level. (Source: The Custodian of the Two Holy Mosques Institute of Hajj Research.)
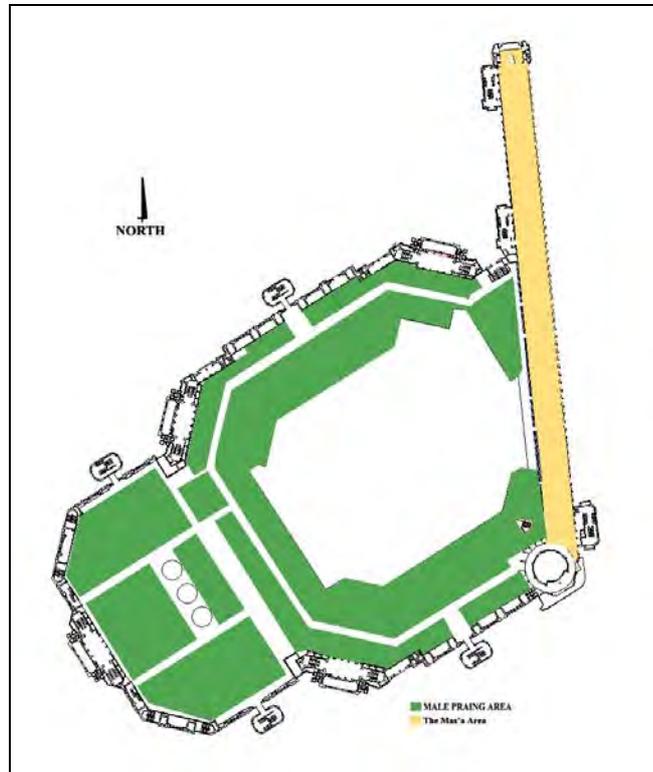
Figure 4-40: The plan layout of the Holy Mosque showing the distribution of the space between male and female prayers on the roof terrace level. (Source: The Custodian of the Two Holy Mosques Institute of Hajj Research.)

4.8.4. Sa'i

This is the seven-fold walk between As-Safa and Al-Marwa, an activity restricted to a custom-built, three stories open gallery as shown in Figure 4-25, 38, 39 and 40. It was commanded by Allah, the Almighty, for all Muslims to perform this in order to complete their Hajj or Umrah. Sa'i could be provided on the upper and roof floors as well as on the ground level, as Professor AbdulWahab Abu Suleiman, a member of staff of the senior committee in Saudi Arabia, said: "Sa'i on the first floor of the Masa'a has the same rules of Sa'i on the ground floor between the two mountains Al-Safa & Al-Marwa and in Wadi Al-Khaleel – Ibrahem - (pbuH) provided the travel distance between the two mountains is satisfied. Walking out of the area of the Musa'a width wise is not allowed." [59]

4.8.5. Drinking Zamzam

Zamzam springs up inside the Holy Mosque. People used to drink the Holy water from the well in the past. Muslims use this water as medicine. For more details about Zamzam see above.

4.8.6. Kissing the Black Stone

Kissing the Black Stone is one of the acts executed by Prophet Mohammed (pbuH), and his friends thereafter.

Said Bekdash pointed out in *Fadel AlHajar AlAswad Wa Maqam Abraham* (The Virtues of the Black Stone and the Maqam of Abraham), (2002), that Omar Ibn Al-Khatab

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[59]. Abu Suleiman, Abdul Wahab I. and Mi'raj N. Mirza, *Al-Masa'a*, 2002. p.7-175

(mAbpwh) said when he kissed the Black Stone: "I know that you are only a stone and can neither do harm nor bring benefit. Had I not seen Allah's Messenger (pbuH) kissing you, I would not have kissed you."[60]

Moreover, Mohammed AlAzraqi reported in *Akhbar Makkah* (Makkah News), (2001) that Omar Ibn AlKhatab (mAbpwh) said: that Prophet Mohammed (pbuH) told him: "Oh, Omar, you are a strong man. So, do not crowd on the stone – the Black Stone – you may harm other people. If you find it with no crowd kiss it or stand forward of it and say AllahuAkbar."[61]

4.8.7. Making *Doa'a* (Begging Allah, the Almighty for His blessing / invocation)

Asking Allah, the Almighty, is a good habit at any time and any place for Muslims. He, the Almighty, commanded his subjects to ask him for everything. The Holy Mosque provides for several occasions where it is believed that doa'a will be acceptable to Allah. Those are:

- Whenever the Sacred Ka'bah first appears in sight.

- During *Tawaf*.

- Inside the Sacred Ka'bah.

- Whenever kissing the Black stone.

- Whenever kissing the Yemeni corner.

- When at the Multazam.

- When at *Hijr* Ismai'l, under the waterspout.

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[60]. Bekdash, Said, *Fadl the Black stone and the Maqam of Abraham*, 2002, p.55.
[61]. Arabic reference, AlAzraqi, M., *Makkah News*, 2001, v.1,p.333

- After prayer, behind the Maqam.

- When at The Mustajar, the place opposite the Sacred Ka'bah gate.

- When at The Ma'jan, a small hall, close to the gate from *Hijr* side. (Abraham and Ismai'l (pbuT) is said to have prepared construction materials here.)

- Whenever drinking at Zamzam.

- During Sai' and at the Safa and the Marwah hills.

In fact, Muslims could perform Doa'a at any time and place and Allah, the Almighty, will answer it if He wishes, but the scriptural authentication of these confirms the pre-eminence of the Holy Mosque as a place for worship in Islam.

4.8.8. Studying

Ever since early Islamic times the mosque has served as the capital, school, mosque and as a centre for other social and cultural activities. The Holy Mosque also used to be a religious school where scholars studied and graduated. Today, there are still special classes inside the Holy Mosque, especially during Ramadan and the Hajj seasons. In 1345 A.H. (1925A.D.) King Abdul Aziz issued his regal authority to create a committee to supervise study at the Holy Mosque. In 1385 A.H. (1965A.D.) the Holy Mosque Institute was established. Moreover, there are many study circles teaching the religious sciences formed by the Imam of the Holy Mosque,, scholars, lay-people and some other specialists on the Islamic world.[62]

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[62]. Abu Suleiman, Abdul Wahab I. and Mi'raj N. Mirza, *Al-Masa'a*, 2002. p. 142

Some of those activities should be followed in special sequence. *Tawaf*, Praying at The Maqam Abraham and *Sai'* should be followed in this series in order to complete the performance of Hajj and duty of Umrah. However, some activities can not be performed singularly such as *Sai'* which should follow *Tawaf* and praying at The Maqam Abraham. On the other hand, some other activities could be done in isolation whenever worshippers wish to do so. These include; praying, kissing the Black Stone, and drinking from Zamzam Well which are simplified in Figure 4-42.

The simplicity in a mosque plan and the combined sequence of its components help also to simplify the spatial organisation of the most important building in Muslim life, the Holy Mosque, Makkah. However, due to its additional activities and components the Holy Mosque presents special problems with the movement sequences of people which creates a complicated pattern as shown in Figure 4-41.
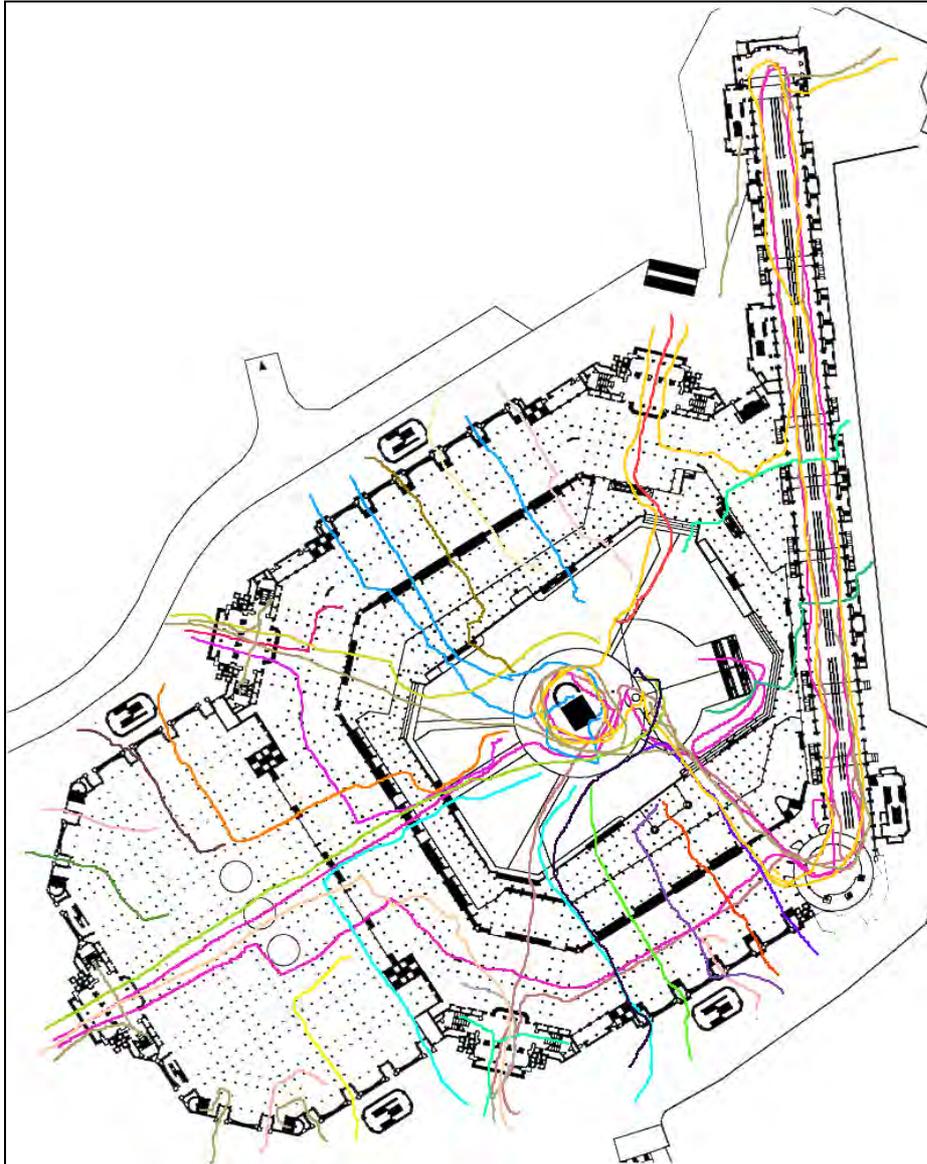
Figure 4-41: A diagram showing the range of movement patterns of worshippers inside the Holy Mosque, with the separate routes taken by individuals indicated in colours.
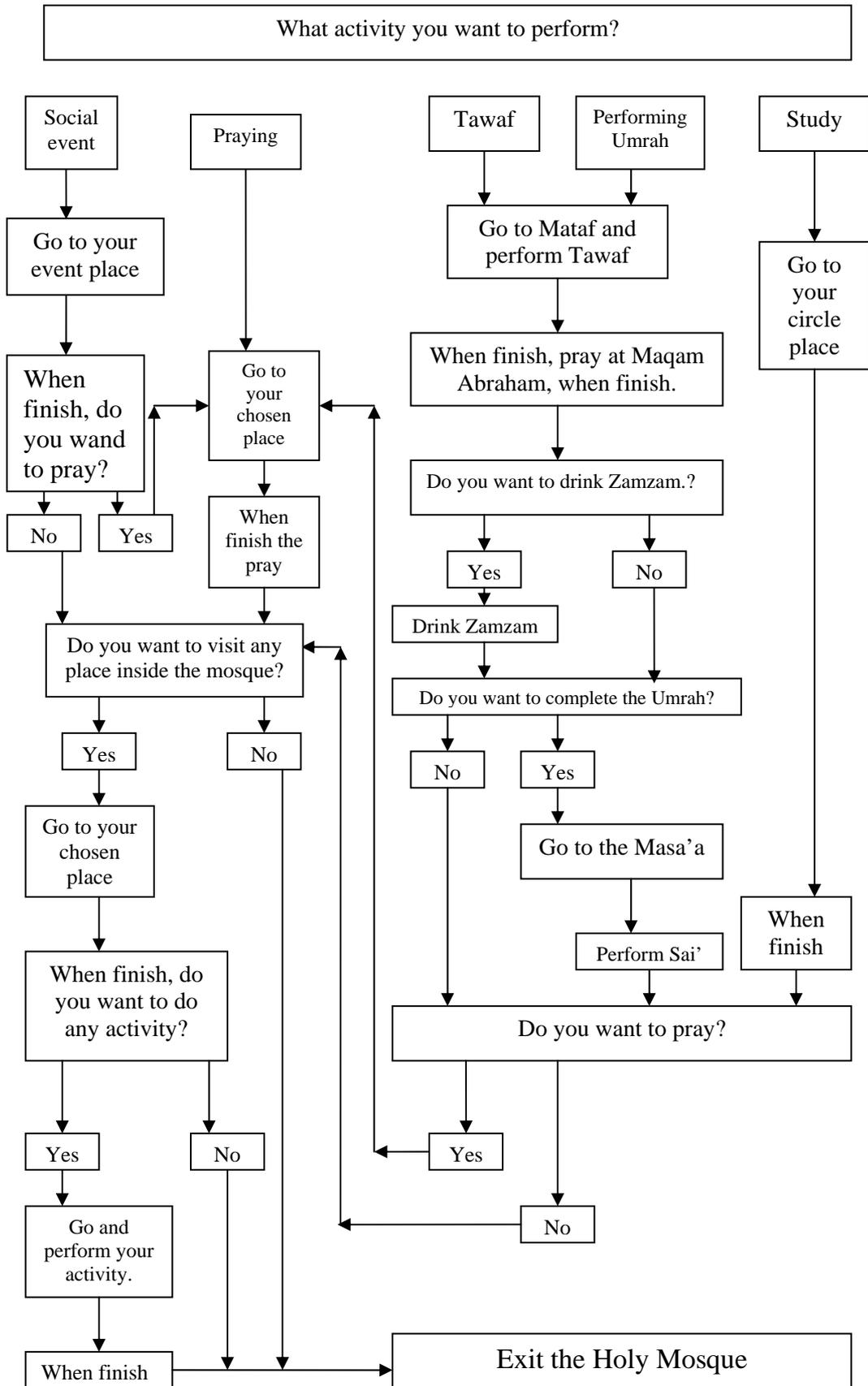
Figure 4-42: Sequences of activities at the Holy Mosque.

4.9.   Summary

The mosque, the religious building of the Islamic religion has been developed over time. However, its physical components would not change or be disposed of throughout this development. This building has its own design and planning standards that have been created to help provide a congenial spiritual atmosphere for worshippers.

In addition, Makkah, the ancient city which holds the Holy Mosque, the first mosque on earth, is a city in the valley of Abraham. It has a hot, dry, still-air climate. Recently, Makkah has modernised and developed into a typical international urban centre, one of the largest in Saudi Arabia, with more than one million people living within city boundaries. In addition, more than twenty million people visit it annually for religious purposes. The city has been called by different names over time, some of these names describe the situation and others reflect the religious connotations. It has always been known as a crowded city, which is reflected in some of the names recorded through history. The architectural environment of the city has been shaped by its international links and because of the large immigration to the city from all over the world.

In addition, the Holy Mosque is, to Muslim communities all over the world, a very special place. There are some fixed elements inside this building that are regarded as sacred and connected with particular religious rites that cannot be performed in any other place. The Sacred Ka'bah and the Holy Mosque have had special consideration throughout history from the governors and Muslim leaders. This is still the case today. The qualities of reconstruction and expansion works that have been carried out on the Holy Mosque and its contents over time testify to the seriousness with which this duty of

conservation is regarded by Muslims and their leaders. Through history, the focal sites inside the Holy Mosque attracted worshippers and visitors which created unexpected overcrowding on these sites which lead to a continues process of expansion. The sequence of the activities performed by worshippers at the Holy Mosque established a unique movement pattern inside the building, that not only distinguishes it from all other mosque, but also put physical limitations to the built form.

In order to study these aspects and the site management problems that arise from them, this adopts a number of analytical procedures as described in the following Chapter.

5   Research Methodology and Field Work

5.1. Introduction.

5.2. The Research Methodology.

    5.2.1. Social Research Methods.

- *Qualitative Research Method.*
- *Quantitative Research Method.*

    5.2.2. Documentation.

    5.2.3. Archival Record.

    5.2.4. Questionnaires.

    5.2.5. Interview.

    5.2.6. Observation.

    5.2.7. Space Syntax (Spatial Analysis Method).

- *The Concept of the Analysis.*
- *The Techniques.*
- *Data Collection Methods.*

5.3. The Application of the Research Methodology.

5.4. Fieldtrips.

    5.4.1. The First Fieldtrip.

    5.4.2. The Second Fieldtrip.

5.5. Data Collected.

    5.5.1. Descriptive Data.

    5.5.2. Digital Data.

    5.5.3. Interviews.

    5.5.4. Photographs.

    5.5.5. Statistical Data.

    5.5.6. On-site Gates Observations.

5.6. Summary.

5   **Research Methodology and Field work**

5.1.   **Introduction**

S everal research methods have been used in this study in order to obtain the required information and to analyse the gathered data. Those methods will be discussed in detail in this chapter. In addition, this chapter will describe the fieldwork that was undertaken in order to collect the necessary information for the purposes of the study. The description will consider some relevant aspects of social research and how its methods could be applied in case studies such as this, in particular through the use of questionnaires and interviews. Another quantitative method, the new digital technique, *Space Syntax* that has been employed to analyse spatial movement patterns in the Holy Mosque will be introduced in this chapter as well. It is believed that the application of such rational methods to the collection of basic information about the daily activities in the Holy Mosque will provide a sound reference base complementing the traditional academic enquiry.

5.2.   **The Research Methodology**

Research Methodology has been characterised by Wolman (1973) as "a branch of logic and/or philosophy of science which analyzes research procedures"[1], in other words, it is a scientific "tool" that could be used to carry out research. It is, as Marzoky noted: "essentially a question of matching of a basic research objective with a specific research

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[1]. Wolman, Benjamin B., *Dictionary of Behavioral Science*, 1973, p.237

method."[2] The research method is, therefore, the techniques and the strategies that are used to achieve the desired research aims and objectives.

Research methods are normally classified as belonging to one of two main research types: *Qualitative* or *Quantitative*.[3] However, these two main types of research methods have some sub categories that cover most of the research methods.

5.2.1.   Social Research Methods

- *Qualitative Research Method:*

According to the Lexico online dictionary, the word, "Qualitative" means "relating to or concerning quality."[4] However, Ragin (1994) describes Qualitative Research as: "a basic strategy of social research that usually involves in-depth examination of a relatively small number of cases. Cases are examined intensively with techniques designed to facilitate the clarification of theoretical concepts and empirical categories."[5]

Studying a small number of cases gives the researcher the opportunity to investigate the case in detail. In order to study the classifications of cases this method is the most suitable method. Such study discovers hidden objects in the cases and analyses data which is not easily quantifiable, or which is concerned with subjective understandings

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[2]. Marzoki, Hatim H., *The Shadow and Substance: Architectural Education and Its Relation to Practice with Special Reference to Saudi Arabia*, 1999, p.27
[3]. Chisnall, *Basic Marketing Research*, 1992, p.
[4]. http://www.dictionary.com.qualitative
[5]. Ragin, *Constructing Social Research*, 1994, p. 190

and reactions. Marzoky (1999) stated that the qualitative method is suitable: "When seeking to gather information about attitudes, perceptions, and responses."[6]

For the most part the qualitative method is associated with certain areas of research activity. Ragin (1994) said: "Qualitative methods are often identified with participant observation, in-depth interviewing, field work, and ethnographic study."[7] Concerning the goals that are typical of qualitative research, He added: "Qualitative research is especially appropriate for several of the central goals of social research. These include giving voice, interpreting historical or cultural significance, and advancing theory."[8] The Qualitative research method is less structured than quantitative research, which will be discussed next in this section. It often involves only one or a few cases.

Descriptive, Explanatory and Normative studies use qualitative research methods which, as Saridar pointed out give the study the ability to report the status of the object, to investigate the reasons behind a specific category or to find out the way the object could be improved.[9]

The use of the Qualitative method will help to provide a clear deep understanding of the case where it helps to gain a better understanding of the background and the nature of the problems. Therefore, it will help to understand the basic problems in order to establish a framework for future action.

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[6]. Marzoky, *The Shadow and Substance*, 1999, p.30
[7]. Ragin, *Constructiing Social Research*, 1994, p.91
[8]. *Ibid,* p.3
[9] . Saridar, S., The Impact of Facade Design on Daylighting Performance in Office Building: The Case of Beirut, 2004, p.124

- *Quantitative Research Method.*

The second social research method is the Quantitative research method. The Lexico online dictionary, in relation to quantitative analysis, states that in contrast to qualitative analysis the *Quantitative method* is "analysis which determines the amount or quantity of each ingredient of a substance, by weight or by volume; contrasted with qualitative analysis."[10]

The Quantitative research method is the other main vehicle for social science research. It usually examines a large number of cases. Ragin (1994) stated: "Quantitative research is a basic strategy of social research that usually involves analysis of patterns of co-variation across a large number of cases. This approach focuses on variables and relationships among variables in an effort to identify general patterns of co-variation."[11]

Studying a large number of cases in order to produce quantitative data seldom provides the chance to study a topic in depth and to examine its details and classifications. The quantitative research method is the most structured research method. The outcome of research which uses this kind of method is statistical data concerning the underlying patterns investigated by the study. Ragin (1994) observes in relation to the goals of quantitative research:

> "Because the quantitative approach favours general features across many cases, it is especially well suited for several of the basic goals of social research. These include the goals of identifying general patterns and relationships, testing theories, and making predications. These three goals

[10]. http://www.dictionary.com/quantitative
[11]. Ragin, *Constructiing Social Research*, 1994, p.190

all dictate examination of many cases – the more, the better - and favour a dialogue of ideas and evidence that centres on how attributes of cases (variables) are linked to each other."[12]

Since millions of worshippers visit this research site, the Holy Mosque, annually, the quantitative method is considered to be the most appropriate method that allows the researcher as well as the reader to access the users' opinions and wishes and choices for action where a full feedback could be found.

5.2.2. Documentation:

The documentation method could be applied in most case studies. Robert K. Yin stated: "Except for studies of preliterate societies, documentary information is likely to be relevant to every case study type."[13] Every single documentary source which includes information regarding the case study could be used in this research method including letters, memoranda, agenda and newspapers. According to Yin, the strength of this method comes from any knowledge which could be a reference and may contain details of an event.[14] On the other hand, the accessibility of those documents would effect its strength.

5.2.3. Archival Records.

Archival records are an important research method that could be found in research for each and every case-study. It provides essential contemporary information which could be considered as a primary source. Yin presents a list of archival record types such as:

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[12]. *ibid,* p. 132
[13]. Yin, R., *Case study research*, 2003, p.85.
[14]. *Ibid,* p.86

service records, organizational records, maps, charts, lists of names, survey data and personal records.[15] Information collected by this research method will provide detailed data which could help to describe an event or the life time of the case study.

5.2.4.   Questionnaires.

Questionnaires are mainly used to support the collection of data for quantitative analysis and to cover a large number of research samples. Chisnall (1992) wrote: "A questionnaire is a method of obtaining specific information about a defined problem so that the data, after analysis and interpretation, result in a better appreciation of the problem."[16] Another writer, Oppenheim (1992) warned that: "A questionnaire has a job to do: its function is measurement, and the specification should state the main variables to be measured."[17] A questionnaire may be followed up by one or more other data collection methods in order to complete the information it seeks to elicit. These may include personal interviews, telephone interviews, and postal follow-up.

A questionnaire always has to follow special criteria. Adams and Schvaneveldt (1991) write: "The questionnaire-ended questions format allows the respondent to answer items by checking categories or by providing a brief writing response. A marking of ' yes' or 'no,' checking an item from a list of responses, or a very short response would be the three main ways in which one answer posed questions in a closed ended style."[18]

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[15] . *Ibid,* p89.
[16]. Chisnall, *Marketing Research*, 1982, p.24
[17]. Oppenheim, *Questionnaire Design*, 1992, p. 100
[18]. Adams & Schvanevedt, *Understanding Research*, 1991, p.201

The structure and design of a questionnaire are important. A questionnaire should of course be prepared carefully in order to meet the requirements of the researcher.[19]

Question order should be looked at carefully. The order of the questions will introduce the interviewees to further questions. The carrying out of a pilot study may help to establish the correct form and order of the final questions, as is pointed out by Chisnall.[20] Researchers may rewrite or change the sequence, composition and style of a questionnaire several times following the pilot study so as to get it into the final stage. These stages could be completed in order to be sure that the research samplers will understand the problem clearly by reading the questionnaire in order to obtain helpful answers.

5.2.5.   Interview.

An interview has been defined by Chisnall (1992) as "a conversation directed to a definite purpose other than satisfaction in the conversation itself."[21] Wolman (1973) elaborates on this definition of an interview: "a conversation between a therapist, counselor, or other professional, and a patient, client, or prospective employee, designed to elicit information for the purpose of assessing diagnosis, treatment, qualifications, or aid in research or guidance. According to the purpose of the interview it may be conducted using a directive or a non-directive approach. For therapeutic purposes, the non-directive approach is usually preferred."[22]

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[19]. Chisnall, *Marketing Research*, 1992, p.135
[20]. *ibid*, p.120
[21]. Chisnall, *Marketing Research*, 1992, p. 139
[22]. Wolman, *Dictionary* , 1973, p.202

Chisnall (1992) identifies three forms of interview in general use: "1- limited response. 2- free response. 3- defensive response."[23] Interviews are often used to put questions to specialists or experts who will add useful information to the study. Adams & Schvaneveldt (1991) state the advantages of interviewing as relating to: "1- Explanation. 2- Co-operation rate. 3- Quality of data. 4- Observation of respondents. 5- Motivation and rapport. 6- The communication process. 7- Sensitive and emotional topics."[24]

For the purposes of this study an interview is a planned conversation between a researcher and a professional or someone with particular information, in order to reach the researcher's objectives.

In the course of this present research interviews were carried out with specific people who could contribute information that was otherwise hard to uncover since so little has been published on the management of the Holy Mosque. The researcher had difficulties in interviewing some of those people for several reasons. The security issues surrounding the information they had and the security of the Holy Mosque, as those people stressed, is the main factor in keeping information undercover. Some interviewees preferred to give off-the-record information. Decision makers, practitioners, workers, Hajj missions' directors for different countries, and social scientists have all been interviewed by the researcher as described in Chapter 8.

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[23]. Chisnall, *Marketing Research*, 1992, p. 140
[24]. Adams & Schvaneveldt, *Understanding Research*, 1991, p.212

5.2.6.   Observation.

The researcher should employ the observation research method on a case-study research by making field trips, visiting the case under investigation. This research method which depends on personal contact with the real situation will help to build a deeper understanding of the case and to discover the specifics of the problem under investigation. However, the researcher may have to make several field trips to the case study in order to gain the needed information over a period of time.

Yin has pointed out that, "the observation can range from formal to casual data collection activities."[25] and the data which could collected on those trips may be effected by the sort of the observation which are made. The collected data by this method could be providing valuable additional information for researcher.

5.2.7.   Space Syntax (Spatial Analysis Method).

The study of architectural morphology is one of the ways which give the best understanding of space-use in the built environment. Bill Hillier, who developed this new technique, in the 1970s, said: "I see a new theory of space as an aspect of social life."[26] Space syntax, which is a technical method of analysing architectural morphology, is helpful to an understanding of the use of space and because it helps to describe spatial organisation in relation with the surrounding environment in scientific terms. It predicts pedestrians' movement and analyses it with relationship to the built environment. As Hillier describes it, "Space Syntax's aim is to understand the morphological logic of

[25]. Yin, R., *Case study research*, 2003, p.92
[26]. Hillier, B., *Space is a Machine*, 1996, p.1.

urban grids especially their growth."[27] Peponis *et al* added: "Space Syntax has proposed that plans can be represented as a set of interrelated convex spaces."[28] Alasdair Turner and Alan Penn have introduced a new method of encoding the natural movement of pedestrians based on the field of vision, Isovist.[29]

Space Syntax analysis, as defined by A. Amir, is "a set of computer-based techniques for the modelling and analysis of spatial layout of all kinds found in buildings and cities."[30] Bill Hillier and Julienne Hanson describe those methods in detail in *The Social Logic of Space* (1984). However, Tim Stonor simply describes it as "a design tool which predicts patterns of pedestrian movement in towns and cities"[31].

According to the *Oxford English Dictionary* 'Syntax' (n.) mean "systematic arrangement of parts or elements."[32]

Hillier sees the relation of the building to the surrounding environment as follows: "Buildings operate socially in two ways: they constitute the social organisation of everyday life as the spatial configuration of space in which we live and move, and represent social organisation as physical configurations of forms and elements that we see."[33] J. Peponis *et al*, added that: "Buildings make space available to our experience,

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[27]. Hillier, B., *Natural Movement*, 1993, p.32

[28]. Peponis, J., *et al, On the description of shape,* 1997, p.764.

[29]. Turner, Alasdair, and Alan Penn, *Encoding natural movement as an agent-based system*, 2002, 473-490.

[30]. Amir, A., *Computer Simulation, Modeling, and Evaluation of Architectural and Urban space Using Space Syntax Techniques*, April 13-17 2002, p.6.

[31]. Tim Stonor*, Space Syntax: interdisciplinary design*, Sep.1998, p.1

[32]. *Short oxford English Dictionary*, Oxford Press, 2002, p.3155.

[33]. Hillier, B., *Space is a Machine*, 1996,p.4.

useful for human activities, and intelligible to our understanding, through the disposition and arrangement of boundaries."[34]

Moreover, in accordance with the natural movement of pedestrians, Hillier stated that "the configurational correlations of movement pattern are found to be measures of global properties of the grid with the 'Space Syntax' measure of 'integration' consistently found to be the most important."[35] He continues to describe the natural movement as follows: "natural movement in a grid is the proportion of urban pedestrian movement determined by the grid configuration itself."[36]

According to M. Batty the useful use of information of pedestrian movement can be demonstrated,"Predicting individuals' movement patterns though space is becoming an increasingly important goal of urban and transport planners interested in designing effective urban space for pedestrians."[37] As Stonor pointed out the aim of the Space Syntax approach is to provide the necessary knowledge to plan the development process.[38] As will be shown later in this chapter, maps and numbers are the two main characters in space syntax analysis.

Hillier and Hanson described the principal objectives of the Space Syntax method as follows[39]:

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[34]. Peponis, J. *et al, On the description of shape and spatial configuration inside building: convex partitions and their local properties*,1997, p761.

[35]. Hillier, B., *Natural Movement*, 1993, p.29.

[36]. Hillier, B., *Natural Movement*, 1993, P.32.

[37]. Willis, Alexandra, *Human movement behaviour in urban spaces: implications for the design and modelling of effective pedestrian environment,* 2004, p.805.

[38]. Tim Stonor*, Space Syntax*, 1998, p.6.

[39]. Hillier, H. and Hanson. *The social logic of space*, 1984, p.52.

- To find the irreducible objects and relations, or 'elementary structures' of the system of interest. To represent these elementary structures in some kind of notation or ideography, in order to escape from the difficulty of always having to use cumbersome verbal constructs for sets of ideas which are used repeatedly;

- To show how elementary structures are related to each other to make a coherent system;

- To show how they may be combined together to form more complex structures.

Kayven Karimi, in his Ph.D. thesis,[40] has looked at how the Space Syntax technique helps to deal with problems that other techniques fail to do. He, concluded that: "the first difficulty is the lack of a morphological and spatial foundation for the study of cities. […] the second problem is that many of these theories and studies fail to establish the concept of an urban system […] The third difficulty arises from the lack of a framework which can create a sensible relationship between the physical or spatial manifestation of the city and the social activities and actual pattern of use […] The fourth enigma is related to the methods of representation and modelling [….] Finally, the last major problem is the analysis of urban models."[41]

The Space Syntax prediction of pedestrian movement, as Hillier *et al* pointed out, is based on natural movement that will not be effected by any conditions such as commercial attraction and other factors.[42] However, the Space Syntax prediction does not count the differences in the characterisation of the spaces as Preechaya Therakomen pointed out: "Space Syntax does not take account of real differences in size of blocks as

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[40]. Karimi, Kayvan. *Continuity and change in old cities*, 1998.
[41]. *Ibid,* p. 61-2
[42]. H., Bill, et al, *Natural movement*, 1993.

well as varying perceptions of time and distance in different spatial configuration."[43] On

the other hand, it was claimed by Hillier that Space Syntax technique allows "us to deal

graphically with the numerical properties of spatial system."[44]

Before explaining the concept of the Space Syntax and its technique, it is necessary to

define the terms regularly employed by its technical users to understand the method.

These definitions are as follows:

axial (adj.) line is "the pertaining that line or forming the axis."[45]

connectivity (n.) is "the degree of being connected."[46]

deformation (n.) is "the change in shape, configuration, or structure."[47]

integration (n.) is "the composition of a whole by adding together or combining separate

parts."[48]

- *The Concept behind the Analytical Method:*

Beyond the definition '*Space Syntax*', there is a concept of analysing space which is best

described by Hillier and Hanson in the *Social Logic of Space* (1984). This concept is as

follows, A connection, that reflects each step of movement, is established between each

convex space[49] with the surrounding convex spaces to create a y-map (the map of the

open space structure) as shown in Figure 5-1 (a y-map of part of a settlement). The

convex spaces created to identify each possible space in the analysing settlement are

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[43] . Therakomen, P., *Mouse Class*, 2001.p.13
[44] . Hillier, B., *Space is a Machine*, 1996, p.132.
[45] . *Short oxford English Dictionary*, Oxford Press, 2002, p.162.
[46] . *ibid*, p.489.
[47] . *ibid*, p.927.
[48] . *ibid*, p.1394.
[49] . It is that space which a straight line could be drawn between any two points within the space.

shown in Figure 5-1. As the settlement became more complicated, more connections should be created.
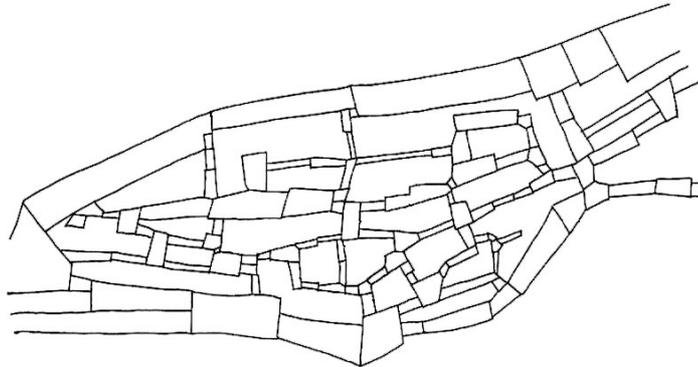
Figure 5-1: Convex map of analysed settlement.
(Source: Hillier and Hanson, The Social Logic of Space, p.92)

- *The techniques:*

Certain techniques were developed at University College, London by Hillier and his colleagues to analyse human settlements using maps and numbers which show the full analysis as follows.

1. *The convex map*: The convex map is known as "the map of the open space structure broken into the fattest possible convex spaces."[50] According to Hillier and Hanson, the concept of drawing these spaces is to have the largest achievable spaces where it is possible to draw a line from any point inside the space to any other point within the same space without going outside the space boundary as shown in Figure 5-2 (a).

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[50] . Hillier, H. and Hanson. *The Social Logic of Space*, 1984, p. 97.
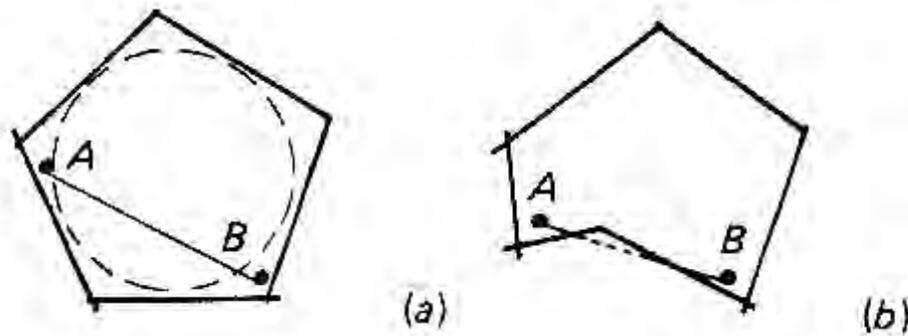
Figure 5-2: the technical setting to create a convex space as in (a) where a line within the space could be drawn from any two points inside the space where it is not possible in Figure (b).
(Source: Hillier and Hanson, The Social Logic of Space, p.98)

2. *The measures of convexity:* From the convexity, convex articulation and grid convexity certain measurements could be determined. Hillier and Hanson set up several equations in order to calculate those measurements.[51] The measure of convexity was described by Hillier and Hanson as: "the degree to which the open space structure is broken up into convex spaces."[52] This measure could be found by dividing the number of buildings into the number of convex spaces.

$$\text{convex articulation} = \frac{\text{number of convex spaces}}{\text{number of buildings}} \tag{1}$$

$$\text{Grid convexity} = \frac{\left(\sqrt{\text{number of island}} + \text{number of island}\right)^2}{\text{number of convex spaces}} \tag{2}$$

3. *The axial map and measures of axiality:* An Axial map of the settlement under analysis will be created by starting with the longest straight line that can be drawn then the second longest line and thereafter until all convex spaces are crossed and all axial lines are linked to other axial lines.

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[51]. *ibid*, p.98-100
[52]. *ibid*, p.98

Hillier and Hanson found that Dividing the number of axial lines by the number of buildings will calculate the degree of axial articulation where a low value indicates the higher degree of axiality[53].

$$\text{axial articulation} = \frac{\text{number of axial lines}}{\text{number of buildings}} \tag{3}$$

In addition, they found that comparing the number of axial lines to the number of convex spaces will indicate the axial integration value of convex spaces where the lowest value is indicating the highest degree of integration.

$$\text{axial integration of convex spaces} = \frac{\text{number of axial lines}}{\text{number of convex spaces}} \tag{4}$$

They add, the value of the grid axiality could be found by comparing the values as in the following equation:

$$\text{Grid axiality} = \frac{\left(\sqrt{\text{number of islands}} \times 2\right) + 2}{\text{number of axial lines}} \tag{5}$$

The higher value indicates stronger estimation to the grid.

4. _the y-map:_ the y-map or the map of the open space structure could be considered as one of the most important maps in Space Syntax analysis since it gives the opportunity to make several analyses and calculations as will be shown. From the convex spaces map and the axial line map, the y-map will be created. As shown in

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[53]. *Ibid*, p.99

Figure 5-3 each convex space is reflected with a point or a small circle. A connection between those points will be drawn whenever the convex spaces share a face or part of a face. As already mentioned, several calculations could be obtained from this map as follows:
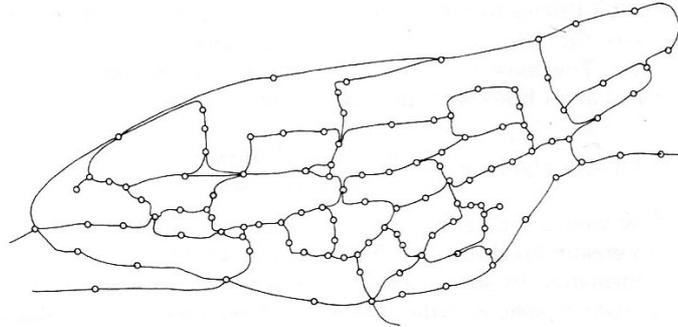
Figure 5-3: The y-map of convex spaces of the analysing settlement.
(Source: Hillier and Hanson, Social Logic, p.100.)

a. *Axial line index*: the axial line index map, shown in Figure 5-4, represents the number of convex spaces that the extended axial line can reach.
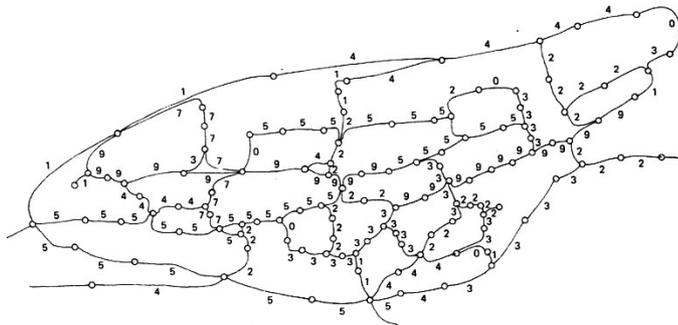
Figure 5-4: the y-map of the analysing settlement showing the axial Line indexes.
(Source: Hillier and Hanson, Social Logic, p.101)

b. *Axial space index*: the axial space index number of each convex space, which is assigned on each convex space point as shown in Figure 5-5, is the total number of convex spaces axially linked to the pointed convex space.
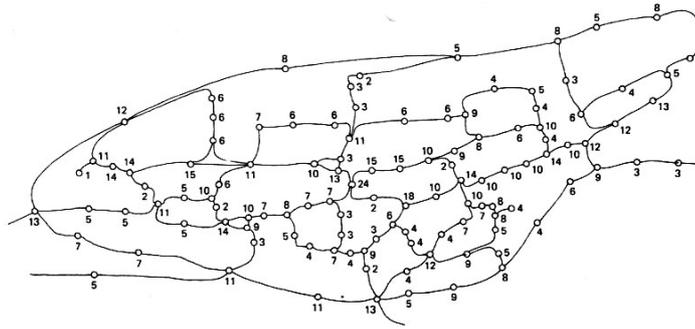
Figure 5-5 the y-map of the analysing settlement showing the axial space indexes.
(Source: Hillier and Hanson, Social Logic, p.101)

c. *Building-space index*: the building-space index map represents the number of buildings that are neighbouring and directly permeable to the convex space as shown in Figure 5-6.
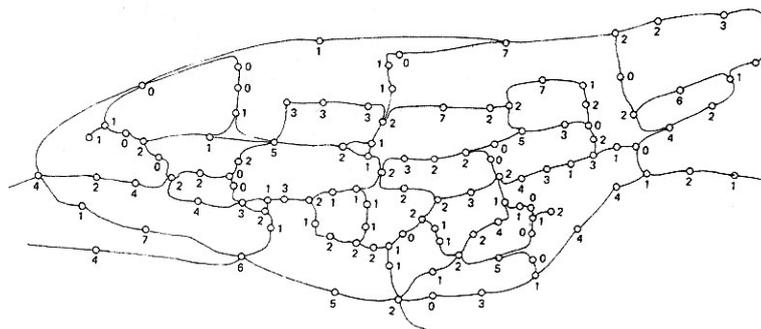
Figure 5-6: the y-map of the analysing settlement showing the building-spaces indexes.
(Source: Hillier and Hanson, Social Logic, p.102)

d. *Depth from building entrance*: the depth from the building entrance represents the number of steps it is away from the nearest building entrance and is shown on each convex space point as shown in Figure 5-7
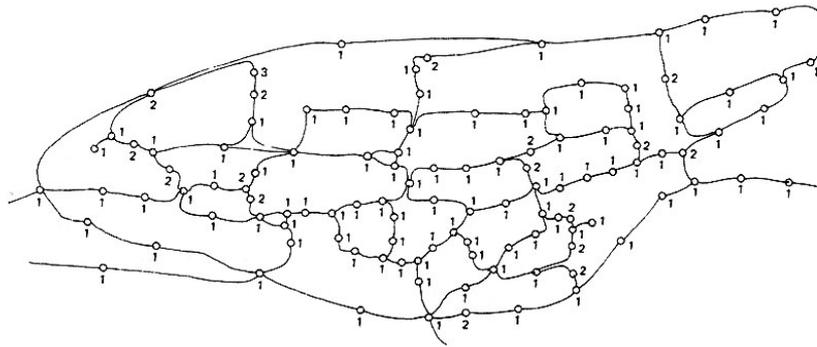
Figure 5-7: the y-map of the analysing settlement showing the depth from building entrances.
(Source: Hillier and Hanson, Social Logic, p. 101)

e. *The ringiness of the convex system*: the ringiness of the convex system could be described as the proportion of the number of the rings or islands on the system to the maximum possible rings for that number of convex spaces and may be calculated by the following equation:

$$\text{convex ringiness} = \frac{\text{number of islands}}{\left(2\,\text{X number of convex spaces} - 2\right)} \qquad (6)$$

5. *Numerical properties of the axial map:* As Hillier and Hanson found[54] several numbers could be drawn from the axial line map that give the required analysis from this map. Axial line index, connectivity and ring connectivity are some of the numerical analysis as follows:

a. *Axial line index*: the axial line index number is the number of convex spaces that the assign axial line passes through as shown in Figure 5-8.

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[54]. Hillier, H. and Hanson. *The social logic of space*, 1984, p.103
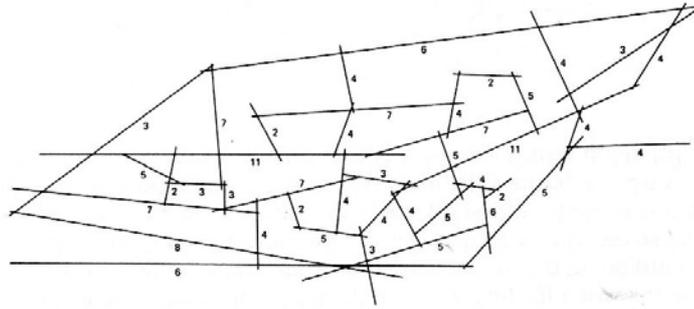
Figure 5-8: the axial map of the selected settlement and the axial line index numbers written on each axial line. (Source: Hillier and Hanson, Social Logic, p. 103)

b. _Axial line connectivity_: the axial line connectivity is described by Hillier and Hanson as "the number of other lines it intersects [with the each axial line]."[55] As shown in Figure 5-9.
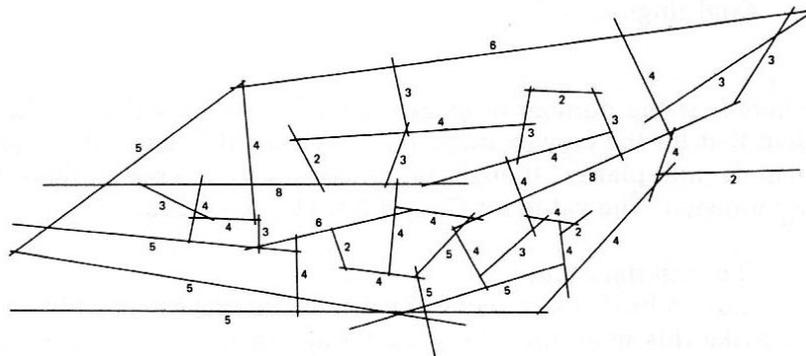
Figure 5-9: the axial map of the selected settlement and the axial line connectivity numbers written on each axial line. (Source: Hillier and Hanson, Social Logic, p. 103)

c. _Ring connectivity_: This is described by Hillier and Hanson as the number of the rings that the axial line creates[56]. However, the rings of un-built space will be hatched, as shown in figure 5-10.

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[55]. _ibid_, p.103
[56]. Hillier, H. and Hanson. _The social logic of space_, 1984, p.103

Hatched areas represent islands of unbuilt space.
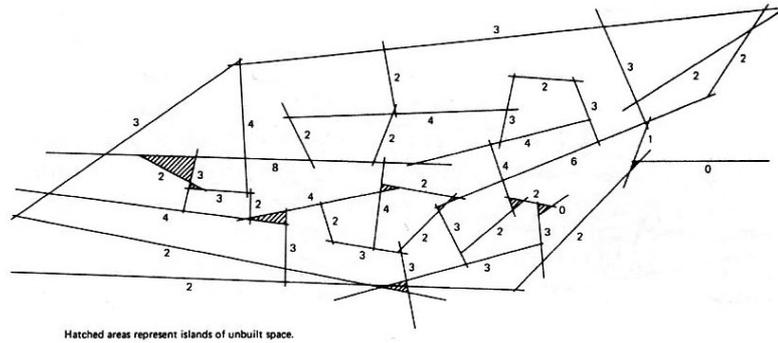
Figure 5-10: the axial map of the selected settlement and the ring connectivity numbers written on each axial line. (Source: Hillier and Hanson, Social Logic, p. 103)

6. *Additional analysis*:

a. *The measure of integration*: Integration was identified by Karimi as: "the most effective syntactic measure, determining how each line is connected to all other lines of the system."[57] Karimi continued and quoted Bill Hillier's statement in this regard as he said: "The 'integration value' of each line reflects its mean linear 'depth' from all other lines in the system." The *depth* is the number of the steps of each line from other lines in the system. Different kinds of *depth* could be measured as Hillier and Hanson stated.[58]

Global and *Local* integration are the two types of Integration it is possible to calculate. Guido-M Stegen described those terms as "the *Global* integration as the value is an inversal of the global mean depth, and represents the degree of centrality of the relation in the global system, where, the *Local* integration is the value is an inversal of the local mean depth and represents the degree of centrality in a local area around the line."[59] Karimi simplifies these terms as "The *Global* integration (radius-n or Rn) calculation is where the calculation of the depth from each line goes up to the largest possible depth.

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[57]. Karimi, Kayvan. *Continuity and change in old cities*, 1998, p.65
[58]. Hillier, H. and Hanson. *The social logic of space*, 1984, p.108/10.
[59]. Stegen, G., *et al*, Qualitative descriptions of urban clusters, 1999. p.3.

And the *Local* integration (radius-3 or R3) calculation is where the calculation of the depth reduced from the global on to the third step a head from each line."[60]

Stoner simplified the process of axial line analysis and its result when generated by computer software and he describe it thus: "the best integrated streets are automatically coloured red by Space Syntax analysis, then orange, yellow and green, through to the most segregated streets which are coloured blue."[61]

7. *Visual Graph Analysis (VGA)*: A related system of spatial analysis is the Visual Graph Analysis (VGA) which is based on the Isovist concept which is the field of vision in a particular space. Alasdair Turner and Alan Penn wrote that the isovist method into spatial analysis was introduced by Tandy in 1967 for analysis of landscape.[62] Michael Batty and Sanjay Rana described this method as an "approach depending not on simplifying morphology as a map which covers a subdivision into convex spaces but on describing the morphology in terms of individual points which in themselves cover areas of the space."[63]

Generating Isovist integration of a space will represent the visual field of each assigned location at that space which is shown in figure 5-11. The generating of isovist integration of a space with a T shape could be representing as it shown in Figure 5-12. It shows the field of vision of thirty-six locations at the space. On the Visual Graph Analysis, the most visible place is represent in red and the less visible is represent in blue as it shown in Figure 5-13 that represent the VGA of a T shape.

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[60]. Karimi, Kayvan. *Continuity and change in old cities*, 1998, p66
[61]. Tim Stonor, Space Syntax, 1998, p.1
[62]. Turner, Alasdair and Penn, Alan, Making Isovist, 1999.
[63] . Batty, M., and Rana, S., The automatic definition and generation of axial lines and axial maps, 2004, p.619.
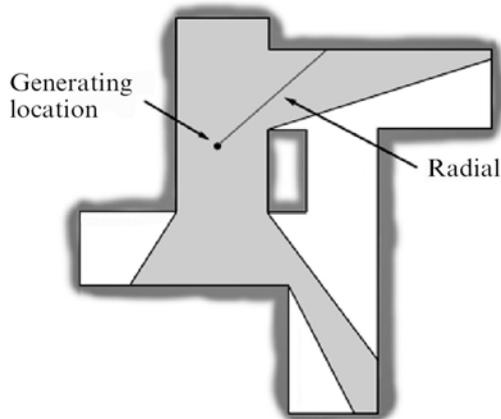
Figure 5-11: The field of vision (isovist) from the generating point. (Source: Turner, A., et al, From isovist to visibility graphs, p.104)
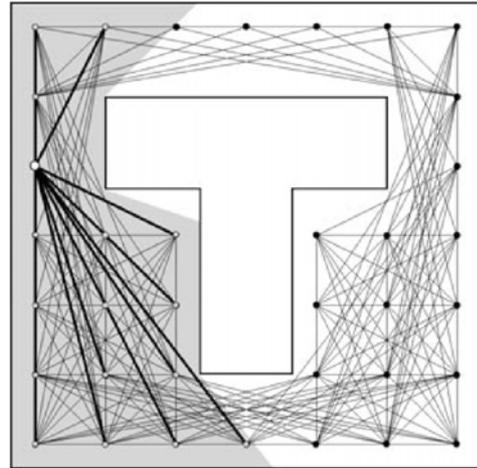
Figure 5-12: The pattern of generating process of a T shape. (Source: Turner, A., et al, From isovist to visibility graphs, p.108)
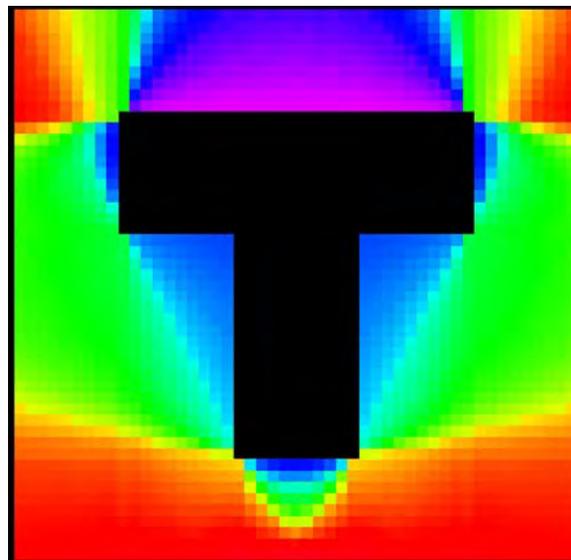
Figure 5-13: a graph showing the VGA of a T shape.

The use of the Isovist integration analysis is for urban space and building space. Alasdair Turner and Alan Penn pointed out[64] that this method was tested at the Space Syntax Laboratory, University College London, on some urban projects where a close relationship was found between the isovist integration analysis and the radius 3 integration of the axial line analysis. However, as the space becomes more complicated, the isovist analysis became more complicated as well.

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[64]. Turner, Alasdair and Penn, Alan, Making Isovist syntactic, 1999.

This method seemed to be suitable for analysing the Prayer Hall at the Holy Mosque as it had been tested on the exhibition hall at the Space Syntax Laboratory. In mosques and prayer areas this method could be used to find out the best form of the space to place the essential religious objects (Muhrab and Minbar) or the most visible place for the Imam who needs to be seen by all worshippers.

Space syntax has already been applied to a variety of urban and architectural systems. It has been used in many cities, some of them Islamic, though these are comparatively few, as noted by Amir (1998).[65]

- *Data Collection methods:*

These methods, as stated on the software manual[66], are:

1. The Gate Method. This is usually used to record moving people or vehicles only. Using this method the investigators stand at each side of a gate position and imagine an invisible line across the space. They then start counting the moving objects – people and vehicles – which will cross the invisible line. People counted might be divided into categories, such as men, women, teenagers and children, and moving vehicles counted might be categorised as cars, buses, light goods vehicles, heavy goods vehicles, motorbikes, and pedal bicycles. The gate should be arranged in such a way that the count will be completed within a single period of time. Some studies will require that there should be separate counts covering different times of the day.

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[65]. Amir, A., *The Spatial Logic of Pedestrian Movement and Exploration in the Central Area of Jeddah*, 1998, p.8
[66]. The Space Syntax software manual provide by Space Syntax Laboratory, London.

2. Static Snapshots. This method is usually used to record the use pattern of space within buildings. It might also be applied to the observation of public squares and spaces. The method is based on a large-scale plan of the area under investigation. The investigator walks from one space to another and takes a mental snapshot of the activities at that moment. It is important not to count people who have entered the space after you have taken the mental photograph. The snapshots will record the main activities to be shown on the plan. The main activities such as sitting, walking and standing each have an individual symbol on the plan.

3. People Following. This method often involves observation of activity from movement distributors such as a train station or a shopping centre. This method is suitable if we want to know the pattern of movement from a specific location, what the movement relationships are between the various routes in the area, and what the average distance is that people walk from a specific location. The procedure is simply to have a plan with specific points where you will pick up people to follow. Usually a group of 25-50 people will be picked up. Each group is advised to have all kinds of people such as men, women, old, young, etc.

4. Directional Splits. This method is suitable for recording the observation of moving people and vehicles only. It is usually utilised for urban investigations and might be applied to interior spaces and buildings. It is used to record the split of movement flows at a junction. This method is based on having a plan of junctions labelled A, B, C, etc. Randomly a moving object – a person or vehicle – is chosen and followed until it reaches its destination. The number of moving objects should be marked on a sheet.

Depending on the situation the procedure might be carried out for a defined time period or all day long.

5. Movement Traces. This method is normally used in conjunction with the snapshot method. It might also be used in a space that is architecturally complex. The number of people can be counted after an event as they move through gates. The observer stands for a set period of three, four, or five minutes and records all the movement through the space under observation.

There are two other methods that are applied only to buildings observation and analysis. These methods are:

1. Interaction Analysis through Questionnaires. This method is suitable for analysing offices or workplaces. Each member of staff is given a list of staff members. A set of five boxes of which the respondent is asked to tick one, is next to each name.

2. Movement Density. This method is appropriate for buildings when people occupying the space are constantly in movement. The count gates are located at all the thresholds of all rooms in the building.

The first method of collecting data, that is the Gate Method, is used in this study in order to gain data about the Holy Mosque. By using this method the study will count people at all of the gates of the Holy Mosque which will make this study the first to observe all of the Holy Mosque's gates.

The Space Syntax Laboratory has written seven software packages used to analyse buildings and urban forms, and the Virtual Reality Centre has created one such software package. Those software packages are:

1. *Axman*. This is an application used to analyse urban and interior space. It constructs a graph of axial lines.

2. *SpaceBox.* This is an application used to generate and analyse axial maps and convex overlap maps. It can be used to study urban form and interior layout.

3. *NewWave*. This is an application used to analyse complex spatial systems. It creates a text file listing the connections between spaces in a given system and NewWave calculates the syntactic properties of those systems.

4. *OrangBox*. This is an application which enables rapid processing of Axman files but does not have the analytic capabilities of Axman software.

5. *NetBox*. This is an application used for creating justified graphs.

6. *Ovation.* This is an application providing a direct interface between GIS and space syntax analysis.

7. *Depthmap*. This is the only application that works under IBM systems. It is a program for performing visibility graph analysis of spatial environment. It performs various analyses of the graph.

Space Syntax method seemed a suitable method to analyse the Holy Mosque building and the surrounding open areas which will provide useful information to analyse and identify the overcrowding hotspots and give a good understanding of the situation because it shows the spatial movement at specific spaces. On the other hand, this project will also provide a good opportunity to test this analytical technique on such a large building that occupies more than half a million worshippers at one time.

5.3. The Application of the Research Methods:

All the methods that have been described (Qualitative as well as Quantitative) provide helpful tools to understand, investigate and analyse this particular case. Gathering information through a range of methods will build a comprehensive understanding of the Holy Mosque and its operational problems.

The benefit of employing both quantitative and qualitative research methods is that it offers a full opportunity to study the Holy Mosque from different aspects. This will enable the researcher to identify and place the problems in a wider context. In such a popular building, understanding the feedback received from users is an important issue. This aspect will be covered by the application of the quantitative research method through the prepared questionnaire.

The questionnaire was designed specifically for feedback from worshippers regarding the overcrowding phenomena. It has been divided into ten parts. Each part seeks to collect a specific type of information. The first part concentrates on general information. The second asks questions about the preparation for and coming to the Holy Mosque. The third asks questions about entering the Holy Mosque building. The fourth part asks

questions about exiting from the building. The fifth gains information about behaviour inside the building. The sixth is regarding to the making of Tawaf. The seventh is about the Sa'i. Then there are some questions about going into retreat at the Holy Mosque. The ninth section is about visiting Zamzam well. The last part asks some additional questions that do not fit into any sections of the above. A full sample of the questionnaire used is provided in Appendix.

Space Syntax had been chosen for this study in order to provide a deeper understanding of the spatial organization of the case undertaken. By predicting the movement pattern of worshippers inside the Holy Mosque building and its surrounding areas its provides connectivity of the spatial layout and its integration. In addition, the capacity of the Isovist method to provide the Visual Graph Analysis helps to find the visible and unvisible space inside the Holy Mosque building. When the Space Syntax models are compared with the observed data obtained by other methods, it will test the efficiency of the Space Syntax method itself. For example, it is claimed that "Space Syntax analysis of crowd movement patterns in public and open spaces show that movement density rates and patterns correlate with spatial properties."[67] If so, a fuller picture of the case thus drawn, will support a deeper understanding of the spatial characteristics of the building.

Together, all the described methods will provide the ability for fully understand the case which will help suggest useful recommendations to help to resolve the problems that may be found as well as to improve the general atmosphere in order to provide a comfortable environment that helps worshippers to complete their religious ritual duties.

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[67]. Amir, A., *Computer Simulation, Modeling, and Evaluation of Architectural and Urban space Using Space Syntax Techniques*, April 13-17 2002, p.28.

5.4. Fieldtrips:

The data collection process took place mainly during the first and the second year of the study. In addition, the researcher used his annual vacations in Makkah for checking and updating the required data.

In order to collect data, two fieldwork trips were undertaken in connection with the case study. The first one took place between 15 January 2001 and 25 April 2001. The second one took place between 15 November, 2001 and 14 April, 2002. The Custodian of the Two Holy Mosques Institute of Hajj Research supported this work. They organized a working place for the research team, the researcher and his students, and provided computers and computer software. In addition, more than two hundred Saudi Arabian university students were hired. To carry out his fieldwork, the researcher used several methods discussed in previous Chapters. These included the questionnaire and interviews that will be discussed later in this chapter. In addition, to collect the necessary information for Space Syntax analysis, the gate method was used.

5.4.1. The First Fieldtrip:

The data collected on this trip was intended to support an in-depth investigation of the case study. It included historical research to build a deeper understanding of the context of the building and its site as well as obtaining geographical method such as digital maps, hard copy maps; information about safety standards in Saudi Arabia, and information related to relevant cultural factors. Makkah's central area base map, for example, had to be updated for the purpose of this study. Additionally, a pilot study was carried out on the research questionnaire using researchers at the Custodian of the Two Holy Mosques

Institute of Hajj Research. This produces a useful final questionnaire to help to support the research questions and the testing of the thesis hypothesis.

5.4.2. The Second Fieldtrip:

The field work on this occasion, (which took place at the end of the second year of the study,) focused on completing the collection of the required data such as the historical information about the Holy Mosque and Arabic sources on this subject. The questionnaire was completed after careful testing. In addition, the Space Syntax data was collected and completed, and the observation process finished. Moreover, cultural information relevant to the subject and to the case study was collected, in Arabic archival research in various Makkah libraries.

5.5. Data collected:

During the two field trips data collected to help answer the research questions fall mainly under four different categories: Questionnaires, Interviews, Digital Mapping and on-site gate observations.

5.5.1. Descriptive Data:

The research conducted included searching in Makkah for published material in Arabic on the Holy Mosque which cannot be found in western societies. This material covers the historical background regarding the city of Makkah and the Holy Mosque. In addition, material was collected on technical issues like the design regulations for Saudi Arabia, but the main focus was on obtaining data from primary research.

5.5.2. Digital Data:

The digital data collected and sorted were mainly the data that could be used for computer simulation models and in spatial analysis and configuration. It was found that most of the digital data were not up-to-date and needed to be updated. The base map of the Holy Mosque building was collected and updated during the fieldtrips. In addition, the city of Makkah base map was collected. The map of the central area of Makkah was updated in order to be used with the Space Syntax analysis project. The base map of the Holy Mosque found at the Custodian of the Two Holy Mosque Institute of Hajj Research also needed some updating. The best base map of the city of Makkah that was found was the base map of the Municipality of Makkah which also needed some modification to be up to date, especially for the central area.

5.5.3. Interviews:

The researcher interviewed many people who were considered to have relevant information in order to get and collect as wide as possible a perspective. The selection of interviewees covered all aspects which could have a bearing on the study and included, clerics, administrators, and other professionals as follows:

▪ *Shaikh Prof. Abdul Wahab Abo Sulaiman.* A professor at Umm AlQura University, a member of staff of the Senior Committee in Saudi Arabia. This interview aimed to investigate his ideas on issues regarding the Holy Mosque, especially the Maqam Abraham and the Dark Marble Line. He represents the opinion of the Senior Committee in Saudi Arabia which draws up most of the religious commands for the government, based on the religious sources.

▪ *Shaikh Dr. Yousif Al Qaradawi.* The Dean of AshSharea'a College, Qatar University and the General Mufti of the State of Qatar. This meeting gave the researcher the religious position on research issues regarding such holy sites as the Maqam Abraham, Zamzam entrance, questions related to entering the Holy Mosque from a particular gates etc. It was important to get the opinion of one of the important current Islamic Imams on the different research topics.

▪ *Dr. Usama F. Al Bar.* The Dean of the Custodian of the Two Holy Mosques Institute of Hajj Research. From his position, he has a view on different aspects that help to locate the problems at the Holy Mosque. In addition, he was asked some questions to get his personal opinion on certain problems that were found.

▪ *Dr. Sami Barhamin.* The general secretary of Makkah Development High Authority. This interview explored the position of the High Authority which drew up the development plan of the city of Makkah.

▪ *Dr. Majdi Hariri.* The Former general manager of the Hajj Research Centre. The aim was to get his experience on directing the research centre that deals with the Holy Mosque studies.

▪ The Former General Commander of the Holy Mosque Force. The information collected from this interview is based on his personal experience on the Holy Mosque. In addition, some of the questions asked were aimed to get information to help discover the overcrowding points and analyse the worshippers' behaviour inside the Holy mosque and at the surrounding areas that could assure the provision of a comfortable religious atmosphere to promote the worshippers duties.

▪ *Professor. Ahmed Al-Badawi Tahaa.* Transportation professor at the Custodian of the Two Holy Mosques Institute of Hajj Research. Since this professor did some studies on movement at the Holy Mosque building, he gave some useful, scientific information about the crowd movement at the Holy Mosque.

▪ *Engineer. Rashad Al-Hemli.* The General Supervisor of the Two Holy Mosques project, The Saudi Bin Ladin Group. This interview was aimed at collecting the required information from the construction company that could not been found in any published book. In addition, he provided some historical and technical information regarding the Dark Marble Line and the unique white marble used at the Mataf area.

▪ *Ahmad Ruzman bin Ahmad Razali,* The General Manager of Tabog Haji, the Malaysian governmental agent responsible for Hajj services. It was known from working with Muslim pilgrims that Malaysian pilgrims are the most organized people during Hajj sessions. This interview aimed to find information about this organisation and how it works. The interviewee is a responsible person in this organization. He provided some information necessary to understand behaviour at these religious sites.

▪ *Brigadier Mohammed J. S. Jamal Al-lail.* The Former leader of the Saudi Arabian Emergency Force. The force or guards opinion in this critical site is helpful information to gain full understanding of the problems and find the best recommendations that will not be ignored by the force department and other guards. The interviewee gave his personal experiences while he worked to organize several events at the Holy Mosque such as protecting VIP visitors and organizing special events like changing the Kiswa of the Sacred Ka'bah.

▪ *Dr. Samir A. Aashi.* The Head of the Urban Studies at the Custodian of the Two Holy Mosques Institute of Hajj Research.

▪ *Engineer. Hossam Abdul Salam.* Traffic engineer at the Custodian of the Two Holy Mosques Institute of Hajj Research. This interview aimed to gain his opinion as one of the specialist that studied the movement problem at the Holy Mosque.

5.5.4. Photographs:

A number of photographs representing the Holy Mosque and supporting the description and the analysis of the problem of the overcrowding at the Holy Mosque were collected from different sources. Some of those photos were taken by the researcher. However, due to the sensitivity of the security issues related to the case, taking pictures inside the Holy Mosque and at its surrounding areas are strongly prohibited; most of the photographs that show the problems were taken from Video Cassette sources.

5.5.5. Statistical Data:

This research project has used a questionnaire to get information and feedback from users of the Holy Mosque in Makkah. The questionnaire went through three stages to reach its final form. Those stages were:

1. A pilot study executed with Saudi students at Newcastle upon Tyne and Saudi students at other architecture schools in the United Kingdom. The aim of this pilot study was to simplify the questions as much as possible in order to make them readily understandable to the public.

2. Consulting academics. The aim of this stage was to make the questionnaire more professional. The researcher consulted some social scientists at the University of Newcastle upon Tyne and at Umm Al-Qura University, Makkah, Saudi Arabia. Consulting social scientists helped the researcher to design questions that respected cultural factors amongst those likely to be asked to respond to the questionnaire. It also went through a pilot study with researchers at the Institute of Hajj Research at Umm Al-Qura University. During this stage the questionnaire took its first shape, with the grouping and format of the questions.

3. A pilot study. This last pilot study took place before starting the actual questionnaire. It aimed to simplify the questions for the research samples that included a translation of this questionnaire into three more languages (Arabic, French and Urdu).

A detailed questionnaire was constructed in order to collect the feedback of the worshippers' who visit the Holy Mosque. The questionnaire was carried out with support from the Custodian of the Two Holy Mosques Institute of Hajj Research. It was collected in four different languages (English, Arabic, Urdu and French).

It is important to get the widest view of the users of the Holy Mosque. It was found that it is possible to reach this aim by getting the right number of questionnaire samples returned. Statistical specialists have developed some equations which could help to find the minimum number of research samples that could reflect the opinions of the community. D. A. Krueckeberg and A.L. Silvers are two of these. They developed an

easy-to-use equation in their book *"Urban Planning Analysis: Methods and Models"* in (1974).[68] :

$$n > \frac{\left[p(1-p)\right]}{\left[\left(\dfrac{E}{z}\right)^2 + \left(\dfrac{p(1-p)}{N}\right)\right]}$$

Where:

    n = research samplers size. E = error factor = 3%
    Z = standardized variable = 0.9 p = true proportion = 0.1
    N= community size.

According to this equation, as will be shown later in the thesis, the minimum number of samples is 279, which will provide the visitors' feedback. The questionnaire was distributed three times during the year, in order to cover the situation of all religious seasons. In total about one thousand five hundred questionnaires were distributed, and more than one thousand one hundred of them returned. It was distributed in such a way as to reflect many view points. The full result of the questionnaires will be discussed later in Chapter 6.

In order to achieve the assigned number of worshippers, ten students were hired at the Custodian of the Two Holy Mosques Institute of Hajj Research for the purpose of this research. The researcher went through the questionnaire with them to make sure they understand the questionnaire and in addition, several trips to the site were made with the students and the form filling process practiced with them.

The questionnaire was administered during three separate periods so as to cover all seasons investigated by the case study. The first of these periods was during the month of *Rammadan*. During this month millions of Muslims visit the Holy Mosque for *Umrah*.

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[68]. Krueckeberg, D. A. and Silvers, A.L., *Urban Planning Analysis: Methods and Models*, 1974.

Most of those people tend to come from Saudi Arabia and the countries of the Arabian Gulf. They usually make *I'etekaf* during the last ten days of this month. The second period was during the month of *Shawal*, which reflects the off-peak period. During this month most people who come to the Holy mosque come from Makkah or from cities close to Makkah. Friday prayers reflect the peak time of this period. The third period was during the month of *Dul-QedaI* and *Dul-Hejja,* when millions of pilgrims arrive in Makkah for the reason of performing the *Hajj.*

5.5.6.   On-site gates observations:

Observing the Holy Mosque's gates and counting people at them is one of the most important requirements for absolute accuracy of the Space Syntax software results which predict the value of pedestrian movement. In addition, it will reflect the worshippers' choice of gates when entering and exiting a session. The Holy Mosque has more than one hundred gates that serve the whole building. Those gates include four major gates, which are composed of three bay entrances each, and five bridges leading from the north side of the Holy Mosque to the upper floor. In order to obtain this information, this research was supported by the Custodian of the Two Holy Mosques Institute of Hajj Research. More than two hundred undergraduate students from Saudi Arabian universities were hired in order to finish this work over a short period of time (see Appendix 3). The task was organized as follows:

- Each student worked on one gate. Major Gates had three students, one for each bay.
- Students counted people entering the Holy Mosque for one hour.
- Students counted people leaving from the Holy Mosque for one hour.
- All the counting processes were done at exactly the same time for all gates.

- Some other students counted people in other special places within the Holy Mosque such as the Zamzam well and Hijr Ismail.

Students were trained to observe the worshippers at their allocated spot in order to gain useful data for the spatial analysis. This work took place on three occasions in order to cover the whole of the Muslim calendar year:

1. On the 28th of Ramadan 1422 A.H., in order to sample the Ramadan season.

2. On the 12th of Dul-Hijjah 1422 A.H., in order to sample the Hajj season.

3. On the 8th of Safar 1423 A.H., this covers off-peak time.

The complete observation data collected by this process are provided at Appendix 3.

5.6. Summary:

Several research methods were employed in order to study, analyse, and discuss the case. This multi-methods research approach included spatial analysis techniques that were applied in order to support other traditional methods and techniques. The nature of the material collected through all of the methods and techniques were discussed in detail in this chapter. The analysis of this data is provided in the following two Chapters.

6 Findings from Survey and Interviews

6.1.   Introduction

6.2.   General Characteristics

6.3.   Findings on the Activities Areas:

    6.3.1. Preparing for and coming to the Holy Mosque

    6.3.2. Entering the Holy Mosque

    6.3.3. Exiting the Holy Mosque

    6.3.4. Praying activity

    6.3.5. *Tawaf* activity

    6.3.6. *Sa'i* activity

    6.3.7. *I'tekaf* (Going into retreat) activity

    6.3.8. Visiting the *Zamzam* well activity

    6.3.9. Finding regarding attracting places inside the Holy Mosque:
1. *The Black Stone area*
2. *The Dark Marble line*
3. *Behind the Maqam Abraham*
4. *The Yemeni Corners of the Sacred Ka'bah*
5. *The Multazam area*
6. *The Hijr of Ismail (pbuH).*

6.4.   Other related problem.

6.5.   Summary

6 Statistical Data Analysis

6.1. Introduction

This chapter will discuss the analysis of the statistical data that has been recovered from the research questionnaires. It has been divided into three main parts. The first part will discuss overcrowding in the activity areas of the Holy Mosque, and the second part will analyse overcrowding in the fixed elements of the Holy Mosque that were discussed in previous chapters. The final part will discuss the overcrowding at the gates of the Mosque during entering and exiting from the Mosque building.

6.2. General Characteristics

The number of the distributed samples was calculated based on the equation given in the previous chapter[1]. In order to fulfil the criteria of the equation and get a representative sample, more than 1,000 questionnaires were distributed (rate of return 75%), which covered all three prayer seasons and the more than 50 nationalities of the pilgrims and worshippers, as shown in Table 6-1. The minimum number of research samples for this study, according to this equation, was found to be 279 people[2]. These nationalities have been divided into groups according to the geographical location of the country, as shown in Table 6-2. Those groups are as follows: the first group is the Arabian Gulf, which contains Saudi Arabia, Bahrain, Qatar, Kuwait, UAE and Oman; the second group is the

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[1] Krueckeberg, D. A. and Silvers, A.L., *Urban Planning Analysis: Methods and Models*, 1974.
[2]. $n > 0.1 (1-1-0.1) / [(0.03/1.67)^2] + [0.1(1-0.1)] / 750000 \rightarrow 0.09/(0.018)^2 \rightarrow 0.09/0.000324 \rightarrow 277.78$

Arab countries, containing Egypt, Yemen, Sudan, Morocco, Syria, Jordan, Algeria, Ethiopia, Somalia, Palestine, Tunisia, Libya, Djibouti and Mauritania. The third group is the South Asian countries, which includes Afghanistan, Iran, Pakistan, India, Bangladesh, Sri Lanka, Nepal and Porma; the fourth group is South-east Asia, containing Malaysia, Indonesia and Thailand. The fifth group is the European group, including France, Turkey, Daghestan and Tajikistan. The last group is the African group, which contains Tanzania, South Africa, Benin, Côte d'Ivoire, Senegal, Ghana, Guinea, Cameroon, Kenya, Mali, Nigeria, Niger, Gambia, Gabon and Burundi.

Some difficulties were encountered in getting a good distribution with respect to the questionnaires among the worshippers that reflect the mixture of sexes, nationalities, ages and other social and cultural identities. Four students were hired to complete the research samples. They worked all over the Holy Mosque, in the different languages of the questionnaire and in different places. Because of religious and cultural codes, it is unusual for a Muslim man to interview an unrelated female, if there is not a close family relationship between them, such as husband and wife, father and daughter, son and mother, etc. The researcher tried to have some additional questionnaires completed, covering these aspects. For that purpose, female family members were enlisted to ask their friends, and friends were requested to ask the females in their families, and so on. The questionnaire was distributed three times over the year, so as to cover all users, as shown in Figure 6-1. As a result of these difficulties, only 10% of the total research samples are female, as can be seen from Figure 6-1 (the percentage of female worshippers is about 30%). More than 50 nationalities were sampled, reflecting the visitors to the Holy Mosque, as shown in Table 6-1. The questionnaire came up with some unexpected results, which will be identified and described later in this chapter.

Table 6-1 Numbers of research samples on each nationality.

Nationality	Ramadan period	Hajj period	Off-peak period	Total	Percentage
Saudi Arabia	76	11	92	179	16.0
India	76	37	36	149	13.3
Pakistan	30	74	18	122	10.9
Egypt	46	19	34	99	8.8
Bangladesh	35	11	6	52	4.6
Nigeria	34	4	14	52	4.6
Yemen	32	14	6	52	4.6
Afghanistan	23	17		40	3.6
Sudan	18	10	8	36	3.2
Benin	16	4	4	24	2.1
Morocco	2	6	16	24	2.1
Syria	16	2	2	20	1.8
Jordan	9		10	19	1.7
Algeria	4	12	2	18	1.6
Senegal	10	5	2	17	1.5
Nepal	10	7		17	1.5
South Africa	3	14		17	1.5
Ethiopia	12	1	2	15	1.3
Indonesia	2	7	2	11	1.0
Malaysia		11		11	1.0
Kenya	8	2		10	0.9
Somalia	6	4		10	0.9
UAE		2	8	10	0.9
Oman	4		5	9	0.8
Tanzania	6			6	0.5
Mali	6			6	0.5
Guinean	4		2	6	0.5
Ghana	4		2	6	0.5
Côte d'Ivoire	4		2	6	0.5
Sri Lanka	4	1		5	0.4
Thailand	2	3		5	0.4
Palestine	2	1	2	5	0.4
Tunis	4			4	0.4
Tajikistan	4			4	0.4
Libya	4			4	0.4
Gambia	4			4	0.4
Niger	2		2	4	0.4
Turkey		3		3	0.3
Tobago	3			3	0.3
Gabon	2			2	0.2
Cameroon	2			2	0.2
Burundi	2			2	0.2
Qatar		2		2	0.2
Iran		2		2	0.2
France			2	2	0.2
Djibouti			2	2	0.2
Daghostan		2		2	0.2
Mauritania		1		1	0.1
Kuwait		1		1	0.1
Bahrain		1		1	0.1
Other	17		2	19	1.7
TOTAL	547	292	283	1122	100.0

Table 6-2: Respondents in each region of origin in percentage.

Origin	Ramadan	Hajj	Off Peak	Overall
Arabian Gulf (n=202)	17	6	33	18
Arabian (n=312)	30	24	27	28
South Asian (n=387)	30	51	26	34
South -East Asian (n=27)	1	7	1	2
European (n=11)	1	2	1	1
African (n=164)1	18	10	12	15
Other Nationality (n=19)	3	0	1	2
Total	100	100	100	100
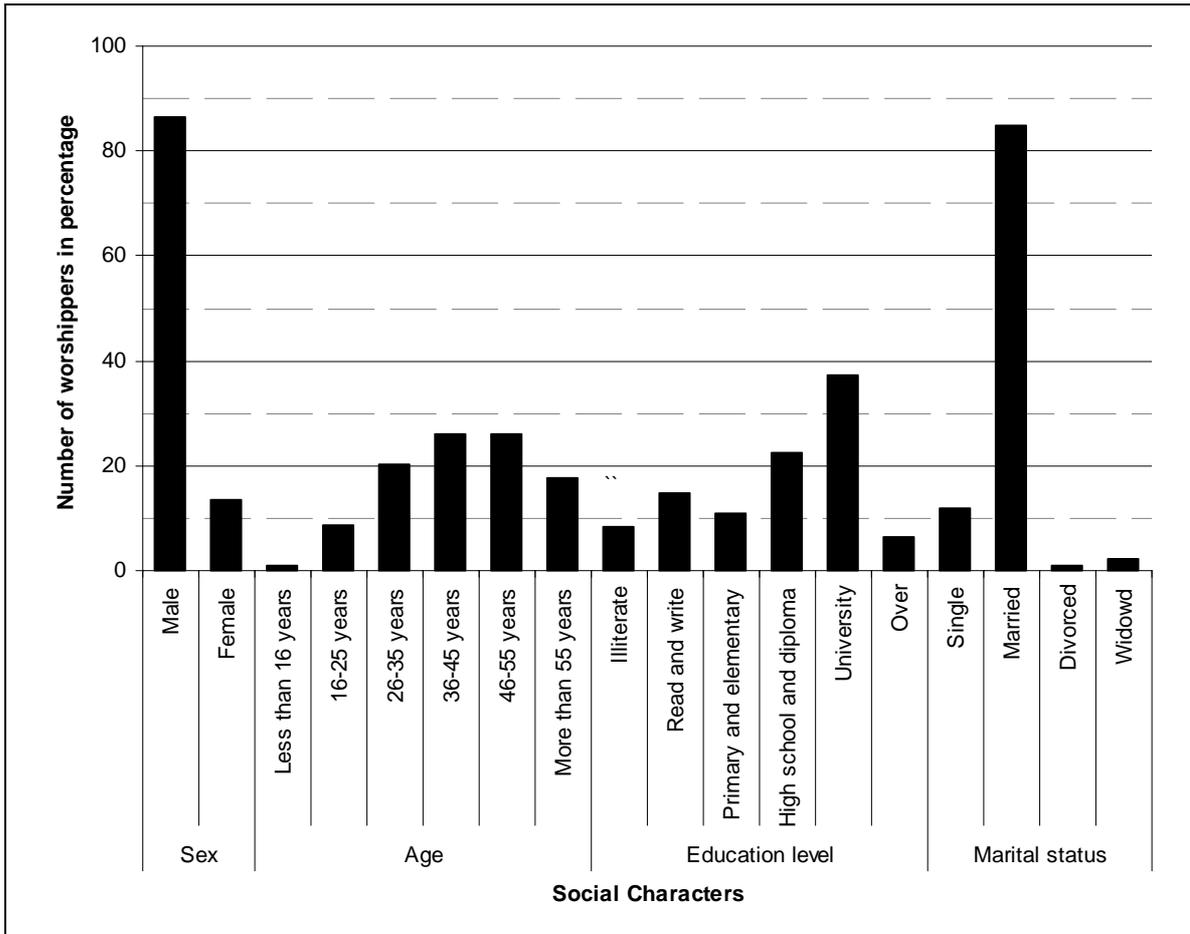
Figure 6-1: The distribution of the social characters of the respondents.

About 44% of the respondents are in the age range between 26 and 35 years; in addition, about 11% of those sampled are 46 years or more in age, as shown in Figure 6-1. However, the majority of these respondents (about 84%) are married, and only about 13% are single, as illustrated in Figure 6-1. The majority (about 66%) of the respondents are well-educated people: about 20% of them have been to high school; about 41% have a

university degree; and about 5% have a higher education degree. On the other hand, only about 5% of the research samples are illiterate, as shown in Figure 6-1.

Several statistical findings have been drawn based on the outcomes of the questionnaire. This section will describe those findings, according to the different activities provided in the Holy Mosque building.

6.3. Findings on the activities areas:

With regard to the religious specialty of the Holy Mosque, which has been discussed in the previous chapters, some activities are practised in a particular place. This section will describe the statistical findings concerning those activities and places.

About 4% of worshippers visited the Holy Mosque to perform *Tawaf*, as shown in Figure 6-2. On the other hand, about 38% of the worshippers came for prayer, obligatory or regular prayers; 6% came to the Holy Mosque to go into retreat; and 46% of them came for *Umrah*, which includes a *Tawaf* activity. This section will analyse the worshippers' behaviour in the activity areas inside the Holy Mosque.

Performing an obligatory prayer was the main activity of the visitors to the Holy Mosque at Hajj time; on the other hand, *Umrah* was the main activity of the Holy Mosque visitors over the year and during the Ramadan season, as shown in Table 6-3. Most of the visitors are Arabian, but other worshippers come from countries such as India and Nigeria (see Appendix 1). Then again, performing an obligatory prayer was the main activity among most of the nationalities of worshippers who visited the Holy Mosque.

In addition, *Umrah* remained the main activity for most of the social categories of visitors to the Holy Mosque, and performing an obligatory prayer was the second most popular activity for those visitors, as shown in Figure 6-2. In the research samples, none of the female worshippers were found to be going into retreat. However, people who are 35 years and less performed *Umrah* activity more than performing Tawaf or a regular prayer.

Performing an obligatory prayer was the main activity of worshippers who came to the Holy Mosque alone, as about 49% of them came to perform an obligatory prayer, as shown in Table 6-4. On the other hand, a high majority of 82% of worshippers who came in groups were performing *Umrah* activity. Moreover, the total percentage of worshippers who performed the same activity differed from season to season over the year, as shown in Table 6-3: about 48% of worshippers performed an obligatory prayer in the Hajj season, but only about 29% did so during Ramadan, and only 22% did it in off-peak time. However, the respondents' results indicated that none of the worshippers went into retreat in the Hajj season, but only about 10% of them did so in Ramadan. This result shows the differences in the activity patterns at the Holy Mosque over the year.
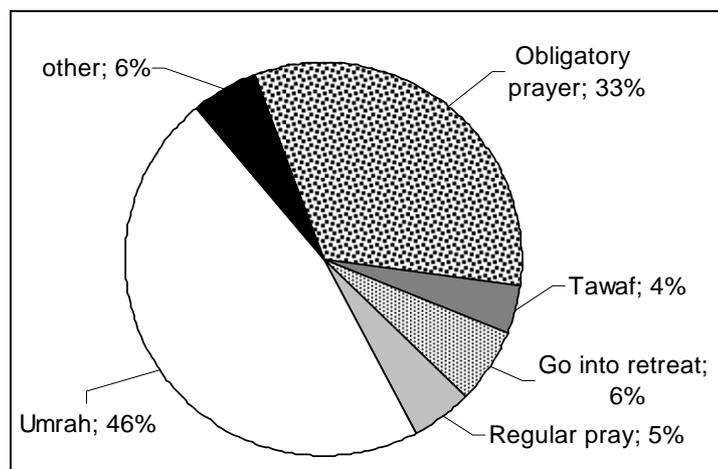
Figure 6-2: A graph showing the numbers of worshippers coming to the mosque for different reasons in each period.

Table 6-3: Number of worshippers coming to the Holy Mosque for each reason in different season, in percentage.

Season	Obligatory prayer	Tawaf	Go into retreat	Regular pray	Umrah	Other	Total (%)
Ramadan (n= 575)	30	4	10	4	44	8	100
Hajj (n= 292)	48	1	0	4	47	0	100
Off Peak (n= 255)	23	6	4	8	54	5	100
Overall	33	4	6	5	47	5	100

Table 6-4: Number of worshippers in each type of group coming to the Holy Mosque for different reasons, in percentage.

member of the group came to the Holy Mosque with	Obligatory prayer	*Tawaf*	Go into retreat	Regular pray	*Umrah*	Other	Total (%)
Came alone	49	3	6	5	30	7	100
Came with some friends	23	2	12	3	53	7	100
Came with the family	21	7	2	7	59	4	100
Came with a group	10	2	2	2	82	2	100
Overall percentage	33	4	6	5	47	5	100

The following sections will provide the research findings based on quantitative analysis.

6.3.1. Preparing for and coming to the Holy Mosque:

As Allah, the Almighty, commanded Prophet Abraham, pbuH, and his son Ismail, pbuH, to prepare the mosque for worshippers to practise their ritual duties, such as *Tawaf, I'tekaf* and prayers (see Chapter 4), worshippers should prepare themselves. However, a majority of them came to the Holy Mosque in groups, as shown in Table 6-5, over the year, except during Hajj time, when the majority of them came to the Holy Mosque alone. The groups might contain 2–50 people, but most were between 2–10 people.

The reasons that encourage worshippers to visit the Holy Mosque differed, as is shown in Table 6-6. A high minority (about 47%) of worshippers who came to the Holy Mosque in order to perform obligatory prayers are from South Asian countries. However, about 39% of worshippers who came to perform *Umrah* are from Arabian Gulf countries. On the other hand, none in the research sample from South-east Asian countries or European countries came to the Holy Mosque to perform *Tawaf* or *I'tekaf*.

Worshippers came to the Holy Mosque at different times of the day, in accordance with the activity they wanted to perform. A majority of the people who arrived a long time before *Adhan*, the call to prayer, came to perform *Umrah*, as shown in Table 6-7, since people needed time to finish their activity before the call to prayer. On the other hand, most of the worshippers who arrived at *Adhan* time (about 45% just before *Adhan*; about 42% at *Adhan*; and about 67% just after *Adhan*) came to perform an obligatory prayer. Moreover, several issues affected worshippers with respect to practising their ritual duties. Overcrowding was one of these, affecting about 39% of worshippers from performing *Umrah*, as shown in Table 6-8.

Table 6-5: Number of members in groups coming to the Holy Mosque, in relation to the time of year, in percentage.

Number in group	Ramadan	Hajj	Off peak	Overall
Alone (n= 551persons)	49	52	46	51
2 to 10 (n= 467 persons)	40	44	47	42
11 to 20 (n= 27 persons)	3	2	2	2
21 to 30 (n= 21persons)	3	0	1	2
31 to 40 (n= 2 persons)	0	0	1	0
41 to 50 (n= 29 persons)	3	1	3	2
more than 50 (n= 16 persons)	2	1	1	1
Total	100%	100%	100%	100%

(Many of the groups containing 2–10 members are couples or family)

Table 6-6: Relation between reasons for coming to the Holy Mosque and worshippers' origin, in percentage.

Origin	Perform obligatory prayer	Perform *Tawaf*	*I'tekaf*	Perform *Umrah*	other reason	Overall
Arabian Gulf (n=202)	9	36	18	39	22	18
Arabian (n=312)	18	7	38	11	34	28
South Asian (n=387)	47	43	21	30	27	34
South -East Asian (n=27)	5	0	0	4	1	2
European (n=11)	0	0	0	0	2	1
African (n=164)1	18	5	24	16	13	15
Other Nationality (n=19)	2	10	0	0	1	2
Total	100	100	100	100	100	100

Table 6-7: Relation between worshippers' arrival time at the Holy Mosque and reasons of coming to the Mosque, in percentage.

Time of arriving the Holy Mosque	Perform obligatory prayer	Perform *Tawaf*	*I'tekaf*	Perform regular pray	Perform *Umrah*	other reasons	Total
long time before *Adhan*	25	3	7	2	56	7	100
at *Adhan* time	45	1	3	6	42	3	100
Before *Adhan*	42	9	8	7	28	6	100
After *Adhan*	67	0	0	13	13	7	100
During praying	23	4	13	13	37	10	100
Other	12	0	3	3	77	5	100
Overall	33	3	6	5	47	6	100

("During prayer" means the worshippers arrived after the prayer began.)

Table 6-8: Relation between worshippers' arrival time at the Holy Mosque and the reason for choosing that time, in percentage.

Reason to arrive at specific time	Perform obligatory prayer	Perform *Tawaf*	*I'tekaf*	Perform regular pray	Perform *Umrah*	other reasons	Total
No crowd	38	4	8	7	39	4	100
Comfortable weather	47	4	3	3	38	5	100
Availability of car parking	27	0	7	0	58	8	100
After work	72	5	0	5	13	5	100
have nothing to do	30	11	7	4	46	2	100
Easy to come by bus	12	4	4	0	76	4	100
Religious considerations	18	3	9	6	57	7	100
Other reasons	11	0	7	4	68	10	100
Overall	33	4	6	5	46	6	100

6.3.2. Entering the Holy Mosque:

"The best option does not mean causing difficulties," Sheikh, Dr. Yousef AlQaradawi said, speaking about specifying a particular entry gate at the Holy Mosque. He went on, "Even if it has been narrated that the Prophet (pbuH) did enter or exit from a specific gate, it does not mean it is sensible to go around the Holy Mosque at overcrowded times to reach that gate." Worshippers did not act according to this thought, as is shown in Tables 6-9 and 6-10. The study showed that about 9% of the worshippers use King AbdulAziz Gate (no. 1) to enter the Holy Mosque in Ramadan, as shown in Table 6-9, and about 6% used the same gate during Hajj, as Table 6-10 shows. On the other hand, more than 2% of worshippers used AsSalam Gate (no. 22) to enter the Holy Mosque during Ramadan, as shown in Table 6-9; however, the same gate was used by about 5% in Hajj.

These differences are caused by many factors: a majority of worshippers (about 71%) were forced by the surrounding environment to choose their entry gate, as is shown in Figure 6-4. Moreover, about 12% of worshippers chose their preferred entry gate out of religious considerations. Overall, about 45% of worshippers preferred to use the King AbdulAziz as an entry gate, while about 14% prefer the AsSalam Gate to enter the Holy Mosque, as shown in Figure 6-3. As a result, a slight majority of the worshippers (about 54%) preferred to use the southern gates to enter the Holy Mosque, as is shown in Figure 6-5.

Worshippers preferred to come to the Holy Mosque at different times, as Table 6-11 shows. About 34% of the people who came early to the Mosque are Arabian people. On

the other hand, the majority of worshippers who arrived after *Adhan* are from South Asia. Moreover, about 46% of worshippers attending the mosque at prayer time are from the Arabian Gulf. Several factors affected the worshippers' selection of a particular gate through which to enter the Holy Mosque. About 50% of the respondents indicated a preferred gate for entry. The favourite gate to use to enter the Holy Mosque was gate no. 1, the King AbdulAziz Gate, at the southern side of the Holy Mosque. As the statistics shown in Figure 6-3 indicate, about 45% of the research samples preferred to enter from King AbdulAziz gate. AsSalam Gate was found to be the second most popular gate for entry, by 14% of visitors. In addition, 43% of those worshippers who preferred to enter through this gate chose it out of religious considerations. Various issues affected this choice. About 10% of people who chose King AbdulAziz Gate chose it because of religious considerations; about 26% chose it because it was the closest to their homes; 27% because of the car parking; and 20% because of the bus stations. Overall, the location of the visitors' residences was found to be the most important reason affecting choice: 35% of the research sample chose a particular gate because it was closest to their houses, and 20% of them because of the location of the car parking. In addition, only 12% of the worshippers questioned said that religious considerations affected their choice of gate, as shown in Figure 6-12. Even though AsSalam Gate was found to be the second most popular entry gate, it is only a one-bay gate, whereas King Fahad Gate, the third most popular gate - as shown in Figure 6-9 - is a three-bay gate.

It has been found that worshippers from the Arabian Gulf who are aware of crowds when choosing the prefer entry gate as about 63% of worshippers who chosen the prefer entry gate because of the overcrowding situation at the gate are from Arabian Gulf countries.

The location of the female praying area affected the males' choice of entry gate: about 11% of male worshippers chose a particular gate because of the location of the female prayer area, when only about 2% of female worshippers were affected by the location of their gender's prayer area at the Holy Mosque. This could be understood as meaning that a male could have a female member in his group, which influenced his going to a gate close to the female prayer area, as just a majority (about 51%) of worshippers came in groups, as shown in Table 6-5. On the other hand, a male worshipper could avoid choosing a gate close to the female prayer area, in order to be far from committing some sin if by mistake he touched or passed by a female. This could be considered a religious consideration, as about 12% of worshippers chose their preferred entry gate due to religious considerations, which is clearly shown in Figure 6-4. On the other hand, car parking was the greatest reason affecting female worshippers' choice of entry gate, which could reflect the concerns of the female Muslims who did not want to walk for a long distance, which might take them to places where they were close to or passing by male worshippers in an overcrowded situation, thereby forcing them to touched or be touch by members of the opposite gender.

The high numbers of people who stopped to pray at the gate areas (as shown in Figures 6-7 and 6-8), rather than passing through quickly, is the first factor that causes overcrowding at the Holy Mosque's gates. The overcrowding at King Fahad Gate, which is shown in Figure 6-9, reflects the nature of the problem at one of the main gates at the Holy Mosque.

Some differences were found between the worshippers' (respondents') preferences, as shown in Figures 6-3, and their actual behaviour, as shown in Tables 6-9 and 6-10. It was found that a high minority (about 45%) of worshippers preferred to use King AbdulAziz

Gate (no. 1) as an entry gate; however, only about 8.9% of worshippers used King AbdulAziz Gate (no. 1) as an entry gate during Ramadan, and about 6.5% during Hajj. This could mean that a majority (about 70%–80%) of worshippers who would rather enter the Holy Mosque through King AbdulAziz Gate (no. 1) were not able to act on their preferences. The same situation applied to other gates, such as AsSalam Gate (no. 24), AnNabi Gate (no. 22), and King Fahad gate (no. 79).
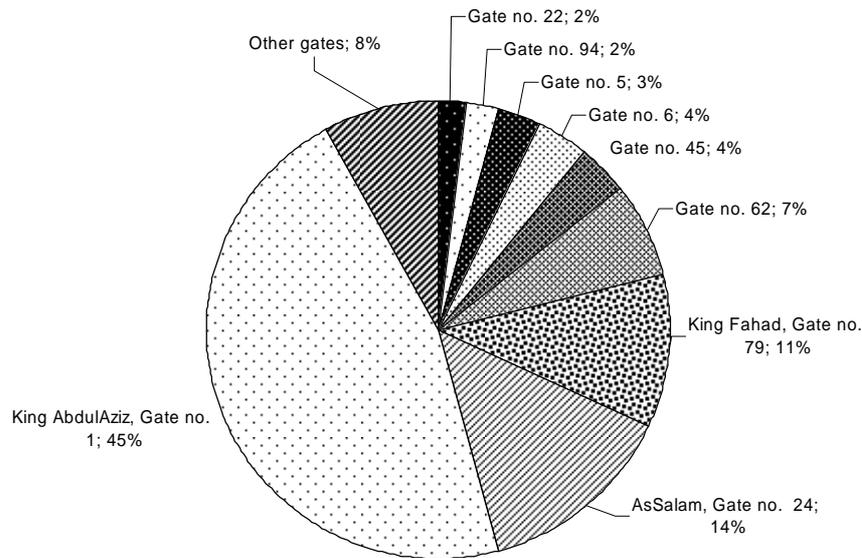
Figure 6-3: People who indicated a preference for entering the Holy Mosque through a particular gate in percentage over the year.
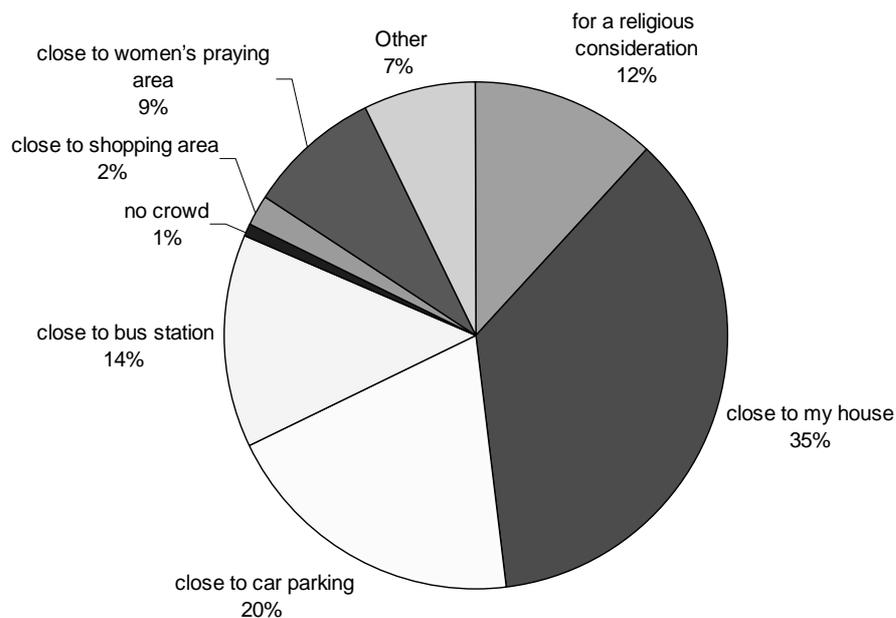
Figure 6-4: Stated reasons for preferring a particular gate.

Table 6-9: Ramadan: Number of worshippers entering the Holy Mosque through the most popular gates in one hour.

Gate Number	Number of worshipper	Person in percentage %
1B King AbdulAziz Gate	8800	4.3
45B AlFath Gate	6404	3.1
1A King Abdul Aziz Gate	6348	3.1
79A King Fahad Gate	5740	2.8
5 Ajyad Gate	5495	2.7
91	4970	2.4
10	4680	2.3
7	4400	2.2
24 AsSalam Gate	4358	2.1
38	3996	2.0
66	3980	2.0
22 AnNabi Gate	3726	1.8
57	3600	1.8
79C King Fahad Gate	3500	1.7
11	3184	1.6
64	3172	1.6
45C AlFath Gate	3124	1.5
56	3120	1.5
17	3099	1.5
1C King Abdul Aziz Gate	3075	1.5
Other gates	115880	56.5
Total	204651	100

(A is the left-hand bay at the main entrance; B is the middle bay; and C is the right-hand bay, which is a female-only gate)

Table 6-10: Hajj: Number of worshippers entering the Holy Mosque through the most popular gates in one hour.

Gate Number	Number of Worshippers	Person in percentage %
24 AsSalam Gate	12320	4.8
22 AnNabi Gate	11678	4.6
23	9521	3.7
11	8824	3.5
79B King Fahad Gate	7823	3.1
1B King Abdul Aziz Gate	7549	3.0
19	5765	2.3
62B AlUmrah Gate	5432	2.1
15	5421	2.1
20	5238	2.1
18	5167	2.0
17	4689	1.8
1C King Abdul Aziz Gate	4621	1.8
79C King Fahad Gate	4562	1.8
1A King Abdul Aziz Gate	4398	1.7
62C AlUmrah Gate	4372	1.7
5 Ajyad Gate	4365	1.7
10	4236	1.7
25	4127	1.6
14	4123	1.6
Other gates	132435	51.3
Total	256666	100

(A is the left-hand bay at the main entrance; B is the middle bay; and C is the right-hand bay, which is a female-only gate)

Table 6-11: Relation between worshippers' place of origin and their arrival time at the Holy Mosque, presented in percentage.

Nationality	Long time before Adhan	At Adhan time	Short time before Adhan	After Adhan	At praying time	Other time	Overall
Arabian Gulf (n=202)	20	12	10	23	46	29	18
Arabian (n=312)	34	24	24	20	10	25	28
South Asian (n=387)	25	43	42	57	33	33	34
South -East Asian (n=27)	1	4	3	0	2	5	2
European (n=11)	1	2	0	0	0	0	1
African (n=164)1	17	14	17	0	8	7	15
Other Nationality (n=19)	2	1	3	0	0	0	2
Total	100	100	100	100	100	100	100

Table 6-12: Reasons behind choosing a gate for entry per each origin, in percentage.

Nationality	Religious considerations	Close to my house	Close to car parking	Close to bus station	No crowd at the gate	Close to shopping centre	Close to female praying area	Other reasons	Total
Arabian Gulf (n=202)	18	10	29	18	63	27	11	24	18
Arabian (n=312)	31	31	15	25	0	14	35	45	28
South Asian (n=387)	21	39	38	38	37	50	38	26	34
South -East Asian (n=27)	0	4	5	0	0	5	0	0	2
European (n=11)	0	2	0	3	0	0	0	0	1
African (n=164)1	25	13	13	15	0	5	16	5	15
Other Nationality (n=19)	5	2	0	2	0	0	0	0	2
Total	100	100	100	100	100	100	100	100	100

Table 6-13: Total percentage of reasons behind choosing the entry gate, for each gender.

Reasons to chose an entry gate	Male (%)	Female (%)
Close to my house	32	21
Religious considerations	18	17
Close to car parking	17	26
Close to bus station	11	16
Close to female praying area	11	2
No crowd at the gate	1	11
Close to shopping center	2	0
Other reasons	8	7
Total	100	100
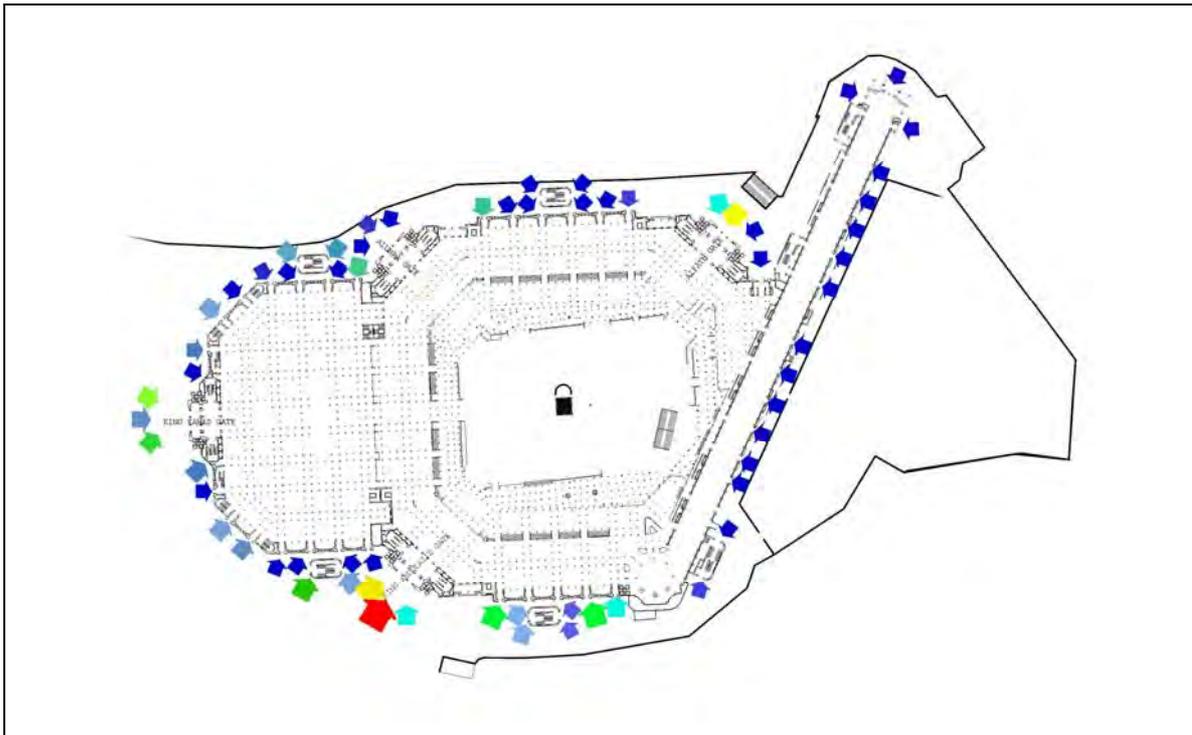
Figure 6-5: Diagram showing the results of a controlled observation exercise on visitors' choice of gate for entering the Holy Mosque during Ramadan season. It shows that King AbdulAziz Gate (in red) was the most popular gate, and the eastern and northern gates (in blue) were the least-used gates.
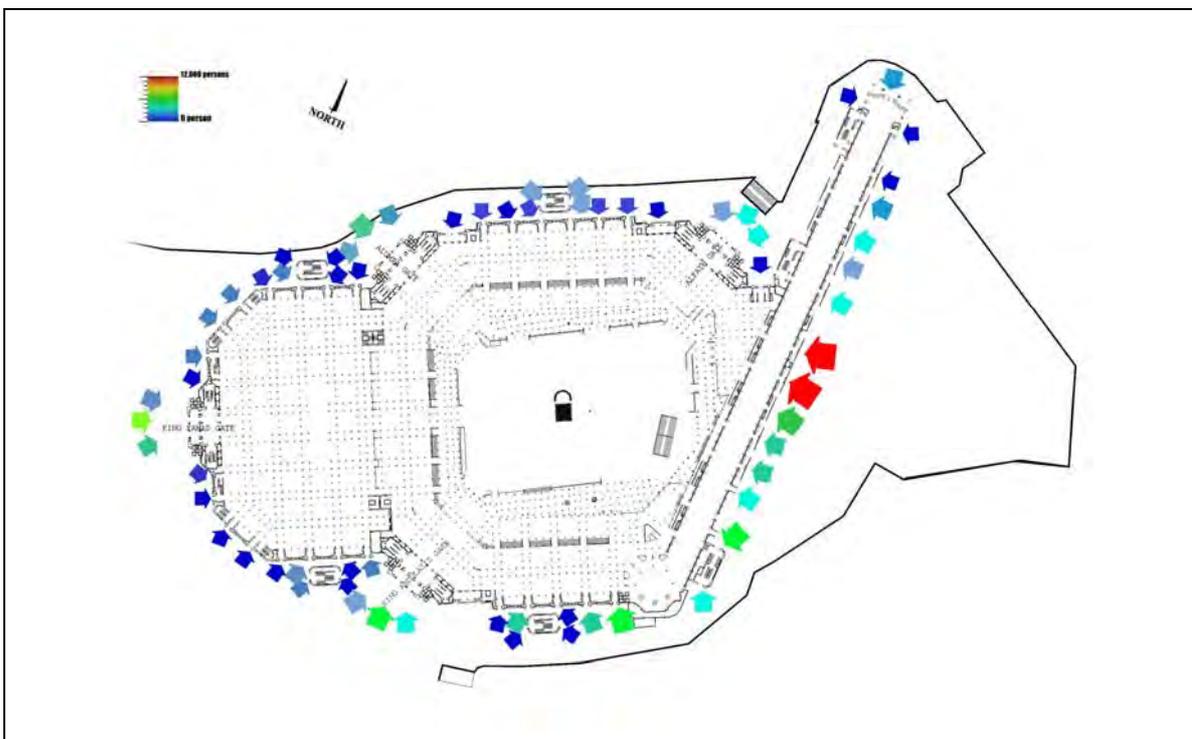
Figure 6-6: Diagram showing the results of a controlled observation exercise on the visitors' choice of gate for entering the Holy Mosque during Hajj season. It shows that AsSalam Gate and AnNabi Gate (in red) were the most popular gates, and the other eastern and northern gates (in blue) were the least-used gates.

Figure 6-7: Picture from inside the Holy Mosque, showing people blocking the escalator at Gate no. 66. (Source: videotape still.)

Figure 6-8: Picture from inside the Holy Mosque, showing people blocking a gate at Gate no. 91. (Source: videotape still.)

Figure 6-9: Overcrowding at King Fahad Gate, the third most popular gate (after the King AbdulAziz and AsSalam Gates). (Source: Custodian of the Two Holy Mosques Institute of Hajj Research)

6.3.3. Exiting the Holy Mosque

The same considerations with respect to entry were applied to exiting from the Holy Mosque; however, the worshippers did not obey the scholars' words, which encouraged them to use any gate to exit the Holy Mosque building. Several reasons influenced

worshippers' behaviour with respect to choosing a specific gate. About 7% of worshippers used King AbdulAziz Gate (no. 1) in Ramadan, as shown in Table 6-14. This percentage was reduced by 1% during Hajj season, as shown in Table 6-15. On the other hand, AsSalam Gate (no. 24) and AnNabi Gate (no. 22), which were not popular gates during Ramadan (see Table 6-14), became popular during Hajj, as more than 6% of worshippers used these two gates, as shown in Table 6-15. Moreover, the majority of the worshippers preferred to exit the Holy Mosque building through King AbdulAziz Gate (no. 1), as shown in Figure 6-10. This choice was affected by different reasons: about 74% of worshippers based their preference on the surrounding environment, as Figure 6-11 indicates.

On the other hand, it was found that about 44% of worshippers took less than ten minutes to leave the Holy Mosque site after they finished their activities, as shown in Figure 6-12. This time included the time they spent to collect their shoes. It was also found that more female worshippers spent one to three minutes than male worshippers, who spent the same amount of time; on the other hand, this proportion did not apply to worshippers who spent between four to thirty minutes, as there were more males than females, as shown in Figure 6-13. Malaysian worshippers spent more time; as Ahmad Ruzman bin Ahmad Razali[3] said, "in our custom, we have to make Doa'a, asking Allah the Almighty, after each prayer for 10 minutes. We never go out directly after prayers."

The differences between worshippers' preferences and their actual behaviour are clearly shown in Figure 6-10 and Tables 6-14 and 6-15, as just over a majority (about 53%) of worshippers preferred to exit through King AbdulAziz Gate (no. 1), but in reality, only about 7.5% of worshippers used King AbdulAziz Gate (no. 1) to exit during Ramadan,

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[3]. The General Manager of Tabog Haji, the Malaysian governmental agent responsible for Hajj services.

and only about 5.7% in Hajj. This situation applied to most of the popular Holy Mosque gates. On the other hand, some gates with a low percentage with respect to worshipper preference were used as an exit gate, such as Ajyad Gate (no. 5), which was referred to by about 3% of respondents, as shown in Figure 6-10; it was used by 2% during Ramadan, as shown in Table 6-14. Moreover, AnNabi Gate (no. 22), which was the preference of about 2% of worshippers, as shown in Figure 6-10, was used by about 3% in Hajj, as shown in Table 6-15. All these examples reflect the differences between worshippers' preference and their actual behaviour.

There has been a great deal of argument between specialists regarding the number of gates at the Holy Mosque. Usama F. AlBar said, "There are too few gates at the Holy Mosque, which is shown every season. It is both a design and management problem. The overcrowding at the gates is not noticeable after 20 minutes on regular Fridays, and up to 60 minutes during the seasons." A former Holy Mosque Force Commander said, "The time needed to evacuate the Holy Mosque in case of an emergency is between 10 and 20 minutes. Going out is the main problem, but we have the same problems during Hajj days, Holy days, and Fridays, with overcrowding at all the gates. The King Fahad, King AbdulAziz, and AlSafa gates are the most crowded gates at the Holy Mosque." He added, "The number of the gates is sufficient for normal usage, but at peak times during Hajj and Ramadan, there needs to be more. And during emergencies, we could have several gates that could open automatically. The crowding depends on three main categories. It is caused by the limited number of gates, the limited width of the gates, and the people's behaviour." On the other hand, Engineer Hossam Abdul Salam argues, "the process of arriving at the Holy Mosque takes a long time, whereas the leaving process takes a short time. The overcrowding problem at the gates is not due to the limited number of gates, but due to the high demand. The overcrowding at the gates is found only during the first

10 minutes after prayers. The overcrowding at the gates disappears after 45 minutes." And Dr. Samir A. Aashi[4] said, "the overcrowding problem at the Holy Mosque gates is one of the concerns of management, and because of the behaviour of the worshippers. The spatial distribution of the gates is excellent." Dr. Sami Barhamin[5] added, "the overcrowding problem is recognized during peak time only. It is both an architectural and management problem. Worshippers might take 10–15 minutes to exit the Holy Mosque building, depending on the overcrowding. The overcrowding at the gates could take up to an hour."
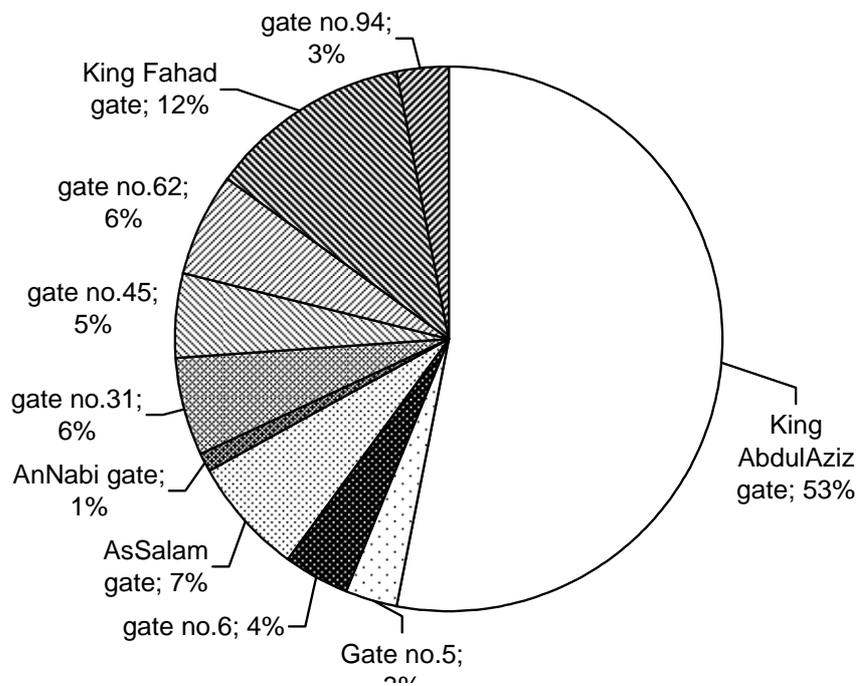
Figure 6-10: A graph showing the percentages for preferred exit gate at the Holy Mosque.
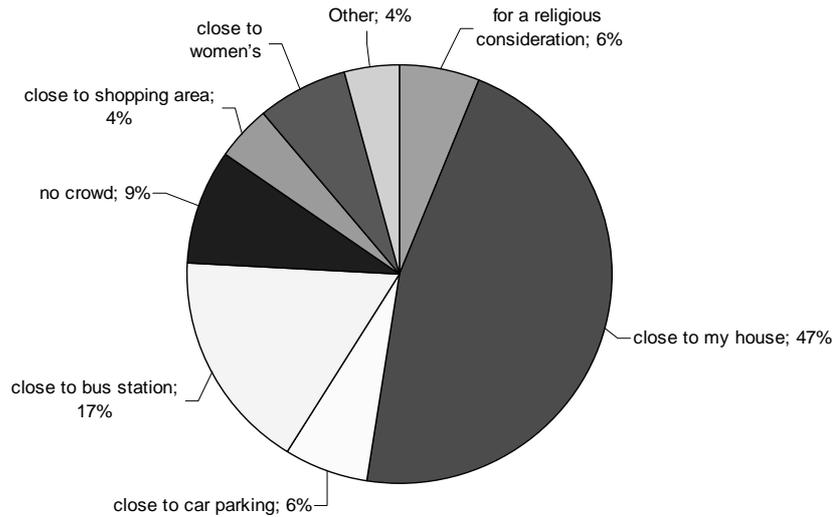
Figure 6-11: A graph showing the percentages for choice of exit gate.

Table 6-14: Ramadan: Number of worshippers exiting the Holy Mosque through the most popular gates in one hour.

Gate Number	*person*	*Person in percentage %*
1B King Abdul Aziz Gate	10221	4.1
91	8362	3.3
79A King Fahad Gate	6940	2.8
79B King Fahad Gate	6317	2.5
1A King Abdul Aziz Gate	5996	2.4
84	5611	2.2
11	5601	2.2
74	5435	2.2
AlMarwa Bridge	5241	2.1
64	5159	2
79C King Fahad Gate (Female only)	5110	2
92	4967	2
94	4765	1.9
15	4398	1.8
14	4311	1.7
45B AlFath Gate	4308	1.7
82	4200	1.7
73	4190	1.7
7	4040	1.6
5 Ajyad Gate	4034	1.6
Other gates	141842	56.5
Total	251048	100

(A is the left-hand bay at the main entrance; B is the middle bay; and C is the right-hand bay, which is a female-only gate.)

Table 6-15: Hajj: Number of worshippers exiting the Holy Mosque through the most popular gates in one hour.

Gate Number	Person	person in percentage %
24 AsSalam Gate	13758	3.2
22 AnNabi Gate	13567	3.1
1B King Abdul Aziz Gate	11897	2.7
23	11423	2.6
11	11351	2.6
32	11225	2.6
31	10569	2.4
30	9453	2.2
1A King Abdul Aziz Gate	8832	2
91	8364	1.9
33	8324	1.9
79B King Fahad Gate	8231	1.9
AlMarwa Bridge	7983	1.8
20	7974	1.8
28	7865	1.8
15	6897	1.6
62B AlUmrah Gate	6745	1.5
AlMadina Bridge	6734	1.5
19	6486	1.5
18	6453	1.5
Other gates	253234	57.9
Total	437365	100

(A is the left-hand bay at the main entrance; B is the middle bay; and C is the right-hand bay, which is a female-only gate.)

Table 6-16: Reasons behind the choice of exit gate for each nationality, in percentage.

Place of origin	Religious considerations	Close to living place	close to pray area	close to car parking	close to bus station	Now crowds	close to shopping centre	close to female praying area	Other reasons	Total
Arabian Gulf (n=202)	38	17	5	23	6	2	3	2	4	100
Arabian (n=312)	53	25	5	5	3	0	1	3	4	100
South Asian (n=387)	33	29	4	12	9	0	4	6	2	100
South East Asian (n=27)	56	26	0	7	7	0	4	0	0	100
European (n=11)	45	55	0	0	0	0	0	0	0	100
African (n=164)	46	29	5	7	4	1	1	7	0	100
Other Nationality (n=19)	42	37	0	11	0	0	0	11	0	100
Overall	42	26	4	11	6	1	2	5	3	100
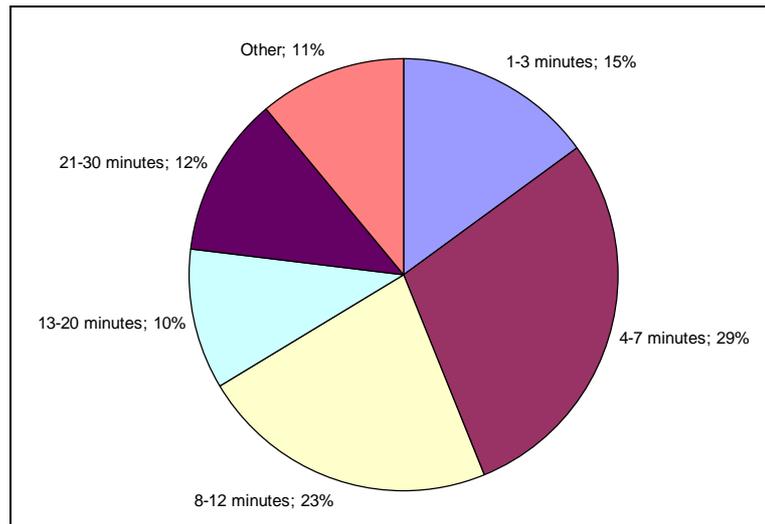
Figure 6-12: Graph showing the percentages of time spent exiting the Holy Mosque

Table 6-17: Time needed to exit the Holy Mosque site for each nationality in minutes, in percentage.

Place of origin	1 to 3	4 to 7	8 to 12	13-20	21-30	more than 30	Total
Arabian Gulf (n=202)	24	33	26	7	5	5	100
Arabian (n=312)	15	31	22	12	9	11	100
South Asian (n=387)	13	32	13	14	14	13	100
South East Asian (n=27)	0	37	22	7	26	7	100
European (n=11)	36	0	9	0	55	0	100
African (n=164)	9	16	18	27	14	15	100
Other Nationality (n=19)	21	0	11	26	32	11	100
Overall	15	29	19	14	12	11	100

Table 6-18: Total percentage of time needed to exit the Holy Mosque site in each season.

Time to exit	Season			Overall
	Ramadan	Hajj	Off Peak	
1 to 3	20	1	20	15
4 to 7	27	32	31	29
8 to 12	16	23	21	19
13-20	14	15	13	14
21-30	13	15	8	12
more	11	15	6	11
Total	100	100	100	100
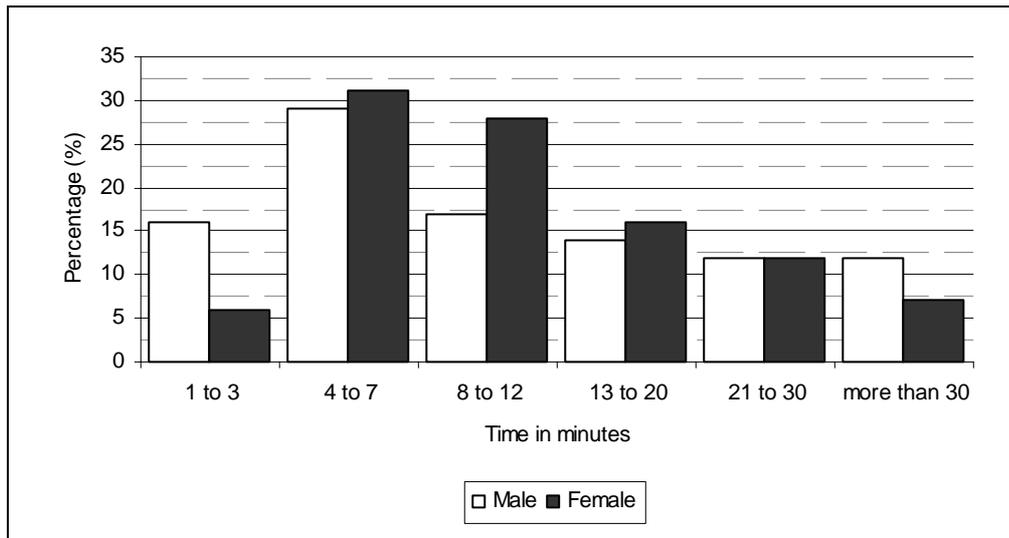
Figure 6-13: Relationship between gender and time taken to exit from the Holy Mosque building.

Table 6-19: Relation between time needed by worshippers to ware their chooses in each season and by place of origin, in percentage.

Place of origin	time for chose			
	a min.	2-3 min.	more than 3 min.	Total
Arabian Gulf (n=202)	77	18	5	100
Arabian (n=312)	70	27	3	100
South Asian (n=387)	58	26	16	100
South East Asian (n=27)	82	18	0	100
European (n=11)	44	48	7	100
African (n=164)	74	18	7	100
Other Nationality (n=19)	68	21	11	100
Overall	69	23	9	100

Research has indicated that most people use the middle bay of King AbdulAziz Gate (no. 1), as indicated in Figure 6-15.
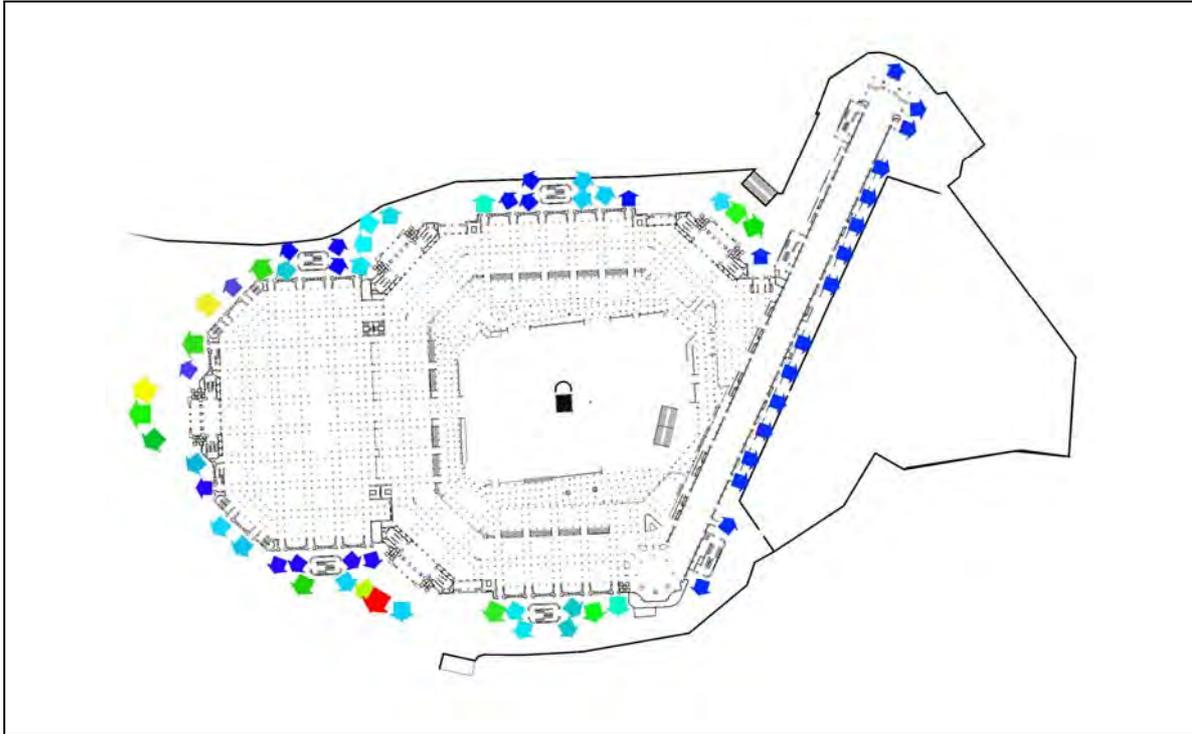
Figure 6-14: Diagram showing the results of a controlled observation exercise on visitors' choice of the proportional use of exits from the Holy Mosque, in Ramadan. It shows that King AbdulAziz Gate (in red) was the most popular gate, and the eastern and northern gates (in blue) were the least used gates.
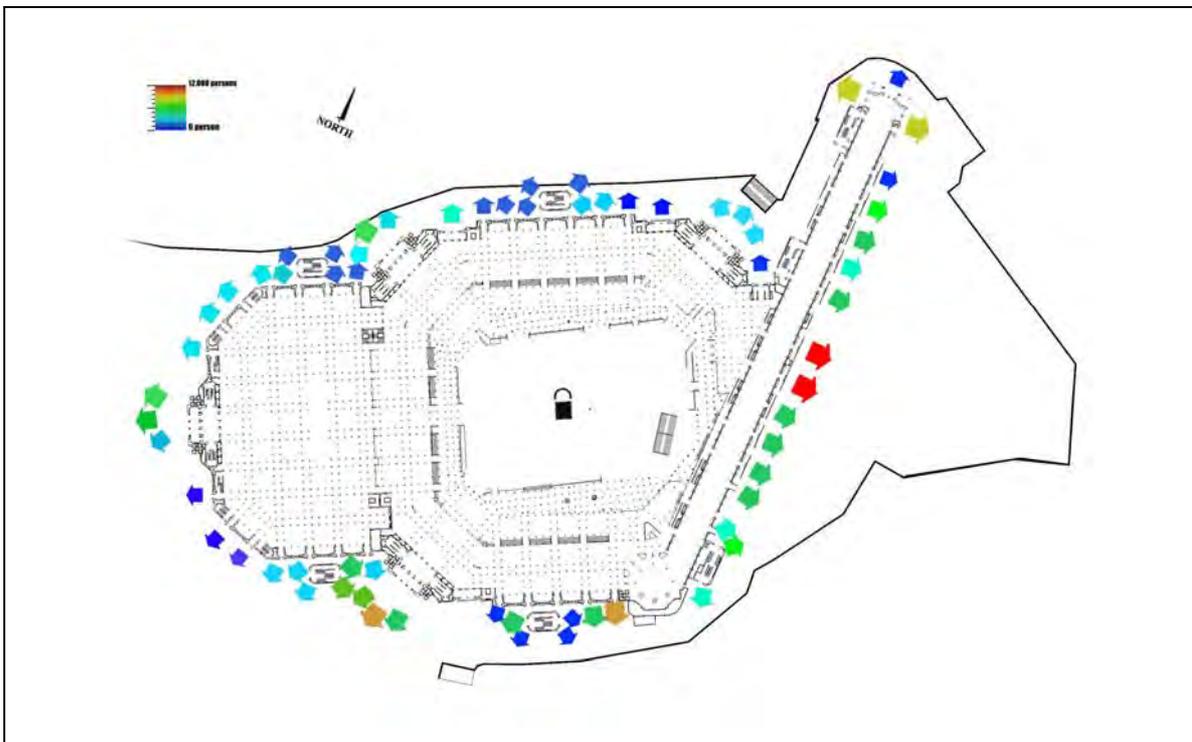
Figure 6-15: Diagram showing the results of a controlled observation exercise on visitors' choice of the proportional use of exits from the Holy Mosque, in Hajj season. It shows that AsSalam Gate (in red) was the most popular gate, and some western and all northern gates (in blue) were the least used gates.

6.3.4. Praying activity

Muslims believe that praying at the closest line to the Imam will give worshippers a merit reward, even at the Holy Mosque, where the rewards are multipliable. As Sheikh, Dr. Yousef AlQaradawi says,[1] "Praying is always better in the foremost lines. However, worshippers should not force themselves through and push others to reach the front lines." However, he added, "The Holy Mosque's surrounding open area is considered to be part of the Holy Mosque, and whoever prays with the Holy Mosque's Imam is praying at the Holy Mosque. Moreover, whoever prays in Makkah is considered to be praying in the Holy Mosque, unless praying with the Holy Mosque Imam, which is better than praying at any other mosque in Makkah." More than 30% of worshippers preferred to pray on the ground floor, including in the central courtyard, as shown in Table 6-20. Since the central courtyard (the Mataf) is the deepest place in the building, worshippers who prefer to pray there should come early enough to find a place. It was found that only about 32% of worshippers who intended to pray at the *Mataf* and on the ground floor came a long time before the *Adhan* (call to prayer), as shown in Table 41; it is also indicated that the majority of worshippers who came a long time before *Adhan* were aiming to pray in the surrounding free area and next to a gate, which blocks other worshippers from going inside to other prayer places in the Holy Mosque.

The distribution of the prayer areas at the Holy Mosque affected the worshippers' choice, as there are some other factors. About 30% of those who prayed at the *Mafat* were affected by the female prayer area; in addition, 39% of people who prayed on the ground floor were affected by the same factor, as shown in Table 6-21. On the other hand, the

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[1]. The Dean of AshSharea'a College, Qatar University and the General Mufti of the State of Qatar.

worry about getting lost after entering or leaving the gate encouraged a high minority of worshippers to think about their choice of where to pray. About 47% of worshippers who were influenced by the entry gate prayed on the ground floor, and about 42% of those affected by the exit gate prayed on the ground floor, as is shown in Table 6-21.

The Holy Mosque, as described in Chapter 4, was designed to accommodate about half a million people praying on its floors, including the surrounding free area. The worshippers' preferences reflect the demand for space in this building, as shown in Figure 6-16. A majority, 51%, prefer to pray on the ground floor, where the designer provided a place for 17% at average capacity and 20% at maximum capacity; the designer also provided about 22% of the total space for prayers on the roof terrace, at average capacity, and about 19% at maximum capacity, but the worshippers' preference indicates that only about 8% of them intended to worship at the roof terrace. Moreover, the *Mataf* area has been preferred by only about 7%, as it was designed to accommodate about 7% at average capacity and about 6% at maximum capacity, as shown in Figure 6-16.

It was found that a high minority (about 46%) of worshippers from the Arabian Gulf preferred to pray next to a gate, as shown in Table 6-22. Moreover, a majority of worshippers (about 73%) who come from South-East Asia preferred to pray on the ground floor. An average of only about 7% of worshippers wanted to pray in the central courtyard; only about 22% of the respondents preferred to pray in a specific place at the Holy Mosque because of religious considerations, such as a higher reward; this is shown in Table 6-23. About 31% of Arabian Gulf worshippers chose their prayer place based on religious considerations, and about 34% of African worshippers did so for the same reason.

On the other hand, Arabian worshippers recorded the highest percentage (about 14%) for choosing a place to pray based on the reason of overcrowding, as shown in Table 6-23, and South-East Asian worshippers recorded the lowest percentage (about 0%) when choosing their place to pray based on the reason of overcrowding. However, Ahmad Ruzman bin Ahmad Razali is concerned, and complains about the mix of genders in prayers.

Table 6-20: Relation between arrival time and place of prayer, in percentage.

When	Surrounding free area	next to a gate	Ground floor	Central courtyard (*Mataf*)	Upper floor	Roof terrace	Total
Long time before Adhan (n=495)	24	28	24	8	9	7	100
Before *Adhan* (n=223)	20	20	31	4	10	15	100
at *Adhan* (n=251)	25	19	26	8	16	6	100
After *Adhan* (n=30)	20	40	23	10	7	0	100
at praying (n=48)	31	40	17	0	10	2	100
other (n=48)	12	48	17	4	16	3	100
Overall	23	26	25	7	11	8	100

A. Average prayers.

Mataf 7%
Ground floor 17%
Free Area 40%
Upper Floor 14%
Roof terrace 22%

B. Maximum number of prayers.

Mataf 6%
Ground floor 20%
Free Area 37%
Upper Floor 18%
Roof terrace 19%

C. Questionnaire outcome.

Mataf 7%
Free Area 23%
Roof terrace 8%
Upper Floor 11%
Ground floor 51%
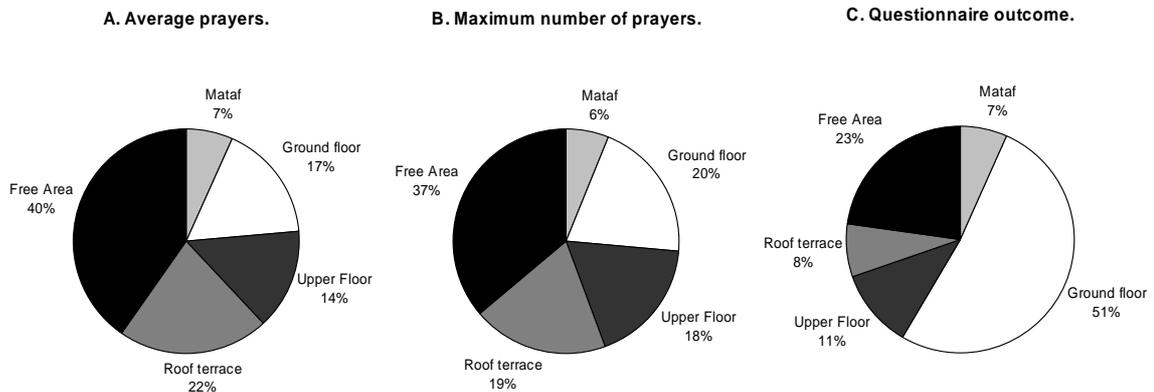
Figure 6-16:   Total percentage of average prayers (A), maximum number of prayers and questionnaires' outcome for each area of the Holy Mosque.

Table 6-21: Relation between worshippers' place of origin and place of prayer, in percentage.

Reasons	Surrounding free area	Central courtyard (*Mataf*)	Ground floor	next to a gate	Upper floor	Roof terrace	Total
Religious considerations (n=248)	27	1	14	53	2	3	100
close to female praying (n=70)	11	30	39	20	0	0	100
away from female praying area (n=52)	13	0	12	25	0	50	100
close to my entering gate (n=100)	13	16	47	20	4	0	100
close to my exiting gate (n=79)	23	22	42	4	6	3	100
Because of the weather (n=148)	31	1	7	17	22	22	100
Because of there is no crowd (n=138)	16	1	24	15	33	11	100
Prepared for praying (n=104)	31	2	19	34	12	2	100
Availability of Zamzam water (n=13)	61	0	0	39	0	0	100
Availability of facilities (n=49)	2	29	47	6	16	0	100
Other reasons (n=121)	27	1	34	26	12	0	100
Overall	23	7	24	27	11	8	100

Table 6-22: Relation between origin of worshippers and chosen place of prayer.

Place of origin	place to pray						Total
	At surrounding free area	At central courtyard	At ground floor	Next to a gate	At upper floor	At Roof terrace	
Arabian Gulf (n=202)	7	7	22	46	8	10	100
Arabian (n=312)	17	5	25	24	21	9	100
South Asian (n=387)	28	4	27	26	7	9	100
South East Asian (n=27)	9	18	73	0	0	0	100
European (n=11)	44	0	41	7	7	0	100
African (n=164)	38	16	20	18	4	4	100
Other Nationality (n=19)	21	11	11	16	42	0	100
Overall	23	7	25	27	11	8	100

Table 6-23 : Relation between place of origin of worshippers and reasons for their choice of place of prayer.

Place of origin	Religious considerations	close to female prayer area	away from female prayer area	close to an entrance	close to an exit	Comfortable weather	no crowd	Well prepared for praying	Availability of Zzamzam water	Availability of the facilities	Other reasons	Total
Arabian Gulf (n=202)	31	10	3	9	7	6	12	8	1	1	12	100
Arabian (n=312)	19	2	6	9	6	13	14	12	0	8	10	100
South Asian (n=387)	17	9	6	8	8	19	11	7	1	1	13	100
South East Asian (n=27)	0	0	0	18	0	9	0	36	0	27	9	100
European (n=11)	11	0	0	11	11	15	7	26	0	15	4	100
African (n=164)	34	5	2	7	8	8	13	6	4	6	7	100
Other Nationality (n=19)	21	0	0	37	0	21	11	11	0	0	0	100
Overall	22	6	5	9	7	13	12	9	1	4	11	100

6.3.5. *Tawaf* activity

Tawaf is the main activity at the Holy Mosque, as was discussed in Chapter 4, in the order of Allah, the Almighty, to prophet Abraham and his son Ismail, pbuT, to prepare the mosque for *Tawaf* (circumambulate), *I'tekaf* (retreat), and *Salat* (prayers).

Overcrowding at the holy Mosque affected most worshippers, about 36%, from performing the *Tawaf* activity over the year, as shown in Table 6-24. In the Hajj season, about 50% of worshippers were aware of overcrowding when performing *Tawaf*; however, during Ramadan, only about 33% of worshippers were aware of the overcrowding at the Holy Mosque.

Table 6-24: Relation between seasons and frequency of performing *Tawaf*, in percentage.

Frequency for performing *Tawaf*	Season			Overall
	Ramadan (n=575)	Hajj (n=292)	Off Peak (n=255)	
Always perform *Tawaf*	19	11	30	19
Depends on the crowd at the Holy Mosque	33	50	27	36
Depends on my health	14	7	12	12
Depends on the weather	1	3	0	1
Depends on the time	22	21	20	21
Other reasons	11	9	11	10
Total	100	100	100	100

Table 6-25: Relation between frequency of *Tawaf* and respondents' place of origin.

Place of origin	Always perform *Tawaf*	Depend on the overcrowding	Depend on my helth	Depend on comfortable weather	Depend on the time	Other reasons	Total
Arabian Gulf (n=202)	17	31	7	1	24	20	100
Arabian (n=312)	15	38	13	1	21	12	100
South Asian (n=387)	21	35	15	2	19	7	100
South East Asian (n=27)	0	45	9	0	9	36	100
European (n=11)	15	33	11	7	30	4	100
African (n=164)	28	39	9	0	23	2	100
Other Nationality (n=19)	16	32	11	0	32	11	100
Overall	19	36	12	1	21	10	100

In the same way that there are reasons for performing *Tawaf*, other factors influence worshippers when choosing the floor on which they will perform it. Sheikh, Dr. Yousef AlQaradawi said, "*Tawaf* and *Sa'i* on the upper floor and roof terrace is acceptable, and worshippers could perform them on those floors, but it could be difficult for them because of the extra distance for circumambulating the upper floor and roof terrace." A high majority of worshippers performed *Tawaf* on the ground floor (about 95%), as shown in Table 6-26. However, about 36% of them were affected by overcrowding at the Holy Mosque when choosing their *Tawaf* time. On the other hand, about 29% of people who performed *Tawaf* on the upper floor always performed the *Tawaf* activity (i.e., 5 out of 35). The same percentage applies to the roof terrace, as well.

The high percentage with respect to choosing the floor on which to perform *Tawaf* was influenced by religious considerations and the distance that worshippers have to walk around the Sacred *Ka'bah*, as shown in Figure 6-17; about 44% of worshippers chose to perform *Tawaf* on a specific floor out of religious considerations, their beliefs and their thinking, and about 33% of worshippers chose their floor because of the distance they had to walk. On the other hand, only about 8% of worshippers were affected by overcrowding when they chose the floor on which they performed *Tawaf*, as shown in Figure 6-32.

Moreover, the majority of worshippers performed their after-*Tawaf* prayer at the *Maqam* area, as shown in Table 6-27. Performing this prayer in the *Mataf* (Courtyard) can obstruct the movement of the circumambulation, especially during Ramadan and Hajj, when the central courtyard of the Holy Mosque is fully occupied.

Table 6-26: Relation between the place in which *Tawaf* is performed and frequency of the performance, in percentage.

Place of performing *Tawaf*	Always perform Tawaf	Depends on the crowd at the Holy Mosque	Depends on my health	Depends on the weather	Depends on the time	Other reasons	Overall
Ground floor (n=1070)	93	98	95	100	95	93	95
Upper floor (n=35)	5	2	3	0	3	5	3
Roof terrace (n=17)	2	0	2	0	3	2	2
Overall	100	100	100	100	100	100	100
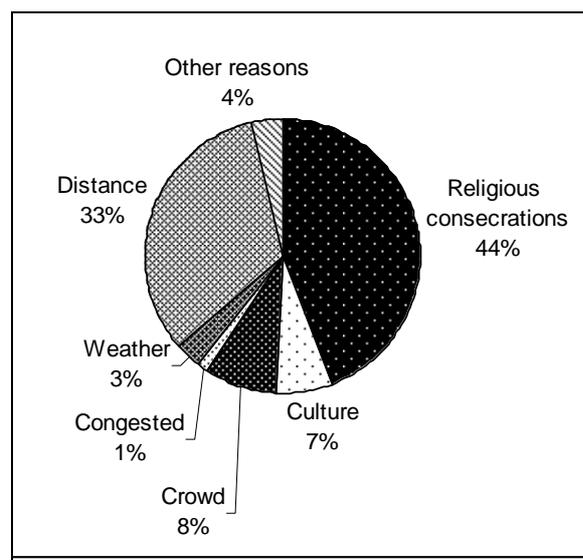
Figure 6-17: Percentage of reasons for choosing the floor on which to perform Tawaf

Table 6-27: Relation between place in which after-*Tawaf* prayer is done and frequency of performance.

Place praying after *Tawaf* prayers	Always perform *Tawaf*	Depends on the crowd at the Holy Mosque	Depends on my health	Depends on the weather	Depends on the time	Other reasons	Overall
Maqam (n=346)	**42**	**23**	**22**	**67**	40	25	31
close to *Maqam* (n=331)	27	34	**35**	**13**	25	24	30
Close to *Zamzam* well (n=44)	**1**	5	8	**13**	3	0	4
Inside the central courtyard (n=180)	15	13	**21**	**0**	16	26	16
Inside the Holy Mosque (n=197)	12	**23**	13	**7**	14	25	18
In another place (n=24)	3	2	2	0	2	0	2
Total	100	100	100	100	100	100	100

6.3.6. *Sa'i* activity

As *Sa'i* has become known as the completion of *Umrah* (with *Tawaf*), about 83% of worshippers performed it on the ground floor. This percentage mostly applies to each season over the year. About 85% of worshippers used the ground floor to perform *Sa'i* during Ramadan, as shown in Table 6-28. In addition, about the same percentage applies to the Hajj season. However, about 77% of worshippers used the ground floor to perform *Sa'i* in the off-peak times.

More male worshippers were found using the ground floor than female worshippers, as shown in Table 6-30. It was found that females do not use the roof terrace for *Sa'i*, as the regulations at the Holy Mosque forbid female worshippers from using the roof terrace for any activity (see Chapter 4).

The research questionnaire results indicate that a high majority (about 97%) of respondents who chose the floor on which to perform *Sa'i* out of religious considerations performed *Sa'i* on the ground floor, as shown in Table 6-31. This reason affected worshippers, since some scholars believe that the performance of *Sa'i* is related to an exact place, which is the ground floor, and it cannot be performed on any other floor. This thought may be reflected in the South-east Asian worshippers' behaviour, as is shown in Table 6-29 and Table 6-31. However, more male worshippers preferred to perform the *Sa'i* activity on the ground floor than female worshippers: about 84% of male worshippers as opposed to only about 77% of females, as shown in Table 6-30. The females' decision to practise *Sa'i* on the upper floor could be related to the overcrowding situation, as about 65% of worshippers who chose to perform *Sa'i* on the upper floor did so because they were aware of the overcrowding, as shown in Table 6-31.

The wheelchairs used by some elderly, disabled and female worshippers during the performance of *Sa'i* on the ground floor in the assigned passageway, as shown in Figure 6-19, creates a high risk area, with some worshippers using this walkway. Many incidents have been reported, as shown in Figure 6-18: worshippers' feet have been run over by wheelchairs, which has led to bleeding and the cancellation of the worshippers' ritual performance. It is important to completely isolate the wheelchair passageway from the worshippers' walkway, as the wheelchair/pedestrian incidents increase during Ramadan, when the ground floor is overcrowded, as shown in Figure 6-18.

Table 6-28: Relation between seasons and the floor chosen for performing *Sa'i*, in percentage.

Floor to perform *Tawaf* at	Season			Overall
	Ramadan	Hajj	Off Peak	
Ground floor	85	85	77	83
Upper floor	14	15	23	16
Roof terrace	1	0	0	1
Total	100	100	100	100

Table 6-29: Relation between worshippers' nationalities and floor chosen for performing *Sa'i*, in percentage.

Place of origin	Sai			Total
	Ground floor	Upper floor	Roof terrace	
Arabian Gulf (n=202)	68	31	1	100
Arabian (n=312)	88	12	0	100
South Asian (n=387)	83	16	1	100
South East Asian (n=27)	100	0	0	100
European (n=11)	89	11	0	100
African (n=164)	91	9	0	100
Other Nationality (n=19)	89	11	0	100
Overall	83	16	1	100

Table 6-30: Relation between worshippers' gender and age and floor chosen for performing *Sa'i*, in percentage.

Social characters		Ground floor	Upper floor	Roof terrace	Total
Gender	Male 1007	84	15	1	100
	Female 115	77	23	0	100
Age	25 or less 279	82	17	1	100
	26 - 35 (n=490)	82	17	1	100
	36 - 45 (n=228)	84	16	0	100
	46 or more (n=125)	89	11	0	100
Overall		83	16	1	100

Table 6-31: Relation between floor chosen for performing *Sa'i* and reasons for choosing floor for *Sa'i*, in percentage.

Reasons	Ground floor	Upper floor	Roof terrace	Total
Religious considerations (n=462)	97	3	1	100
Culture & customs (n=72)	85	15	0	100
Overcrowding (n=207)	35	65	0	100
Not congested (n=27)	52	48	0	100
Weather factors (n=8)	75	25	0	100
Distance (n=154)	100	0	0	100
Accessibility (n=166)	94	4	2	100
Other reasons (n=26)	85	15	0	100
Overall	78	16	6	100

Table 6-32: Relation between exiting gate after *Sa'i* and floor chosen for performing *Sa'i*, in percentage.

Exiting gate after *Sai'*	Ground floor	Upper floor	Roof terrace	Total
The closest gate (n=290)	86	14	0	100
From where I entered (n=79)	72	23	5	100
Gate no.1 (n=495)	80	20	0	100
Gate no. 31 (n=102)	85	15	0	100
Gate no. 6 (n=15)	100	0	0	100
Gate no. 79 (n=119)	97	3	0	100
Other gates (n=22)	64	36	0	100
Overall	83	16	1	100

Table 6-33: Relation between floor chosen for performing *Sa'i*, and reasons for choosing floor, in percentage.

Reasons	Ground floor	Upper floor	Roof terrace	Total
Religious consideration (n=138)	85	11	4	100
close to house 218	82	18	0	100
close to parking 135	78	22	0	100
close to station 76	80	20	0	100
no crowd 8	75	25	0	100
close to shopping 30	93	7	0	100
close to women area 83	78	22	0	100
closest to me 2683	85	15	0	100
other 166	87	13	0	100
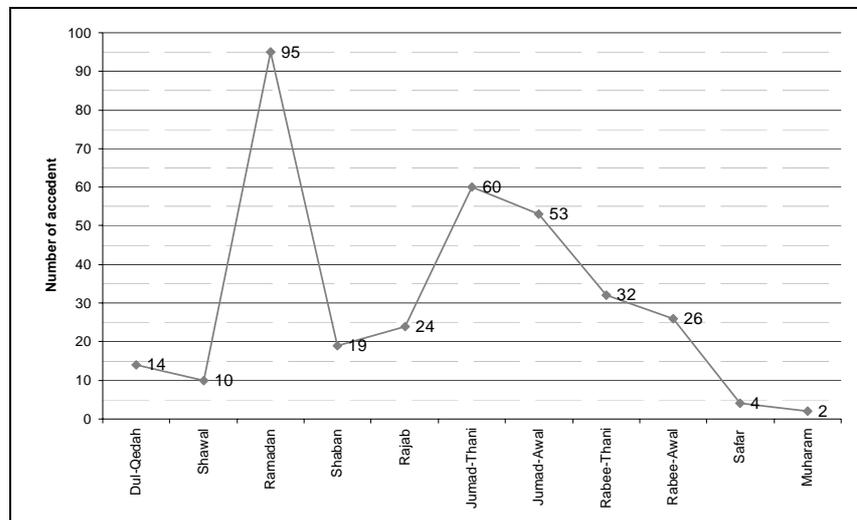
Figure 6-18: Graph showing the number of wheelchair incidents per Arabian calendar month, excluding Hajj, caused by wheelchairs hitting other worshippers. (Source: Data based on Holy Mosque force information.)

Figure 6-19: Picture showing the Al Masa'a area overcrowded with people in some places, some of whom are using the wheelchair lanes illegally. (Source: Videotape still.)

6.3.7. *I'tekaf* (Going into Retreat) activity

I'tekaf has been described as one of the main activities performed at the Holy Mosque as Allah, the Almighty, ordered His prophet Abraham, pbuH, and his son Ismail, pbuH, to prepare the mosque for worshippers who want to perform *Tawaf*[14], *I'tekaf*[15] and prayer. So as to obey this order, worshippers performed the *I'tekaf* at the holy Mosque over the year. However, a majority of them (about 67%) performed *I'tekaf* during Ramadan, as shown in Figure 6-20. Egyptian worshippers were reported to make up the highest percentage of worshippers who performed *I'tekaf*, with about 20% of those coming from Egypt, as shown in Figure 6-21. In addition, a high majority of those worshippers who practised this activity are male: about 98%, as shown in Figure 6-22.

Seeking a high reward from Allah, the Almighty, by obeying his order and performing *I'tekaf* could be considered a religious consideration, a main factor affecting the worshippers performing *I'tekaf*: 94%, as shown in Figure 6-23. On the other hand, only about 1% of worshippers perform this ritual duty because of economical factors, as they

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[14] . who circumbulate the Sacred Ka'bah.

[15] . who go into retreat.

cannot pay for a place to stay. Moreover, the condition of the location affected worshippers when looking for a place to perform *I'tekaf* inside the Holy Mosque, as a high minority (about 42%) of worshippers who perform this activity chose the place because of its condition and whether it was well prepared, with a carpet, *Zamzam* water and air-conditioning. As shown in Figure 6-26, however, only about 7% of worshippers chose the place in which to perform *I'tekaf* because of the place in which they lived.
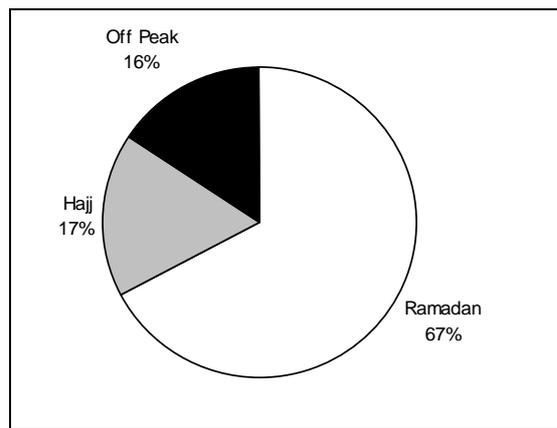
Figure 6-20: Total percentage of worshippers who went into retreat over the year.
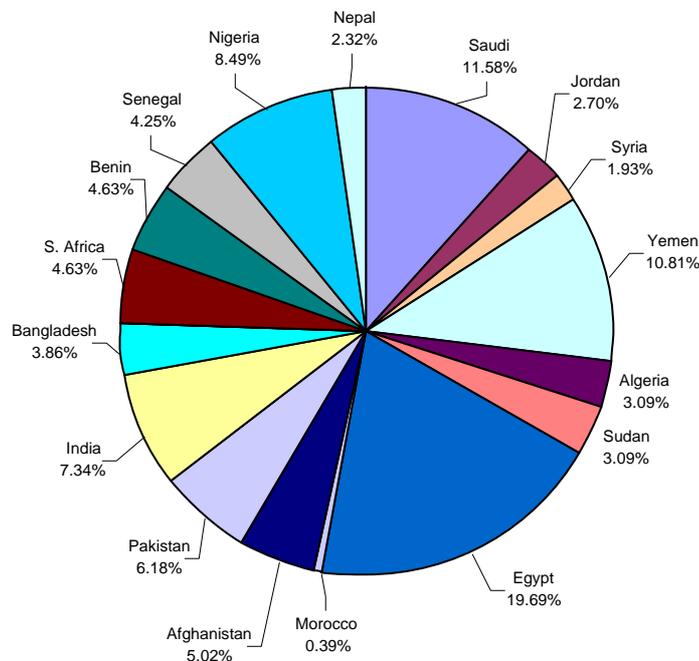
Figure 6-21: Total percentage of worshippers who went into retreat, by nationality.
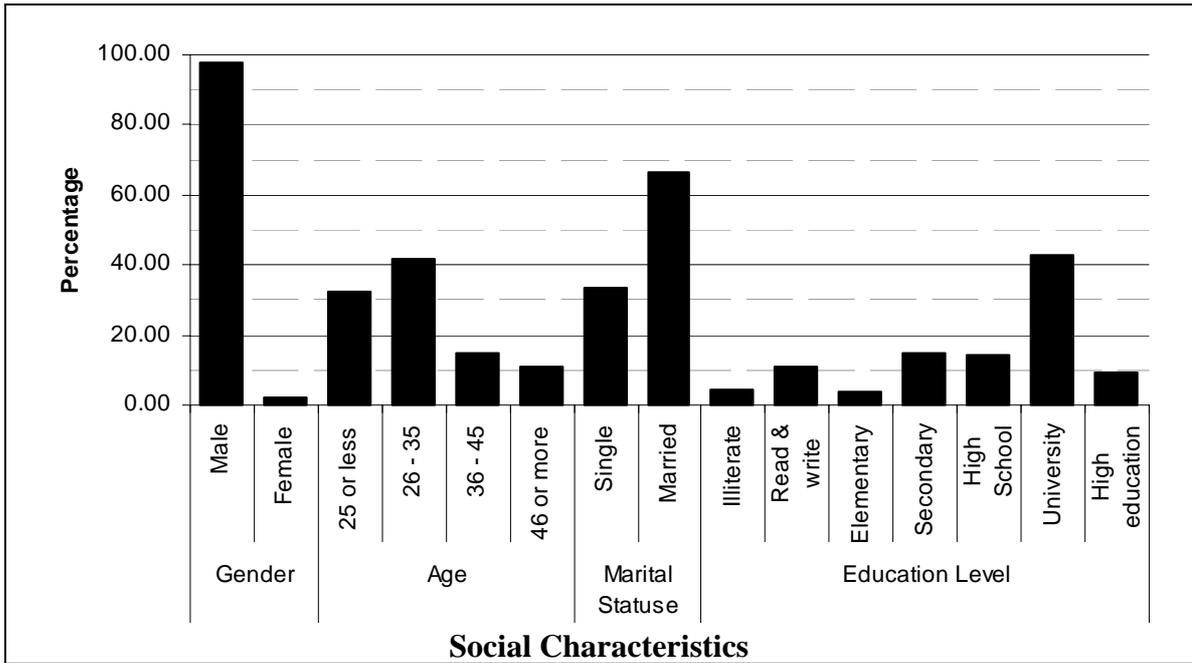
Figure 6-22: Relationship between the retreat activity and the worshippers' gender, age and marital status.
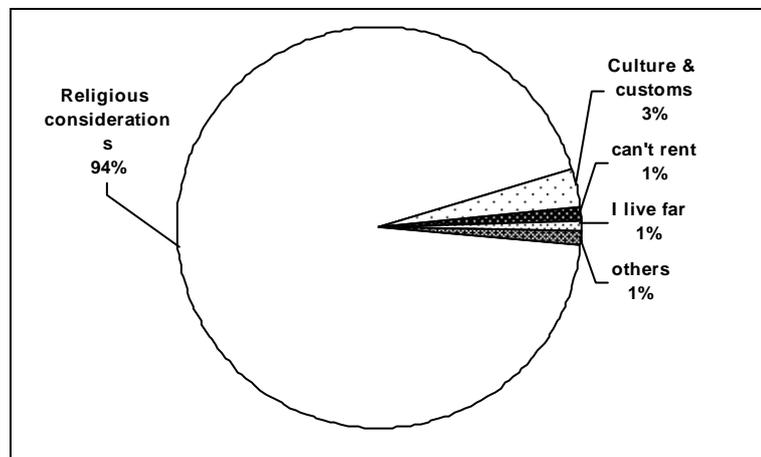
Figure 6-23: Total percentage of reasons for worshippers to go into retreat.
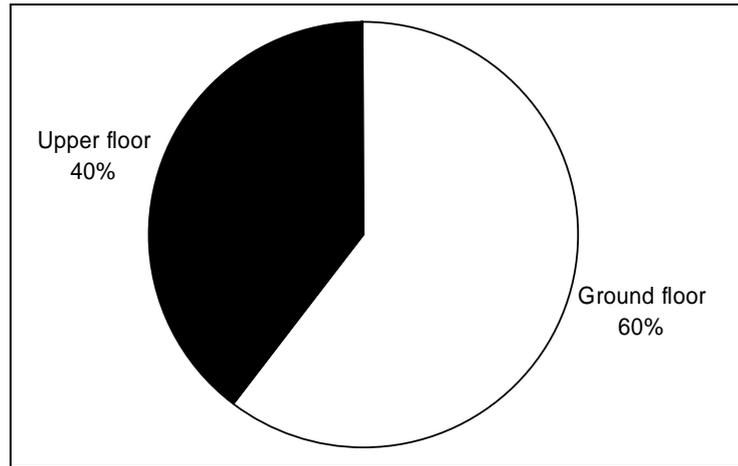
Figure 6-24: Total percentage of preferred place in which to go into retreat.
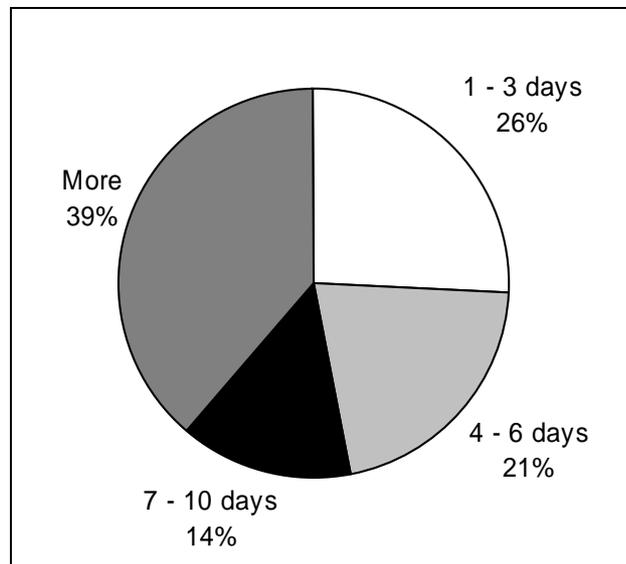
Figure 6-25: Total percentage of the time for going into retreat.
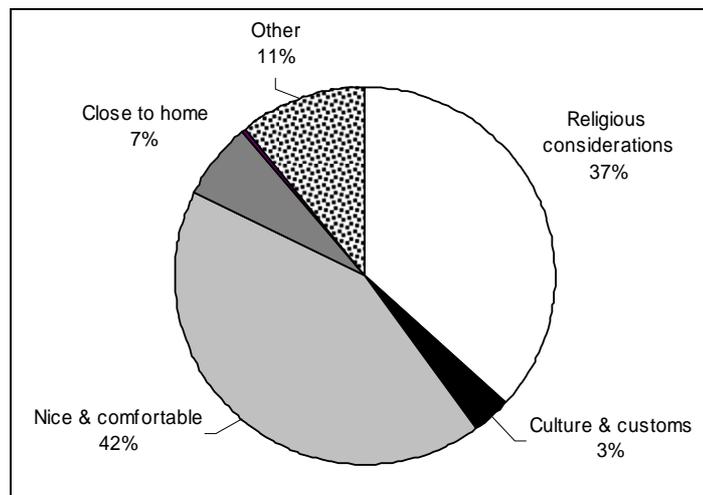
Figure 6-26: Total percentage of the reasons for choosing the place to go into retreat.

6.3.8.   Visiting the *Zamzam* well activity

Since *Zamzam* is the holy water for Muslims (see Chapter 4) and cannot be found in any place other than the Holy Mosque, worshippers preferred to visit the well on different occasions, as shown in Figure 6-28. A high minority (about 40%) of worshippers visited the well occasionally, when about only 17% visited it based on the overcrowding situation at the entrance of the well, which is shown in Figure 6-27, and the *Mataf* area. Two entrances were designed to allow the worshippers to enter the well level, under *Mataf*, based on their genders, as shown in Figures 6-27 and 6-30. The number of worshippers visiting the *Zamzam* well and waiting for their relatives and friends at the well entrances creates an overcrowding point in the *Mataf* area. Religious considerations encouraged a majority of worshippers (about 62%), as shown in Figure 6-27, to visit the *Zamzam* well, in order to practise the saying of the Prophet Mohammed, pbuH, as discussed in Chapter 4. In addition, a minority (only about 1%) of worshippers visited the well to pray inside it, which helps to increase the capacity of the courtyard for prayers.

Specialists have argued over the Saudi Arabian government's decision to close the well entrance. As Engineer Hossam AbdulSalam[16] said, "Closing the *Zamzam* well entrance is one solution, but other factors affect the overcrowding in the *Mataf* area. A sudden, unexpected movement can be seen in the *Mataf* area whenever it is raining." Ahmad Ruzman bin Ahmad Razali said, "The *Zamzam* entrance is not a problem; it's OK. And most of our pilgrims want to go inside *Zamzam*." However, Engineer Rashad AlHemli said, "The *Zamzam* well entrance in the *Mataf* area causes many problems." Usama F. AlBar[17] said, "Closing the *Zamzam* well entrance could be a good decision for solving the

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[16]. Traffic engineer at the Custodian of the Two Holy Mosques Institute of Hajj Research.
[17]. The dean of the Custodian of the Two Holy Mosques Institute of Hajj Research.

circulation problem in that area, and it may cause some confusion for people who come from outside Makkah, but not for Makkah residents. However, the Institute will work on studying people's reaction to this decision and the numbers of *Zamzam* water fountains that will be needed to help people throughout the Holy Mosque." A former Holy Mosque Force Commander said, "Closing the *Zamzam* well entrance will help the movement in the *Mataf* area. It will be replaced by several *Zamzam* fountains inside the Holy Mosque; the *Zamzam* well entrance causes some problems, especially on the 10/12/13 of the month of Hajj, because it stops the pilgrims, and during the prayers there is a huge crowd. I think that it would be better to move it from the courtyard." However, other specialists[18] at the Custodian of the Two Holy Mosques Institute of Hajj Research disagree with this solution, since it will cut out one of the most important elements at the Holy Mosque, which was resolved by Allah, the Almighty, to be in this specific area, and has a very strong connection with the people, especially those who live in Makkah. Of course, there will be no circulation problems in this area if the *Zamzam* entrance is not there any more. In addition, Mahmood Kesnawi[19] said, "Closing the *Zamzam* well entrance will not be well received by worshippers who wish to visit the well, especially scholars and scientists. In addition, this will be harmful to the residents of the city of Makkah. The project could be better if it was divided into several phases."

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18. Some professors and architects in conversation with the researcher made on Sunday the 10th of May 2003.

[19]. A physiologist professor at Umm AlQura University, Makkah.
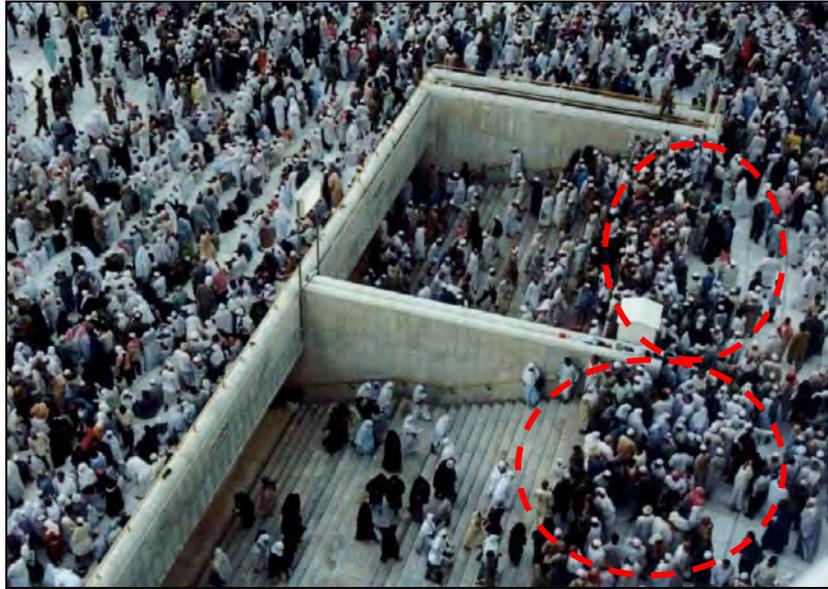
Figure 6-27: The *Zamzam* well entrance, showing the over-crowding at each side. (Source: Custodian of the Two Holy Mosques Institute of Hajj Research)
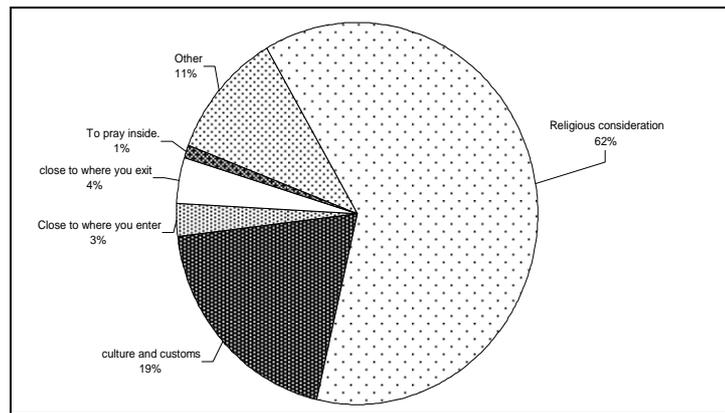
Figure 6-28: Graph showing the total percentage of the reasons given by worshippers for visiting the *Zamzam* well.
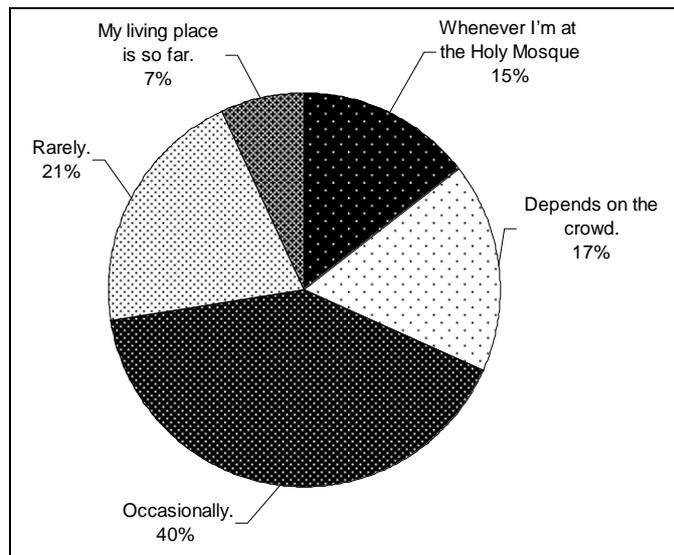
Figure 6-29: Total percentage of timing sequences of visiting the *Zamzam* well.
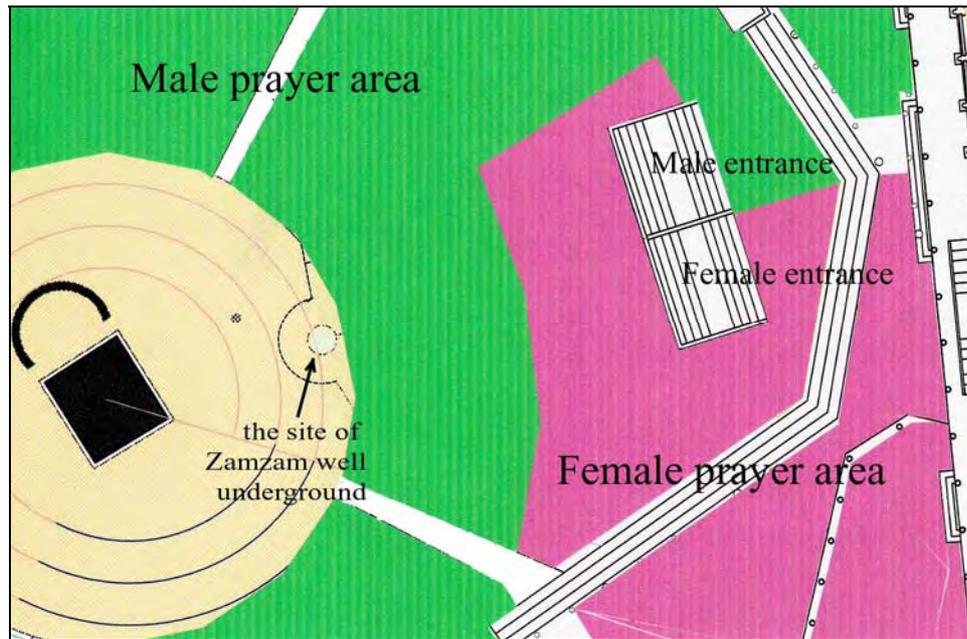
Figure 6-30: Diagram showing the *Zamzam* well entrance area.

6.3.9.   Findings regarding attracting places inside the Holy Mosque

Some places inside the Holy Mosque, particularly in the *Mataf* area, as shown in Figure 6-31, are more attractive to worshippers than others. This creates high-risk areas in these popular areas of the Mosque. Visits to these areas vary from one time to another over the year, as shown in Table 6-34.

Worshippers visited the Maqam Abraham during Ramadan more than during Hajj, as shown in Table 6-34. The study also shows that about 70% of worshippers visited the Maqam in Ramadan, and only about 19% in Hajj. On the other hand, some places attracted more worshippers during Hajj than in Ramadan; a majority of worshippers visited *Zamzam* (about 81%) and the Black Stone (about 75%) during Hajj, as shown in Table 6-34, while only about 19% visited *Zamzam* and only about 9% visited the Black stone during Ramadan. Overall, a high minority (about 45%) of worshippers who had a

specific place to visit inside the Holy Mosque wished to visit their preferred place during

Ramadan, as shown in Table 6-34.

Worshippers' place of origin affected their choice of preferred place to visit, as shown in

Table 6-36. About 50% of European worshippers preferred to visit *Zamzam* well, and

about 60% of South-east Asian worshippers wanted to visit the Black Stone. People from

other places in the world preferred to visit Maqam Abraham, as indicated in Table 6-36.
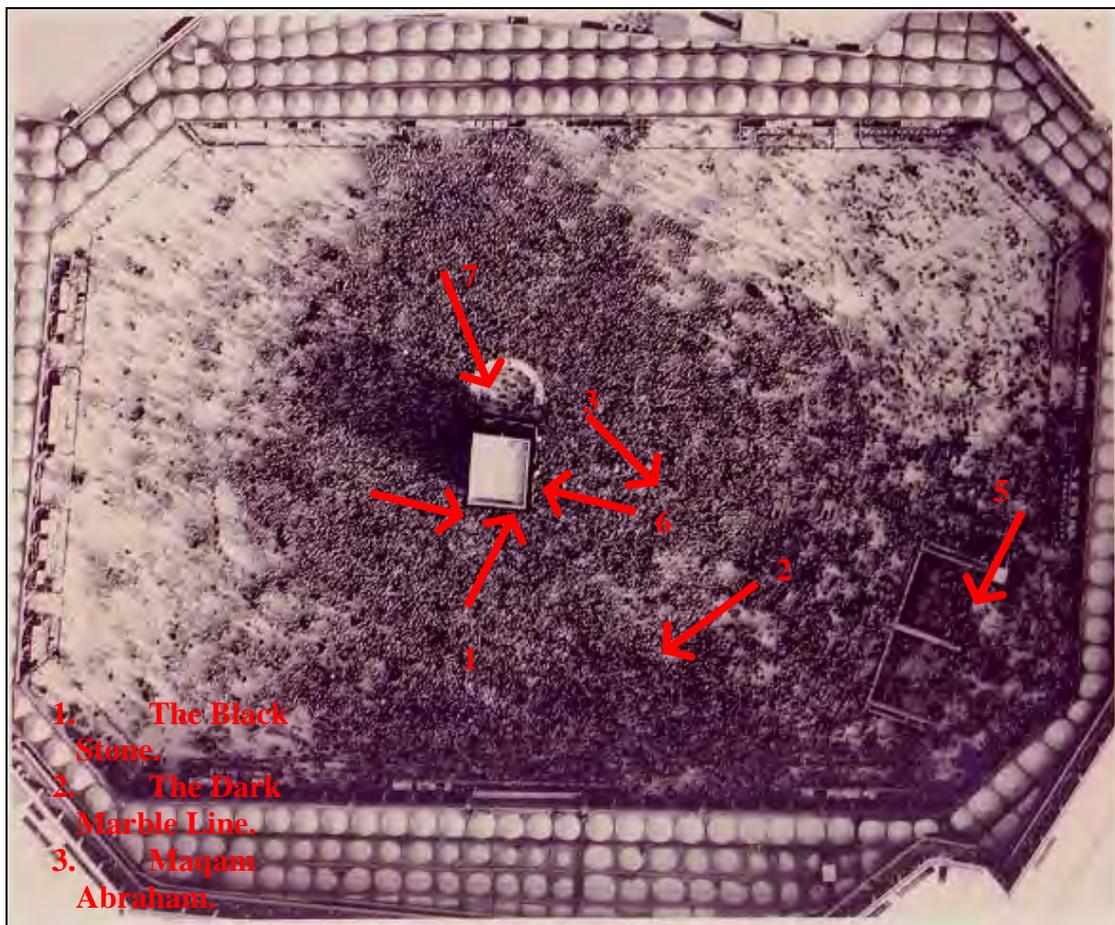
Figure 6-31: Aerial picture of the *Mataf* in mid-season during Hajj. The arrows indicate the most attractive sites inside the *Mataf* area. (Source: Enqawi et al., *Movement at Mataf*)

Table 6-34: Number of worshippers who visit such places inside the Holy Mosque.

The Places which attract worshippers	Ramadan	Hajj	Off Peak	Total (%)
Maqam Abraham (n=140)	70	19	11	100
Zamzam well (n=16)	19	81	0	100
Hijr Ismail (n=14)	29	29	43	100
The Black Stone (n=89)	9	75	16	100
The Ka'bah curtain (n=18)	56	0	44	100
Mended (n=28)	61	22	17	100
Others (n=15)	40	33	27	100
Overall	45	38	17	100
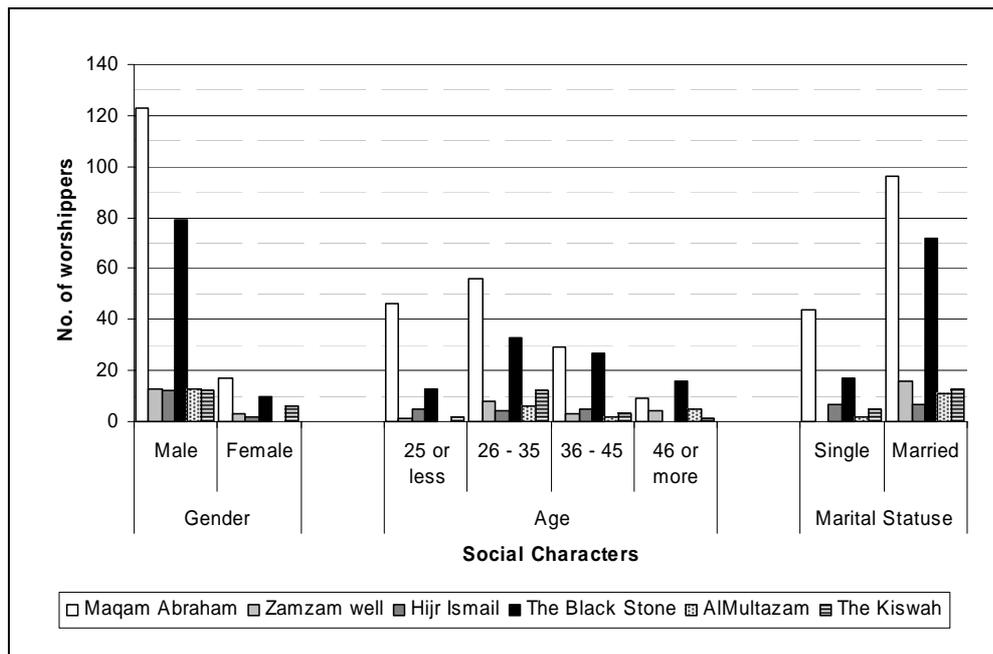
Figure 6-32: Social characteristics of the worshippers who visit particular places inside the Holy Mosque.

Table 6-35: Reasons for worshippers to visit particular places inside the Holy Mosque.

Reasons to visit some places inside the Holy Mosque	Ramadan	Hajj	Off Peak	Total
Religious considerations (n=285)	48	41	11	100
Cultural aspects (n=18)	39	50	11	100
Other reasons (n=819)	53	20	27	100
Overall	51	26	23	100
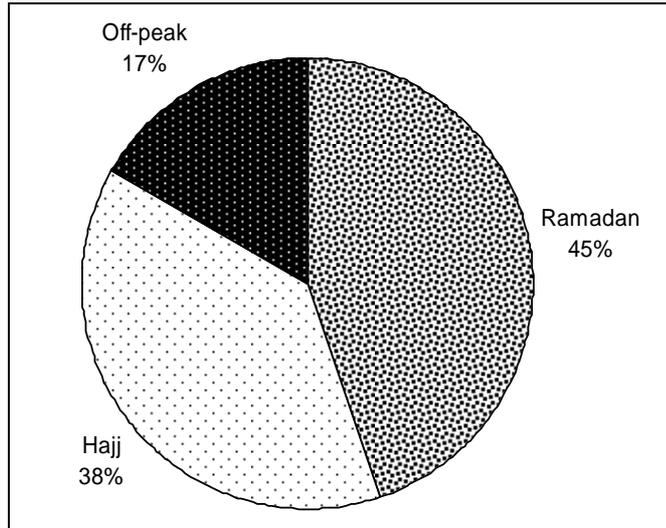
Figure 6-33: Graph showing the total percentage of people visiting a particular place in the Holy Mosque during each period of time.

Table 6-36: Relationship between place of origin and visiting place at the Holy Mosque.

Place of origin	*Maqam Abraham*	Zamzam well	Hijr Ismail	The Black Stone	*Multazam*	Others	Mended	Total
Arabian Gulf (n=35)	40	0	11	31	0	9	9	100
Arabian (n=78)	45	3	3	24	3	5	18	100
South Asian (n=150)	37	7	3	29	7	4	13	100
European (n=4)	0	50	0	25	0	0	25	100
South East Asian (n=5)	0	20	0	60	0	0	20	100
African (n=152)	58	0	6	21	0	4	12	100
Other Nationality (n=6)	100	0	0	0	0	0	0	100
Overall	42	5	4	27	4	5	12	100

1.   *The Black Stone area.*

The Black Stone, the *Tawaf* starting point, is one of the most popular places at the Holy

Mosque: it was selected by about 28% of the respondents who wanted to visit a particular

place at the Holy Mosque. Its popularity during Hajj is higher than at any other time of

the year; it was selected by about 75% of worshippers as the place they would visit in

Hajj, when only about 9% did so during Ramadan, and about 16% during the rest of the

year, as Table 6-34 shows.

In order to follow the behaviour of the Prophet Mohammed, pbuH, Muslims intend to kiss the stone. They spent more time reaching the Black Stone from the overcrowding at the edge during Hajj than during Ramadan, as shown in Figure 6-34. Based on the overcrowding in the Stone area, which is shown in Figure 6-34, people spent between 2 and 5 minutes during Ramadan and between 6 and 13 minutes during Hajj on travelling from the edge of the crowd in the Stone area until they reached the Stone itself, as shown in Figure 6-35. However, worshippers spent about ten seconds kissing the Stone, which reflects the time they spent reaching the Stone and performing the duty.

Figure 6-34: A close-up view of the crowd of people kissing the Black Stone. (Source: Videotape still.)
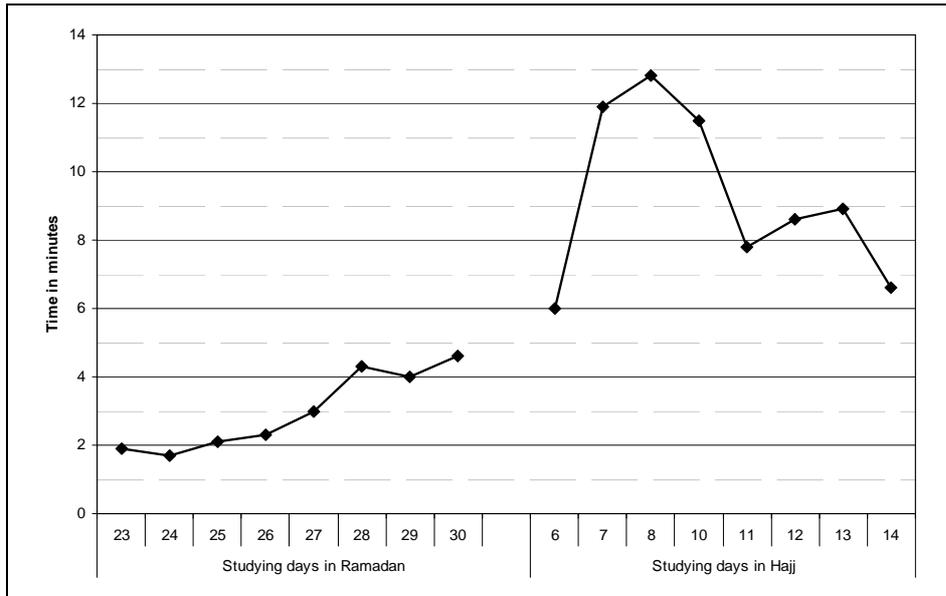
Figure 6-35: Graph showing the average time in minutes that people spent reaching the Black Stone from the edge of the Black Stone zone during the Ramadan and Hajj seasons. (Source: Enqawi et al., 1987)
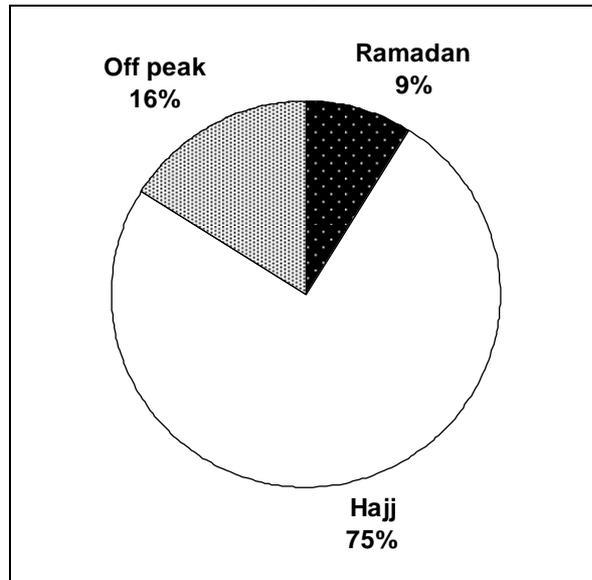
Figure 6-36: Graph showing the average visits to the Black Stone over the year.

2.   *The Dark Marble line*

Sheikh, Dr. Yousef AlQaradawi said, "The Dark Marble Line that identifies the *Tawaf* starting point was put in to help the worshippers. Yet they need not obey it." Engineer Rashad AlHemli said, "The Dark Marble Line that indicates the *Tawaf* starting point was not there in the past; the Presidency of the Holy Mosque Service decided to have that

line. It would be better if the line drawn from the Sacred *Ka'bah* to the Holy Mosque building was removed." The Dark Marble Line cannot be counted as a popular place to visit, but it is considered to be one of the areas of overcrowding in the *Mataf*. This Line dams the flow of people who circumambulate the Sacred *Ka'bah*, performing *Tawaf*, as shown in Figure 6-37 through time frames. In addition, the pausing[20] of worshippers at this line varied from one time to another throughout the year. This time, which was between one and three minutes in Ramadan, increased during Hajj to between three and five minutes, as shown in Figure 6-38. (why people pause at this line)

Figure 6-37: Snapshots at 11-second intervals, showing the damming-up of people at the Dark Marble Line, indicated by a black line in the photograph. (Source: One of the Custodians of the Two Holy Mosque Institute of Hajj Research, videotapes made in Ramadan season.)

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[20] . worshippers are pausing as they reach this line because it identify the Black Stone as they have to start and finish the performance of *Tawaf* and its rounds.
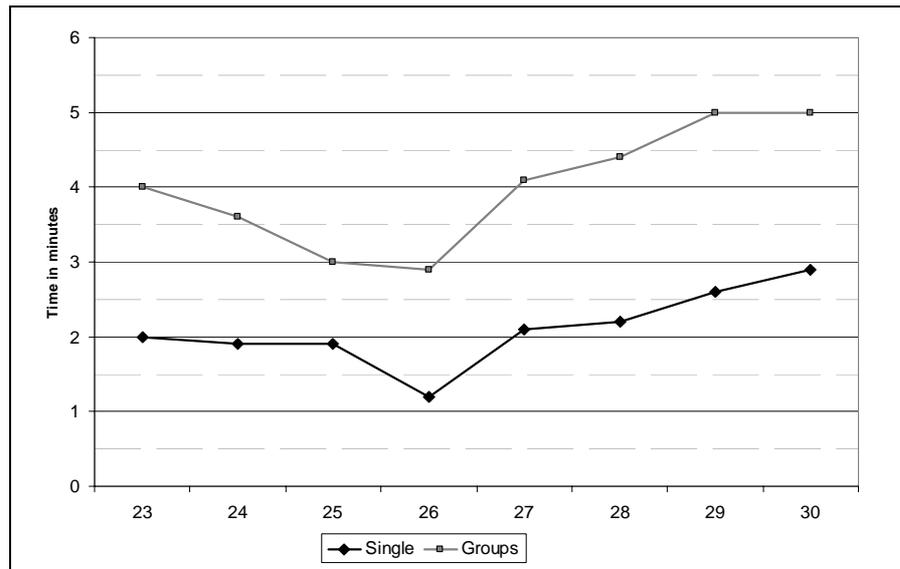
Figure 6-38: Average time in minutes that people stopped on the Dark Marble Line in Ramadan season. (Source: Enqawi et al, 1987)

3.   *Behind the Maqam Abraham*

Engineer Rashad AlHemli[21] stated, "The Abraham Maqam has never been moved from its place since it was placed there by Omar Ibn AlKhatab (mAbpwh). However, when King Faisal decided to remove the shelter with the support of the scholars, we [the Saudi Bin Laden Construction Company] removed the building and exchanged it with a 180 X 180 cm transparent glass case." The prayers performed after *Tawaf* in the Maqam Abraham area were the main factors in the overcrowding in this area; about 40% of worshippers performed this prayer next to the Maqam, and about 26% performed it close to the Maqam, as shown in Figure 6-39. In addition, a high minority (about 44%) of worshippers chose the Maqam as their preferred place to visit in the Holy Mosque, as shown in Table 6-34. Moreover, about 70% of those worshippers did visit the Maqam during Ramadan. On the other hand, the location of the Maqam itself increased the overcrowding in the Mataf area, as it was located close to some other popular places in the Mataf area, as shown in Figure 6-31.

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[21]. The General Supervisor of the Two Holy Mosques project, Saudi Bin Laden Group.
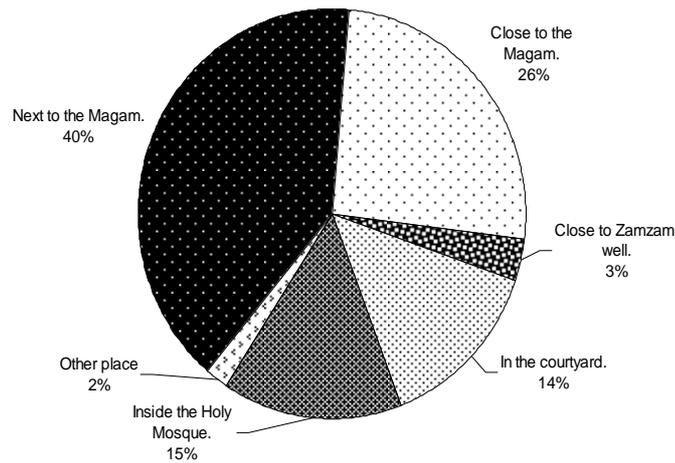
Figure 6-39: Graph showing the places where people preferred to pray after *Tawaf*.

Figure 6-40: Close-up view showing overcrowding of people at the Maqam of Abraham. (Source: Videotape still.)

4. *The Yemeni corner of the Sacred Ka'bah:*

Since the Yemeni corner is one of the original corners of the Sacred Ka'bah, worshippers overcrowd this area. However, queuing at the Black Stone increased the density at the Yemeni corner, as shown in Figure 6-41.

Figure 6-41: Close-up view showing the overcrowding of worshippers at the Yemeni corner, caused by the overcrowding in the Black Stone area. (Source: Videotape still.)

5.   *The Multazam area*

Because performing Doa'a at the Multazam yields the highest reward for worshippers , as described in Chapter 4, worshippers are encouraged to visit this place. Even though only about 1% of worshippers wished to visit the Multazam, the limited space at the Multazam cannot accommodate more than 10 people at the same time, while more than five thousand people want to visit it when the Holy Mosque is at a capacity of more than five hundred thousand people praying. In addition, a majority (about 82%) of the worshippers who prefer to visit this place visited during Ramadan, and about 23% during Hajj time, as shown in Table 6-43.

Figure 6-42: Close-up view showing the overcrowding of people in the Multazam area. [Indicated by the circle.] (Source: Videotape still.)
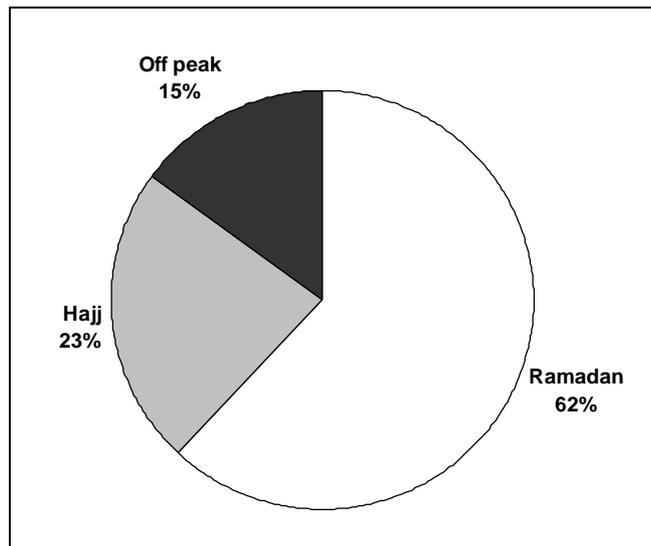
Figure 6-43: Average number of people visiting the Multazam during each period.

6.   *The Hijr of Ismail (pbuH).*

The limited size of the *Hijr* cannot accommodate all the worshippers who wish to visit the *Hijr* and perform a prayer inside seeking a higher reward, as was discussed in Chapter 4, and this is the main factor leading to overcrowding in this area. The highest density in this area is found at the within two meters of the *Sacred Ka'bah*, as shown in Figure 6-44,

since it is known as a part of the *Sacred Ka'bah*, as discussed in Chapter 4. About 29% of the worshippers who visited this area visited during Ramadan, and the same percentage (29%) in Hajj time, as is shown in Figure 6-45.

Figure 6-44: Close-up picture showing the overcrowding of people at *Hijr Ismail* (pbuH). (Source: Videotape still.)
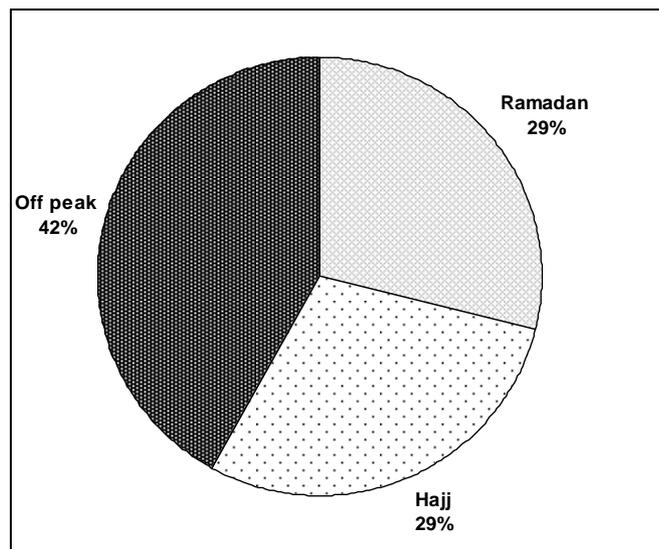
Figure 6-45: Graph showing the total percentage of visitors to the *Hijr* at each period during the year

6.4. Other related problems:

In addition, some other problems emerged during the interviews and the pilot study of this research questionnaire. These are worth considering because they are related to safety and atmospheric conditions in overcrowded situations. Those problems were identified as follows:

- The covering of a large area, shown in Figure 6-46, with a special type of white marble, during the recent expansion of the Holy Mosque, in the *Mataf* area. It causes two major problems, found by the quantitative analysis. These are:

  - Slipping on the floor surface: It was found that 18% of visitors questioned had some problems with slipping, especially when the floor is wet. A former Holy Mosque Force's Commander said, "when it rains, slipping is a very big problem in the interior courtyard. How do you solve this problem? Lots of studies on this problem have been done for us by the Presidency and the Institute to find different solutions and options. The options are to roughen the surface area in the walking places, or to use tough plastic sheeting during the rainy period only. We tell the people to be careful and we also dry the place directly after the rain." *Engineer Rashad AlHemli said:* "Slipping is caused by the type of marble used in that special area. It is from Greece, very white, unique and very fragile (wastage was 60%), and its thickness is about 8cm, therefore, hammering will not be a good solution. Also, it would lose its reflective properties, but it should be kept dry at all times. This kind of marble reflects the sun's heat, which makes it feel cool any time of the year."

▪ Glare: a strong reflection of the sunlight, sun glare, is caused by the large area of space covered with white marble, in the hot, still weather conditions of the city of Makkah. It was considered to be a problem by 41% of the people questioned.

• Emergency response: As a safety requirement, people should know what to do in case of emergency in the building they are in. However, it was found that a majority of the users of the Holy Mosque do not know what to do in case of emergency. Ahmad Ruzman bin Ahmad Razali said, "The training program for Malaysian pilgrims goes on for thirteen weekends. One weekend session is on safety issues. Most of the sessions are about the religious ritual worship. We did use the stadiums, big mosques, big yards, public squares, piazzas, and we have our own training centre, where we have a big mosque and some spaces for that particular guidance. We teach them a lot of things, such as how to make *Tawaf* and how to throw to Jamarat, and so on. The crowd inside the Holy Mosque can make the people confused with respect to seeing and recognizing the notices. People get lost when they come out from the Holy Mosque." In addition, he added: "We do not want to alarm or worry worshippers about the Holy Mosque, because nobody wants to have an emergency there. But we did teach our pilgrims that in case something happens, if you are inside the Holy Mosque, please stay inside, and if you are outside the Holy Mosque, please go back to your home. And if you see any crowd or gathering, please be aware of it, because if you tell them about an emergency, they will be worried and they will stay at their home until Arafat day."

Figure 6-46: Satellite photo, taken on 22nd Feb. 2002, of the central area of the city of Makkah. The large space covered in white marble is shown in the centre of the picture. (Source: King AbdulAziz City for Science and Technology.)

6.5. Summary:

A detailed questionnaire was created for the study in order to understand worshippers' behaviour inside the Holy Mosque building. This questionnaire was distributed among the worshippers several times during the year to get a complete measurement of users' behaviour over the full year. Research samples represent all different social characteristics in each category, such as gender, level of education, nationality, marital status and others.

The study observation carried out as part of this research shows some unexpected differences in the usage of the Holy Mosque gates during the year. Moreover, some other

differences were found in other measured characteristics and elements inside the Holy Mosque building.

In addition, several 'snapshots' were taken inside the Holy Mosque building to represent the overcrowding situation in order to provide a full understanding of the related problems. Specialists and the people in charge of the Holy Mosque services provided some useful information through interviews, which will be useful in considering the design standards and other measurable factors.

7. Spatial Data Analysis

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7.2.2. The axial map and measure of axiality

7.2.3. Numerical properties of the y-map.

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7.6. Summary

7. ■ Spatial Data Analysis

7.1. Introduction

A nalysing the area of the Holy Mosque is the aim of this chapter. It will complete this topic using the Space Syntax method and various techniques. The chapter is divided into three sections. The first will analyse the spatial layout of the Holy Mosque in accordance with the Space Syntax method. The second section will establish the computer simulation model for the axial lines of the Holy Mosque and the analysis of its spaces using the Visual Graph Analysis method. The last section contains evacuation calculations which will help determine the time required to evacuate the mosque building under current conditions.

7.2. The Analysis of the Spatial layout

In order to acquire a full understanding of spatial movement inside the Holy Mosque, Space Syntax analysis was applied to its ground floor, and two axial line models were created, shown in Figure 7-4 and 7-7. The first axial line model describes the spatial configuration when the Holy Mosque is fully occupied by prayers, which is shown in Figure 7-1. The second axial line model describes the spatial configuration of the central courtyard (*Mataf*) used for *Tawaf*, as shown in Figure 7-2. This approach would enable us to investigate the possible cause of the overcrowding problem and to analyse the spatial configurations of the Holy Mosque area. The movement pattern of

the first model of the Holy Mosque is represented by the open spaces on the open space structure map, which is shown in Figure 7-1.

The full analysis of the system must begin by establishing the convex spaces map, which is the drawing of the widest convex spaces on a map as shown in Figure 7-3. About 286 convex spaces have been found in the ground floor system of the Holy Mosque.
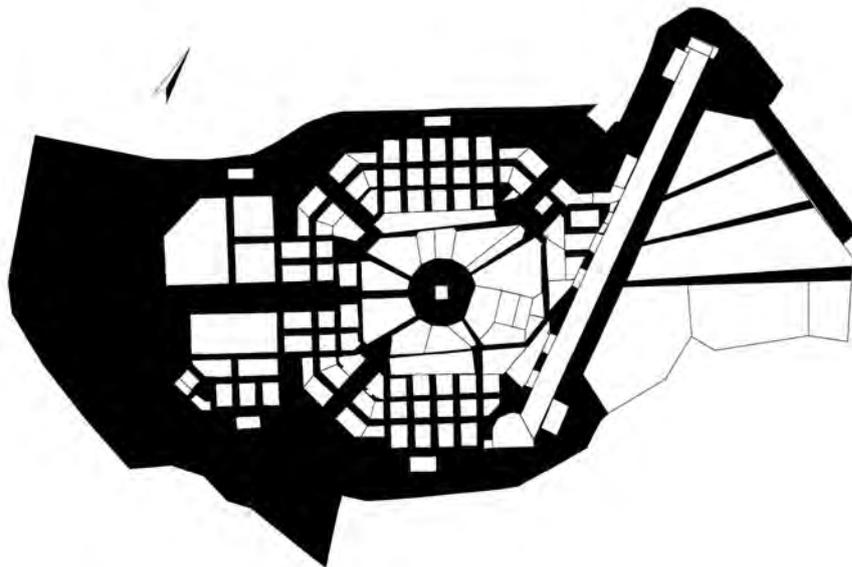
Figure 7- 1 : Open space structure map of the first axial line system.
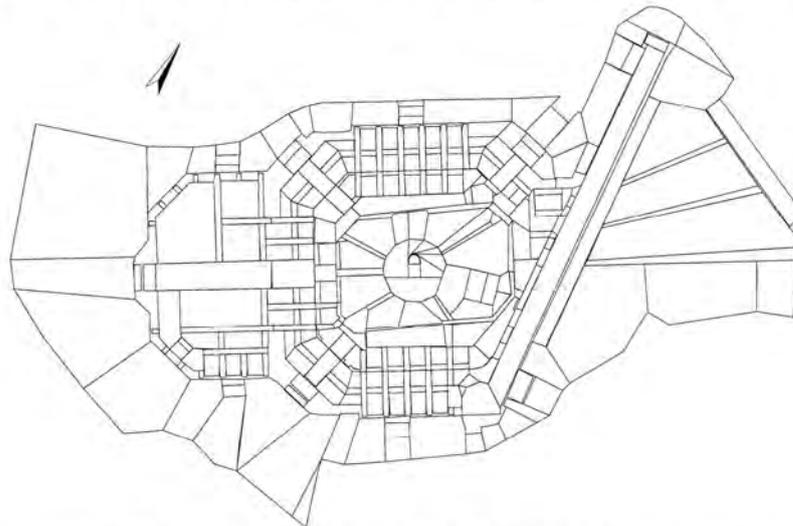
Figure 7- 2 : Convex map of the first model of the ground floor of the Holy Mosque.
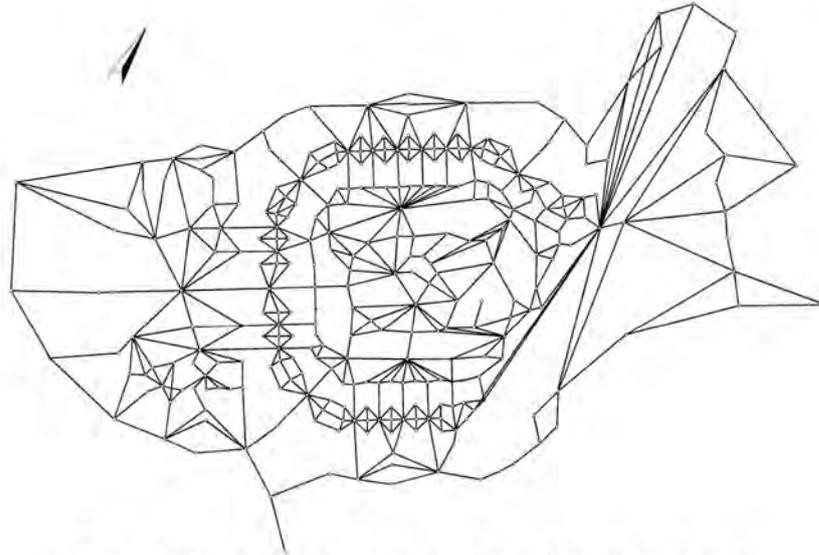
Figure 7- 3 : Y-map of the ground floor of the Holy Mosque.
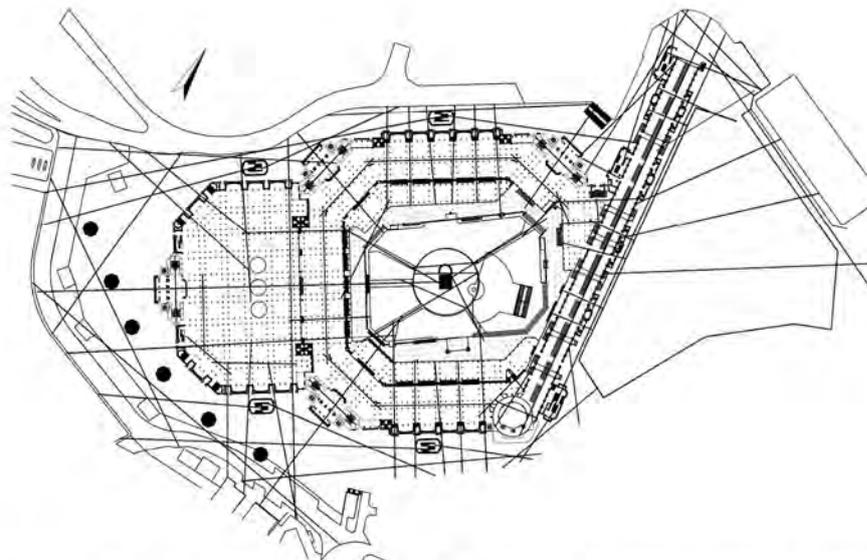
Figure 7- 4: The ground floor map at the Holy Mosque with the first axial lines model assigned on as the central courtyard (*Mataf*) used as a prayer area.

The number of convex spaces found in the system of the first axial line model is 302. The number of buildings is 83. The number of islands is 285, and the number of axial lines is 92 as shown in Figure 7-2, 3 and 4. However, in the system of the second model, there were 279 convex spaces, while the number of buildings is 51, which is that of island 224, and axial lines 82 as shown in Figure 7-2.

7.2.1. The measure of convexity

The convex articulations of the first model of the system of the ground level of the Holy Mosque are calculated as follows:

$$\text{convex articulation} = \frac{\text{number of convex spaces}}{\text{number of buildings}} = \frac{302}{83} = 3.639$$

This high number indicated that the system is more likely to break-up. However, the calculation of the grid convexity will give precise information about the convexity of the system. It could be calculated as follows:

$$\text{grid convexity} = \frac{\left(\sqrt{I}+1\right)^2}{C} = \frac{\left(\sqrt{285}+1\right)^2}{302} = \frac{\left(16.882+1\right)^2}{302} = \frac{319.766}{302} = 1.059$$

The grid convexity (1.059) indicates there is a little deformation of the grid. The calculation of the second model will be as follows:

$$\text{convex articulation} = \frac{\text{number of convex spaces}}{\text{number of buildings}} = \frac{279}{51} = 5.471$$

$$\text{grid convexity} = \frac{\left(\sqrt{I}+1\right)^2}{C} = \frac{\left(\sqrt{224}+1\right)^2}{279} = \frac{\left(14.967+1\right)^2}{279} = \frac{254.945}{279} = 0.914$$

7.2.2. The axial map and measure of axiality

In order to perform the processing of this calculation, an axial map of the system was created, which is shown in Figure 7-4. To get the axiality of the system, several calculations need to be completed. Axial articulation can proceed as follows:

$$\text{axial articulation} = \frac{\text{number of axial lines}}{\text{number of buildings}} = \frac{92}{83} = 1.108$$

While axial articulation for the second model is:

$$\text{axial articulation} = \frac{\text{number of axial lines}}{\text{number of buildings}} = \frac{82}{51} = 1.608$$

The higher number obtained in the calculation for the second model indicates a great likelihood of break-ups in the system. For further investigation, we also need to compare this with the axial integration of convex spaces, which is calculated for the first model as follows:

$$\text{axial integration of convex spaces} = \frac{\text{number of axial lines}}{\text{number of convex spaces}} = \frac{92}{302} = 0.305$$

And for the second model is:

$$\text{axial integration of convex spaces} = \frac{\text{number of axial lines}}{\text{number of convex spaces}} = \frac{82}{279} = 0.294$$

In addition, the grid axiality of the system must be calculated in the following:

$$\text{grid axiality} = \frac{\left(\sqrt{I}\ X\ 2\right)+2}{L} = \frac{\left(\sqrt{285}\ X\ 2\right)+2}{92} = \frac{(16.882\ X\ 2)+2}{92} = 33.764 + 2/92 = 0.389$$

The grid axiality for the second model is:

$$\text{grid axiality} = \frac{\left(\sqrt{I}\ X\ 2\right)+2}{L} = \frac{\left(\sqrt{224}\ X\ 2\right)+2}{51} = \frac{(29.933)+2}{51} = 0.626$$

The low number of the result indicates a greater degree of axial deformation on the system. According to the results of these analyses, the system of the ground floor of the Holy Mosque is breaking up, and its grid has a greater degree of deformation on the first model than the second one.
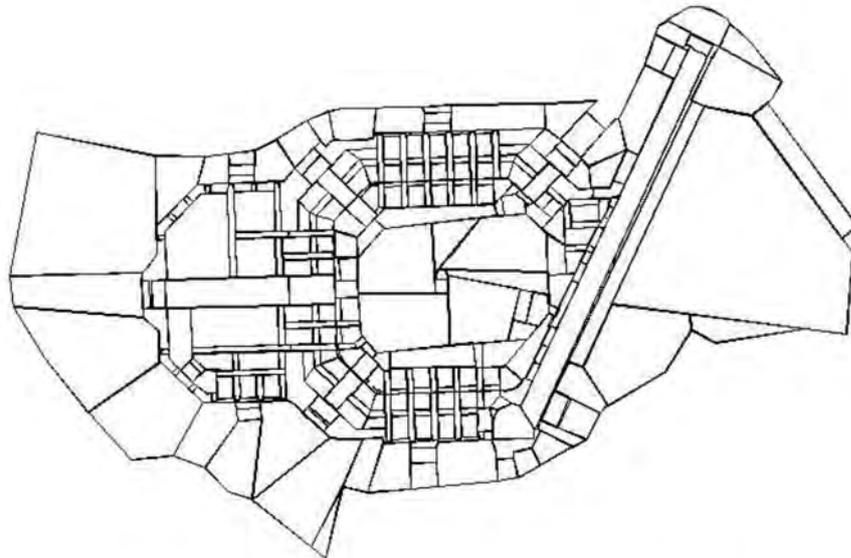
Figure 7- 5: Convex map of the second model of the ground floor of the Holy Mosque.
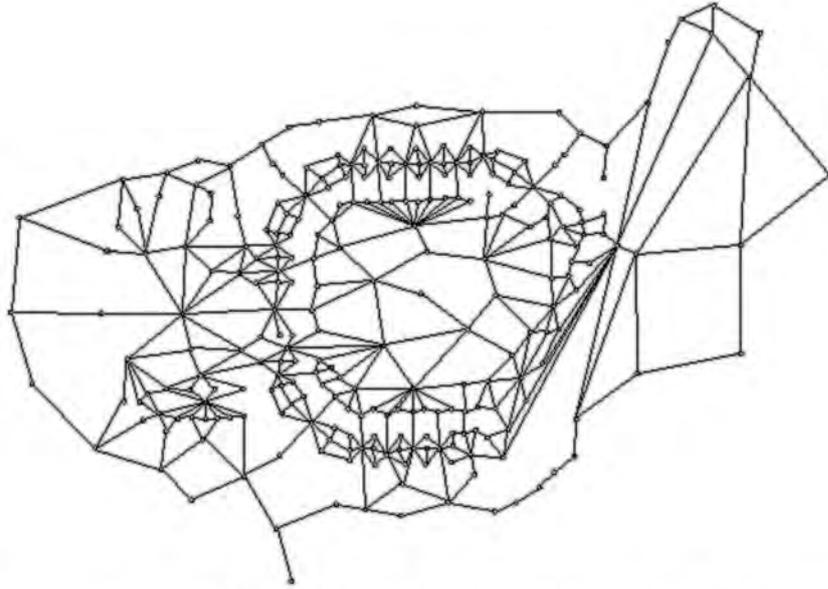
Figure 7- 6: Y-map of the second model of the ground floor of the Holy Mosque.
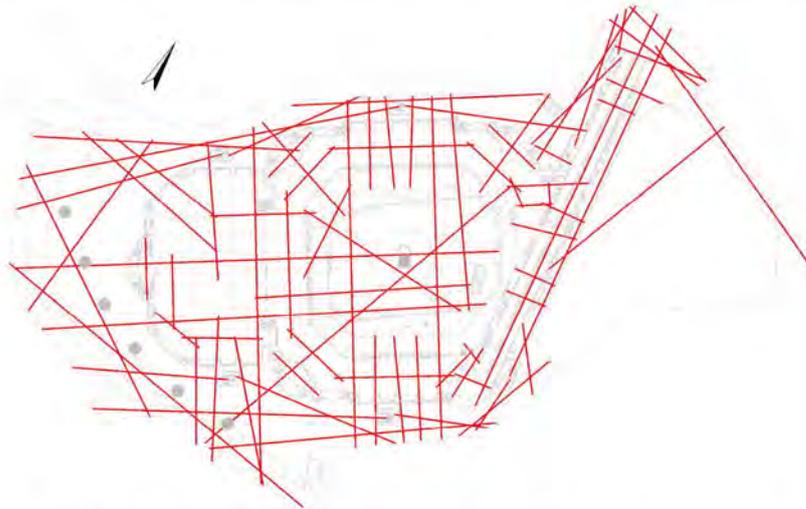
Figure 7- 7: The ground floor map at the Holy Mosque with the second axial lines model assigned on the central courtyard (*Mataf*) used as a movement area.

7.2.3. Numerical properties of the *y-map*.

Furthermore, additional analysis shall be run by transforming the convex map into a y-map as shown in Figure 7-6. As previously discussed, several numbers could be drawn on this map which represents several issues as it will be shown below.

In addition to this, we shall draw a calculated number through a formula to represent the ringiness of the convex system on the first model as follows:

$$\text{convex ringness} = \frac{I}{2C - 5} = \frac{285}{604 - 5} = 0.476$$

For the second model as follows:

$$\text{convex ringness} = \frac{I}{2C - 5} = \frac{224}{558 - 5} = 0.405$$

The comparison of the two axial line models (see Table 7-1) indicates that the first system has a higher degree of deformation than the second one. It also has higher break-ups in the system, and this is the main reason that causes worshippers to get lost inside the Holy Mosque system.

Table 7- 1: A comparison of the two axial line models calculations.

Numerical reference	First model calculation	Second model calculation
Convex spaces	302	279
Islands	285	224
Axial lines	92	82
Number of buildings	83	51
Grid convexity	1.059	3.639
Convex articulation	0.057	5.471
Axial articulation	1.108	1.608
Axial integration of convex spaces	0.305	0.294
Grid axiality	0.389	0.626
Convex ringness	0.944	0.803

7.2.4. Numerical properties of the axial map

We may now use the y-map to draw several analyses from the axial line map. The axial line indexes which are shown in Figure 7-8 indicate the axial line in the northern side of the mosque has the highest value of index, 13.

The other analysis from the axial line map is the axial line connectivity, which is shown in Figure 7-9, inside the mosque building; two axial lines have recorded the highest value which is 14. These were shown at Mas'a and at the western side of the mosque. In the external axial lines, the southern axial line gave the highest connectivity value as shown in the same figure.

Ring connectivity is the third analysis from the axial line map, which is shown in Figure 7-10. The highest value was recorded on the western side of the mosque while most of the lowest values were recorded at the southern side of the *Mas'a* area and at Al-*Fath* gate, the north-east main gate.

Depth value is another axial line analysis, which is shown in Figure 7-11. The highest value has been recorded on the central courtyard, while the highest value on the surrounding free areas was recorded at the southern free area.

Over all, most of the highest values were recorded on some of the axial lines at the western side of the mosque building; also the *Mas'a* recorded most of the second highest values.
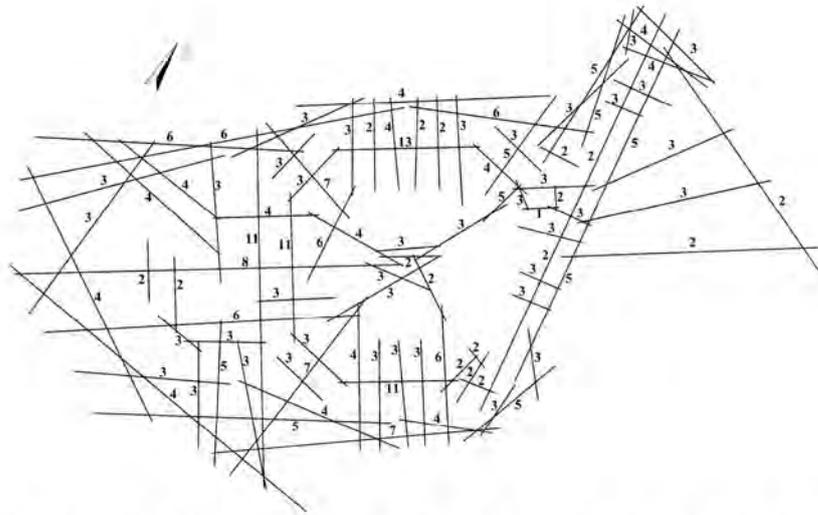
Figure 7- 8: Axial map of the ground floor of the Holy Mosque showing axial line indexes.
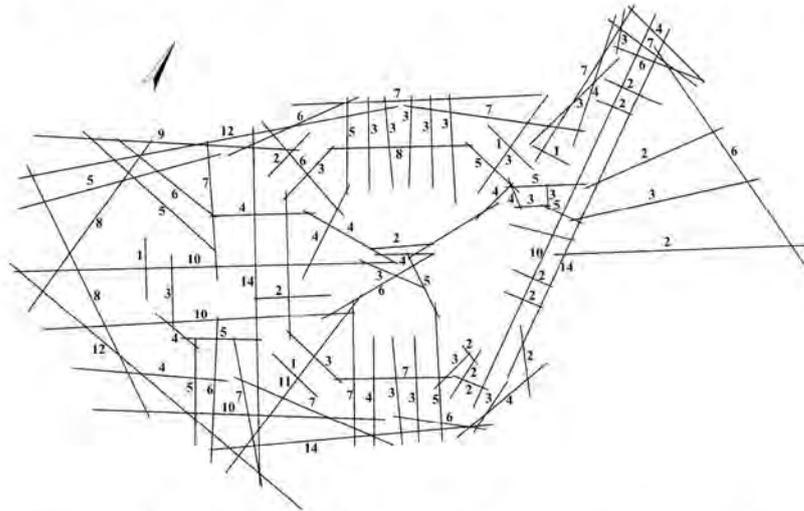
Figure 7- 9: Axial map of the ground floor of the Holy Mosque showing axial line connectivity.
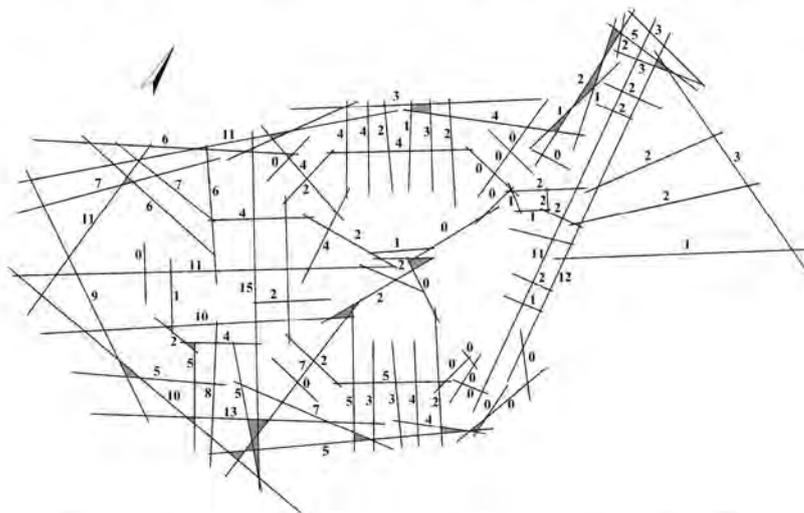
Figure 7- 10: Axial map of the ground floor of the Holy Mosque showing rings connectivity.
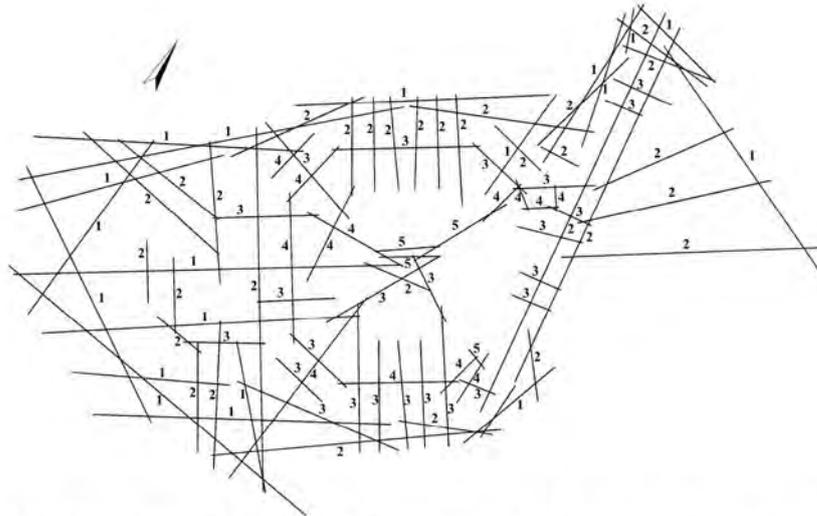
Figure 7- 11: Axial map of the ground floor of the Holy Mosque showing depth value.

7.3. Computer simulation model

There are several computer software on the market which have been developed to create simulation models. In *Space Syntax* analysis, there are also some computer programs which have been written and developed to create computer simulation models. In this study, I chose the Axman program for the simulation models of the axial line analysis. However, in order to establish a VGA model, I decided to use the Depth map program.

The main reason I decided to use these particular models are because of their accuracy and easy availability.

7.3.1. Axial Line Analysis of the first model of the ground of the Holy Mosque:

Two axial line systems have been created for this analysis. On one hand is the Holy Mosque, the case-study of this research, and on the other hand is the axial line model of the central area of Makkah City.

This model indicates that the axial line that connects gate number 94 in the southwest with the opposite gate in the northwest, the axial line that connects *AsSafa* with *AlMarwah,* and the axial line of the south open area are the most connected lines on the ground floor of the Holy Mosque. On the other hand, most of the axial lines at the north side of the Holy Mosque building and the west edge of the Mas'a are the least connected axial lines on this floor as shown in Figure 7-12.

Equally, in the Global Integration Model, the same axial line in the west section of the Holy Mosque building connecting gate number 94 in the southwest with the opposite gate in the northwest and the axial line of the south open area are the most integrated axial lines. Contrarily, the axial lines inside the east open area are the most segregated lines as shown in Figure 7-13.

The local integration model shows, on the other hand, that the axial line of the Mas'a area is the most integrated line, and the short internal axial lines of the Holy Mosque are the most segregated lines in this model as shown in Figure 7-14.

Figure 7- 12: Axial line analysis graph of the Holy Mosque, showing the axial lines connectivity.

Figure 7- 13: Axial line analysis graph of the Holy Mosque, showing the global integration of the Holy Mosque axial lines.

Figure 7- 14: Axial line analysis graph of the Holy Mosque, showing the local integration of the Holy Mosque axial lines.

Correlation graphs showing the relation between Global and Local integration with axial line connectivity.
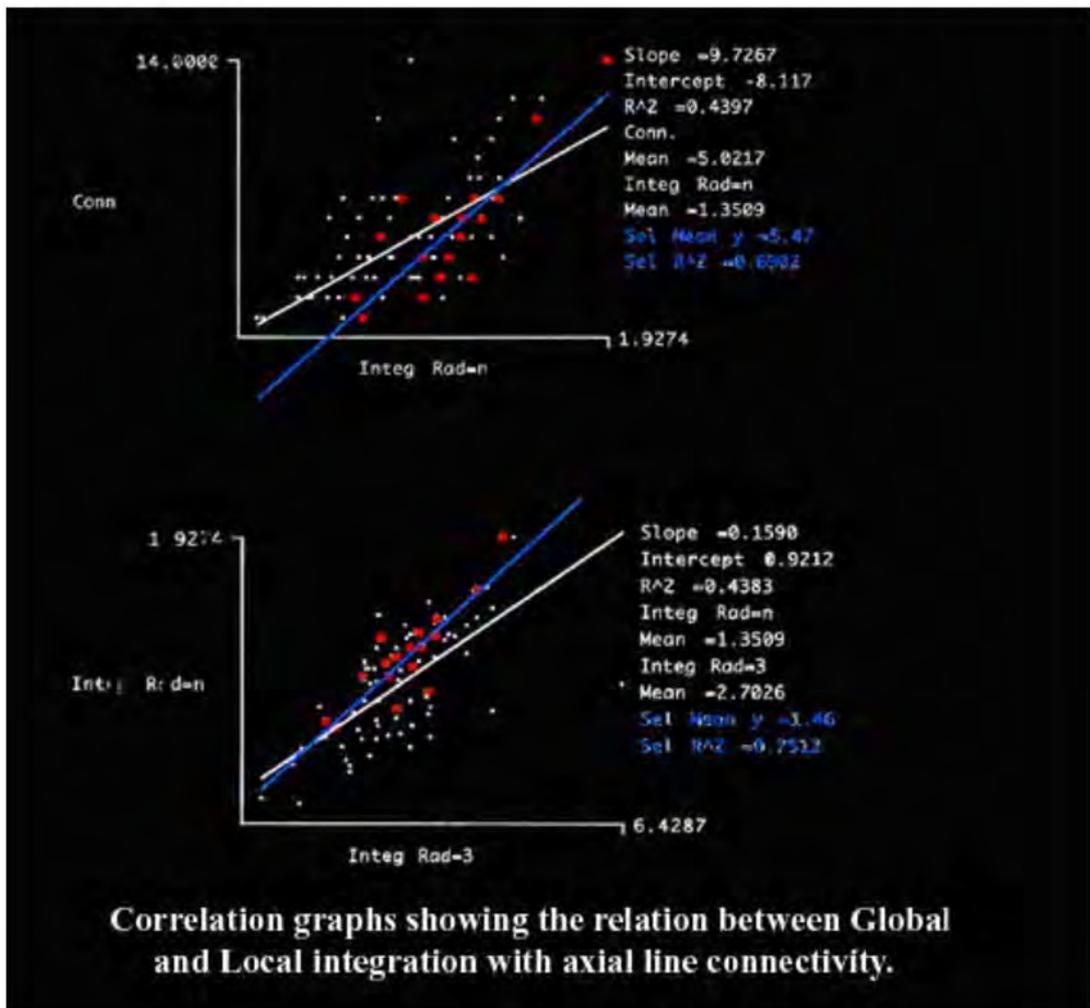
Figure 7- 15: The correlation graphs indicating the relation between Global with Local integration and Global integration with axial line connectivity.

In the analysis of the central Makkah area, the local integration model shows the axial line which is located at the west side of the Holy Mosque at the central area. Some axial lines at the west side of the Holy Mosque are indicated as the most integrated axial lines while the east and the northeast axial lines are the most segregated as shown in Figure 7-17A.

The Global Integration Model also shows that most of the main streets in the southwest section, depicted in red, and the south axial line of the ring road are the most integrated axial lines, and the west axial lines of the Holy Mosque are more integrated than the east axial lines as shown in Figure 7-17 B.

The axial connectivity model shows that an axial line which is located west of the Holy Mosque and some of the west axial lines at the Holy Mosque are the most connected axial lines in the system; in addition, the north and south axial lines of the Holy Mosque are more connected than the others as shown in Figure 7-17 C.

Finally, the correlation graphs reflecting the relationship between the local and global integration, Figure 7-18, shows a deep slope in this relationship.

A. Correlation graph of King Fahad gate axial lines.

B. Correlation graph of AsSalam gate axial lines

C. Correlation graph of King AbdulAziz gate axial lines.

D. Correlation graph of AlFath gate axial lines.

E. Correlation graph of AlUmrah gate axial lines.

F. Correlation graph of the Mataf Area axial lines.
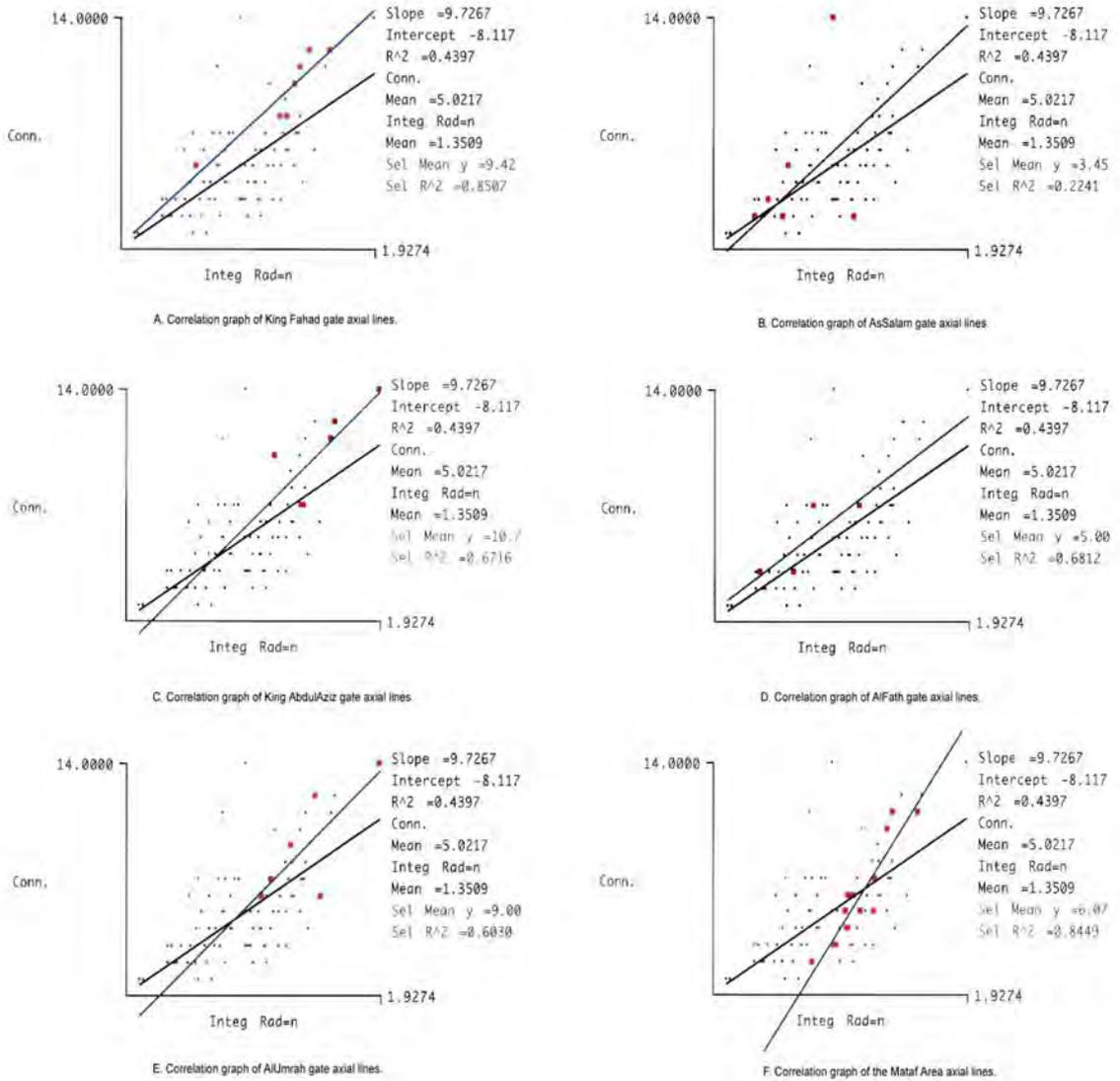
Figure 7- 16: A correlation graph of the Holy Mosque system indicating the axial lines on each main gate and the Mataf area.
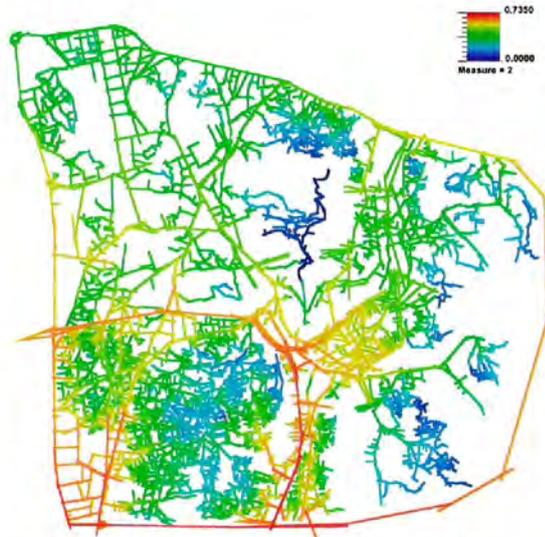
A. Global integration of the axial line model of Makkah central area.
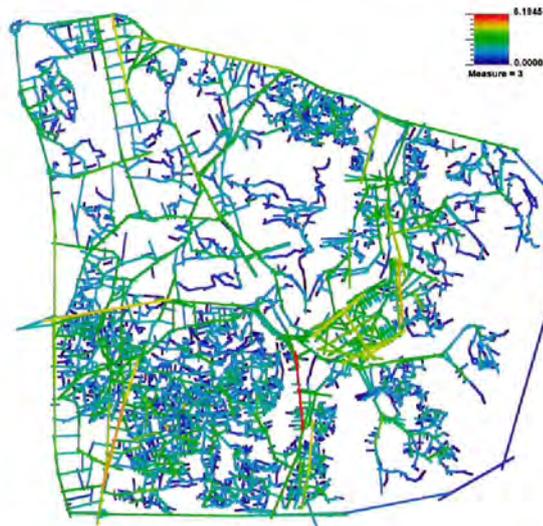
B. Local integration of the axial line model of Makkah central area.
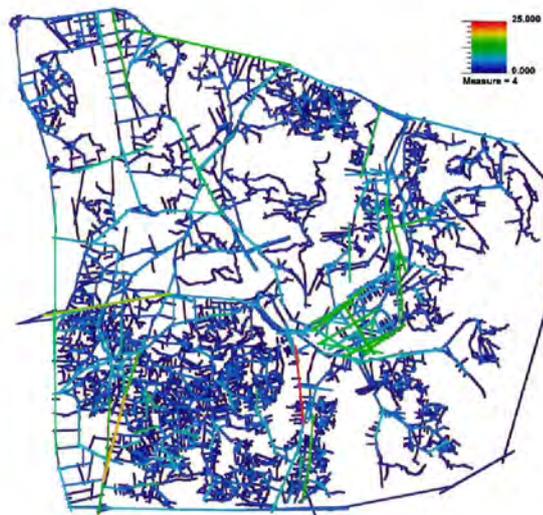
C. Axial connectivity of the axial line model of Makkah central area.

Figure 7- 17: Axial line model of the central area of Makkah City.
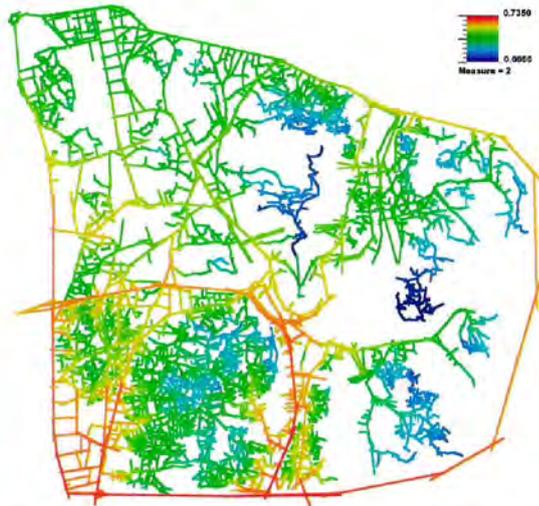
A. Global integration of the axial line model of the central area of Makkah city without the Holy Mosque.
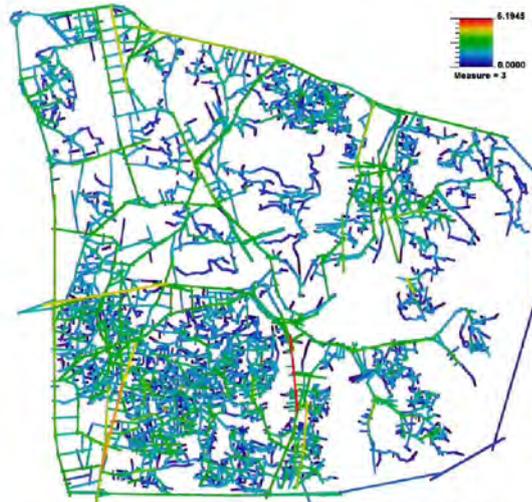
B. Local integration of the axial line model of the central area of Makkah city without the Holy Mosque.
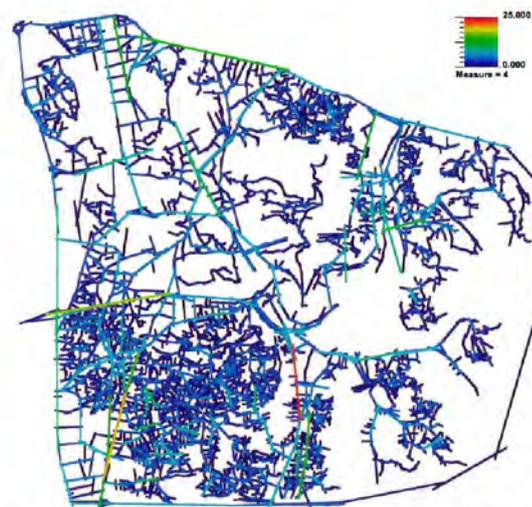
C. Axial Connectivity of the axial line model of the central area of Makkah city without the Holy Mosque.

Figure 7- 18: Axial line model of the central area of Makkah City without the Holy Mosque building.
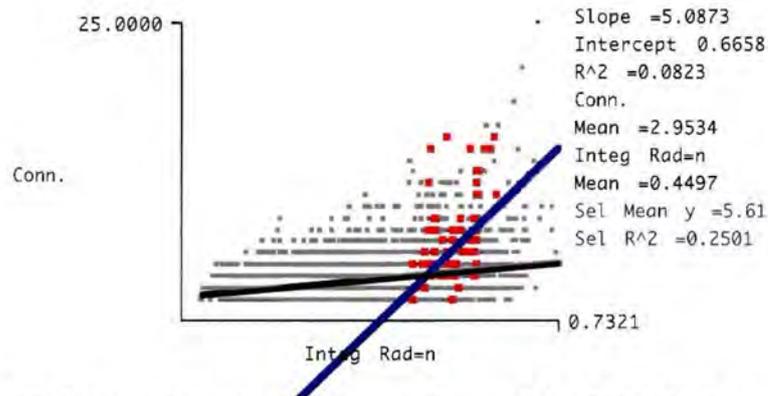
Figure 7- 19: A correlation graph of the central area of Makkah City showing the higher integration on the Holy Mosque system among the whole system.

7.3.2. Axial Line Analysis of the second model of the ground floor of the Holy Mosque:

7.3.2.

Some differences occur when the second Axial line model of the Holy Mosque's ground floor is analysed. The western and south-western main entrance became the most connected axial line in the system. The connectivity of the axial line of gate number 94 became less connected as shown in Figure 7-20. The connectivity of the axial line that connects the Mataf and the Mas'a became more connected than in the first model since this axial line is designed to connect worshippers who travel from Mataf to Mas'a to complete the required performances of their Umrah as shown in Figure 7-20. Consequently, the connectivity of the northern axial line became higher than in the first model.

In the integration analysis of the second model, the global integration of the axial line of gate number 94, the most integrated axial line in the first model, becomes less integrated while the axial line of the area between the Holy Mosque building and the eastern free area becomes the most integrated axial line in the system as is shown in

Figure 7-21. The integration level of the axial line of the *Mataf* is higher as its function changed from prayer to movement.

The axial line of gate number11, *AsSafa* gate, also becomes the most integrated axial line in the system of the ground floor of the Holy Mosque; whereas, the level of integration of the axial line at the *Mataf* becomes higher than in the first model as is shown in Figure 7-22.
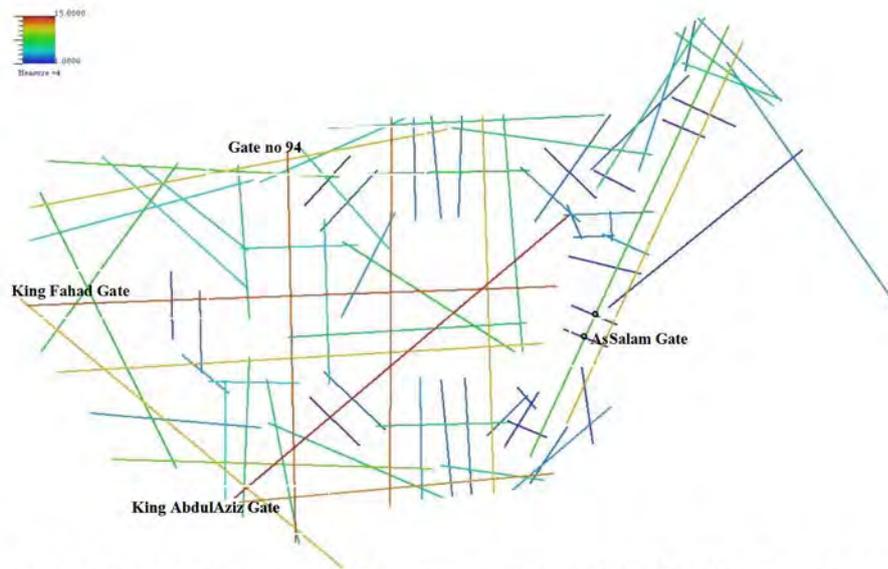
Figure 7- 20: Axial line analysis graph of the second model of the Holy Mosque, showing the axial line connectivity.
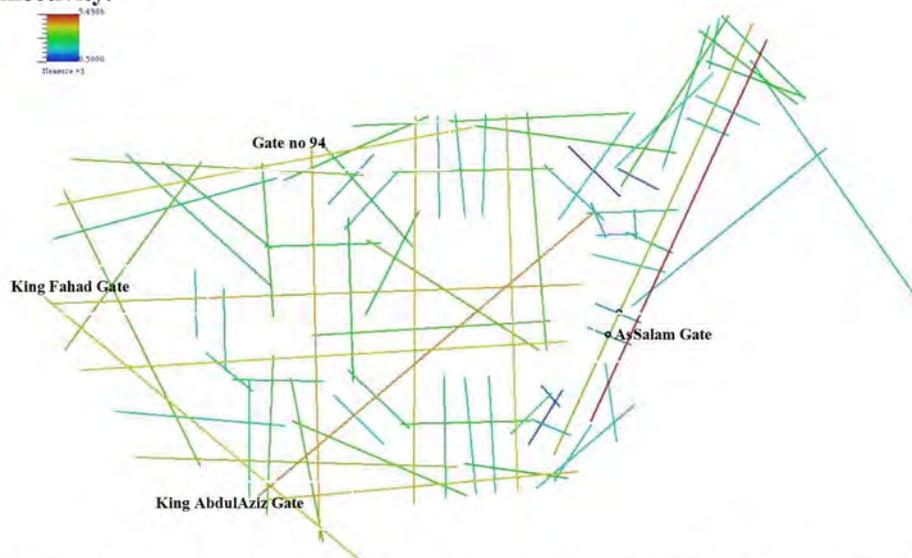
Figure 7- 21: Axial line analysis graph of the second model of the Holy Mosque, showing the axial line global integration.
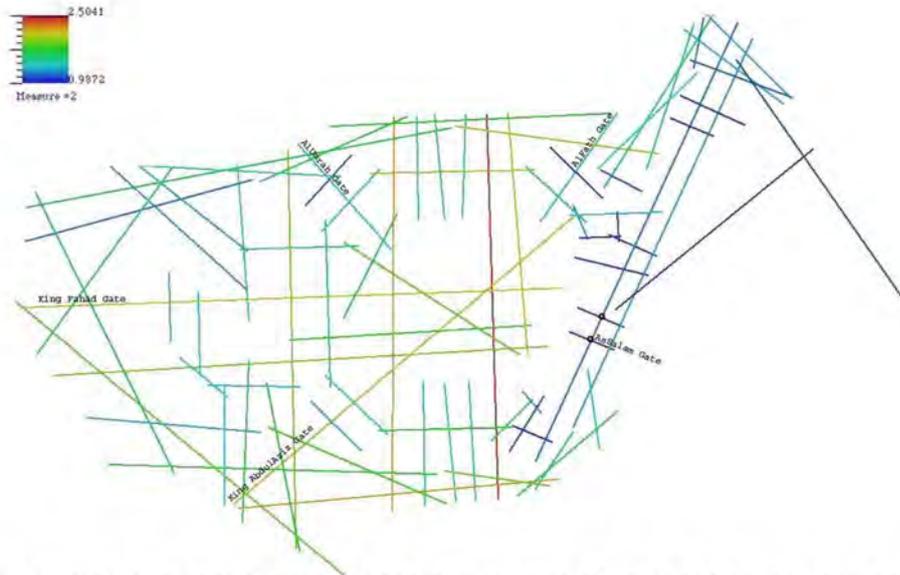
Figure 7- 22: Axial line analysis graph of the second model of the Holy Mosque, showing the axial line local integration.

7.3.3. Visual Graph Analysis

I employ the Isovist concept to help identify the integrated, most visible areas, as well as the most segregated, hidden areas at the Holy Mosque. The *Depth Map* program is used to run the process. The process was run for all the floors of the Holy Mosque building. This was done so that multiple results could be obtained from these analyses.

Starting with the analysis of the basement floor, it shows the western section of this floor in red is the most integrated section, and the northeast and southeast sections are the most segregated parts of the floor as depicted in Figure 7-23 A.

The VGA graph of the ground floor of the Holy Mosque, for example, has indicated that the western section of the *Mataf* area, the central courtyard in red, is the most integrated area of this floor. In contrast to this, the female praying areas inside the building, the *Mataf* area, and most of the Mas'a area, all shown in blue, are the most

hidden areas of the complex. Also, among the surrounding free areas, the western and the southwest areas in red are the most integrated areas around the mosque building, and the northeast and southeast areas in blue are the hidden areas, as shown in Figure 7-23 B. However, when excluding the external surrounding free areas, the *Mataf* became the most visible area in the Holy Mosque complex as shown in Figure 7-24.

The VGA of the upper floor of the Holy Mosque indicates that the western section of the floor, in red, is the most integrated area of this floor. While, some parts of the northern section and the southern section, in blue, of the floor are the most segregated area of the floor as shown in Figure 7-23 C.

The Visual Graph Analysis of the roof terrace floor shows that the western section of the roof terrace in red is the most integrated part of the floor. In addition, the eastern section of the floor closest to the Mas'a area in blue is also part of the most integrated area of the roof terrace floor.

As a result, due to the use of partitions for the female praying area to give them more privacy, most of the segregated areas on all of the Holy Mosque's floors are female praying areas. Equally, the stairs and the escalator areas also have the most segregation. The western parts of the building and its surrounding areas are indicated as the most integrated areas in the Holy Mosque's VGA results.
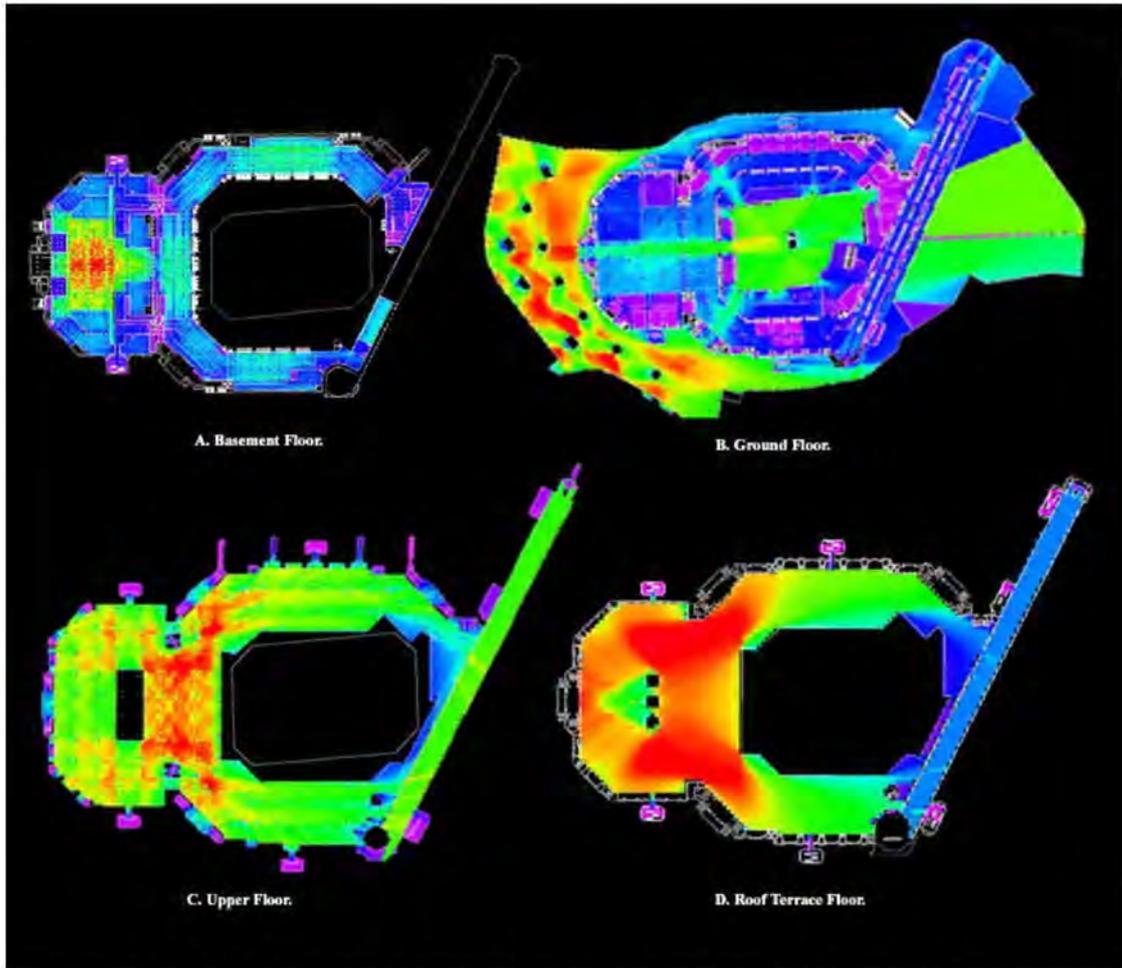
Figure 7- 23: A graph of the Visual Graph Analysis of the Holy Mosque's floors.
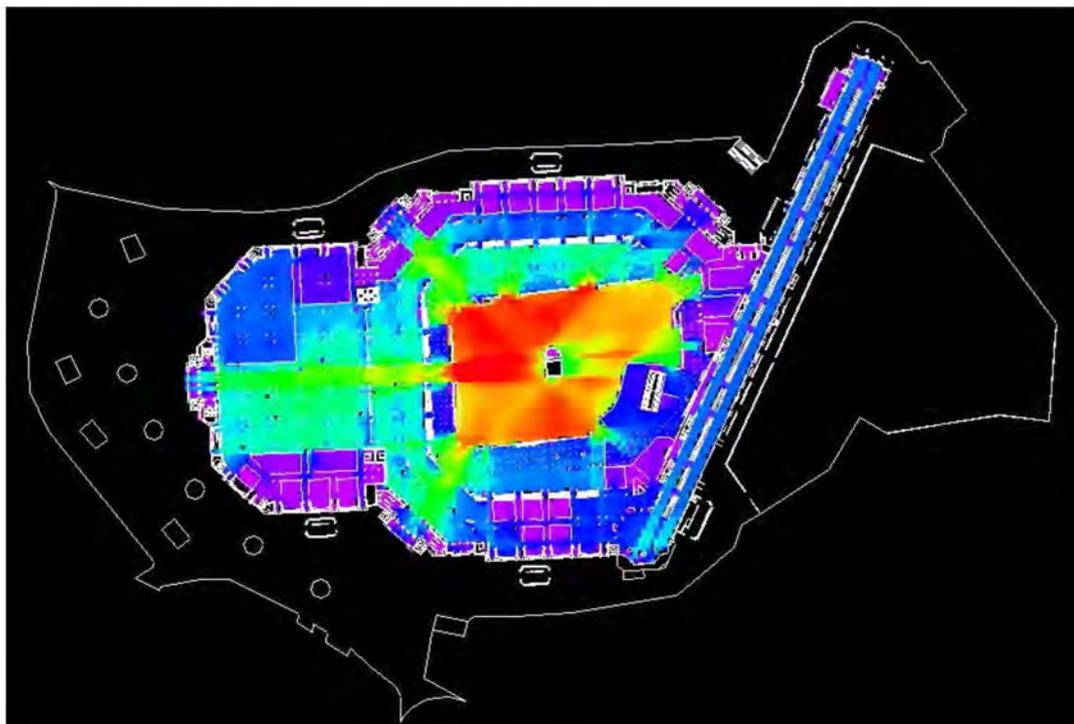
Figure 7- 24: A graph of the Visual Graph Analysis of the ground floor of the Holy Mosque excluding the surrounding free areas.

7.4.   Calculation for evacuating the Holy Mosque building:

In order to calculate the actual time to evacuate the mosque building, several issues must be addressed. Total area, walking speed of people and the distance to exits are some of the factors that will strongly affect the evacuation process of the Holy Mosque building.

The level of service "E" is the proper level of service to be applied in the case of the Holy Mosque; the average speed of this level of service is less than 46 metres per minute, and the people flow is less than 82 persons per minute per metre.

The following calculations were made on the assumption of the highest possibility on this level of service:

7.4.1. Calculation for evacuating the basement:

Total capacity of the floor = 52800 persons.

Total number of exits leading directly to outside = 9 exits, with total width = 32.70 metres

Total number of exits to the ground level of the building = 20 exits,

Total width = 168.30 metres

$$\text{Total flow to outside of the building} = \frac{\text{total exit width}}{82} \times 100 = \frac{3270}{82} \times 100 = 3987.80 \, \text{p/m}$$

$$\text{Total flow to the ground floor} = \frac{16830}{82} \times 100 = 20524.39 \, \text{p/m}$$

$$\text{Total time to evacute the floor} = \frac{\text{Total capacity of the floor}}{\text{total people flow}} = \frac{52800}{3987.80 + 20524.39} = 2.15 \, \text{min}.$$

Total number of people evacuated to the ground floor

$$= \text{total flow to the ground floor X total time of evacuation}$$

$$= 20524.39 \times 2.15 = 44210.15 \, \text{person}$$

7.4.2. Calculation for evacuating the ground level:

Total capacity of the floor = 142208 persons.

Total number of people from other floors = 44210.15 + 91520 = 135730.15 persons

The total number of people to evacuate = 142208 + 135730.15 = 277938.15 persons

Total number of exits to outside on the floor = 60 exits, total width = 166.05 metres

$$\text{Total flow of people} = \frac{16605}{82} \times 100 = 20250 \, \text{p/m}$$

$$\text{Total time to evacute the level} = \frac{\text{Total capacity of the floor}}{\text{total people flow}} = \frac{277938.15}{20250} = 13.73 \, \text{min}.$$

7.4.3. Calculation for evacuating the upper level:

Total capacity of the floor = 91520 persons.

Total number of exits to outside the building = 18 exits, total width = 43.40 metre

Total number of exits to the ground level of the building = 21 exits,

$$\text{Total width} = 50.70 \text{ metres}$$

$$\text{Total flow to outside the building} = \frac{\text{total exit width}}{82} \times 100 = \frac{4340}{82} \times 100 = 5292.68 \text{ p/m}$$

$$\text{Total flow to the ground floor} = \frac{5070}{82} \times 100 = 6182.93 \text{ p/m}$$

$$\text{Total time to evacute the level} = \frac{\text{Total capacity of the floor}}{\text{total people flow}} = \frac{91520}{5292.68 + 6182.93} = 7.98 \text{ min.}$$

Total number of people evacuate to the ground floor

$$= \text{total flow to the ground floor} \times \text{total time of evacuation}$$

$$= 6182.93 \times 7.98 = 91520 \text{ person}$$

7.4.4. Calculation for evacuating the roof terrace:

Total capacity of the floor = 96800 persons.

There is one exit; its width is 15 metres. Its total flow $= \frac{1500}{82} \times 100 = 1829.27 \text{ p/m}$

Total number of escalators = 30 escalators; total width is 30 metres.

The total flow of each escalator is 83.33 per minute.

The total flow of escalator = 83.33 X 30 = 2499.90 p/m

$$\text{Total time to evacute the level} = \frac{\text{Total capacity of the floor}}{\text{total people flow}}$$

$$= \frac{96800}{1829.27 + 2499.90} = 22.36 \text{ min.}$$

7.4.5. Additional calculations:

The observation of the Holy Mosque gates, which is discussed earlier in Chapter 6, gave the following results:

o The maximum number of people flow was recorded at 1456 people in five minutes on the middle bay of King AbdulAziz gate (gate number 1).

o The highest flow of the gates which was recorded on the middle bay of King AbdulAziz's gate $= \dfrac{1456/5}{2.55} = \dfrac{291.20}{2.55} = 114.20 \text{p/m/m}$

It is 22.20 p/m/m higher than the level of service "E".

o The average flow of worshippers over the Holy Mosque exits recorded in five minutes is 692.94 people /gate. It indicated that the average flow of people =

$\dfrac{692.94/5}{2.55} = \dfrac{138.59}{2.55} = 54.35 \text{p/m/m}$

This still gives an indication of the level of service "E" that has an average flow more than 46 and less than 82.

7.5.   A Model for the movement at the Holy Mosque.

Activity performed at the Holy Mosque building must follow a specific path. This is especially the area of *Tawaf*, *Sai'* and to a lesser degree on other activities as it was discussed in Chapter 4. However, because of the location of the fixed elements inside

the Holy Mosque building, the movement pattern between two activities, or during the performance of an activity that requires movement, creates an overlap of movement with each other as shown in Figure 7-25.

Figure 7- 25: A graph showing the most efficient routes for fixed activities inside the Holy Mosque building with the location of the fixed elements and the most convenient gates allocated. Praying could be performed at any place inside the mosque however, the green sites is the assigned area for praying.

7.6. Summary:

Several points could be drawn out from the spatial analysis of the Holy Mosque building, as two axial line models were created to reflect the uses of the spaces inside the Holy Mosque building; in order to help us understand the spatial configuration of the Holy Mosque system. Contrary to convention expectations, axial lines of some gates were found to be the most connected axial lines. Such as the axial line of gate no. 94 in the first axial line model, Most of these axial lines, like the axial line of gate no.94, are also the more integrated gates than others such as the axial line of King Fahad gate which is changed in the second axial line model.

However, the King Fahad Gate's axial line has the highest value of integration among other axial lines of the system, in the first axial line model, which gives this gate some importance, since it will give the best accessibility to the Holy Mosque system.

We also found out that, the Holy Mosque, in relation to the grid system of the central area of the city of Makkah, is strong. Due to the fact that the location of the Holy Mosque building changes the integration values of some axial lines at the centre of the city and it improves the connectivity of the central axial lines.

Worshipers may find some difficulties while they are moving between performance areas, whenever the connection between these areas that are as a matter of fact, supposed to be integrated are in reality identified as being segregated areas. These segregated areas that are depicted in dark blue in the Visual Graph Analysis are warning in respect of security at the Holy Mosque.

On the other hand, the layout of the Holy Mosque building is muscularly affected by the axial line models and the y-map which increase the deformation value of the Holy Mosque grid system. This, I think, is a main cause that results in the misunderstanding of direction of information system of the Holy Mosque, which make it easy for worshippers to get lost inside the Holy Mosque building.

Movement calculations indicate that in the existing situation of the Holy Mosque, the building requires a long time to be evacuated, than should have been expected under a conducive circumstances. In addition, the movement inside the building for the performance of religious activities tends to creates additional overcrowding areas.

It is hoped that all information gained from the collected data and analyses, will build a base of knowledge that will aid the authority in charge of the management of the Holy Mosque. The information produces a wider view of the overcrowding problem in the Holy Mosque building and I shall use this information to draw useful recommendations to help provide a comfortable atmosphere for worshippers in the pprocess of perform their religious duties.

8 Analyses of Findings

8.1.   Introduction

8.2.   Overcrowding at the Holy Mosque

8.2.1. Places where the overcrowding problem occurs.

8.2.2. Times when the overcrowding problem occurs.

8.3.   Causes of the Overcrowding Problem at the Holy Mosque

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8.3.2. Spatial factors

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8.4.1. Health and safety.

8.4.2. Functional efficiency.

8.5.   General Discussion

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8.6.   Conclusion.

8 Analyses of Findings

8.1.   Introduction:

This chapter discusses the findings of the study. It is divided into four sections in order to answer the stated objectives. The first section focuses on the problem of overcrowding in order to find out where exactly the overcrowding problems occur, and when the problems occur. In addition, it uncovers the extent of the overcrowding problem. The second section is focused on the causes of the overcrowding problem at the Holy Mosque. It will discuss the relation between impact of human behaviour and the spatial factors. The third section is focused on the likely implications of the overcrowding problem. It relates health and safety issues to the performance of the various activities in the popular spaces of the Holy Mosque. The last section focuses on the wider context of the findings, such as the nature and extent of the overcrowding problem and the causes of the overcrowding problem in the Holy Mosque.

8.2.   Overcrowding at the Holy Mosque:

The overcrowding problem at the Holy Mosque appears to be the main problem at the Holy Mosque, since this site is at a point of crisis. This section aims to find out the exact nature and extent of the overcrowding problem at the Holy Mosque.

The crowd definition (see Chapter 3) that been found to be a socio-physical concept. Socially, it seems to be a gathering of people under certain circumstances of time, place,

area and cause. On the other hand, physically, when an individual is crowded and lose the control are the selection of people allowed within his/her personal space. He/she needs more physical space and the design standards is exceed and the people density on the gathering area is became high. Moreover, as the situation go beyond this point it will be an overcrowding as the definition of the level of spaces is destroyed and the person has no longer control on any space, even the intimate space. It is noted that there are variations in the social definition of crowd from person to another, also between cultures.

In order to understand this matter, two questions should be answered regarding the place and the timing of the problem. These are: Where does the overcrowding problem occur at the Holy Mosque? And, When does the overcrowding problem occur? These questions will be discussed in the following sections.

8.2.1. Places where the overcrowding problem occurs at the Holy Mosque:

The Holy Mosque's access points, the entrance gates, are found to be a major overcrowding 'hotspot' at the Holy Mosque. Religious concerns affect human behaviour in the choice of entering and exiting points. It has been found that about 12% of the research sample chose their entrance and 6% chose their exiting points exclusively because of religious considerations. On the other hand the effect of the surrounding built environment in this matter is reflected the concept of the architecture and spatial relationships (see Chapter 2). It was found that about 74% of worshippers chose their entrance, and 71% chose their exiting points, with regard to the surrounding build environment. It was found that about 1% of the research sample chose their entering and about 9% chose their exiting gates because of overcrowding concerns. The difference in

the last two percentages could be considered to be the difference in the amount of people who are using the same point to enter or to exit the Holy Mosque building as shown in Figure 6-18 which reflects a particular observation period. The entering process was found to be a building-up procedure and the exiting process is mostly the opposite procedure which started from a large number an reduced to a small number. It causes people who are aware of overcrowding to find a better exiting point.

One of the gates most preferred, *AsSalam* gate, is located at the *Masa'a*[3] area and the flow of entering and exiting people crosses the flow of people who are performing *Sai'*[4] on the ground floor of the Holy Mosque as shown in Figure 7-16. As, AlQaradawi pointed out in his interview with the researcher, that worshippers should not force themselves to enter from a particular gate if there is any difficulty such as overcrowding or distance.

Since the male prayer area is about 65% of the assigned praying areas of the ground floor of the Holy Mosque and female worshippers have their unisex gate, which only female worshippers can use, and they have access to 100% of the Holy Mosque gates, the average speed of movement on the female only flow are less than other gates as shown in Figure 6-18. Gates 1C, 45C, 62C and 79C are female only gates; in addition to these gates, there are some others that are located next to female prayer areas which are shown in Figure 4-37.

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[3]. It is the place between the *Safa* and the *Marwah*, it is the place where worshippers perform the *Sai'*
[4]. It is the action of walking between *Safa* and *Marwah* seven times.

The graphical analysis which understood from Figures (4-28, 6-63 and 6-79) indicating that the most overcrowded area inside the *Hijr*[5] is the closest area to the Sacred *Ka'bah* which strongly reflects the Prophet's (pbuH) saying to His wife (mAbpwh) which indicates that the closest place to the *Ka'bah* is to be used as a part of it as discussed in Chapter 4.

The east section of the *Mataf*[6] area has been found to be the most overcrowded part of the *Mataf*. This matter is caused by the location of most of the fixed elements at this section of the *Mataf* that attract worshippers to visit and perform certain religious ritual duties as shown in Figure 4-25; in addition, the movement between these elements during the visit or the performance of any ritual activity, especially the movement after *Tawaf* toward the *Masa'a*, as shown in Figure 7-16, creates additional movement which will increase the density in this area and cause an overcrowding risk as shown in Figure 8-1.

The analysis of the Holy Mosque's spatial configuration in relation to other evidence as shown in Figure 8-1, indicates that the most integrated places are the areas at the axial line of gate no. 94, at the western area of the Holy Mosque and the southern free area.

The difference between the prediction of the axial lines analysis, as shown in Chapter 7, and the actual observations results, which are shown in Chapter 6, will be considered as the causes that affect the natural movement of worshippers at the Holy Mosque which will be discussed in the following section.

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[5]. It is the semi-circular place at the north-east side of the sacred Ka'bah.
[6]. It is the internal courtyard at the Holy Mosque where worshippers perform *Tawaf*.

Figure 8-1: The plan of the ground floor of the Holy Mosque showing the global integration (Rn) of the axial lines model of the Holy Mosque (coloured lines), the identified overcrowding places at the building (in red) and the movement pattern of worshippers while they are performing their activities (with black arrows).

As was described in earlier Chapters, according to Table 4-1 and 4-4 and to the design standards shown in Figure 4-4, 4-5 and 4-6, and in addition to the Holy Mosque floor plans that are shown in Figure 4-37, 4-38, 4-39 and 4-40, the Holy Mosque could occupy more than five hundred thousand worshippers at one time. Overcrowding at its gates is the most visible problem even though the building has more than a hundred gates.

The overcrowding problem is a common problem that occurs mostly at the Holy Mosque gates in addition to some of the more attractive focal elements inside the Holy Mosque that are shown in Figure 4-25. However, not all of these elements are found to be overcrowded sites. In addition, and according to the observation and survey, overcrowding problems do not occur at all these sites. This problem is found to be most difficult at the Black Stone, The Maqam Abraham, The Multazam, the closest part of the

Hijr to the Ka'bah and at the King Fahad gate, King AbdulAziz gate and AsSalam gate in addition to the route from the Mataf to the Masa'a as shown in Figure 8-2.
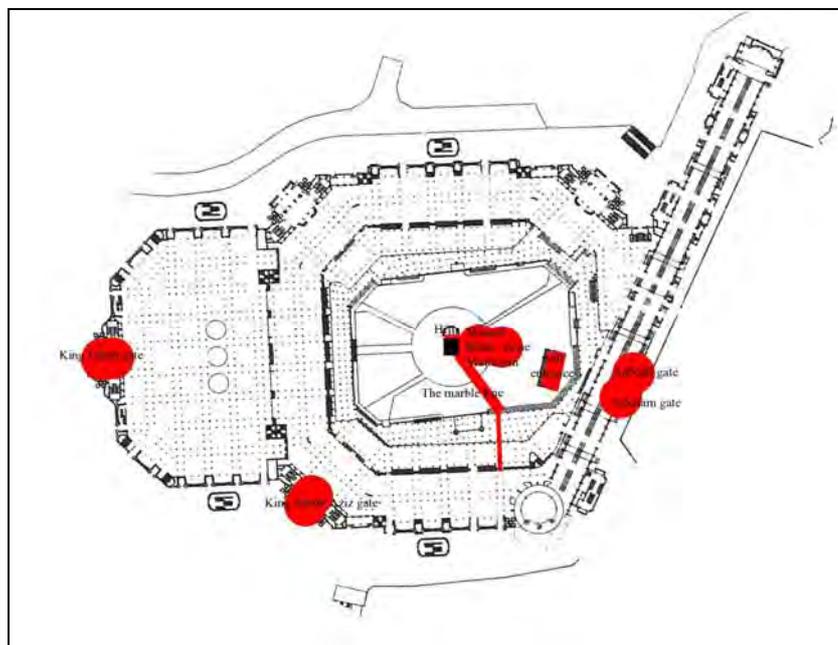
Figure 8-2: The ground floor plan of the Holy Mosque building showing the critical overcrowding points.

8.2.2. The Times when the Overcrowding Problem Occurs:

The overcrowding problem based on the occupancy of the Holy Mosque building could be assumed to be a daily and hourly problem. However, according to the findings in Chapter 6, the overcrowding problem inside the Holy Mosque building occurs in all seasons throughout the mosque's spaces, during praying times, as is shown in Figures 3-1, 6-35, 6-36 and 6-38. Moreover, this crisis that occurs at other times could be shown at the foci in the seasons' periods shown in Table 6-2 and also in Figure 8-3, which has been developed based on the interview results and the study of questionnaire.
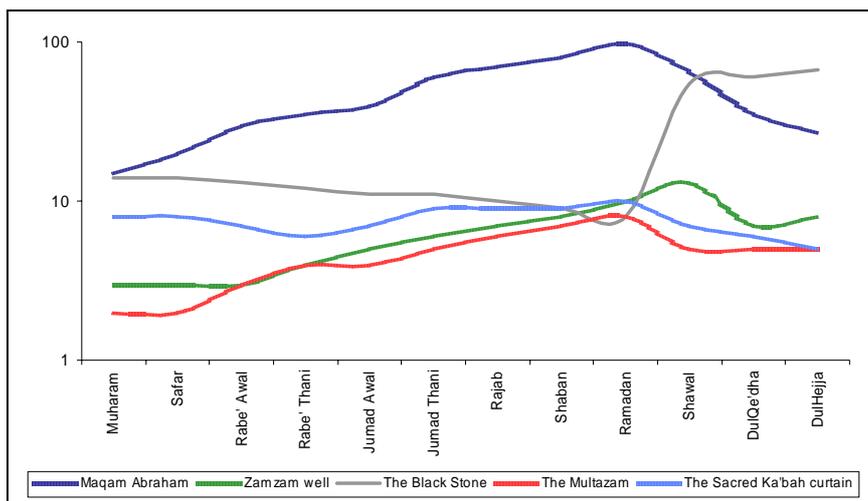
Figure 8-3: The overcrowding at the fixed elements inside the Holy Mosque over the full Arabic calendar year.

In addition, the overcrowding problem at the Mataf area was found to be the major problem in the last ten days of the Ramadan month, as well as to the 12th of *DulHejah*[7], as was discovered by the observations and confirmed by the former Commander of the Holy Mosque Force.

A part from the overcrowding inside the Holy Mosque building, the overcrowding problem at the gates is shown mostly after each prayer time in busy seasons as shown in Figures 6-19, 6-20 and 6-21 this was also pointed out by Sami Barhamin when he said: "The overcrowding problem is recognizable in peak time only." This overcrowding is due to the high demand on the gates, according to Husam AbdulSalam, and not due to the limited number of gates. Samir Aashi agreed, on the other hand, Usama AlBar, a former Commander of the Holy Mosque force department, argued that this overcrowding is due to the deficiency of the number of gates at the Holy Mosque.

According to mosque design standards, which were discussed in Chapter 4, the Holy Mosque could accommodate more than five hundred sixty thousand (560,000) worshippers to perform prayers at the same time. However, according to the movement

standards, which were discussed in Chapter 2, the average flow of people categorised the overcrowding problem at the Holy Mosque gates to the *level of service* 'E', see Chapter 2 and 7, and the overcrowding shown in the study illustrations, as shown in Figures 3-1, 6-67 and others, showing the destroying of individual personal space into a territory space, as described in Chapter 2 and 3, had identified the Holy Mosque case as the *level of service* 'F', see Chapter 2.

To illustrate the extent of the overcrowding problem in some areas inside the Holy Mosque, which will give a general understanding of the Holy Mosque situation, the analysis of the overcrowding at the Black Stone area (reported in Figure 6-67) will suffice. It shows a density of 12-15 persons/meter^2 at that area at a given moment, which means that each person is given about the area of the level of service '*E*' shown in Figure 2-2 and the intimate space of each person been destroyed. Since the study survey indicated that about 27% of worshippers prefer to visit the Black Stone (as shown in Table 6-2) it translate into a great number of people considering the total capacity of the Holy Mosque building, more than fifty thousand (50,000) worshippers. This situation appears to be similar at other sacred spots within the Holy Mosque buildings such as the Multazam, The *Hijir*, and the *Maqam Abraham*.

Another example is the overcrowding at the gates. It has been found by the research survey that about 26% of worshippers prefer to pray at the gate areas (see Figure 6-35). This causes the overcrowding and blocking of the gates as shown in Figure 6-19 and 6-20. It reflect the highly demand on that praying area which will identify it as an overcrowding area at the Holy Mosque. This describes the situation of the overcrowding problem at certain identified points in the Holy Mosque.

[7] . The last month in Arabic calendar.

8.3.   Causes of the Overcrowding Problem at the Holy Mosque:

The general improvement in the economic conditions and the increase in the number of Muslims all over the world wishing to visit Makkah are contributing to the overcrowding problems at the Holy Mosque. This section will discuss the specific causes of the overcrowding problem at the Holy Mosque in order to find an answer to the research question, which is, "what are the possible causes of the overcrowding problem?"

8.3.1.   Human Behaviour:

The study found that, in addition to the affects of the age, gender and other social characteristics, the activity to be performed will powerfully affect the behaviour of worshippers at the Holy Mosque (Chapter 6.) As an example, it is shown in Figure 6-4; that females do not go into retreat at the Holy Mosque at any time of the year and yet it is the third most performed activity by males after Umrah and obligatory prayers. Moreover, it has been found that the majority of female worshippers came to the Holy Mosque in company with their families, as shown in Figure 6-5, whereas most of the male worshippers arrive at the Holy Mosque alone. In addition, it was found that the preferred entry gates seem to be mostly the same for both genders, as shown in Figure 6-16. However, the reasons behind that are different, as indicated in Figure 6-17. Overcrowd factor is raised by females as a factor affecting their choice, but it seems not to be a factor affecting male choice. Moreover, the Multazam is not a preferred place to visit for female worshippers and for worshippers of the age of 35 years or more, as shown in Figure 6-64. On the other hand, the black stone is the most preferred place to visit for

illiterate worshippers and the Maqam Abraham for most other worshippers, as seen in Figure 6-66.

Apart from the Islamic commands, weather considerations and overcrowding were found to be the two main factors that affected the choice of place of praying at the Holy Mosque. However, time of arrival at the building and the place of praying are shown strongly to influence the choice of entering and exiting gates, which affects the time it takes to leave the mosque. Ahmed Ruzman stated, (see the interview in Chapter 6) that the Malaysian pilgrims stay inside the Holy Mosque for a period of time after praying until the overcrowding problem at the Holy Mosque gates discharges, then they leave the building.

Crowding is not the only factor that affects human behaviour in religious buildings, as was found in chapter 6. However, it still remains one of the main factors that affect the behaviour of worshippers in the Holy Mosque building when choosing their preferences for the access gates, place to pray, time to do certain activities and several other issues. It was found to be the second most important factor affecting the arrival time at the Holy Mosque, as shown in Figure 6-10. In addition, it was found that about 9% of worshippers who have a preferred gate to exit from had made their choice because of the overcrowding crisis which is indicated in Figure 6-26. Moreover, overcrowding is one of the main factors affecting the choice of the praying place, as shown in Figure 6-36. On the other hand, it remains the main factor affecting worshippers of both genders who perform the Tawaf activity, in all age groups throughout the year, as shown in Figure 6-39.

The high number of people who stop to pray at the gate areas as shown in Figure 6-19 and 6-20, rather than passing quickly, is the first factor that causes overcrowding at the Holy Mosque's gates; since the nature of Muslim prayers requires prostration, this takes time. Second, some worshippers prefer to leave immediately after prayer thus increasing the localised traffic. The third reason is that every worshipper is supposed to take his or her shoes off before entering any mosque in order to keep the building as clean as possible, which creates a traffic jam and delays the entering process. Fourth, people are using the spaces outside the Holy Mosque, which are close to its gates, as meeting areas after prayer. The final factor is that some worshippers also want to enter the Holy mosque after prayer for other activities such as *Umrah*[8] or *Tawaf*[9] while others are exiting. Most of those factors are shown in Figure 7-16 which also shows the overcrowding at King Fahad Gate, one of the main gates at the Holy Mosque.

Worshippers performing the duty of *Umrah* was found to be the main activity at the Holy Mosque, which had been recorded by 46% of worshippers as shown in Chapter 6. The *Umrah* duty includes the performance of *Tawaf*, praying at *Maqam* Abraham and *Sai'* as shown in Chapter 4; it could be assumed that this describes clearly what Allah, the Almighty, said in the Holy Quran when ordering Prophet Abraham, pbuH, ""*And when We showed Abraham the site of the House, Associate not anything with Me, and sanctify My House for those who circumambulate it, and those who stand up, and those who bow, and make prostration*" [22:26][10], This is discussed in Chapter 4 and identified as the first activity to be *Tawaf* which is a part of *Umrah* activity, as mentioned before. This activity is recorded more in the Ramadan season than others. In the Hajj season, the performance of obligatory prayers was reported as the most performed activity. It was found (see

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[8]. It is the performance of *Tawaf* and *Sai'* together in a particular religious order and process.
[9]. It is the circumambulation of the *Sacred Ka'bah* seven times.

Chapter 6) that most worshippers arrived a long time before *Adhan*[11] especially those who are performing *Umrah* duty, since it takes time. Worshippers who want to perform other activities such as obligatory prayers arrive at the Holy Mosque before *Adhan* or at *Adhan* time, as shown in Chapter 6, for the main reasons of crowding and religious considerations.

Worshippers are influenced by many factors in their choice of access point to the Holy Mosque system; religious considerations factor is one of the most important reasons as shown in Chapter 6. On the other hand, in most of the architectural environment, the form of the building and it facilities enable the users to practice their religious ritual duties. However, at the Holy Mosque building, no symbiotic relationship could be found between the users' behaviour, the layout and the sequence of activities, as the built form does not help the worshippers in their duties. This reflects the individuality of this mosque and its unique activities that distinguish it from other religious buildings in Islam. For example, the behavioural analysis indicated that the *AsSalam* gate is one of the most used gates at the Holy Mosque and the preferred gate at many times throughout the year. This gate, *AsSalam* gate, is a one bay gate; where as , some other less preferred and less used gates such as Al*Umrah* gate are three bay gates.

Among worshippers' attitudes, religious considerations were found to be the most affective factor in addition to the others such as weather considerations, crowding and the surrounding built environment which affect the worshippers behaviour inside the Holy Mosque building.

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[10]. *The Holy Mosque Qur-an: English translation of the meanings and Commentary*, 1990, p.956.
[11]. The call for obligatory pray.

8.3.2. Spatial factors:

During the practicing of *Tawaf* - as worshippers have to move from the *Mataf* area toward the *Masa'a* to complete the performance of *Umrah* by finishing the *Sai'*, which is shown in Figure 7-16 - worshippers should travel between two semi-integrated areas, the *Mataf* and the *Masa'a*. This travel should be done, as the physical environment of the building allows, through a highly segregated area as shown in Figure 7-9 B, C and 7-16 and more clearly in Figure 8-1.

Spatial configuration analysis (Space Syntax) indicates that King Fahad gate is an integrated gate. It is also a preferred gate used by about 12% of the worshippers, (see Figure 6-25) according to the questionnaire, on the other hand, *AsSalam* gate, which is one of the most segregated gates in the Holy Mosque axial lines model, is the second most popular gate, found to be preferred by about 14% of worshippers. The axial line model had indicated that the most integrated axial line is the axial line of gate no. 94, as shown in Figure 7-9A, which was found to be preferred by only about 2% of worshippers.

The sequence of activities in relation to the 'plan' is another aspect where the building's physical layout does not support the performance of the activities, as shown in Figure 8-1. For example, during the process of *Tawaf* and the completions of *Umrah*, or, with the visits to any of the fixed elements at the *Mataf* area. The overlapping pattern of the processions related to the various activities and the fixed relic sites, which cannot be changed, demonstrate this problem, as shown in Figure 7-16 and in Chapter 4.

It reflects the overload of the Holy Mosque gates at the ground floor by worshippers from the upper floor and roof terrace. However, prayers at the roof terrace have a choice to use either the external escalators or the internal stairs. Moreover, there appear to be no strong relationships to be found between the place of praying and the floor of *Sai'*, a good distribution of the worshippers on each floor and on each praying area.

The development of the Holy Mosque building overtime has been affected by the fixed relic inside the Holy Mosque and the rites performed, which have led to the cause irregularity in the Holy Mosque building shape. This is reflected in the spatial analysis, as the grid system of the Holy Mosque was found to have a great deformation based on the calculations as the grid axiality = 0.389, and it has a great break up as the convex articulation = 3.639 and the axial articulation = 1.108. There is a little deformation on the grid system which is indicated by the grid axiality = 1.059. Those break-ups and deformations in the system could be reduced by reducing the number of the convex spaces if the praying areas were rearranged.

The Holy Mosque guards indicated, in "off the records information", that most of the recorded mugging and robbery incidents were found to take place at the female praying areas that are identified as a segregated area by the isovist analysis which is shown in dark blue and purple in Figure 7-15.

On the Holy Mosque's axial lines model, the *Mataf* axial lines have been found to be more integrated than the system of the Holy Mosque as shown in Figures 7-9 and 7-10 F. The integration value of the *Mataf* axial lines, $R^2 = 0.8602$, are higher than the value of the system, $R^2 = 0.4397$ which reflects the intelligibility of this area to the complete system, which has accessibility to many parts of the system.

In addition, the correlation graphs of the spatial analysis of the Holy Mosque system is shown in a comparison analysis of the major gates of the Holy Mosque, As can be seen in Figure 7-10 A-E. King Fahad gate, no.79, has the highest integration value over other gates, $R^2 = 0.8734$. On the other hand, Al*Umrah* gate has the second highest value of integration, $R^2 = 0.6244$, although both gates are not preferred gates at any time of the year. However, King Fahad gate is the third most used gate of the Holy Mosque.

The consequence is that the surrounding environment of the Holy Mosque is found to be the most compelling factor in the worshippers' choice of access gate; it has been shown that the majority of worshippers choose their entering gate because of this urban context, 35%, by the location of their houses; 20%, by the location of car parking; 14%, by the location of bus station, and 2% by the location of shopping centre. This fact suggests the possibility of improving the segregated gates, increasing the level of service of the unusable gates and reducing the traffic at high density gates, which will help to distribute the worshippers more evenly within the praying areas inside the Holy Mosque. At the same time it will help to improve the architectural environment of the areas adjacent to the integrated gates.

As in the *Space Syntax Laboratory* case-study of Trafalgar Square, with the city of London axial line map,[12] The Makkah axial lines models reflect the concept of centrality cities which is shown in Figure 7-12. Moreover, Mir Azim Zadah has described the concept of the central city and the *Bazar*[13]; there are some differences found with the case of Makkah but the concept of the central axial line remains. In addition, it could be

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[12]. Hillier, B., *et al, From Research to design,* 1998, p.3.
[13]. Zadah, Mir Azim. *Evolving urban culture in transforming cities*, 2003.

assumed that if the whole axial lines model of Makkah city was built, it will have similarities with the organic city which was described by Kayvan Karimi.[14]

On the other hand, the lightly integrated axial lines, (which means that this axial line is semi-integrated with the Holy Mosque axial lines system and does not have a high intelligence to the system), located at the western side of the mosque are not affected by the Holy Mosque; however, the axial lines that are located on the eastern side of the mosque are affected by the Holy Mosque as shown in Figure 7-12 and 7-13, as it has been changed from strongly segregated axial lines to semi-integrated axial lines. The axial lines of the southern section of the second ring road of Makkah are more integrated than other parts of the ring road as shown in Figure 7-12 A, in addition, these axial line integrations are not affected by the Holy Mosque.

The Holy Mosque axial lines are strongly affected by the surrounding built environment as shown in Figure 7-12. The western axial lines of the Holy Mosque are more integrated than the eastern. However, the northern axial lines which are semi integrated in *Global* integration models of the central area of Makkah are less integrated in the Holy Mosque axial line *Global* integration model. These axial lines which reflect the northern access to the mosque building are the least used gates which is found in the site observation in Chapter 6 and none of these gates is a preferred access in entering or exiting procedures of the Holy Mosque, which has been drawn out from the study questionnaire.

Spatial analysis of the Holy Mosque found that there are some differences between the Axial line model of the Holy Mosque and the actual observation of the Holy Mosque gates, which represent the existing situation of worshipper behaviour and gate use.

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[14]. Karimi, Kayvan. *Continuity and change in old cities*, 1998.

Moreover, it was found, due to the shape of the Holy Mosque building, there is a great deformation on the axial line model. On the other hand, the performance of the activities that need movement are not supported by the building layout as discussed earlier.

8.4. Likely Implications of Overcrowding:

In a building such as the Holy Mosque, it is important to find and predict the likely implications of overcrowding, because it would help with the efficient management of such a complex mixed-culture environment. The following sections will discuss some of these matters in relation to the described standards and theories.

8.4.1. Health and safety:

Studying natural disasters, such as floods, and man-made incidents, such as terrorism, helps to predict the likely implications for the crowded Holy Mosque site. A full list of historic incidents that occurred at the Holy Mosque and Makkah, which has been added as Appendix A, showing the loss of life and damages to the Holy Mosque building. On the other hand, there are frequent incidents reported by the Holy Mosque Force Department that involve wheelchairs at the Masa'a area, mentioned Chapter 4 and 6.

- *Natural Incidents*: these are mostly concerned with the likely implications of natural events, such as earthquake, rain, flood or lightning strike, causing panic and the surge of crowd movement towards. In such instance, slipping problems may occur and are a critical issue of concern since this may cause blockages of the egress toward escape routes.

The many diseases that were recorded in Makkah history occurred mainly during Hajj seasons, as shown on Appendix A, the overcrowded environment providing a fertile breeding ground for many diseases to become an epidemic. This was the case in the great Cholera outbreak of 1865, which was caused by pilgrims from Indonesia.

- *Artificial or Man-made Aspects*: As in the case of natural events, panic may occur during artificial incidents such as fire or war and aggression. Even though the Holy Mosque building has limited furniture, and lighting a fire is prohibited inside the building, several fire incidents have been reported, as shown in Appendix A. On the other hand, the only fire incident to occur inside the Holy Mosque building was about twelve hundred years ago which destroyed some parts of the building. However, this issue remains a concern due to the usage of the electricity.

Terrorism is a critical area of concern in overcrowded environments all over the world. In the history of the Holy Mosque, several incidents were reported, as indicated in Appendix A, when many people died. The last reported incident in this category occurred about twenty five years ago, with several worshippers killed and hundreds kept as hostages. This type of event leads to a serious problem in overcrowded conditions which could cause panic and increase the number of dead in the Holy Mosque, as at any overcrowded gatherings throughout the world.

The large number of worshippers who gather at the Holy Mosque increase the space density and categorize the Holy Mosque space, according to the *Highway Capacity Manual* (1965) as requiring level of service "E". The normal walking speed of all people is restricted and the pedestrian space is less or equal to 1.83 meters and the flow rate is

less or equal to 45 p/m/m, from the calculations which were made of the average of flow of people entering and exiting the Holy Mosque, (see Chapter 7.)

According to Table 2-2, following these calculations, the Holy Mosque exits should have about 29.79 kilometres in total width. It means that even if the Holy Mosque had no walls it would not be enough to qualify with those standards. This does not, however, mean that the Holy Mosque building is not a safe building for its visitors. In fact, it has a very good treacle record considering that even some public buildings in Western countries that qualify with these standards have had a high number of victims in cases regarding escapes, as will be shown later in this Chapter.

Moreover, according to Table 2-1 the Holy Mosque should have about 1104 exits as shown below:

$$\text{The total number of exits} = \frac{548720 \,(\text{the capacity of the Holy Mosque} - 12000)}{500} + 7$$
$$= 1104 \,\text{exits}$$

The calculation further indicated that more than 45 minutes is needed to evacuate the Holy Mosque building, in the existing situation. However, it was stated by Usama Albar and Sami Barhamin that due to the overcrowding problems at the Holy Mosque currently need about 60 minutes are needed to discharge, in peak time, and about 45 minutes according to Husam AbdulSalam. The highest flow of people that was recorded by us on the most popular gates, King AbdulAziz gate, is 114.20 persons/minute/meter which is higher than the average flow of people of *level of service* "F" (see Chapter 2). On the other hand, the total average of people flow recorded is 54.35 p/m/m which is about 8 p/m/m more than the minimum flow of *level of service* 'E'. For comparison, Keith Still

indicated the amount of flow of people at Gate 'C' at Wembley stadium as 660 people per hour per turnstile, which is about 10 gates.[15] And he considered that situation to be safe. However, at the Holy Mosque, the average flow of people currently is more than the Wembley Stadium example and the situation could be considered critical at some points where the average of flow was found to be the highest, such as King AbdulAziz gate and AsSalam gate (see Chapter 6 and 7).

In addition, there are several problems which would need to be considered in order to create a suitable atmosphere for worshippers to perform their ritual duties at the Holy Mosque. These are :- the smooth surface of the Holy Mosque marble floors that cause a slipping problem for worshippers, as about 18% of those interviewed concentrated this problem, which in an overcrowding situation could lead into a disaster, as in some of the cases that were noted in Chapter 2; the glare problem, which is caused by covering the entire Holy Mosque floor surface with white marble, as shown in Figure 6-81, this factor also caused some difficulty in the view of the worshippers about 41% of the research sample.

8.4.2. Functional efficiency:

The Holy Mosque building is presently not complying with most of the building design standards for public buildings in Saudi Arabia and the USA and Britain, because of various peculiarities. Some of those are as follows: The Holy Mosque building is a unique building in its function and physical features and these building standards are not designed for this specific kind of religious building and the activities of the users of this building are different from other buildings.

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[15]. Still, G. Keith, *Crowd Dynamic*, 2000.

As it was stated earlier, the Holy Mosque building's shape, which has 'grown' organically over time (see Figure 4-18), does not support the sequence of the activities shown in Figure 4-42. In addition to what was discussed before, the rectangular shape of the *Mataf* area does not support the circular movement of the circumambulation, *Tawaf*, around the Sacred Ka'bah and the circular shape of the rows during the praying process.

It seems to be that there are some difficulties with the locations of some gates with the functions of this religious building. As an example, the amount of flow of people at some gates such as AlFath gate, a three bay gate, located at the northern side of the Holy Mosque is lower than AsSalam gate, a one bay gate, which is located at the eastern side of the Holy Mosque building. The wrong measurement or prediction of the amount of people flow by designing the wrong width of exits could lead to an overcrowding disaster as shown in some examples such as in Park Patten, Pakistan in 2001 and in Nasik, India in 2001.

The complexity of the Holy Mosque, developed throughout history and caused by the religious shrines, the fixed relics, and the activities related to these specific places, (see Chapter 4) with the large gathering of mixed culture worshippers, make the overcrowding problem in this building different from most other religious sites over the world (which usually have only one shrine or the religious site is a shrine only.)

We have identified that the people flow in some points of the Holy Mosque was at the *Level of service* 'E' category according to the Traffic Engineer Handbook, this level of overcrowding will reduce the praying space available to worshippers, which is not congenial for the practice of their ritual duties. Moreover, the movement of people

between spaces inside the Holy Mosque, required for some activities, at this level of service seems to be unacceptable where movement is in both directions.

The walking distances while performing religious duties at the Holy Mosque could also be considered as a factor that affects worshippers' choice and behaviour. In the performance of Tawaf, as it shown in Figure 6-41, about 33% of the worshippers chose their floor to perform Tawaf on the bases of minimum distance. In addition, in the performance of the Sai' duty, about 33% of worshippers, as shown in Figure 6-45, consider the walking distance while performing their Sai' as the main reason for chose their Sai' floor. Even though in fact the difference between the Holy Mosque floors is relatively small (see Figure 4-25, 4-37, 4-38, 4-39 and 4-40)

The movement pattern and worshippers behaviour, which is formed and effected by the performance of the various activities at the Holy Mosque, in an overcrowded environment, could therefore cause incidents at particular areas.

Moreover, the overall shape of the Holy Mosque building does not support the performance of major activities such as praying. Since worshippers have to stand in rows facing the Sacred Ka'bah, which mean the prayers lines and rows have to circle the Sacred Ka'bah, the sequence shape of the Holy Mosque building is not compatible with this in its current form. This complexity of the Holy Mosque building's spatial arrangement developed over history and was formed by the religious fixed elements and the activities that are related to specific places (see Chapter 4.) The large number of worshippers from a mixture of cultures getting there makes the overcrowding phenomenon in this building unique. Other pilgrimage sites have only one shrine or the religious site itself is a single shrine only.

8.5. General Discussion:

This section discusses the findings of the study with respect to the overcrowding problems at the Holy Mosque from a wider perspective, taking account of the relevant literature.

8.5.1. Nature and extent of the problem:

Elias Canetti has identified the different types of crowd well (see Chapter 3). According to his definition, the crowd at the Holy Mosque, is an "open crowd", since it allows the number of gathered people to grow becamw the interior and exterior spaces are linked through the access points which are all interconnected to allow for prayers. In contrast, the crowds at the *Mataf* area and for some particular activities such as *Tawaf,* or praying inside the *Hijr* Ismai'l or *Sai'* at the *Masa'a,* are a "closed crowd", because it is unable to grow due to the limitation of the space provided, as Canetti pointed out. Moreover, it could be argued, that the crowd at the focus points inside the Holy Mosque is an 'open crowd' since there is no actual border that stops the growth of the crowd or limits it but, simultaneously, it is also a 'close crowd', because of its relation to the particular spot which attract worshippers to gather around it. It could be assumed that there is an invisible boundary that limits worshippers from gathering far from the attraction point.

Worshippers at the Holy Mosque exactly reflects Gustave LeBone's definition of a "crowd", discussed in Chapter 3. People, worshippers of different nationalities, profession, or sex gather at the Holy Mosque for different reasons, such as *Tawaf*, Prayers or other activities.

Although, according to Steven J. Heine *et al*, the pattern of attitudes is one way to define one culture from another and thus are of importance in a multi-cultural situation like this. None of the worshippers from any particular cultural background or nationality have been found by the study surveys to consider themselves being forced to behave in a certain manner because of their cultural background. However, religious considerations have been found by the survey to be the most important conditioning factor upon worshippers' behaviour reflecting in most of their movement patterns and behaviour in and outside the Holy Mosque.

Another important aspect, is the orientation of individuals within a crowded environment. in Chapter 3, we have discussed the concept of the mental map that human being, according to Kaplan and Piajet, form in advance of experience, and which help them to relate to new environments. It can be assumed that this psychological trait conditions affects the behaviour of worshippers at the Holy Mosque as they move from one fixed object to another. Most of the psychologists and the sociologists stated that age, sex, and the social class are important knowledge to predict human behaviour (see Chapter 3). However, in such a religious building, religious considerations the overriding factor that helps to predict the movement pattern inside the building. In addition, most of the people, as found in Chapter 6, visit these relics because of religious considerations and have been prepared by an initiation process from childhood … etc. as for example, the religious process of any activity at the Holy Mosque building, shown in Figure 4-42, will help in the prediction of the worshippers behaviour.

On the other hand, the concept of the personal atmosphere, which was described by Edward Hall could arguably not apply in religious buildings especially not in the Holy

Mosque. In Islam, the religious considerations, the Quran verses and the Prophet's (pbuH) sayings, definitely condition the worshippers behaviour as they over ride the personal and cultural issues, as was shown in Figure 3-2. At the Holy Mosque, and mosque generally, as people from different cultural backgrounds stand together feet to feet and shoulders to shoulders with no gap, no space as they practice their religious ritual duties, and, however, a split in male and female praying areas should be identify. However, as was discussed previously in this Chapter, allowing a seriously overcrowded situation to develop at critical access points within the Holy Mosque environment for example at the AsSalam gate, is clearly creating the situation that destroys personal space in a way that might have a negative impact on crowd behaviour. This has nothing to do with religion, but is a question of space managment.

The concept of the *Haram* and its boundaries, which were discussed in Chapter 4, and the belief of some Muslim scholars that the high rewards attributed to praying in Makkah, applies to all of this area, not only the Holy Mosque building (see interviews in Chapter 6 with AlQaradawi and Abo Solaiman) could help alleviate the growing problem of the overcrowding at the Holy Mosque building. This will allow the creation of gathering sites all over the city of Makkah inside the *Haram* area, thus spreading the demand to a larger and less restricted area.

8.5.2. The Likely Implications of the Overcrowding Problem:

Controlling a building that can be considered as the cultural and religious pilgrimage centre for all Muslims in the world that hosts multi-cultural events several times in the year for an ever growing number of people, would seem to be an impossible target to

achieve without a rational science based safety policy. This place aims at maintaining optimum conditions for worship within its premises.

Nevertheless, in a wider context and considering of the reviewed incidents in Makkah and world history, several implications may be deduced for this site. The death of many people could be expected in case of a stampede from the Holy Mosque building through its gates as has been reported in other religious and other events in world history which were discussed in Chapter 2. There are also specific implications for the Holy Mosque site as it occurred in others, which were reviewed in Chapter 2. The situation of the Holy Mosque could potentially be worse since the people who gather in this building are from different cultures, gender, nationalities – a factor which could affect crowd behaviour as was discussed in Chapter 3. However, the implication of an incident could be consider as a disaster in an overcrowded environment regarding to the number of dead people and lost in the properties. These implications could be caused be a natural or man-made event as these which been reported in the history.

Moreover, the difference between the predictions of the axial line analysis, shown in Chapter 7, and the actual observation of the current usage of the Holy Mosque spatial access points, shown in Chapter 6, test the Space Syntax method and the affects of the attracting factors that control the result of the syntactical analysis of spatial movement. This difference could impact some problems on this holy site as well as other popular and attractive sites.

8.6.   Conclusion:

The overcrowding problem was found to occur at several points in the Holy Mosque building; at some of the foci inside the building and at several gates of the Holy Mosque. This overcrowding was found to be occurring in different places and at different times over the year and seem to be affected by the worshippers' behaviour and attitudes towards the building and its contents as well as spatial layout. Religious considerations were found to be the most significant factor that influences the worshippers' behaviour at the Holy Mosque building. Although, spatial organisation was, also, found to affect the overcrowding problem at the Holy Mosque building in consideration with the performance of specific activities.

For a site like the Holy Mosque, that attracts more than a billion worshippers from over the world over period of time, understanding the overcrowding problem could be an important factor in helping to provide an environment where worshippers would reach the optimum level of engagement in their religious activities.

Moreover, the likely implications of the overcrowding problem may be that a number of people may come to harm, due to the large number of people gathering to perform their activities in this building at any one moment. Our research revealed that, according to international transportation engineering and movement standards, on average, the building falls into '*Level of Service* E' category suggesting a seriously overcrowded condition. It is indent that this position is not sustainable in the long term.

9 **Summary and conclusion**

9.1.   Research Summary

9.2.   Conclusion

9.3.   Recommendations

9.3.1. General Recommendations:

9.3.2. Recommendations for further studies:

9.4.   Concluding remarks

9 Summary and conclusion

9.1. Research Summary:

This study was undertaken to develop an understanding of the overcrowding problem at the Holy Mosque. The specific objectives were as follows: to investigate the context, background, nature, and extent of the overcrowding problem, to identify and study its causes, to assess the likely implications of this problem, and to make recommendations that will contribute to the effective management of the Holy Mosque.

The study was divided into nine chapters. Chapter 1 introduced the overcrowding problem at the Holy Mosque and set up the background. Additionally, it illustrated the importance of the study, described its aims and objectives, formalised the research strategy, and explained the structure of the thesis and general overview.

Chapter 2 examined overcrowding with respect to religious buildings, specifically mosques. It highlighted certain historical incidents in world history as well as in the history of Makkah, which will provide for a wider view of the problem. It analysed relevant Islamic regulations and the design standards regarding overcrowding in Saudi Arabia and in some other Western countries. This chapter concludes that religious buildings should be constructed with a significant degree of care in their architecture, which would help to create a comfortable environment for visitors as well as a means of control for service providers.

Chapter 3 discussed human behaviour as an important factor in controlling crowd movement. There are many factors that affect human behaviour and a critical one in this case is the Islamic religion, which influences the behaviour of Muslims through its commands and regulations. For example, according to some Western psychological studies, a certain distance should always be kept between people in order to respect personal space. Islamic culture, on the other hand, encourages Muslims to be close to one other, especially when united in prayer.

Makkah is a culturally mixed society. Over time, the visits during the Hajj season have developed special characteristics at the Holy Mosque, which distinguish Makkah from other cities; these too have a bearing on crowd behaviour. Crowds create power, and therefore, overcrowding should be dealt with carefully. There are some characteristics, defined by sociologists, that identify types of crowds. There is a strong relation between architecture and space that has been noticed and recorded throughout history. People always reflect their customs and culture in their closest environment, and the relation between people and buildings is very strong. The mosque as the principal social and religious centre in Muslim societies is therefore of special importance.

History shows us that overcrowding is not a new phenomenon in Islam. Even before its advent, Makkah was the religious centre, and as such, it provides the most acute example of such overcrowding. This study began with the emergence of Islam, the calling of the Prophet Abraham (pbuH), continued with the arrival of Prophet Muhammad's (pbuH) calling, and ended with Islam in its present form and the implications thereof.. The social behaviour of pilgrims has had a long term effect on the customs and culture of Makkah, since most of the city's residents originally emigrated from other countries. This fact makes Makkah society uniquely capable of catering to the needs of pilgrims.

Chapter 4 focused on the Holy Mosque in Makkah as the case study. Although a unique building, the Holy Mosque still functions as a mosque and as such conforms to the basic characteristics of that type. The study, therefore, examined the mosque, the religious building of the Islamic religion. This type of building has developed its own design and planning standards aimed at furnishing a comfortable spiritual atmosphere for worshippers. The Holy Mosque is to Muslim communities all over the world a very special place. There are some fixed elements inside this building that are regarded as sacred and connected with particular religious rites that cannot be performed in any other place. The quality of reconstruction and expansion work that has been carried out on the Holy Mosque and its contents over time testifies to the seriousness, with which the duty of conservation is regarded by Muslims and their leaders. Throughout history, the focal sites inside the Holy Mosque have attracted worshippers and visitors, generating unexpected overcrowding on these sites. In addition, the sequence of the activities performed by worshippers establishes a unique movement pattern inside the building, which was also investigated in this chapter.

Makkah, the ancient city that holds the Holy Mosque is a city in the valley of Abraham. Recently, Makkah has developed into a typical international urban centre with more than one million people living within city boundaries. The city has been called by different names over time; some of these names describe the political or social situation at the time and others contain religious connotations. It has always been known as a crowded city, which is reflected in some of the names. The architectural environment of the city has been shaped by its international links and the large amount of immigration from all over the world.

Chapter 5 dealt with the various research methods adopted to analyse the operational aspects of this unique building. The approach has been described as multi-methods research, which employs different investigative techniques including spatial analysis. The data was collected using the latest scientific methods, provided specific evidence that supports other data obtained through social and historical surveys, and thus provides substantial knowledge and supporting evidence. Space Syntax was chosen for this study to predict the movement pattern of worshippers inside the Holy Mosque building and its surrounding areas. This information was analysed using the spatial movement of people inside the building. When its findings were compared with the data collected through observation, the veracity of the Space Syntax method was tested. A much fuller picture of the nature of usage patterns and their conditioning factors at the Holy Mosque was established in this way.

Chapter 6 presented the findings of the study obtained from the research survey and interviews. This analysis helped us to understand worshippers' behaviour and attitude at the Holy Mosque and revealed differences. This chapter addressed the observation of the Holy Mosque gates, which took place three times over the year. These observations were unique; as it was the first time that a complete observation of all of the Holy Mosque gates has been attempted. Moreover, the interviews for the study incorporate the experience of specialists and experts and their response to the overcrowding problem at the Holy Mosque.

Chapter 7 presented the spatial analysis of the Holy Mosque building as well as the analysis of the Space Syntax methods, including axial line analysis and Isovist Visual Graph Analysis. It also introduced the calculations for the evacuation process with the existing physical situation of the building. Finally, the chapter illustrated the movement

calculations that helped to identify the *Level of Service* of the Holy Mosque building and its gates.

Chapter 8 examined the research findings in relation to each other and within the wider scope of the literature. Moreover, it answered the questions originally asked that underlay the research in this study. This chapter identified the overcrowding problem at the Holy Mosque in the specific places and times it occurs and discussed its causes. In addition, based on the findings and its analysis in relation to the reviewed literatures, likely implications are presented both for cases similar to the conditions under examination and for the Holy Mosque specifically.

The overcrowding at the Holy Mosque is found to be caused by factors that fall in one of four main categories. These are as follows: overcrowding caused by the design of the Holy Mosque and its elements, overcrowding caused by regulations established by the governmental agency that supervises the services at the Holy Mosque, overcrowding caused by religious commands and thought, and overcrowding caused by worshippers' behaviours and their manner. Table 9-1 describes these factors in detail.

Table 9-1: The factors cause the overcrowding problem at the Holy Mosque.

Place of Overcrowding	Design	Regulations	Religious Thought	Behaviour
1. The Holy Mosque gates as worshippers enter the building.	• The distribution of the surrounding environment. • The relation between the gates' size and the demand on some gates.	• The distribution of the prayer area inside the Holy Mosque.	• Some worshippers prefer to follow the Prophet Mohammed (pbuH) as he enters the Mosque.	
2. The Holy Mosque gates as worshippers exiting the building.	• The distribution of the surrounding environment.			• Praying at the gate area. • Waiting for relatives and companions.
3. *Tawaf*	• The shorter distance at the Mataf.		• Some worshippers believe that the performance of the activity should be on a specific land, not on a floor.	• Performing as their families and relatives perform.
4. *Sai'*	• Distance because of the boundaries under the domes. • The accessibility from everywhere on the ground floor.		• Some worshippers believe that the performance of the activity should be on a specific land, not on a floor.	• Performing as their families and relatives perform.
5. Zamzam well entrance	• The wall surrounding the well entrance.	• Distribution of the prayer area.	• Drinking the Holy water from its spring.	• Waiting for relatives and companions.
6. The Black Stone.	• Limitation of the space.		• High demand for kissing the stone.	• Worshippers pushing others to reach the stone. • The time some worshippers spend as they kiss the stone.
7. The Dark marble line.		• The creation of the line has no religious background.		• Praying at the line. • Stopping and waiting at the line.
8. Behind Maqam Abraham.	• Limitation of the space.		• High demand for the praying area.	• Stopping, waiting, watching, and kissing the Maqam dome.
9. The Yemeni corner	• Limitation of the space.	• Overcrowding at the Black Stone.		
10. The Multazam.	• Limitation of the space. • Location between the Black Stone and the Sacred Ka'bah gate.			
11. The Hijr of Ismail	• Limitation of the space.	• Distribution of the prayer area inside the Hijr.		

9.2.   Limitations of the Study:

Certain issues require further explanation in order to enable one to understand the overcrowding problem in the Holy Mosque completely. However, these explanations go beyond the scope of this study. This is not due to lack of researcher efficiency, but due to the nature of the research case. These issues are as follows:

Actuality of the Data: As mentioned before, the data used in this study were collected between 2001 and 2002. Since that time, several maintenance projects have been developed and realised at the Holy Mosque building, which may have some limited effect on our results. For example, closing the Zamzam well entrance at the *Mataf* area inside the building will strongly affect the movement pattern at the *Mataf* area and the worshippers' behaviour throughout the Holy Mosque.

Access to Data: The second issue is the inaccessibility of relevant data, which limited the scope of the study to undertake the physical, social, and functional aspects of the the Holy Mosque's usage. It was equally impossible to study the management issues of this building, which seem to be important factors to address and investigate.

Sensitivity of the Research Object: The last issue is the sanctity of the Holy Mosque, which caused most of the interviewees to be circumspect and cautious in their conversations. Moreover, some of those interviewees preferred to keep their identity hidden, while others refused to talk to us altogether.

The researchers have tried to make up for these deficiencies by actualising the results obtained from data analysis in order to reflect the present situation on the ground. The

management issues were tackled by reviewing available documentation and what can be referred to as operations manuals at the Holy Mosque. All the issues that seem to be important considerations will help to complete the understanding of the overcrowding problem at the potential pilgrimage site for more than one billion Muslims around the world. In spite of the limitations, the following conclusions can be drawn.

9.3.   Conclusion:

The contextual review of the historical implications of the Holy Mosque main building and the surrounding buildings revealed the development of the overcrowding problem and the religious causes behind the phenomenon.

The Holy Mosque, which can hold more than 500,000 worshippers, was found to fall into Level of Service 'F' with an average flow of people requiring access to and exit from the building, while it is even worse than level 'F' in some access points and focal sites, as From level "A", which has a free flow, 'B' has a minor conflict, 'C' has some restrictions to speed, 'D' has restricted movement for most, 'E' has restricted movement for all and level 'F' which has shuffling movement for all.[1]

Most of the year, with the exception of peak periods, that is to say, the prayer time during Ramadan and Hajj seasons and regular Friday prayers, the overcrowding problem was found to occur in several specific places. A number of these are focal sites inside the Holy Mosque itself; however, not all focal points are places of overcrowding.

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[1]. Still, G. Keith, *Crowd Dynamic*, Ph.D. thesis, University of Warwick, Department of Mathematics, August 2000. p.3-2.

Turning our focus onto the peak periods, namely during Hajj and Ramadan and to a lesser extent during Friday's noon prayers, the overcrowding problem was found to occur in many places at a magnitude much greater than what is observed the rest of the year.

The time and place of the overcrowding problems inside the Holy Mosque were found to vary over the course of the year. For example, worshippers preferred to visit the Black Stone during the Hajj season more than any other time. However, people preferred to visit the Maqam Abraham during the Ramadan season.

This will explain that the importance religious considerations play in worshippers' behaviour and their overcrowding. There are, of course, other factors involved, that is, demographic features and social characteristics, such as worshippers' gender, age, marital status, and education level. For example, the land use inside the Holy Mosque and the distribution of the prayer area tends to affect male worshippers more than females, especially the location of the female praying area when males are about to enter or exit the Holy Mosque building. Preparing for overcrowding and good management of identified overcrowding problems will reduce the risk of injury for the millions of worshippers worldwide who use this building.

The Holy Mosque's physical layout is not supportive of the activities that need to be performed inside the building. When the spatial layout was analysed with respect to the activities performed and the required movement pattern, an overlap in the movement pattern in some areas was seen to develop into an overcrowding problem.

We were able to conclude that applying Western design standards to the building will not necessarily be suitable for the Holy Mosque. However, we discovered many

similarities in the history of like buildings around the world. In fact, several people died because of overcrowding incidents, including those in religious buildings, and these events could occur at the Holy Mosque if the problems are not adequately addressed and resolved.

The spatial analysis of the Holy Mosque and the transportation calculations by specialists[2] indicate that its level of service is categorised as 'E' where the movements of people are restricted for all individuals on the site. The situation becomes even worse at some particular gates that are popular with pilgrims.

The concept of safety in public buildings in Western countries was found to provide a suitable model to follow in this case. However, it must be understood that detailed standards, applicable to safety conditions in the West, need to be modified in order to suit the particular requirements of religious buildings such as the Holy Mosque.

The surrounding environment was found to strongly affect the overcrowding crises at Holy Mosque access points. Further development and reconstruction of the buildings surrounding the main building will help to reformulate the spatial movement pattern in the Holy Mosque and help the worshippers perform their ritual duties in a much more conducive atmosphere.

Level of service "F" is regarded as the worst level of service, indicating overcrowding problems. In a case such as the Holy Mosque and in similar cases such as the Jamarat bridge in Muna, we could clearly identify *level of service* "F" and introduce the *level of*

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[2] Still, G. K., (2000). Crowd dynamics (Doctoral Dissertation, University of Warwick, 2000), p. 3.2.
[4] The High Authority of the Development of Makkah.

service "G" since level "E" is about 22 p/m/m less than what we found at the Holy Mosque.

9.4. Recommendations:

9.4.1. General Recommendations:

The above conclusions suggest certain recommendations, general strategies based on the findings of this study. These recommendations could help reduce the risk of overcrowding for worshippers at the Holy Mosque. They will also help create a comfortable religious atmosphere that gives worshippers the optimum level of engagement in their ritual duties.

This strategic plan aims to help the service providers at the Holy Mosque resolve the overcrowding problem and should be embraced. This aim can be achieved as long as certain requirements have been completed. These requirements are discussed below.

Several projects have been approved for construction in the central area of Makkah,[4] such as the *AshShameyyah* project at the north side of the Holy Mosque (size about 775,000 m^2), the *Jabal Omar* project on the western side of the Holy Mosque (size about 230,000 m^2), and the *Jabal Khandama* project on the east side of the Holy Mosque (size about 578,000 m^2). All these projects will balance the worshippers' flow toward the Holy Mosque, which will encourage users to utilize all of the Holy Mosque gates. In order to attain the best use of the gates' capacity, the northern free area should be connected to the Northern district (*AshShameyyah*), and the difference between the two levels will have to be reduced. On the other hand, the width of the gates should represent the needs of the

worshippers and their use. For example, the AsSalam gate should be a three-bay gate since it has some religious background and many worshippers prefer to use it as an entry point following the Prophet (*pbuH*) as He entered the Holy Mosque from this particular gate.

A new awareness programs should be provided for worshippers focusing on religious recommendations and how Muslims should behave on such a sacred site. They should be admonished with religious commands and requirements that will affect their manner in an overcrowded environment. This should be developed taking into consideration the different religious and cultural backgrounds of the visitors to find an effective method to shape their behaviour in such a way as to suit our plan.

Electronic surveillance and the awareness among the visitors of an operative monitoring system informing people about the usage of CCTV on the site and reinstallation of a TV system could help decrease the crime level. In addition, an intensive information system about the Holy Mosque should be introduced to worshippers to help them while they are there. This system should be connected with the CCTV system of the Holy Mosque and be managed by a control room thereby assisting worshippers in their search for a comfortable place at the Holy Mosque to practice their ritual duties. A "red and green" system should be employed to reflect the overcrowding situation at each gate. In addition, a colour system that associates each gate with a different colour and shows the pathway from each gate to the *Mataf* area should be put into effect. This system will mesh nicely with the CCTV system mentioned above.

The colour system used to indicate the overcrowding situation at the Holy Mosque is a system utilizing *red* and *green* colour to reflect the situation at that entry point. The red

colour will indicate that the entry gate is overcrowded, whereas the green colour will indicate that access point's availability for use, as shown in Figure 9-1. This will help worshippers select their access gate as they reach the surrounding free area. In addition, this system will help reduce the overcrowding level at the entry points and to distribute the usage of all access gates according to the capacity for which they were designed. Guards at the gates could use these colours to determine when to stop the worshippers' flow through an already overcrowded gate.

Figure 9- 1: The proposed colouring system shown on some of the Holy Mosque walls

This colouring system could be developed as an information system inside the Holy Mosque as well. For example, each entrance could be identified by a specific colour. This colour should extend from the entrance to the *Mataf*. Many elements could be painted using that colour, such as part of the lighting system, water fountains, the carpets, and sections of the columns. In addition, all signs and information plats could use that same colour.

Creating a prohibited for prayer area in front of each gate will help to increase the flow of exiting worshippers and reduce the overcrowding level at the gates. A walkway should also be created at the external free area.

Several points in the surrounding free area should be introduced to attract worshippers who wait for their families and companions next to the Holy Mosque gates. These points could be used as information centres as well. These will be helpful if they are identified by pictures or colours instead of numbers.

External emergency staircases should be built outside and should connect to the upper floor and the roof terrace to be used as means of egress when evacuating worshippers from the upper floor and the roof terrace to the surrounding free area.

Introducing a scheduling system will help to distribute circumambulators at *Mataf* and worshippers who perform *Sai'* at *Mas'a* over the three floors, the ground floor, the upper floor, and the roof terrace. Using worshippers' preferences, their religious considerations, physical requirements, and cultural backgrounds will allow for the optimum use of all of Holy Mosque spaces.

As the passageway between the *Mataf* and the *Mas'a* has been used more than other passageways, this one should be clearly identified and enlarged in order to help worshippers that are moving from the *Mataf* toward the *Mas'a*. In addition, it should be connected in a way that takes them to the starting point in order to reduce unnecessary movement and help the worshippers practice their ritual duties.

A special training program should be developed for all Holy Mosque employees that teaches them how to deal with worshippers in different situations and improves their communication skills.

A system should also be developed to cover the *Mataf* and surrounding free area, which will enable worshippers to use these areas at any time of the day. In addition, it will reduce the glare problem that causes difficulties for both worshippers and workers. Moreover, this will reduce precipitation on the surface, which causes slippage for walkers at the Holy Mosque, especially in the *Mataf* area.

Since the main function of the Holy Mosque is *Tawaf*, and as it been asserted by Allah, the Almighty and many scholars that the reward of prayer at any place in Makkah is the same, worshippers should be encouraged to use any mosque at any place in the city, in addition, the development projects should provide spaces for prayers at the lower levels. This will help reduce overcrowding at the Holy Mosque, especially during the Ramadan and Hajj seasons.

A prayer area should be constructed for worshippers to perform their after-*Tawaf* prayer as an alternative to praying next to the *Maqam* Abraham. This will help to eliminate the overcrowding at the *Maqam* Abraham area. This new prayer area could be set up inside the Holy Mosque behind the *Maqam* Abraham.

All the gates at the *Mas'a* area should be closed at certain time to avoid mixing people who enter the building from the outside and worshippers who walk and perform the *Sai'* activities inside.

Regulations should be established to keep the walkways clear. Worshippers should not be allowed to pray or perform any kind of religious activity in the walkways so that their flow will not be obstructed.

A master plan and a detailed strategic plan must be in place for the development of the Holy Mosque and its focal elements. Such plans must take into consideration the overcrowding sites and the causes discovered by this study.

Reducing the overcrowding risk at some of the fixed elements at the Holy Mosque could reduce the overcrowding risk of the whole system. This could be achieved by moving or eliminating some of the elements that have no religious significance or that could be accessed from other points. This action should be completed by carefully considering worshippers' behaviour.

Several concepts could be introduced to help reduce the overcrowding situation at the fixed elements and to make the level of service better, which will help worshippers to better practice their ritual duties. For example, at the *Black Stone*, a queuing system could be established starting from the *Yemenis corner* and ending at the Black Stone. This queue should be composed alternately of male or female worshippers to give all in attendance the ability to kiss the stone. Moreover, specific times of day should be nominated for worshippers with special needs worshippers and their companions. A well-prepared schedule will enable all circumambulators to practice their *Tawaf* activity in a comfortable environment. This schedule should take into consideration the worshippers' choice of time, any factor that could affect their choice of time, and religious considerations (if applicable).

Since a large majority of worshippers visit the Zamzam Well on many different occasions, the entrance at the Mataf area should be carefully studied, and an entrance should be created from the northern area of the Mataf or from outside the building at the eastern free area. In fact, the story of the well could be drawn on the walls. The wall of the passageway from the assigned entrance to the spring could recount the story of the Holy water, Zamzam, which would enable the worshippers to understand the story deeply.

Worshippers should be enlightened about their behaviour while they are at the Holy Mosque. This awareness should be supported with religious commands, since they are visiting the most important religious site in the Islamic religion. This is an important factor that could solve many of the current problems inside the Holy Mosque. Ideally, such orientation should take place before people arrive at the city of Makkah either in their own country of origin or during transportation.

There are also many special requirements for disabled worshippers that should be met, such as enabling them to practice their ritual duties without any physical or invisible obstacles. The general atmosphere of the Holy Mosque should be made comfortable for them to do so. This should include space and time dimensions. A particular time should be assigned only for worshippers with disabilities or special needs to visit the sites at the Holy Mosque. This time could also include female worshippers, as they cannot engage in overcrowding sites with male worshippers due to religious and cultural regulations.

The abovementioned recommendations constitute the strategic plan to eliminate the overcrowding problem at the Holy Mosque. However, a detailed strategic plan should be

developed along with a master plan for the Holy Mosque and its elements that have religious significance and cannot be removed from their places.

9.4.2. Recommendations for further study:

It is highly recommended that, based on this dissertation, further study be performed. Some of this research should address the lack of information on very important issues within the management system. Particularly, there should be further investigations into the following: *the implications of the Holy Mosque projects on worshippers' attitudes and movement patterns, the relationship between the Holy Mosque's movement patterns and the surrounding buildings, and levels of service.* These themes will help to preserve this sacred site for current worshippers and for future generations.

9.5.   Epilogue

The uniqueness of this study is found in the different methods used to demonstrate the overcrowding problem at the Holy Mosque. It is the first study of its kind to observe and study all Holy Mosque access points at the same time over three seasons, which covers the entire religious year. Overall, this study will not only provide a better understanding of the overcrowding problem, which will help the management team introduce assuagement measures but also will provide insight into human behaviour in such conditions.

Recently, some of the recommendations which came out of this thesis have been applied successfully, in collaboration with the Custodian of the Two Holy Mosques Institute of Hajj Research, the Presidency of the Holy Mosque in Mecca and the mosque of the

Prophet in Medina. Among these recommendations was the removal of the dark marble line that identifies the starting point of the Tawaf. Without the line to obstruct movement, worshippers now process easily in their circumambulation of the sacred Ka'bah. Similarly, in the light of the recommendation of this thesis, the female prayer area at the Mataf will soon be shifted to the north-eastern side. The implementation of these ideas should help to identify that this thesis has accomplished some of its objectives by identifying the causes of overcrowding at the Holy Mosque. Moreover, such improvements should give us pause to reflect on whether the other recommendations of this research can live up to the challenge, given the current social, economic, political, spatial and environmental realities at this unique structure, the largest religious building in the world .

Architectural ideals alone cannot solve the problems of overcrowding in the Holy Mosque. Equally, integrating the behavioural patterns of users with architecture may help to mitigate such problems, but it is not the only thing necessary to this purpose. If the ultimate aim of architects, planners, and urban mangers is to improve the conditions of life, what tools do they have in order to achieve their goals and purposes? In many cases, such ideas and tools exist on paper, but from a practical point of view there is insufficient administration to enforce them effectively. Therefore, architects and other professionals must incorporate in their work some mechanisms for the implementation of these ideas in a way that satisfies their objectives while contributing to the improvement of the quality of life.

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Appendices

Appendix A: Additional Statistical Graphs and Crowd Incidents in Saudi Arabian History.

Appendix B: The Historical Development of the Holy Mosque and its Qualities as an Architectural Monument.

Appendix C: Glossary of Arabic Terms

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Appendix E: The Quran Verses used in the Dissertation

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Appendix G: Samples of Interviews.

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Appendix A: Additional Statistical Graphs and Crowd Incidents in Saudi Arabian History.
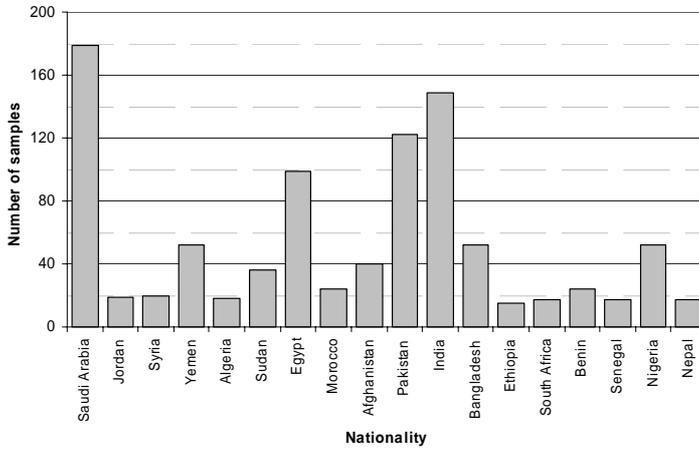
Figure 1: A graph showing the number of questionnaire research samples for each nationality that has more than fifteen research samples or more.
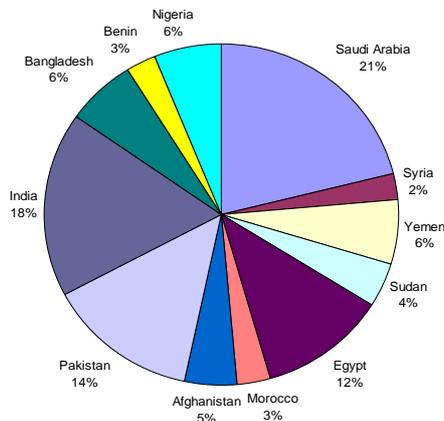
Figure 2: The percentage of the nationalities that have 20 questionnaire samples or more.
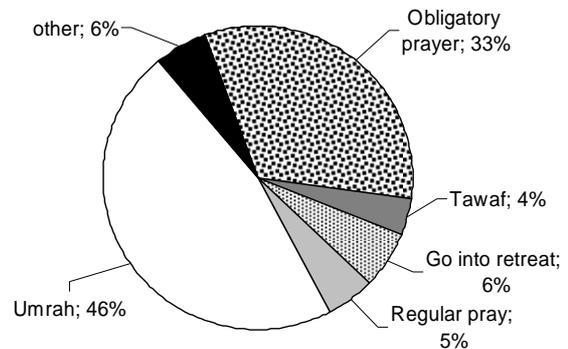
Figure 3: A graph showing the total percentage for the reasoning that worshippers came to the Holy Mosque for.
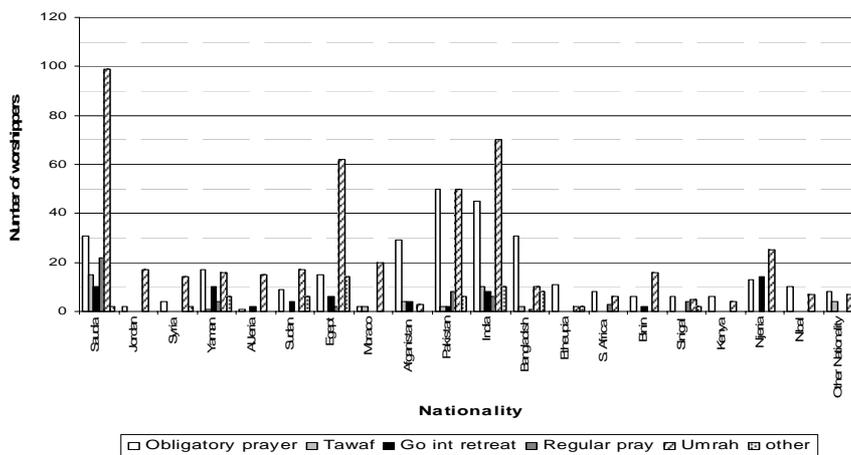
Figure 4: A graph showing the activities at the Holy Mosque by each nationality.
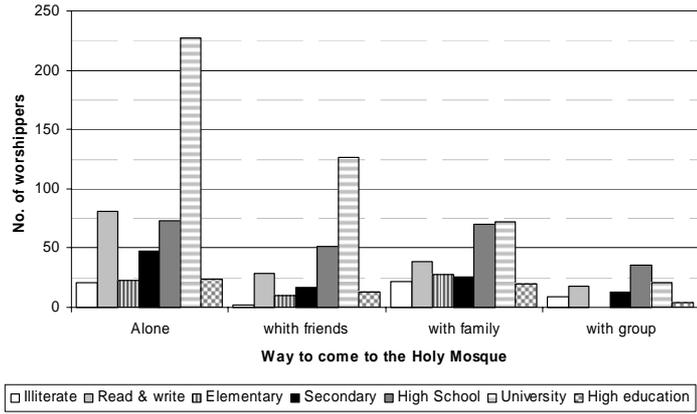
Figure 5: The worshippers' activities at the mosque in relation to their arriving time and the reasons of it.
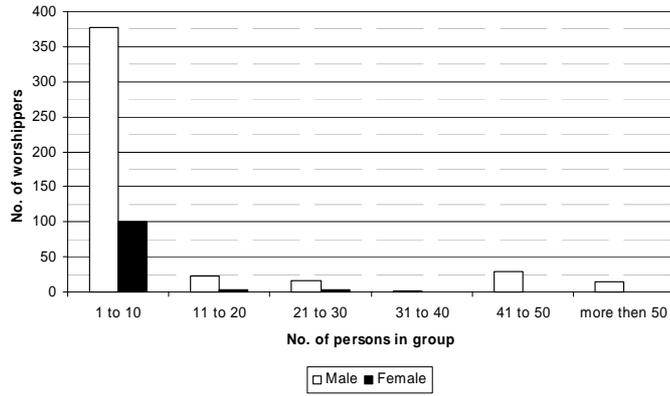
Figure 6: The worshippers' activities at the mosque in relation to their arriving time and the reasons of it.
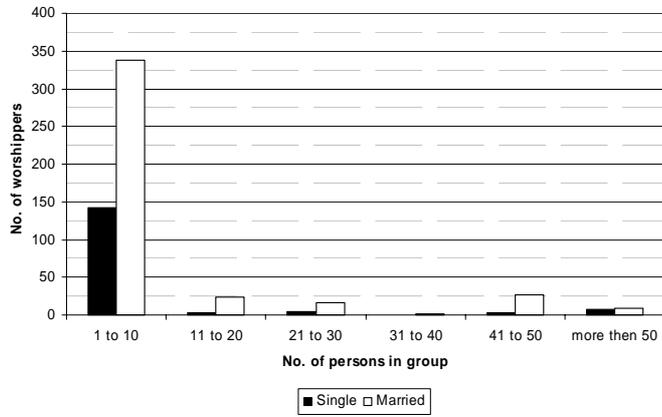
Figure 7: The worshippers' activities at the mosque in relation to their arriving time and the reasons of it.
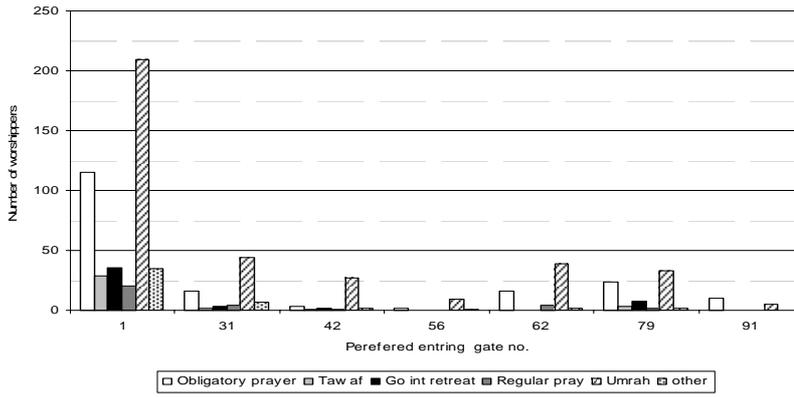
Figure 8: The worshippers' activities at the mosque in relation to their preferred entering gates.
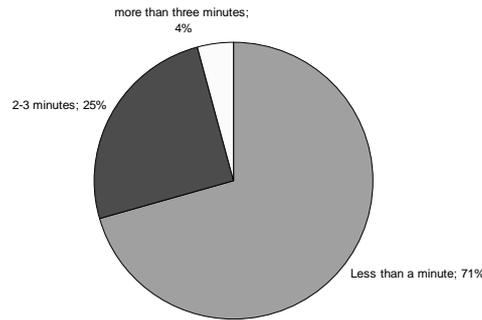
Figure 9: A graph showing the percentage of figures for the time spent to locate shoes at the gates.
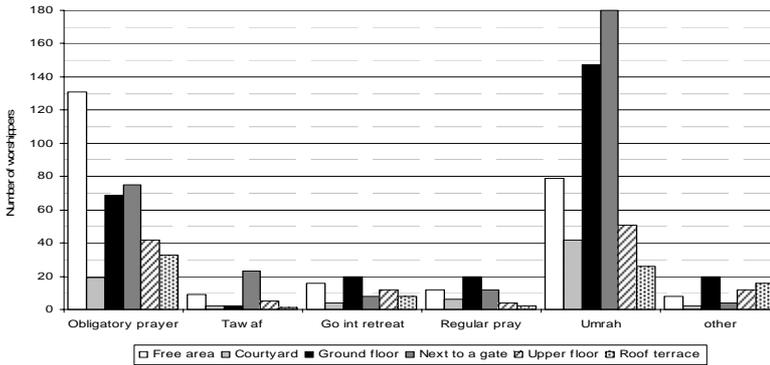
Figure 10: The place of praying at the Holy mosque in relation to the reason of coming to the mosque.
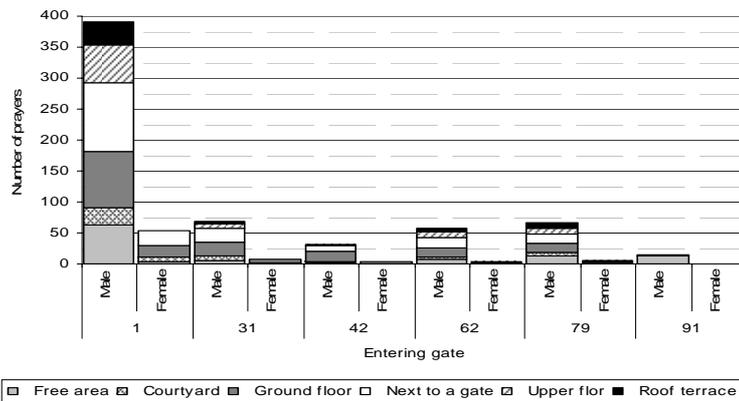
Figure 11: The preferred entering gate in relation to the place of prayers and the gender.
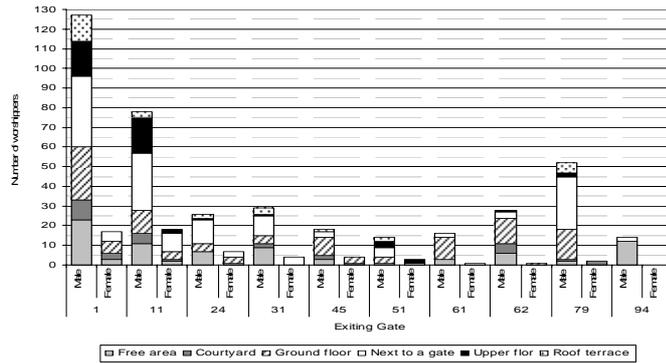
Figure 12: The preferred entering gate in relation to the place of prayers and the gender.
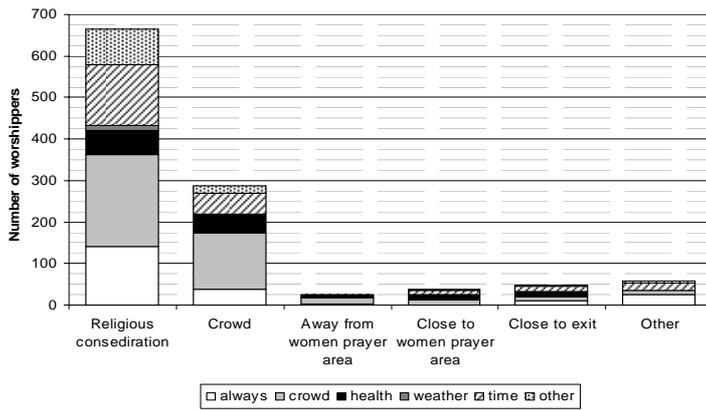
Figure 13: The relations between the factor affect the place of after *Tawaf* prayer with the timing sequence.

A. Ramadan period.

B. Hajj period.

C. Offpeak time.
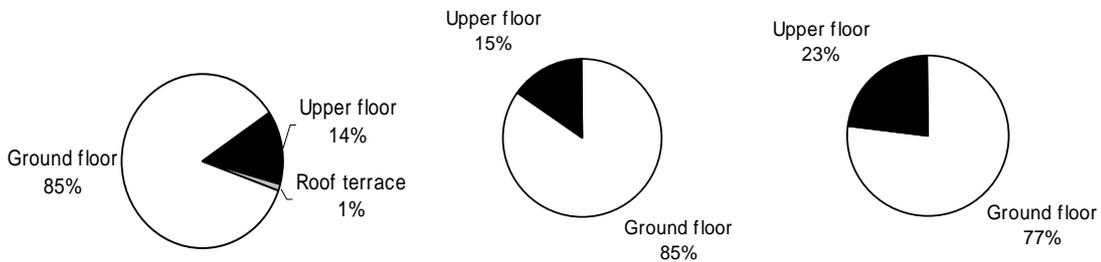
Figure 14: The total percentage of the use of the *Sai'* area during the time of the year.
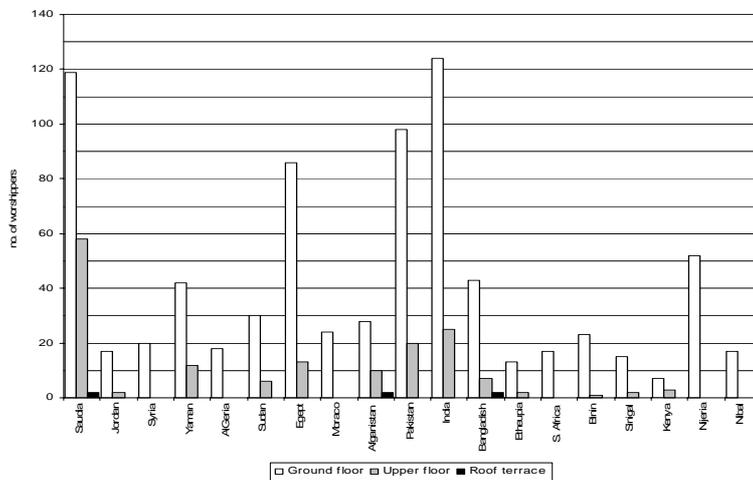
Figure 015: The relation between the worshippers' nationalities with the floor of *Sai'*.
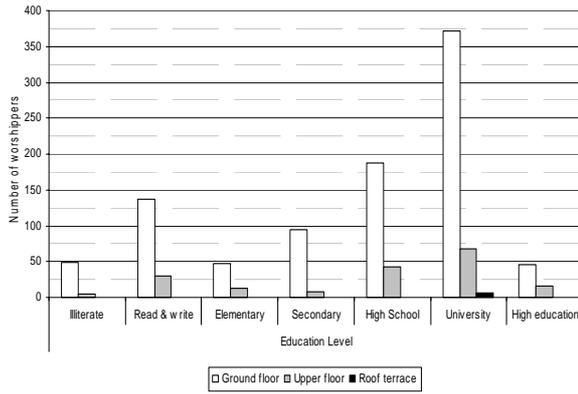
Figure 16: The relation between the worshippers' education level with the floor of Sai'.
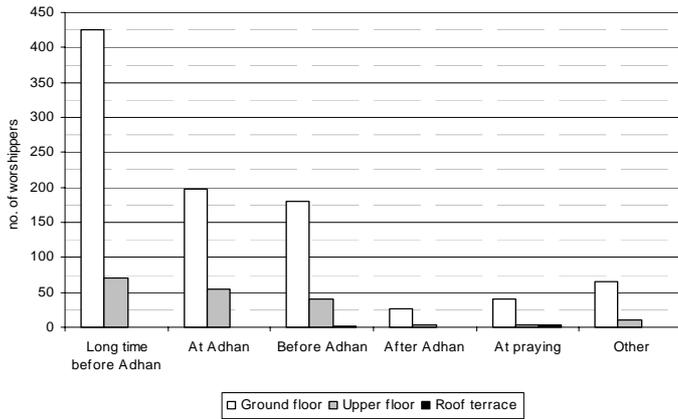
Figure 17: The relation between the time of arriving with the floor of Sai'.
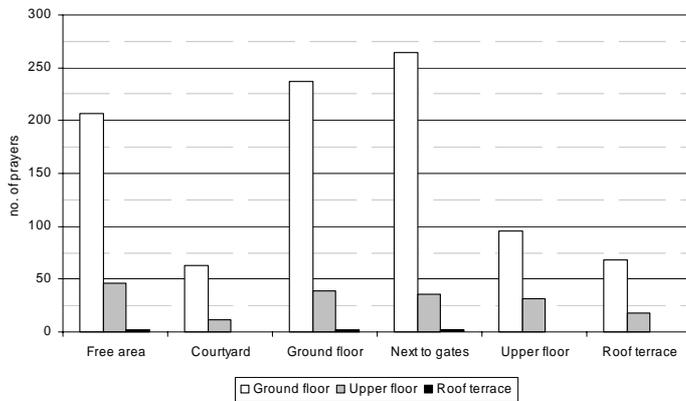
Figure 18: The relation between the place of praying with the floor of *Sai'*.
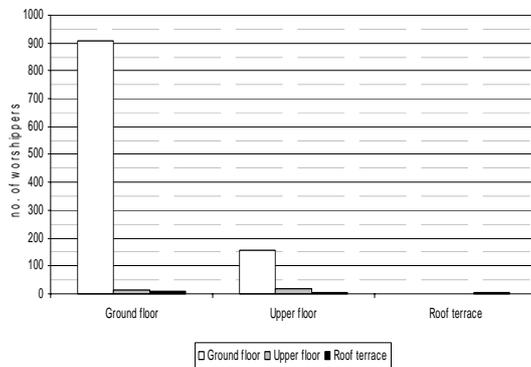
Figure 19: The relation between the floor of *Tawaf* with the floor of *Sai'*.
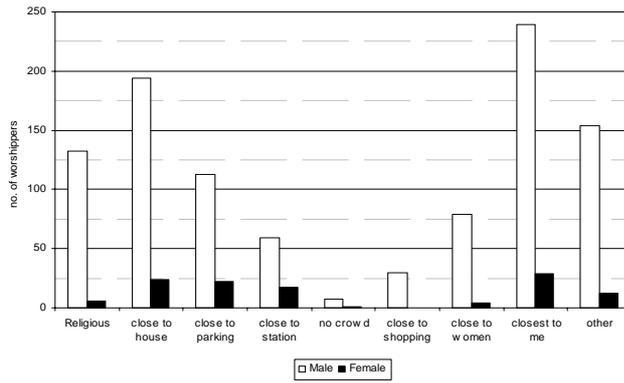
Figure 20: The relation between the reasons of choosing the floor of *Sai'* with worshippers' gender.
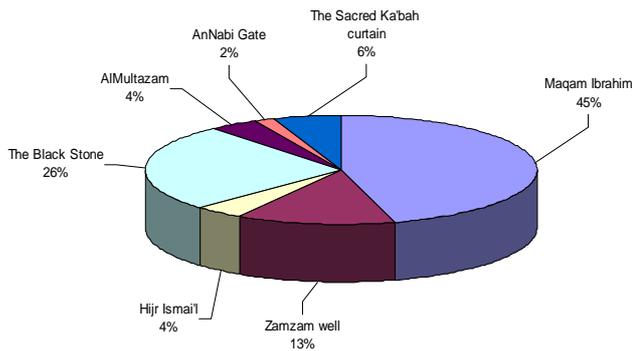
Figure 21: A graph showing the percentage of people who visit each focus point inside the Holy Mosque.
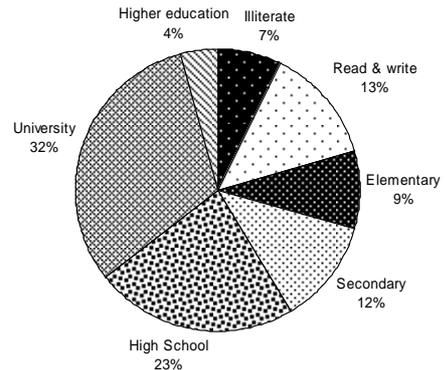
Figure 22: A graph showing the total percentage of the education level of the people who have a place to visit at the Holy Mosque.
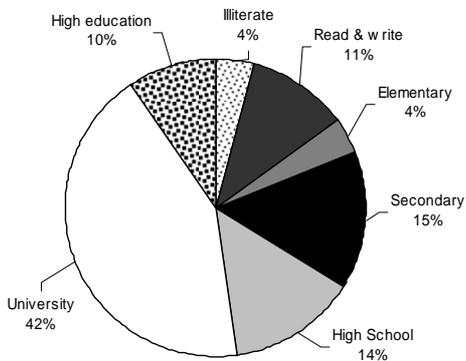
Figure 23: The total percentage of education level of the worshippers who go into retreat.
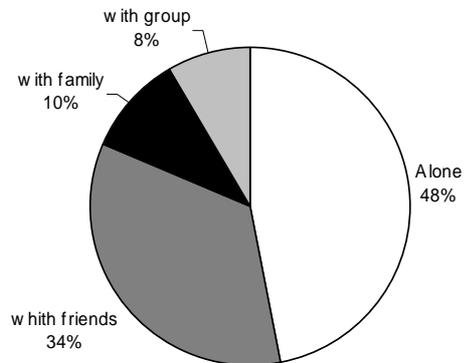
Figure 24: The total percentage of the way of coming to the mosque for worshippers who go into retreat.
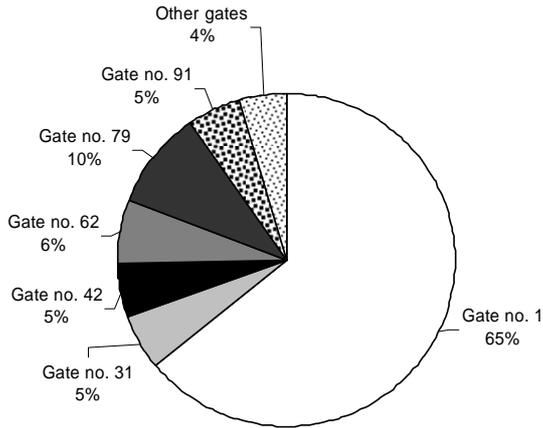
Figure 25: The total percentage of the preferred entering gate for worshippers who go into retreat.
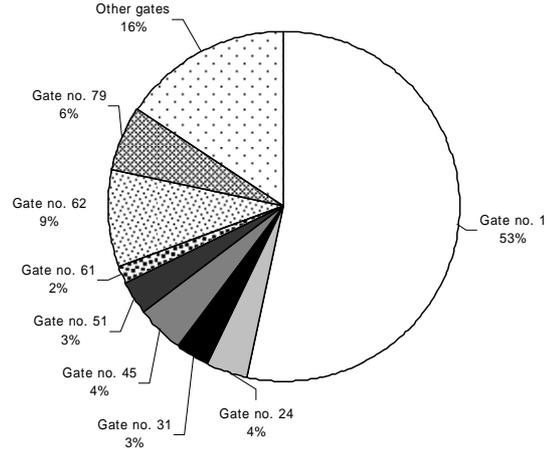
Figure 26: The total percentage of the preferred exiting gate for worshippers who go into retreat.
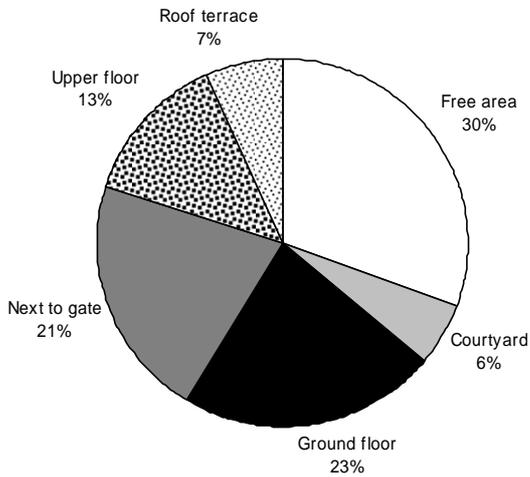
Figure 27: The total percentage of the preferred place of praying for worshippers who go into retreat.
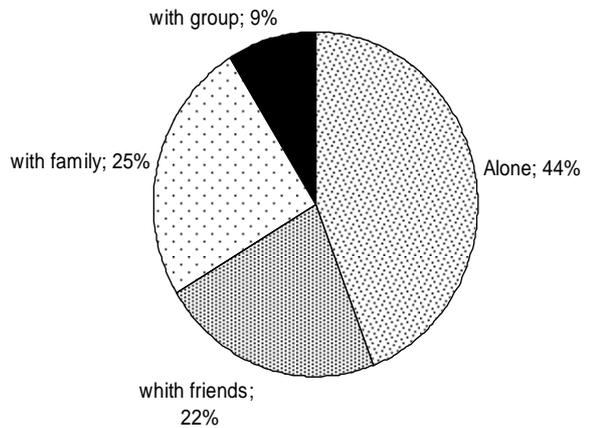
Figure 28: A graph showing the total percentage of people visiting a particular place at the Holy Mosque regarding the way of coming to the Holy Mosque.

Overcrowding Incidents in Makkah History.

- Natural events:

The Natural events section will include all incidents that could happen with out interference of humans, those that may be caused by uncontrollable conditions such as changes in weather. The principal events of this kind relevant to this case are earthquakes, floods and storms and epidemics.

- Earthquakes:

Even though the city of Makkah is not located within an earthquake zone it is necessary to include this since there are recorded episodes in the history of the Sacred Ka'bah where earthquake have caused some damage to the building. According to A'del Gabashi, a history professor in Umm Al-Qura University, only three earthquakes have been reported in Makkah's history[1]:

- In 245 A.H., (859 A.D.), an earthquake struck Makkah and it was recorded that most water springs were lost because of this earthquake.

- In 515 A.H., (1119 A.D.), another earthquake struck Makkah and it damaged part of the Yemenis corner.

- In 592 A.H., (1195 A.D.), the last earthquake was reported and it caused further damage to the Yemenis corner and some unidentified structured damaged to other parts.

- Floods & Storms:

Although Makkah is considered to fall within a desert zone, it has an annual rain fall of 160 ml.[2] which often comes as single storms resulting in floods. In addition, Makkah is located in the Ibrahim valley which put it at risk to flooding. The history of floods in Makkah was studied by Samr Shoman and his conclusions regarding this impact on the Holy Mosque site are given in Figure 5.1. Although the most important and biggest historic floods that been recorded are many they are relatively it unknown and these for worth listing (Table 5.1.) Over years several projects have been instigated to control

1. Ghabash, A., *The Historical Aspect of Natural and Artificial Aspects on Makkah*, Safety at the Sacred Lands Symposium, v.1 p. 188.
2. Merza, M., *Rain and Floods in the Makkah History*, Safety at the Sacred Lands Symposium, v.1 p. 228.

floods and some dams have been built that help to protect the Holy Mosque from floods such as the unique one of 1968, the effects of which are shown in Figure 5.2.

Lightning strikes are also known to have caused some problems in the history of Makkah. The Islamic history recorded that traditionally the *Moa'dhen* (Caller to Prayers) used to climb the minarets which exposed them to the risk of being shocked by lightening. However, the use of microphones in the calling for prayers now means that the *Moa'dhen* no longer have to ascend the minarets, which mean this is no longer a problem and the physical risk to minarets have been minimized by using a lightening conductors. The lightning strikes in the history of Makkah are summarized in Table 5.2.

Although, the floods are not considered as a main cause of disaster since 1985, when a storm water drainer has been constructed to serve the central city of Makkah[3], rain can still be considered as a serious problem since it causes slipping in the Mataf area[4]. Several accidents of this kind have occurred, yet there is no official statistical data available for this at any department which serve the Holy Mosque.
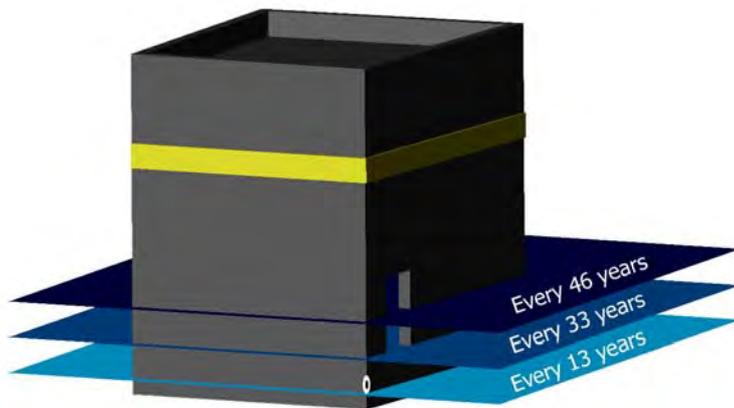
Figure 29 : A diagram showing the showing the historic flood levels related to the Sacred Ka'bah. (Source: this drawing is based on information from Samer Shoman paper given at the Safety of the Holy Lands Symposium.)

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3. An interview with the Dean of the Custodian of the Two Holy Mosque Institute of Hajj Research.
4. An interview with former General Commander of the Holy Mosque Force.

Table 01: A list of most important floods in Makkah history, drawn from different sources[5].

Flood Name	Year (A.H.)	Year (A.D.)	Notes
Unknown	Jorhum time		**Destroyed the Holy Ka'bah.**
Fara.	Khoza'a time		Named for the woman who was killed by this flood.
Unknown	Before Islam		Covered everything between the two mountains of the valley.
Umm Nahshal	17	637	During Umar, mAbpwh, time. It **removed Ibrahem station** and killed a woman named Umm Nahshal.
Al-Jehaf	80	699	During the time of AbdulMalik Ibn Marwan. It happened on the 8th of Dul'Hedjah. It piled up a loaded camel inside the Mosque and destroyed some buildings.
Al-Khabal	84	703	Caused some diseases and illness.
	88	707	During the time of Umar Ibn AbdulAziz.
Al-Mukhbel	104	722	Caused a lot of panic and some diseases.
	120	738	During Hisham Ibn AbdulMalik time.
Ibn Handhala	202	817	During AlMa'mon time. Destroyed many buildings and caused some panic and diseases.
No name	208	823	During Al-Ma'moon time. Piled up a lot of sand and mud to the Mosque. Men, women and pilgrims worked together to clean it out.
No name	225	840	Filled up Zamzam well.
No name	240	854	Destroyed a lot of buildings.
No name	253	867	Raised up on the Holy Ka'bah and destroyed some buildings.
No name	262	875	A great flood, rose up to the Holy Ka'bah gate.
No name	279	892	A great flood filled up the springs of Zamzam well.
No name	280	893	
No name	297	909	Reached the Holy Ka'bah gate.
No name	349	963	After the Hajj and killed most pilgrims on their way back home.
No name	417	1026	Got inside the mosque, reached the library, destroyed many books.
No name	489	1095	Killed too many people.
No name	528	1132	Many people were angered.
No name	549	1154	The hail was tennis-ball size. Filled up Ibrahim valley.
No name	569	1173	A great flood and entered the mosque from Bani Shaibah gate.
No name	570	1174	Caused by a lot of rain. Ibrahim valley filled up five times.
No name	593	1196	A great flood. Covered the candles. Some people swim in order to do the Tawaf. Destroyed some buildings.
No name	620	1223	It was a great flood. It destroyed some buildings.
No name	669	1271	A great flood entered the Mosque. Described as a sea.
No name	687	1289	On Wed. 14th Duhl'Qe'da. Seven people sunk inside the Mosque and five hundreds outside. Rose 7.33 hands on the Holy Ka'bah wall. Floods stayed inside the mosque for four days. Friday prayers cancelled at the Mosque.
No name	730	1329	Came with no rain. Entered the Mosque. Stayed in the Mosque for a hundred days.
No name	732	1331	In the last days of DuhlHedjah. Came with a heavy rain. Five people killed.
No name	738	1337	A great flood.
	750	1349	With a strong wind before which destroyed the iron pillars at the Mataf.
	771	1369	A great flood. Destroyed many buildings. About a hundred people killed.

5. AlKurdi, M., *AlTareekh AlQaweem*, Koshak, Y., *Zamzam* and AlFayroozi, H. *Meyah Makkah*)

	802	1399	A great flood. Rose above the Holy Ka'bah gate by 75cm. Sixty people killed.
	814	1411	Came at noontime.
	825	1422	Came after Fajr prayer. Entered the Mosque and reached the Holy Ka'bah gate. Destroyed Al-Ma'laa wall.
	837	1433	Entered the Mosque and destroyed about one thousand buildings.
	838	1434	Entered the Mosque, destroyed Zamzam gate and about eight hundreds buildings.
	865	1460	Entered the Mosque, raised above the Holy Ka'bah doorstep by 37cm.
	867	1462	After a heavy rain, entered the Mosque from all gates. Rose above the Holy Ka'bah doorstep by one meter.
	880	1475	A great flood entered the Mosque. About 180 people sunk.
	887	1482	On the 4th of DhulQedaa. A great flood, Many people killed and many houses destroyed.
	897	1492	A great flood. About a hundred people killed.
	900	1494	Reached the Holy Ka'bah.
	971	1561	Reached the Holy Ka'bah lock.
	1039	1629	A great flood. Entered the mosque and the Holy Ka'bah. Reached the candles in the Mataf. About a thousand people killed. Some parts of the Holy Ka'bah destroyed at after noontime in the following day.
	1055	1645	Rose above the Holy Ka'bah doorstep by 75cm.
	1091	1680	A great flood, entered the Mosque, Rose up to the middle of the Holy Ka'bah.
	1242	1826	A great flood.
	1278	1861	Unexpected flood, entered the Mosque before Fajr prayer, many people were sunk.
	1323	1905	Caused a traffic problem. Came during Hajj season.
	1325	1907	On 21st of DhulHedja, a great flood. Rose up to 2 meters.
AlKhedawi	1327	1909	Named after Egyptian Khedawi who did his Hajj at that year. On the 23rd of DhulHedja, rose up to 2 meters.
	1349	1930	Caused by a strong rain. Rained for 3½ hours. Came up to 1½ m. Caused a lot of damage. Nobody killed.
Wednesday	1360	1941	In the month of Rabee Alawal, many buildings destroyed. Came up to 2½ m. Many people lost their sales items from shops. Traditional houses destroyed.
Wednesday	1384	1964	On Wednesday the 5th of Shaban. Many people killed.
Wednesday	1388	1968	On Wednesday the 4th of DhulQe'da, reached the Holy Ka'bah gate, many people killed. Caused by a heavy strong rain and raining for 8 hours. No damage by this flood reported.

Table 02: A list of recorded Lightning strict at Makkah area throughout the history combined from different sources.

no.	A.H.	A.D.	Place	Notes
1	73	629	Around Makkah.	30 people were killed.
2	154	770	The Holy Mosque.	5 people were killed.
3	184	800	The Holy Mosque shading area.	It burned the shading areas and two people were killed.
4	600	1203	Abi-Qubais mountain, southern the Holy Mosque.	Two people were killed.
			AlKhaif Mosque, in Muna.	One person was killed.
			The Holy Mosque.	Five people were killed.
5	695	1295	Ali gate at the Holy Mosque	The prayer caller died.
6	750	1349	The Holy Mosque.	All pillars around the Mataf fall down.
7	825	1421	AlTondebawi district.	Four people were killed.
8	897	1491	Arfat.	One person was killed.
9	909	1503	Qaitbai minaret at the Holy Mosque.	Some of it floors were burned.

(Source: Ghabash, A., *The Historical Aspect*, Safety at the Sacred Lands Symposium, v.1 p. 193)
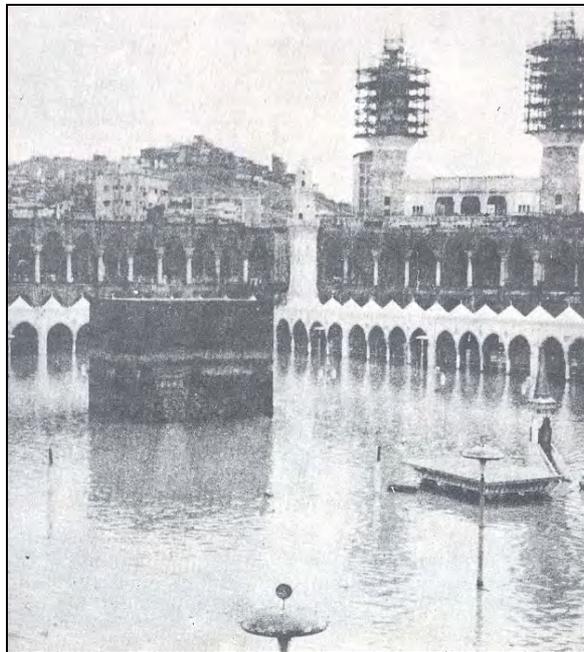
Figure 30: A picture of the 1968 A.D. flood level inside the Holy Mosque. (Source: Koshak, Y., *Zamzam*, p. 74)

- Epidemics

An epidemic is known as a "disease spreading rapidly among many people in the same place for a time."[6] Since the city of Makkah is incited by millions of worshippers annually, it is a place where many cultures mix. This city therefore can become a fertile breeding ground for any disease to become an epidemic, as was the case in the great Cholera outbreak of 1865, which was caused by pilgrims from Indonesia. Many epidemics have been reported in Makkah's history as is shown in table 5.3.

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6. Hornby, A.S. et al, Oxford Advanced Learner's Dictionary of Current English, 1984, p.288.

Islam has had to deal with this basic threat to humanity evet since it appeared. It has been narrated that that the Prophet Mohammed (pbuH) said: "If the Plague, which reflects any epidemic, is recognized in a town, do not let any one to enter or exit from that town until it's over." In obedience of that religious command, the Saudi Arabian government habitually issue an annual statement where the Minister of Health in the country gives an official release for pilgrimages after Hajj. He, the Minister, gives his reasons after a complete investigation to ensure that there were no epidemic cases discovered in that season. The importance of this procedure was demurs noted in 1949 when it is recorded that the pilgrims were kept inside Makkah for several months, until the city was cleared.

As result of that tradition, the Ministry of Health in the Saudi Arabian government study and prepare annually for any disease that could be expected over the year. Moreover, they acquire helpful counteractive inoculators for any expected viruses or bacteria. In addition, many hospitals and clinics prepare before every season and hundreds of staff are hired for the task of ensuring a healthy environment for worshippers. At the Holy Mosque, five clinics are open to help the people inside the building. Moreover, the Hijr of Ismail is used as a temporary clinic during the Ramadan and Hajj season to help people by offering first aid services until they can reach the closest hospital which is located close to the Holy Mosque inside the first ring road zone. Several cases that were helped by those clinics were reported in the last year as shown in Figure 5.3.

Earthquakes, floods and epidemics could be classified as natural events, but since, people could actually stop or reduce the problem before or affect it started if it is studied and prepared for, it could also be returned a man-made disaster. On the other hand, there are the other aspects which are absolutely caused by the action of people.

Table 3: A list of reported epidemics that affect the city of Makkah throughout history combined from different sources[7].

No	A.H.	A.D.	What happen?	Notes
1	84	703	Unknown disease it seem thing like dementia.	Number of deaths unknown.
2	174	790	Unspecified Epidemic.	Number of deaths unknown.
3	670	1271	It was described as an exterminatory epidemic.	About fifty people were killed.
4	749	1348	Unspecified Epidemic.	About forty people died.
5	793	1390	Unspecified Epidemic.	
6	968	1560	Smallpox disease on Makkah residents.	A large number of people died.
7	971	1563	Same as in 1560.	
8	1246	1831	Cholera.	
9	1261	1846		
10	1281	1865		Caused by a pilgrims from Indonesia
11	1275	1859		
12	1289	1872		
13	1307	1890		
14	1308	1891		
15	1310	1893		
16	1313	1896		
17	1314	1897		
18	1315	1898	Plague.	
19	1316	1899		
20	1317	1900		
21	1319	1902	Cholera.	A lot of people died in this year.
22	1320	1902	Plague.	Some countries prevented pilgrims from going to Makkah
23	1324	1907		
24	1326	1909		
25	1327	1910		
26	1330	1912	Cholera.	
27	1331	1913	Plague.	
28	1332	1914		
29	1336	1918		
30	1368	1949	Smallpox	545 injured 198 died
31	1370	1951		
32	1372	1953		
33	1407	1987	Meningitis	104 injured
34	1410	1990		126 injured

7 . Ghabash, A., *The Historical Aspect*, Safety at the Sacred Lands Symposium, v.1 p. 195, AzZahrani, R., *Deployment of Epidemics at the Holy Lands,* Safety at the Sacred Lands Symposium, v.2 p. 7-44
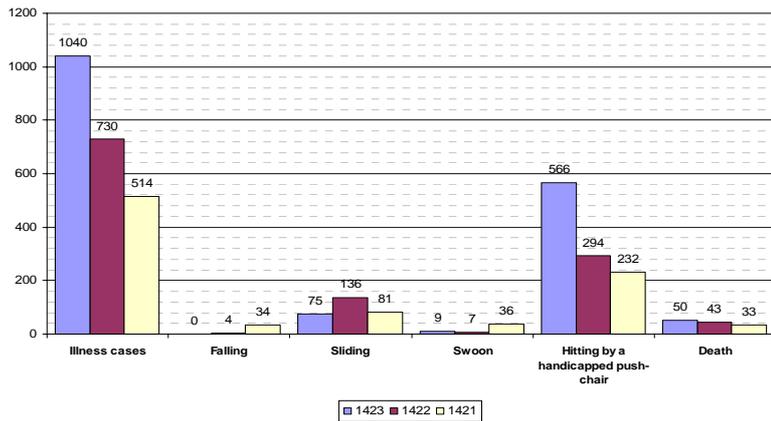
Figure 31: A diagram showing the reported cases served by the medical clinics inside the Holy Mosque over the last three Arabic calendar years (1421-1423 A.H.\2000-2003 A.D.). (Source: the records of the Holy Mosque Force department.)

- Artificial/man-made aspects

This type will point out episodes that were completely caused or supported by people and there is no natural reason for it.

- Overcrowding

The overcrowding issue was discussed in general terms in the former chapter. It has been reported throughout the history of Makkah that overcrowding causes death (see table 5.4.) However, although the issue was raised every season, overcrowding only came to be regarded as a crisis of some proportion after 1864 A.D. Adistinction is have drawn between death caused by overcrowding and death resulting from acts of war and aggression, which will be discussed later in this chapter.

The Saudi Arabian government is aware of the overcrowding problem wand several departments and agents had been established to deal with the issue. The Presidency of the Two Holy Mosques is the main department charged with related problems at the Holy Mosque. It is an independent authority which has supporting departments. Moreover, all other ministries and departments in the government are briefed to support its custodianship of the worshippers at this holy site. The Ministry of Interior had established a separate force for the security of the Holy Mosque. Additionally, as it had been stated by a former commander of the Holy Mosque Force Department, "a unique operation room had been created in 1996 that have a CCTV system to watch the Holy Mosque."[8] This system helps to get immediate action in case of troubles of the Holy Mosque. As it been stated before, the Custodian of the Two Holy Mosques Institute of Hajj Research been established in 1975 to study the problems of Hajj cities on a continues basis.

Overcrowding can be seen to be the main historic problem at the Holy Mosque. As shown in Figure 5.4, most of the expansion projects in the past started after serious problems caused by an overcrowding.

Table 4: The overcrowding problems as it been reported in Makkah history.

A.H.	A.D.	Incident
581	1185	34 people died inside the Sacred Ka'bah because of the overcrowding.
619	1222	A group of people died at the Masa'a because of the large number of pilgrims.
677	1278	Eighty people died while they are exiting from AlUmrah gate when a camel blocked their way out.
784	1382	Forty people died at AsSalam gate.
845	1441	Seven people died at the Mataf area.
1281	1864	Three people died next to the biggest pillar at Muna because of the crowding.

(Source: 1.Ghabash, A., *The Historical Aspect*, Safety at the Sacred Lands Symposium, v.1 p. 197)

- Fire

In the past, Makkan people used oil lamps to get light after sunset. If used without care there is a potentially dangerous situation. Also, as mentioned in chapter one, Makkah's traditional houses had a lot of wooden features such as the Roshan, Mashrabiya, as well as structural elements. The combination of those factors caused many fires in Makkah, especially in the central area. Even today, fire remains a problem. According to Zuhair Kutbi, a Saudi Arabian writer, there were 1778 fires in Makkah in the year 1991[9] alone. Figure 5.5 shows the number of fires for years from 1982-1991. The most important historic fire accidents at the central area are shown in table 5.5. The 1958 fire was the last great fire in Makkah's history that was considered a disaster. There are, however, many fire accidents reported after that date, as is shown in Figure 5.4, but they were not considered disasters. The Saudi Arabian government had issued some building commands and regulations which reduce the usage of wooden elements in buildings in order to help reduce the number of fire incidents. This, in turn, has had an architectural impact and brought about changes to the traditional Makkan architectural style.

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8. An interview with a former Commander of the Holy Mosque Force Department.
9. Kutbi, Z., *Location analysis of Fire Accidents in Makkah*, 1994, p. 132
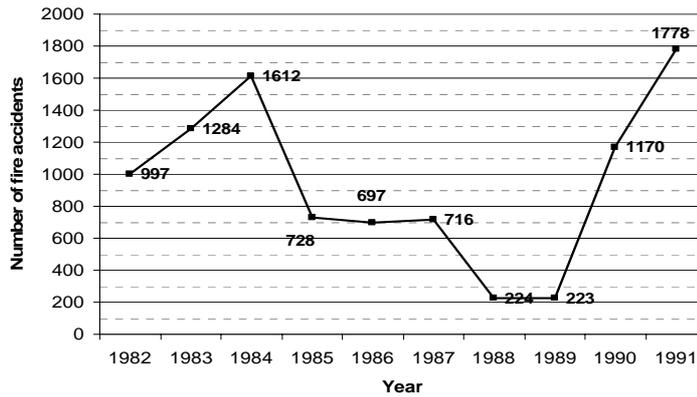
Figure 032: A diagram showing the show the number of fires for the years 1982-1991
(Source : Kutbi, Z., *Location analysis*, p133)

Table 5: the main fire disasters in Makkah history combined from different sources[10].

Fire place	Year (A.H.)	Year (A.D.)	Notes
The Sacred Ka'bah	Quraish time		Caused by a spark from a woman while she was incensing the Sacred Ka'bah's walls caused a fire.
AsSahn, The courtyard of the Holy Mosque	64	683	Some tents built by Abdullah Ibn AzZubairs army inside the Holy Mosque courtyard were fired by AlHajjaj army. The fire moved to the Sacred Ka'bah because of the wind. It was burnt and its walls became weak. In addition, the Black stone divided into three parts because of the fire.
Building around the Holy Mosque	571	1175	Some buildings around the Holy Mosque were burnt because of a war in Makkah.
Inside the Holy Mosque	802	1399	Started in some rooms inside the Holy Mosque and it became bigger and burnt the western side roof and part of the northern side roof. It destroyed about 130 of the Mosque's pillars.
Building around the Holy Mosque	909	1503	It burned for two days. It was a great fire and a lot of people injured.
AsShameya District	1352	Sept. 1932	Destroyed four houses but nobody was injured.
AsShameya District	1356	August 1936	Started from a shop at Ga'at Ashifa. One house destroyed but nobody was injured.
Al-Qushashiya district	1357	October 1937	Started from a house at Al-Qushashiya district. There was nobody killed or injured.
Souq Al-layl area	1360	May 1940	Started from a house at Souq Al-layl area. The house occupiers escaped but a newborn baby killed, and four people injured.
Ashamiya district	1378	July 21st, 1958	This was the biggest fire. A gas candle at a shop in Ashamiya district caused it while people were praying at the Holy Mosque. It took five days to extinguish the fire completely. Forty-four houses and four shops were destroyed. Some pilgrims threw themselves from their houses. Six people killed and twelve injured.

10. an interview with Colonial. Salem Alhazmi, Makkah firefighter department, AlKurdi, M.T. *AlTareekh AlQaweem*, *AlNadwa newspaper* issue no. 47 on Thursday July 24th, 1958 p. 4 and *AlMadina newspaper* issue no. 744 on Sunday July 27th, 1958 p. 3.

- War and Aggression (Terrorism)

War and aggression is prohibited by the Islamic religion. The Prophet (pbuH) said: "the Muslim is that one who other Muslims will be safe from his tongue and his hand." Moreover, as it will be shown in later chapters, Makkah is regarded a special place where all human kind should be safe. Ibn Abass (mAbpwt) narrated that Prophet Mohammed (pbuH) said: "Allah has made Makkah a sanctuary (sacred place) and it was a sanctuary before me and will be so after me. It was made legal for me (to fight in it) for a few hours of the day. None is allowed to uproot its thorny shrubs, or to cut its trees, or to chase its game, or to pick up its fallen things except a person who announces it publicly." On the other hand, three major incidents and several minor ones have been recorded in the history of Makkah. The most famous incidents were:

▪ **<u>The Elephant accident:</u>** It was the most famous story of terror in the History of the Holy Mosque. This story is best told as Allah, the Almighty, said in the Holy Quran in Surat Al-Fil (The Elephant) *"Have you (O Muhammad, pbuH) not seen how your Lord dealt with the owners of the Elephant? [The Elephant army which came from Yemen under the command of Abrahah Al-Ashram intending to destroy the Ka'bah at Makkah]. Did He not make their plot go astray? And He sent against them birds, in flocks, Striking them with stones of Sijjîl (baked clay). And He made them like (an empty field of) stalks (of which the corn has been eaten up by cattle)."* [105:1- 4]   It been described by several scholars and historians. According to Ibn Kathie, the author of one of the best Quran descriptions, this is what happened:

> "This incident happened during the period of the birth-year of Prophet Muhammad, pbuH. Abrahah Al-Ashram was the governor of Yemen on behalf of the king of Ethiopia (as Yemen was a part of the Ethiopian kingdom). He (Abrahah) thought to build a house (like the Ka'bah at Makkah) in San'a and call the Arabs to perform the pilgrimage there in San'a instead of the Ka'bah in Makkah, with the intention of diverting the trade and benefits from Makkah to Yemen. He presented his idea to the king of Ethiopia who agreed to his idea. So the house (church) was built and he named it Al-Qullais; there was no church of its like at that time. Then a man from the Quraish tribe of Makkah came there and was infuriated by it, so he relieved his nature (stools and urine) in it, soiled its walls and went away. When Abrahah Al-Ashram saw that, he could not control his anger and raised an army to invade Makkah and demolish the Ka'bah. He had in that army thirteen elephants and amongst them was an elephant called Mahmûd which was the biggest of them. So that army proceeded and none amongst the Arab tribes that faced them (fought against them) but was killed and defeated, till it approached near Makkah. Then there

took place negotiations between Abrahah Al-Ashram and the chief of Makkah (Abdul Muttalib bin Hâshim, the grandfather of the Prophet, pbuH), and it was concluded that Abrahah would restore the camels of Abdul Muttalib which he had taken away, and then he (Abrahah Al-Ashram) would decide himself as regards the Ka'bah. Abdul Muttalib ordered the men of Makkah to evacuate the city and go to the top of the mountains along with their wives and children in case some harm should come to them from the invading oppressors. Then that army moved towards Makkah till they reached Muhassir valley. While the army was marching towards Makkah, in the middle of the valley, suddenly it was overtaken by flocks of birds, flocks after flocks, air-raiding that army with small stones slightly bigger than a lentil seed. There never fell a stone on a soldier except it dissolved his flesh and burst it into pieces. So they perished with a total destruction. Abrahah Al-Ashram fled away while his flesh was bursting into pieces till he died on the way (back to Yemen). Such was the victory bestowed by Allah, the Almighty, to the people of Makkah and such was the protection provided by Him for His House." (See Tafsir Ibn Kathir, Surat Al-Fil).

▪ **AlQaramita Incident:**[11] As AzZarkashi narrated in his book E'lam AsSajed: On the Monday the 14th of Dul-Hijjah of 317 A.H., (11,1, 930 A.D.) the *Alqaramita*, whose leader was Abo Taher Sulaiman bin Abi Rabia'a Alqurmuti, pulled up the Ka'bah cover and divided his men. They pulled out the black stone and the Ka'bah gate and then tried to get the waterspout, but without success. They stayed in Makkah for eleven days and left only after they had killed thirteen thousand people. They took the Black Stone with them to Hajr. After about twelve years without a Black Stone in that Sacred corner of the Ka'bah it was returned to its original place on the 10th of Dul-Hijjah 339 A.H. by Sunbr Ibn AlHassan AlQurmuti.

▪ **The Holy Mosque Incident:**[12] It been called the Holy Mosque incident since it is such an unusual event. It happened on the first day of the fourteenth century in the Arabian calendar (Wednesday, the First day of Muharam 1400 A.H., 21st-11-1979 A.D.) while people were saying the Fajr prayer and the Imam was reading some verses from *Surat Al Tawba*. Hundreds of Saudi Arabian men and some women, following a leader named *Juhaiman*, entered the Holy Mosque with guns and ammunition and with other provisions. One of them pulled up the microphone from the Imam and started his speech, some others closed the gates and the rest occupied the minarets. They remained inside the building with hundreds of hostages of different nationalities. Some of those hostages escaped from the mosque and others were caught. Those who were killed were thrown

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11. Arabian referance, As AzZarkashi, *E'lam AsSajed fi Ahkam AlMasajed*, p. 204
12. Arabian reference, published AnNadwa Newspaper, *Wtamot AlFetna*, 1980.

into Zamzam well. For sixteen days there was neither praying nor adhan in the Holy Mosque. On Thursday the 17th of Muharam, the Saudi Arabian government recaptured the Holy Mosque, and cleansed it and released all hostages. It was reopened for the public on the late afternoon of that Thursday. Most of those gunmen were executed by the Saudi Arabian government according to Islamic law. It was reported briefly in the western media.[13]

In addition to these major events there are several other small incidents reported in the history, mainly for the fourteenth century:[14]

- During Hajj in 724 A.H., (1323 A.D.) One hundred and fifty Nigerian pilgrims came to perform hajj with their king. Before pilgrims went to Arafat, some of the Nigerian pilgrims had an argument with some Turkish pilgrims and took their swords inside the Holy Mosque and started fighting, but their king stopped them.

- On the 4-12-730 A.H., (18-9-1330 A.D.) A big fight took place between Egyptian pilgrims and some of the residents of Makkah. It happened during Duhor prayers. The Egyptian leader and his son, some of their pilgrims and some of Makkah's residents were killed. Some pilgrims died at gates of the Holy Mosque while they tried to leave the Holy Mosque.

- On Arafat day the 9-12-743A.H., (4-5-1343 A.D.) Ashraf and Turkish pilgrims fought on Arafat. Sixteen Turkish pilgrims and some of the Ashraf were killed.

- In 744 A.H., (1344 A.D.) A fight occurred around the Holy Mosque between Turkish people and Makkah residents.

- In 761 A.H., (1359 A.D.) A big fight happened between Turkish people and Egyptian soldiers on one side and the Ashraf on the other. This fight took place all over Makkah and some of the Ashraf entered the Holy Mosque and closed the gates. Many people died in this fight.

- On 5-12-817 A.H., (15-2-1415 A.D.) The *Aljarad* fight was one of the biggest to happen at the Holy Mosque. It was started when the Egyptian leader put one slave in the jail because he carried a weapon into the Holy Mosque. The slaves' friends released him

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13 . http://www.bartleby.com/67/3889.html
14. Arabian reference, AnNadwa Newspaper, *Wtamot AlFetna*, 1980, p 31-45

during jumaa prayers. The slaves entered the Holy Mosque and the soldiers ran after them. The slaves and the soldiers killed each other next to the holy Ka'bah. The Egyptian soldiers won this fight and the leader commanded his soldiers to close all of the Holy Mosque gates except Bab Bani Shaibah and one another gate at asShameyah area. They reopened the mosque after a long negotiation. The Adhan and the prayers were stopped for about two full days because of this incident.

- On 10-12-958 A.H., (8-12-1551 A.D.) at Muna, the Egyptian leader, with his soldiers, was fighting Abi Numai, Makkah's governor. The Egyptian leader called on the pilgrims and said that Abi Numai was no longer a governor of Makkah. then a great fight happened at Muna. When the Bedouin heard about that, they went to Muna and killed many pilgrims and stole their possessions. Then they went to Makkah and started robbing the houses but Abi Numai and his soldiers stopped them and closed most of the Holy Mosque gates. However, they did not stop either the Adhan nor the prayer.

- On 25-5-1204 A.H., (10-2-1790 A.D.) one of the Ashraf's sons wants started a coup d'etat to be a leader of Makkah. He sent five hundred of his slaves with their weapons to the Holy Mosque. They fought everywhere in the Holy Mosque, stopping prayers for four days.

- In 2-1288 A.H., (4-1871 A.D.) was the Fitnat Haowa. A person whose name is Haowa got in to trouble with the soldiers at the market of AlMa'laa. The people at the market helped the man and fought the soldiers with him.

The fourteenth century appears to have seen most troubles when the Ottoman Empire became the leader of the Islamic world. Apart from the 1871 incidents, the Holy Mosque seems to have had a comparatively peaceful history since the 15th century with only one serious 20th century event recorded. However, such troubles can not be ruled for the future. The potential of terrorise and aggression to cause death and chaos in the sacred city, and especially at the Holy Mosque, it remains one of the main problems related to mass movement.

It can be argued that, studying these historical lists of natural events and manmade disasters will help to find solutions which may help to avoid and limit the damage. Furthermore, it will improve our understanding of mass movement and the liability to control it, especially at the Holy Mosque. To avoid a repeat of previous problems, several

projects have been undertaken recently, such as the flood project at Makkah central area, the use of new materials and techniques to avoid lightning,.. etc.

Appendix B: The Historical Development of the Holy Mosque and its Qualities as an Architectural Monument.

- **The Importance of the Holy Mosque**

The *Qibla* or the prayer direction was toward the Jerusalem Mosque before Islam but, during early Islamic times, and Prophet Mohammed changed this to The Sacred *Ka'bah* at Makkah. According to the command of Allah, the Almighty, since then, the Holy Mosque has become the most important building for Muslims for all over the world. It contains the Sacred *Ka'bah* which is the direction for prayer. As Allah, the Almighty, said in the Holy Quran:

> *"Verily! We have seen the turning of your (Muhammad's,pbuH) face towards the heaven. Surely, We shall turn you to a Qiblah (prayer direction) that shall please you, so turn your face in the direction of Al-Masjid-al-Haram (at Makkah). And wheresoever you people are, turn your faces (in prayer) in that direction. Certainly, the people who were given the Scripture (i.e. Jews and the Christians) know well that, that (your turning towards the direction of the Ka'bah at Makkah in prayers) is the truth from their Lord. And Allah is not unaware of what they do."* [2:144]

The Holy Mosque, which contains the *Ka'bah*, has twelve places where the Doa'a, invocation, is acceptable and answerable (see section 7.4.7.) Every year, more than twenty million Muslims visit this building in order to perform Hajj or Umrah. It is the place where Islam started. Moreover, it is the favourite place of Allah, the Almighty, as it has been narrated that Prophet Mohammed (pbuH) said: "The best place on the earth to Allah, the Almighty, is Makkah." And He (pbuH) said*:*

> *"The only place on the earth where Allah, the Almighty, multiply the reward to one hundred thousand rewards except Makkah."* Moreover, He (pbuH) added: *"Whoever prays a single prayer in Makkah, Allah, the Almighty, will multiply it to one hundred thousand prayers."*

In addition, Allah, the Almighty, made it a special city when he said, in the Holy Quran:

> *"Verily, those who disbelieved and hinder (men) from the Path of Allah, and from Al-Masjid-al-Haram (at Makkah) which We have made (open) to (all) men, the dweller in it and the visitor from the country are equal there [as regards its sanctity and pilgrimage*

(Hajj and 'Umrah)] – and whoever inclines to evil actions therein or to do wrong (i.e. practise polytheism and leave Islamic Monotheism), him We shall cause to taste from a painful torment."
[22:25]

These are the virtues of the Holy land and its sacred relics which confirm the importance of Makkah and the Holy Mosque to Islam.

- **The History of the Holy *Ka'bah***

According to Muslim theology Allah created the *Ka'bah*'s base under his throne millions of years ago. Then he created the whole earth from that base. After that Allah commanded the Angels to build him a house under Al-Bait Al-Mamoor, which is in the upper heaven, they built the Holy *Ka'bah* and they make Tawaf around it as they did on *Al-Bait Al-Mamoor*.

Along time after that, Adam (pbuH), when he came to the earth, needed to have a place for worship. Seth Ibn Adam (pbuH) re-built the Holy *Ka'bah* after it got destroyed by rain and floods. For all that time the Holy *Ka'bah* has been a pilgrimage place for all Prophets. There are hundreds of Prophets' graves next to the Holy *Ka'bah*. As it is narrated that Prophet Mohammed (pbuH) said:

> "Every one of the prophets (pbuT) when his followers leave him goes to Makkah and every Prophet who escapes from his community escaped toward Makkah and lived their until death."

And He said: "Around the Sacred *Ka'bah*, there are three hundreds Prophets' graves." He (pbuH) added: "the grave of Prophets Nooh, Shoaib and Saleh (pbuT) [lies] between Zamzam and the *Maqam*."

Thousands of years later Allah, the Almighty, commanded *Abraham* to take his wife Hajer along with his only son *Ismai'l* to the place called there after Makkah. Nobody then lived at this place. He left them in a valley with no trees. When *Ismai'l* became older Allah commanded *Abraham* to build the Holy *Ka'bah* with his son. Allah says in the Holy Quran:

> *"And (remember) when Ibrâhîm (Abraham) and (his son) Ismâ'îl (Ishmael) were raising the foundations of the House (the Ka'bah at Makkah), (saying), "Our Lord! Accept (this service) from us. Verily! You are the All-Hearer, the All-Knower" Our Lord! And make us submissive unto You and of our offspring a*

*nation submissive unto You, and show us our Manâsik (all the
ceremonies of pilgrimage – Hajj and 'Umrah), and accept our
repentance. Truly, You are the One Who accepts repentance, the
Most Merciful. Our Lord! Send amongst them a Messenger of
their own (and indeed Allâh answered their invocation by
sending Muhammad, pbuH), who shall recite unto them Your
Verses and instruct them in the Book (this Qur'ân) and Al-
Hikmah (full knowledge of the Islâmic laws and jurisprudence
or wisdom or Prophethood), and purify them. Verily! You are
the All-Mighty, the All-Wise."* [2:127-129]

Abraham built the Holy *Ka'bah* of stone without a roof. It was nine cubits high. Its
length on the eastern side from the corner of the black stone to the northeastern corner
was thirty-two cubits. Opposite this, the western side, between the Yemeni corner and
the northwestern corner, the wall was thirty-one cubits. The southern side, from the
Black stone to the Yemeni corner, was twenty cubits. The northern side facing *Hijir
Ismai'l* (pbuH) was twenty-two cubits. He set up two opposing doors, one of them lay
on the eastern side near the Black Stone, and the other was on the western side near
the Yemeni corner. He dug a hole three cubits deep on the right side of the Black
Stone door as a coffer for the properties and gifts of the Holy *Ka'bah* as it shown in
Figure 01.
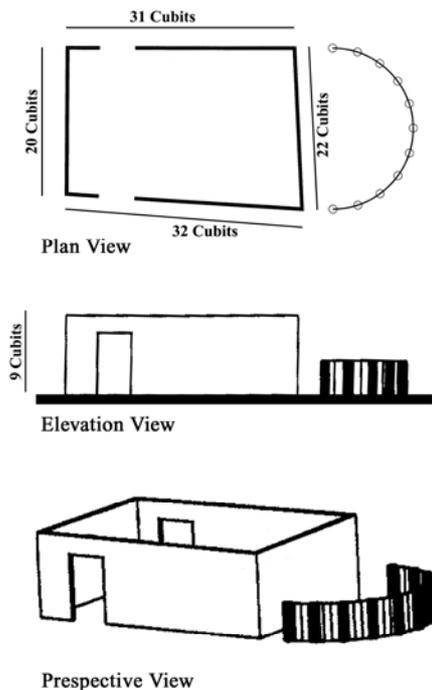
**Figure 33: A reconstruction
of the Prophet *Abraham*'s
(pbuH) building, the Sacred
Ka'bah.** (Source: The author's
drawing based on the
information collected form
several sources)[15]

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15 . Taqi AlDin AlFasi, *Shefaa AlGharam*; Hamed Abbas, *Story of Great Expansion*; A.AsSeba'e,
Tareekh Makkah and Associated Constructing Engineers, *The Extension and Construction of Haram
Sharif*.

o   The Construction of the Holy *Ka'bah* by the Quraish Tribe

Husain Basalamah reported that during the *Quraish* era (when the Prophet (pbuH) was about 35 years old)[16] a *Quraish* woman burnt the interior *Kiswah* of the Holy *Ka'bah* while she was perfuming it and the walls collapsed. It was made worse by the torrential rains which followed. The *Quraish* decided to pull down the Holy *Ka'bah* and rebuild it. They got to know about a Roman ship that was wrecked at *Al-Shua'iba*, Makkah's port. They bought the wood of the ship and they made a contract with a carpenter named *Baqum*, who was one of the passengers of the ship, to rebuild the Holy *Ka'bah* with them.

It was decided not to finance the building of the Holy *Ka'bah* with money obtained by usury, gambling, the fees of prostitutes or money obtained through illegal or unjust means. The *Quraish* tribe, therefore, distributed the duties of demolishing and rebuilding the holy *Ka'bah* among the tribes. All the people contributed to the work. Men carried the stones while women carried the mortar. The Prophet Mohammed (pbuH) carried the stones with them when he was thirty-five years of age. Then they started the rebuilding of the Holy *Ka'bah*. When it reached the stage of laying the Black Stone in its position, there was a quarrel over who was to have the honour of restoring it to its place.

This dispute almost caused a civil war. Someone suggested that they should agree upon the judgment of the first person coming through the door of Bani Shaiba. The first to come was the Prophet Mohammed (pbuH) the man most renowned for honesty in all of Makkah, He put the Black Stone in the middle of a piece of cloth, and asked a representative of each tribe to hold one of the edges of the cloth and raise it close to its place. Then the Prophet (pbuH) picked up the Black Stone with his hands and restored it to its place. Afterwards, they built to the height of four cubits and one hand span. Then they filled the interior of the Holy *Ka'bah* with earth. After that they set up a door at this point, and resumed building by placing a layer of wood followed by a layer of stones. They increased the height from nine cubits to eighteen and roofed it over. Inside they created six columns to support the ceiling in two rows. Each row was formed of three pillars from the Northern side to the Southern one. The waterspout was made to pour into *Hijir Ismai'l*. They also made wooden stairs inside

the Holy *Ka'bah*, in the Northern side, leading to its roof. One door was created which could be locked. The money they had was not enough to rebuild the Holy *Ka'bah* to its former size because they promised that they would not use unlawful money in that reconstruction work. They, as AlFasi reported in his book, *Shefaa Algharam*, therefore, reduced the building on the Northern east side at *Hijr* Ismail side for about three meters.[17]

o   The Construction of the Holy *Ka'bah* by Ibn Al-Zubair

It is reported that Abdullah Ibn Al-Zubair and his companions took refuge in the Holy mosque, and built shelters with reed stalks round the holy *Ka'bah*, and wooden structures to protect them from the heat of the sun and from the stones hurled from the catapults outside when Yazeed Ibn Muawiyah sent Al-Husayn Ibn Numair with his army to Makkah to fight Ibn Al-Zubair.[18] He subjugated the whole of Makkah except the holy Mosque. On the evening of Saturday, The third of Rabie Al-Awwal (the third month in the Arabic calendar) 64 A.H. (683 A.D.) Al-Husayn Ibn Numair threw stones at the Holy *Ka'bah*. The Kiswah began to shake. One of Ibn Al-Zubair's companions lit a fire, and a spark flew off and set alight the Holy *Ka'bah*. When the news of the death of Yazeed Ibn Muawiyah arrived, Al-Hussein ended the siege and left Makkah with his army on the fifth of the Rabie Al-Thani in the same year. Then the Holy *Ka'bah* was pulled down and rebuilt.

Ibn Al- Zubair consulted experienced people concerning this problem. He finally decided to demolish and rebuild the Holy *Ka'bah*. He reconstructed it on the foundation of *Abraham* (peace be upon him), thus fulfilling what Prophet Muhammad (blessings and peace be upon him) had hoped for. As' Quraish, collected the stones from Makkah's mountains, Hitra, Thabeer, Al – Mugatta, Al- Khandamah, Halhala, *Ka'bah* and Mardalla. People in Makkah helped Ibn Al-Zubair to pull down the Holy *Ka'bah*. When the foundations of the Sacred House were excavated, it was discovered that it was six cubits and a hand span inside *Hijir Ismai'l*. He set up the eastern door one base higher than Al-Shadhrwan which is on the ground, and the western door was parallel to the eastern door at the back of the Holy *Ka'bah* and

16. Basalamah, H., *Tareekh AlKa'bah AlMua'dhama*, 2000, p.42.
17. AlFasi, TaqiAlDin, *Shefaa Algharam*, 1999, p.182-190.
18. AlFasi, T., *Shefaa Algharam*; Basalamah H. *Tareekh Alkaba AlMuadhama*; AlAzraqi M., *Akhbar Makkah* and AsSeba'e, A., *Tareekh Makkah*.

opposite to it. When the building reached the site of the Black Stone, he put it in its place unobtrusively. He increased the height of the Holy *Ka'bah* to twenty-seven cubits and the width of the wall by two cubits. He put then three pillar columns in one row to support the ceiling from north to south. He built the ceiling with marble brought from Sana'a, Yemen. He made two leaves for each door instead of one. The height of the door was eleven cubits. He built a zigzagged staircase made of wood inside the Holy *Ka'bah* at the northern corner. After he completed the building, he perfumed the interior. The building was completed on the 17th of Rajab, 65 A.H., (684 A.D.) this is a confirmed recorded description of the story behind the construction work by Ibn AlZubair for the Sacred *Ka'bah* as Basalamah, who died in 1937A.D., as stated in *Tareekh AlKabah AlMuadhama* (early 20th century).[19]

o   The construction of the Holy *Ka'bah* by Al-Hajjaj Ibn Yousof AlThaqafi

In 74 A.H. (693 A.D.), as it has been recorded by most historians,[20] Al-Hajjaj, an army leader, wrote to Abdull Malik Ibn Marawan, a Muslim leader in Umayyad Empire, that Abdullah Ibn Al-Zubair had made additions to the building of the Holy *Ka'bah* and fixed another door. Abdull Malik instructed Al-Hajjaj to close down the western door which been added by Ibn Al-Zubair, and to pull down the part that had been added. Al-Hajjaj demolished six cubits and a hand span on the side of Al-*Hijir* and built it on the foundation of the Quraish to be the same size as during the Prophet's time. He spread the floor with the remaining stones, and closed the western door at the back of the Holy *Ka'bah*. He left the rest of the building as it was. He closed down the western door and raised the eastern door to its former position as made by the Quraish as shown in Figure 02.

o   The construction of the Holy *Ka'bah* by Sultan Murad Khan

On Wednesday, 19th Sha'ban, 1039 A.H., (1543 A.D.), as it Basalamah reported[21] when a heavy rain fell on Makkah and continued up until Thursday evening. This caused torrential flooding. Flood levels in the Holy Mosque reached half way up of the walls of the Holy *Ka'bah* and consequently the building collapsed. Upon hearing of the disaster Sultan Murad Khan sent a ship laden with all the equipment required

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19. Basalama, H., *Tareekh AlKa'bah AlMuadhama*, 2000, p. 65.
20. AlFasi, T., *Shefaa Algharam*; Basalamah H. *Tareekh Alkaba AlMuadhama*; AlAzraqi M., *Akhbar Makkah* and AsSeba'e, A., *Tareekh Makkah*.

for the rebuilding of the Holy Mosque. The work started at the end built by Al-Hajjaj. The walls of the Sacred *Ka'bah* were demolished down to the first layer of stones above floor level and rebuilt. Its dimensions were not changed, as Hamed Abbas reported.[22] The stones needed to complete the building were taken from *Ka'bah* Mountain. During the demolition work, all corners were pulled down except the corner of the Black Stone. It was found that the colour of the hidden part of the Black Stone was white just like the marble of *Abraham*'s Station. A plaque was fixed inside the Holy *Ka'bah* in which the name of the constructor was inscribed.

o   The construction of the Holy *Ka'bah* by the Custodian of the Two Holy Mosques, King Fahad Ibn Abdul Aziz Aal Saud:

According to A. Kurdi,[23] 375 years after the last rebuilding work for the Holy *Ka'bah* it became necessary to rebuild it because weathering had caused peeling and gaps to form in the surface of the external layer of stone work. On 1414 A.H. (1994 A.D.) King Fahad issued his order to repair the external wall of the Holy *Ka'bah* together with all necessary works required. The stonework was repointed, cleaned and repaired using stone from the mountains around Makkah, that tests have shown to be comparable with those of the original building. The latest technology was employed to treat the stone walls so as to preserve the structure for future generations.

Kurdi added that after the successful restoration of the structure an extensive study was made of the interior of the Holy *Ka'bah*. Random samples indicated that white ants and fungi had destroyed many materials on the floor and in the walls. The wooden pillars, which were covered by a mixture of mud, sand and lime, were also infected. It was clear that better and stronger wall treatments were required to prevent any further deterioration of the interior of the Holy *Ka'bah*. King Fahad had issued his order to complete this work in 1416 A.H. (1996 A.D.), and work started after the following Rammadan and Hajj seasons. Wall decorations, such as memorial plates and other pieces were removed, cleaned and stored in a safe place. The ceiling, floor, pillars and plaster work of the walls all had to be carefully removed and either repaired or replaced depending on its state of decay.

21. Basalama, H., *Tareekh AlKa'bah AlMuadhama*, 2000, p. 70.
22 . Abbas, H., *Storey of Great expansion*, 1996 , p. 94
23. Abaidullah Kurdi's book, *The Sacred Ka'bah and the Two Holy Mosque* (1996) is the only
   published book that discussed this construction project.

This work involved excavating below the level of the current internal floor of the Holy *Ka'bah*, down to the present level of the circumambulation area and below it to the depth of 40 to 70 centimetres. In the order to check and secure the original foundations, there were found to be in a good state of repair, The subsequent restoration of the Sacred *Ka'bah* was conducted with equal care. Only the very best materials available would suffice.

The best wood in the world for replacing the ceiling of the Holy *Ka'bah* were found to be *Teak* from the forests of *Burma*. The old waterspout was replaced with a new one, shown in Figure 02, of the same dimensions. It was stronger, more solid and more beautiful than the previous one. The old rock bases of the pillars were replaced with reinforced concrete. The old marble of the *Shadhrwan* were replaced by new marble resembling the old. The old marble plinth on the side of the door of the Holy *Ka'bah* was kept because of its symbolic value and the beauty of it design, as shown in Figure 03. The old marble of the wall and the floor of the *Hijir Ismai'l* were removed. The lanterns on the walls were cleaned and restored to their previous condition. It was the most thorough reconstruction of the Holy *Ka'bah* ever, but considered a great success, (see Figure 02 and 03).
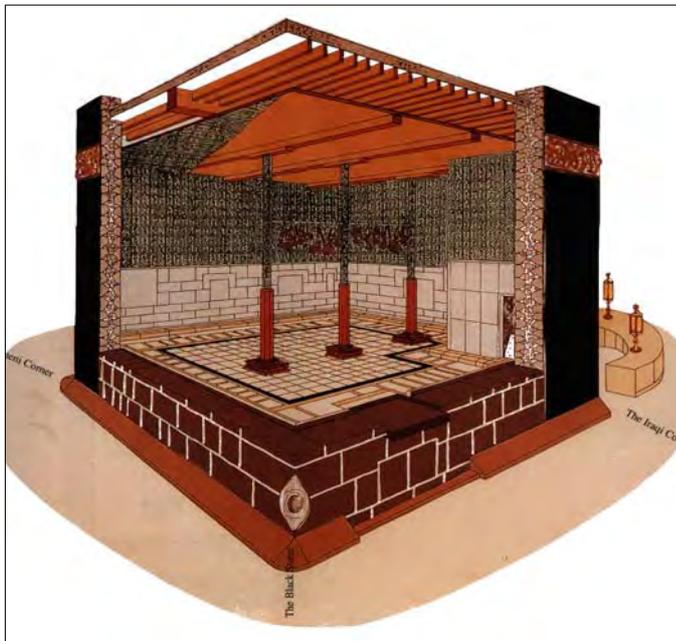
Figure 34: A cut-away perspective of the Sacred *Ka'bah* showing King Fahad's reconstruction work. (Source: Kurdi, A., *The Sacred Ka'bah,* p.129)
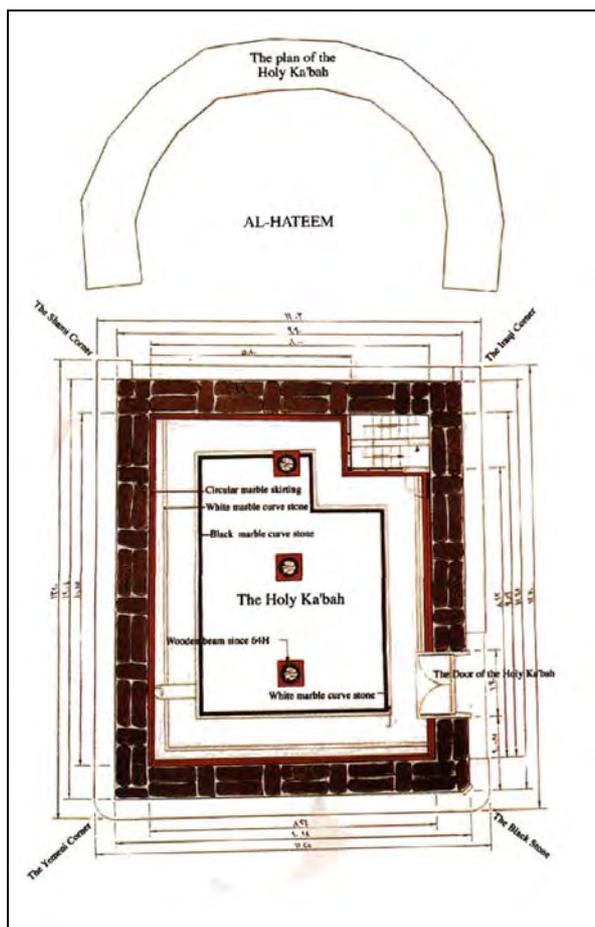
Figure 35: A Floor plan of the Sacred *Ka'bah* from King Fahad's reconstruction. (Source: Kurdi, A., *The Sacred Ka'bah,* p.188)

- **The Dimensions of the Sacred *Ka'bah***

As seen from the previous part, the dimensions of the Sacred *Ka'bah* have been changed several times since *Abraham*'s (pbuH) construction. At that time it was nine cubits high, (1 cubit = 50 cm), the north-eastern wall was 32 cubits in length, the north-western wall was 22 cubits length, the south-eastern wall was 31 cubits length, and the south-eastern wall was 20 cubits in length. Today, it is twenty seven cubits high. The north-eastern wall is 26 cubits in length, the north-western wall is 22 cubits in length, the south-eastern wall is 25 cubits in length, and the south-eastern wall is 20 cubits lengthas shown in Figure 04. The wall thickness is 50 cm. and the doorstep two meters high from the Tawaf level and it is 1.90m. in width as it shown in Figure 04. The reduced length at the *Hijr* side could be ensured by what is revealed by Aishah (mAbpwh) – one of Prophet Mohammed's (pbuH) wives – who said:

> ''I wanted to enter the Holy *Ka'bah* to pray inside it but I couldn't, the Prophet Mohammed (pbuh) took me to *Hijir Ismai'l* and said: 'If you want to go inside the Holy *Ka'bah*, and then enter this place Quraish

didn't have enough money to build the whole Holy *Ka'bah* so they didn't include *Hijir Ismai'l* in the building."

a) The Sacred Ka'bah in the time of the Prophet Abraham (pbuH).

b) Under the Quraish tribe

c) As built by by Ibn Al-Zubair (mAbpwt)

d) As reconstructed by Al-Hajjaj
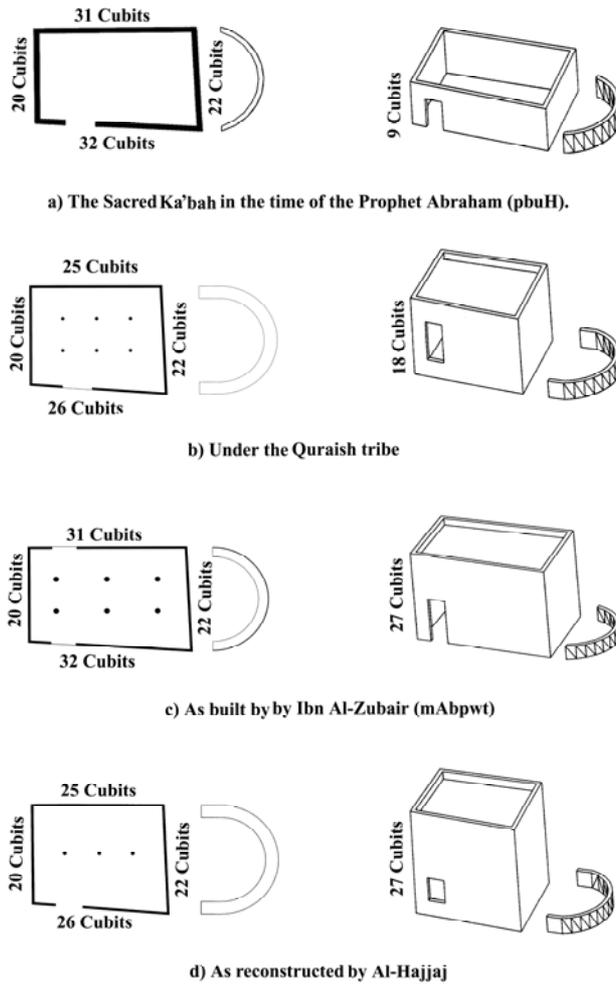
Figure 36: The development of the Sacred *Ka'bah* from the earliest time until the building by Alhajaj . (Source: the author's drawing based on the information collected from several sources.)[24]

- **The History of the Holy Mosque**

Al-Masjid Al-Haram, the Sacred Mosque or the Holy Mosque means it is the mosque of the Holy *Ka'bah*. It said that Al-Masjid Al-Haram is the Haram which means all the city of Makkah area. As Al-Nisa'I, a narrator of the Prophet's sayings, relates on the authority of Abu Hurairah (mAbpwh) that the Prophet (pbuH) said: "a prayer at the Holy Mosque is better than a prayer in my mosque by a hundred times".

Table 1 and Figure 05 summarizes the expansions of the Holy Mosque in the course of history.

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24. Taqi AlDin AlFasi, *Shefaa AlGharam*; Hamed Abbas, *Story of Great Expansion*; A.AsSeba'e, *Tareekh Makkah*; S. Angawi, *Makkan Architecture* and Associated Constructing Engineers, *The Extension and Construction of Haram Sharif* .

o   The Quraish Era

Most historians described the Holy Mosque during the *Quraish* tribe time as an open space around the Sacred *Ka'bah*. It was surrounded by secular buildings. Hassan Basalama, an Arabian historian who was born in 1881 A.D., wrote that, "the orbits of the circumambulation area used to be known as the Holy Mosque before the expansion of the Leader of the faithful, Omar Ibn Al-Khatab (mabpwh), is the area around the Holy *Ka'bah* up to the Zamzam well and Bab *Shaibah* in the east and the lamp pillars in all other sides."[25] It was not necessary to have an expansion since it was enough to accommodate Makkah's residents for prayer at that time. However, it has been reported that more than one hundred thousands of Muslims performed the Hajj journey with the Prophet Mohammed (pbuH) in His journey on the 9th year after his immigration to Medina. [26]

Table 6: The expansions of the Holy Mosque.

Leader Name	Year		Expansion in m.	Expansion %	Area after expansion in m.	Capacity (wprshippers)
	A.H	A.D.				
During Quraish Era.					2126	3324
Leader of the faithful, Omar Ibn Al-Khattab (mabpwh)	17	638	1487	70%	3613	5650
the Leader of the faithful, Othman Ibn Affan (mAbpwh)	26	646	869	24%	4482	7008
Abdullah Ibn Al-Zubair (mAbpwt)	65	684	2983	67%	7465	11673
Al-Waleed Ibn Abdul Malik Ibn Marawan	91	709	2805	38%	10270	16059
Abu Ja'far Al-Mansour	137	754	5221	51%	15491	24223
Mohammed Al-Mahdi Al-Abbasi	160-176	776-783	12512	81%	28003	43788
Al-Mu'tamid Billahi Al-Abbasi	284	897	1340	5%	29343	45882
Al-Muqtadir Billahi Al-Abbasi	306-307	918-919	715	2%	30058	47000
The First Saudi Extension made by King Abdul Aziz Aal Saud	1375	1955	13104	436%	161099	313000
The Great Expansion made by King Fahad Ibn Abdul Aziz	1406 - 1412	1986-1992	206000	128%	319,800	560,720

(Source: The Custodian of the Two Holy Mosques Institute of Hajj Research)

25. Basalamah, H., *Tareekh A'marat AlMasjid AlHaram*, 2001, p.12-4/18
26. Associated Constructing Engineers, *Extension and Construction*, p.30.

The Extension Omar Ibn Alkhatab, mAbpwh.

The Extension Othman Ibn Afan, mAbpwh.

The Extension Abdullah Ibn Alzubair, mAbpwt.

The Extension AlWaleed Ibn Abdulmalik.

The Extension Abu Ja'far AlMansour.

The Extension Mohammed AlMahdi Alabasi.

The Extension AlMu'tamid Billahi Alabasi.

The Extension AlMuqtader Billahi Alabasi.

The First Saudi Arabian Extension.

The Second Saudi Arabian Expansion.
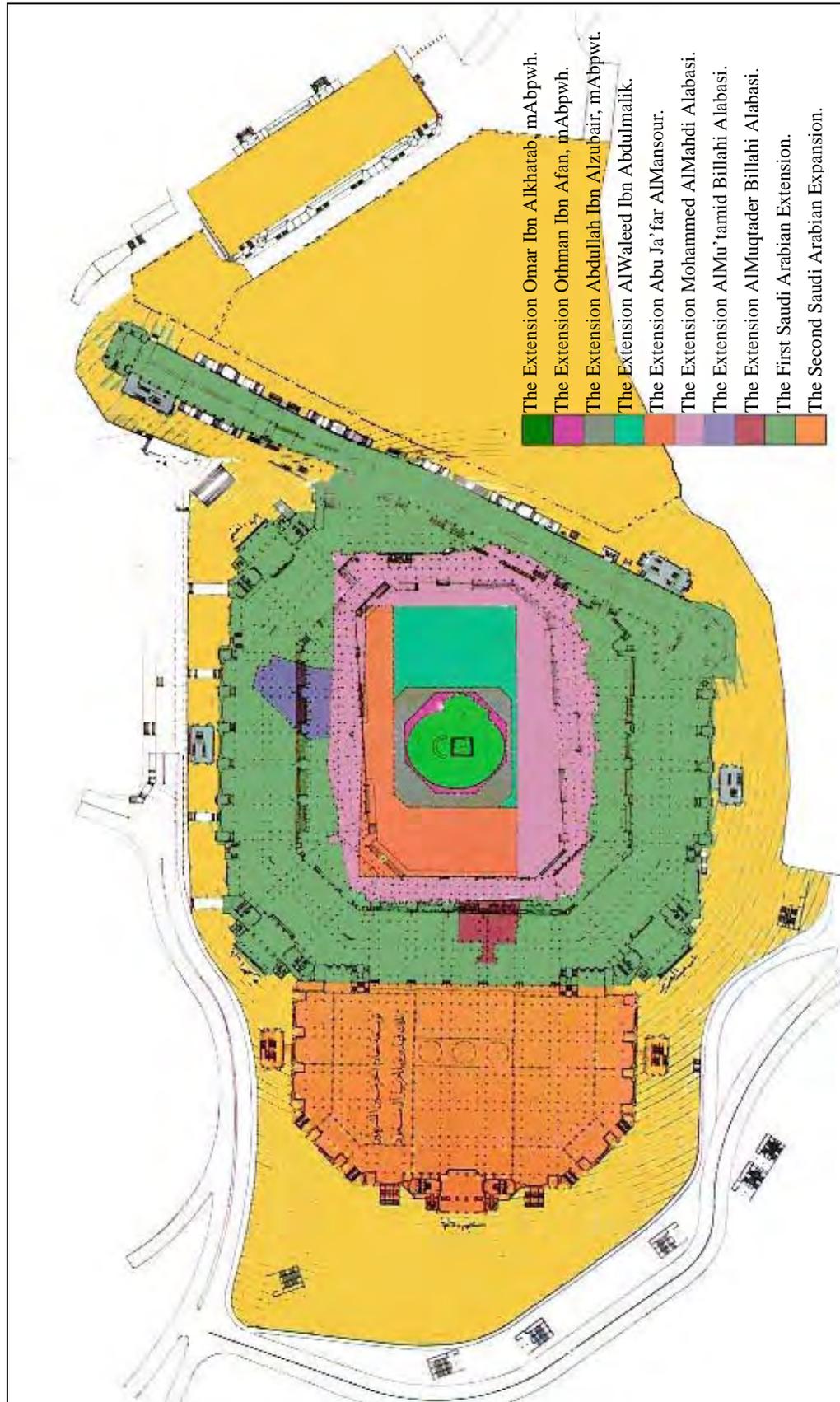
Figure 37: A plan showing the Extension of the Holy Mosque through the history . (Source: Bin Ladin Saudi Group)

o   The Leader of the faithful, Omar Ibn Al-Khattab (mabpwh)

In 17 A.H. (638 A.D.), Makkah had a great flood called, Umm Nahshl (Nahshl mother – because she died in that flood), the *Maqam Abraham* from its place to the bottom of the *Abraham* Valley. Omar Ibn Al-Khatab came to Makkah and restored the stone of *Abraham*'s Station to its original place (as discussed above). According to AlAzraqi, who died in the second Arabian century, Omar found that the Holy Mosque could no longer accommodate all pilgrims. He, therefore, bought some of the houses adjacent to the Holy Mosque and demolished them and added their area to the mosque. Then he built a wall less than two meters high around the Mosque and made doors in it. They put the lamps which they used to illuminate the mosque on this wall. He covered all area with gravel. The area which was added to the mosque was estimated at about 1400 square meters.[27]

o   The Leader of the faithful, Othman Ibn Affan (may Allah be pleased with
    him)

In the year 26A.H. (646 A.D.), the leader of the faithful, Othman Ibn Affan (mAbpwh) came to Makkah for Umrah. Hamid Abbas pointed out this expansion when he wrote that Othoman found that the residents of Makkah had become very numerous and that the Holy Mosque could not accommodate all of them when they were performing their prayers. He bought up some of the houses adjacent to the Holy Mosque and had them demolished to add to the space. He was the first to set up corridors (arcade) sheltering worshippers from the sun. The total area added to the Holy Mosque was 1475 square meters.[28] (See Figure 06)

27. AlAzraqi, M., *Akhbar Makkah*, 2001, p.2/69
28. Abbas, H., *Story of Great Expansion*, 1996, p.208.
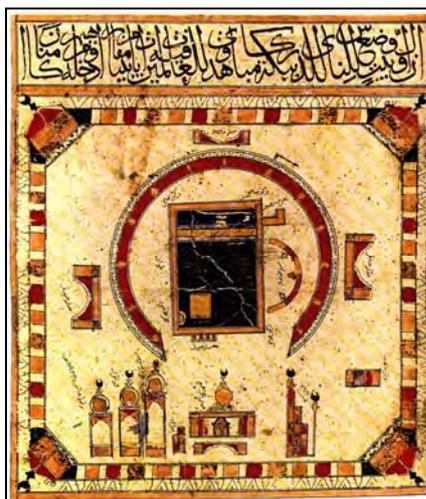
Figure 38: An old drawing showing the Holy Mosque after the expansion of Othman Ibn Affan (mAbpwh). (Source: Stewart, D., Mecca, 1980, p.21)

o   Abdullah Ibn Al-Zubair (may Allah be pleased with them)

According to H. Abbas, in 65H. 684 A.D., after Abdullah Ibn Al-Zubair had completed the building of the Holy *Ka'bah* (see above), he found that the mosque was not large enough for prayers. He bought the houses adjacent to the Holy Mosque and pulled them down and incorporated their area into the Mosque. He covered some parts of the Holy Mosque. He greatly expanded the Holy Mosque at that time. He built marble pillars. The total area of the Holy Mosque was 3225 square meters.[29]

o   Abdul Malik Ibn Marawan

As it been pointed out by Basalamah, in 75 A.H. (694 A.D.), a year after Al-Hajjaj finished the construction work of the Holy *Ka'bah*, it was found that the Holy Mosque needed some maintenance and construction work. Abdul Malik ordered the repair of the whole building. The walls were raised and the Holy Mosque was lined with the best kind of wood decorated with gold. However, the Holy Mosque building did not expand at this time.[30]

o   Al-Waleed Ibn Abdul Malik Ibn Marawan

AlAzraqi described this expansion. In 91 AH., (709 A.D.), Al-Waleed Ibn Abdul Malik Ibn Marwan expanded the eastern side of the Holy Mosque. Marble pillars were brought from Egypt and Al-Sham (Syria). The capitals of the pillars were coated with sheets of gold. He roofed the Mosque with decorated teak wood. He set up

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29. *ibid*, p.209.
30. Basalamah, H., *Tareekh A'marat AlMasjid AlHaram*, 2001, p.23-6

battlements and made windows in the walls and covered their upper sides with mosaics. This expansion was estimated at about 1725 square meters.[31]

o   Abu Ja'far Al-Mansour

According to Basalamah, the work on this extension was started in Muharram 137 A.H. (753 A.D.) The expanded area was on the northern side of the Holy Mosque. Houses in that area were demolished to increase the area of the Holy Mosque. They started near Dar Al-Nadwa, and continued up to the minaret of Al-Umrah's door. The mosque was decorated with gold and mosaic and *Hijir Ismai'l* overlaid with marble. The work continued for three full years and it was finished on Dhu Al-Hijjah 140H. Al-Mansour ordered a minaret to be built at the end of his expansion. The increase of area was estimated at 4950 square meters.[32]

o   Mohammed Al-Mahdi Al-Abbasi

Hamed Abbas summarized the expansion work: Mohammed Al-Mahdi Al-Abbasi made two expansions. He made the first one when he came for hajj for the first time in his life in the year 160 A.H. (776 A.D.) He brought with him large sums of money (estimated at thirty millions dirham.) and got permission from the chief judge of Makkah to buy some houses at the top end of the mosque. These were demolished and incorporated into the mosque. Houses between the Holy Mosque and Al-Mas'a were demolished as well as houses on the northern, western and southern sides. The total addition of this area was estimated at 8,383 square meters.

When Mohammed Al-Mahdi came for Hajj for the second time in 164 A.H. (780 A.D.), he found that the Holy Mosque was not in a square form and that the Holy *Ka'bah* was not in the centre of the mosque. He held a conference and ordered the engineers and skilled builders to make the Mosque in the shape of a square so that the Holy *Ka'bah* could be located in its centre. This proved to be impossible as the southern side of the mosque could not expand due to the course of the flood plains of *Wadi Abraham* – the *Abraham* Valley - and, also because behind there were houses and shops. The leader of the faithful insisted on carrying out this plan. The engineers set their minds to perform this work as best they could and when Al-Mahdi was

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31. AlAzraqi, M., *Akhbar Makkah*, 2001, p.2/71-2
32. Basalamah, H., *Tareekh A'marat AlMasjid AlHaram*, 2001, p.28-30

satisfied that his wish would be fulfilled, he returned to Iraq leaving behind him large sums of money for buying up the houses, demolishing them and adding their areas to the Holy Mosque. This expansion was the greatest expansion up to that time and the increase of area was estimated at 6560 square meters.[33]

o   Al-Mu'tamid Billahi Al-Abbasi

Al-Mu'tamid Billahi Al-Abbasi's expansion was made in the year 271 A.H. (884 A.D.) when a small building collapsed on the Holy Mosque and destroyed two domes decorated with wood. Al-Mu'tamid Billahi ordered a complete maintenance for all the Holy Mosque's buildings. In 281 A.H. (894 A.D.) he constructed all the Holy Mosque with pillars, windows and corridors, and roofed it with ornamental teak wood. Twelve doors were set up with six big arches and between them six smaller ones. He built a minaret as well. The work was completed in three years. This increase of area was estimated at 2500 square meters.

o   Al-Muqtadir Billahi Al-Abbasi

This expansion was summarized by Haned Abbas; it was done in the year 306 A.H., (919 A.D.) Al-Muqtadir Billahi expanded the western side of the Holy Mosque. He also renovated the pillars of the mosque. The increase of area was estimated at 980 square meters which shown in Figure 07.

Figure 39: A print on ceramic showing the Holy Mosque after Al-Muqtadir Billahi's expansion, dated 1774 A.D. (Source: Ali, A., The Holy Mosque in Makkah, 1996, Figure 49)

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33. Abbas, H., *Story of Great Expansion*, 1996, p.211.

o   The Ottomans (1569 A.D.)

It has been reported by Hamed Abbas that during the eighth century, following Al-Mahdi's expansion, no major reconstruction took place only maintenance and repair, as when a great fire happened on the Mosque in 802 AH and the wood work had to be restored. In year 979 A.H., however, cracks appeared in the walls and the corridors visibly began to lean towards the courtyard of the mosque. This led Sultan Salem to embark on the complete reconstruction of the Holy Mosque. With great care the wooden roof was replaced with domes. Many new marble columns were created plus the pillars that remained from Al-Mahdi's construction and pillars made from stones brought from Al-Shumaisi. It also recorded that, in total, 589 pillars were employed to form the colonnade on all sides of the mosque supporting 881 arches and 152 domes with 26 new doors which are shown in Figure 08. The Ottoman expansion added 28,003 square meters to the area of the Holy Mosque. In addition, it has wonderfully decorative work, as it shown in Figure 09.

o   King Abdul Aziz Aal Saud.

Abaid Allah Kurdi explains this expansion: early in 1344A.H. (1926AD.) King Abdul Aziz had issued his order to repair all parts of the Holy Mosque. They started the work in Jumada Al-Awwal, the third month in the Arabic calendar, with the tiling of all the floor area of the Holy Mosque with marble. Much all repair work was necessary to restore the Holy Mosque's dilapidated walls, floors and columns, and the walkways.[34]

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34. Abbas, H., *Story of Great Expansion*, 1996, p.245-74.
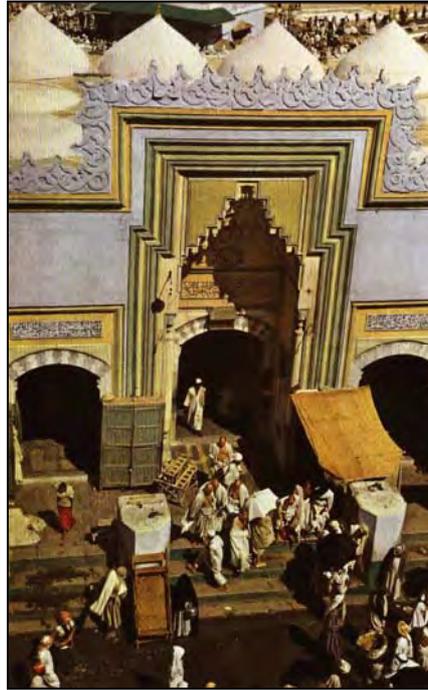
Figure 40: A picture showing the Safa gate before the first Saudi expansion. (Source: *National Geographic Magazine*, July 1953, p.23)

Figure 41: An old picture shows the Mataf in early twentieth century where the Ottoman buildings of the Holy Mosque can be seen surrounding the Mataf area. (Source: Abass, H., Story of the Great Expansion, p.13)

He added, in 1346H., (1928 A.D.) King Abdul Aziz issued orders for the complete reconstruction of the interior and exterior of the Holy Mosque. This repair work included extensions to Dar Al-Nadwa and *Abraham* gates. It also included repairing the stone which covered the four Maqamat around the Holy *Ka'bah*, all the external and internal walls and staircases leading to the Mosque's gate. All domes were cleaned externally and internally and repairs made to all broken doors. The Engineer Mohammed Taher Al-Jewainim, who is responsible for the design, created a new look for the Holy Mosque upon King AbdulAziz's command.[35] The work on the expansion started with the first phase of the expansion in 1375-1381 when they built the two floors of the Masa'a, with a length of 394.5 meters and width of 20 meters.

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35. Associated Constructing Engineers, *The Extension*, p. 45.

The first floor was 12 meters high and the second floor 9 meters. A low partition was erected in the middle to divide the Masa'a into two lanes, one going to Safa and the other to Marwa. They built two staircases, one for Safa and the other for Marwa. Eight gates were opened on the eastern side of the first floor. Two gates were opened to the second floor, one at al-Safa and the other at al-Marwa. They installed two elevators, one on each side of the Masa'a.

Phase two (1383-1389 A.H.), of the work involved the old part of the Holy Mosque being renovated and the construction work on the exterior part of the new building started. The expansion on the Mataf (courtyard) was completed. A staircase leading to Zamzam well was completed. During phase three (1393-1396 A.H.) the interior work was done on the *Mukabbiriyah* platform. The work outside the Holy Mosque included open spaces and road works were completed during this phase. Phase four (1393-1396 A.H.) included the renovation work on the old mosque (ottoman mosque) and the four corners were restored for the building of the three main gates. Figure 10 is an aerial photograph showing the first Saudi Arabian expansion.

Figure 42: An aerial photograph of the Holy Mosque after the first Saudi Arabian expansion. (Source: The Custodian of the Two Holy Mosques Institute of Hajj Research)

The total area of the Holy Mosque became 131,041 square meters.

o   The Great Expansion made by King Fahad Ibn Abdul Aziz.

As Hamed Abbas wrote in his book, *The Story of the Great Expantion*[36], in 1403 A.H., (1983 A.D.), only seven years after the previous expansion by Custodian of the Two Holy Mosques, King Fahad Ibn Abdul Aziz, it was found that the Holy Mosque

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36. Which been published to record the expansion work.

area was not enough to accommodate the pilgrims and visitors during the whole year. King Fahad, therefore, took the following steps relieve the situation:

King Fahad's expansion, that shown in Figure 11, followed the style of the first Saudi expansion. Two more minarets were added making a total of nine. More entrances were provided to the main building, to make a total of 95 gates. The total praying area after this expansion became 160,168 square meters. Now the Holy Mosque could accommodate more than half a million worshippers at peak time.[37]
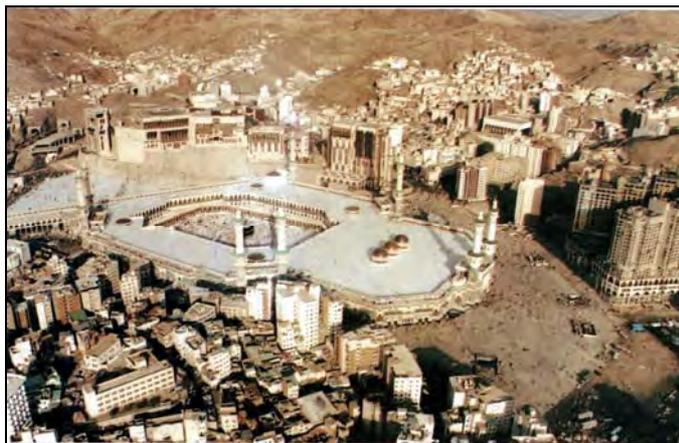
Figure 43: An aerial photograph of the Holy Mosque after King Fahad's expansion. (Source: Abass, H., Story of the Great Expansion, p.456)

- **The Aesthetic Qualities of the Holy Mosque**

Throughout history the Holy Mosque, as a building, received the highest attention from the Muslims leaders. The very best building materials and skills, and the most wonderful decorative elements have been continually employed for its maintenance. It also benefited from precious gifts from Muslims leaders.

Ahmed AsSeba'e pointed out that during the Ottoman Empire, Sultan AbdulHamid's mother gave the Holy Mosque six columns at the head of each a palm tree made from a gold, holding a candle on each of the six branches.[38] He added, in 1276A.H. (1859A.D.), The Ottoman Sultan sent a waterspout for the Sacred *Ka'bah* that been manufactured in Istanbul and it been covered with fifty pound of gold.[39] The architectural work of this particular expansion, as described in several books,[40] include marble columns, stone masonry walls, arches and parapets and brick masonry

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37. A figure of "more than a million" has been recorded in the media, which could not be (see Chapter 3.)
38. AsSeba'e A., *Makkah History*, 1979, p. 591.
39. *ibid*, p. 591.
40. Associated Constructing Engineers, *the Extension*; Hamed Abbas, *Story of Great Expansion*; A. AsSebae'e, *Tareekh Makkah*.

domes as in Figure 13. Some of the surviving columns decorated with calligraphic characters contain verses from the Holy Qura'n or Arabian histories are shown in Figure 14.

During the first Saudi Arabian expansion, the overall shape of the building received much attention which enhanced the impact this unique building has on the visitor, as the following quote described: "As one approach the Masjid AlHaram [the Holy Mosque], one is overwhelmed by the scale of the building, the beauty of the grey, white marble and the anticipation of the Holy *Ka'bah* that lies within."[41] In addition, the concept of the section has been well studied so as to engage the building with the surrounding topography. The gradual decreasing of the height from the surrounding mountains to the Sacred *Ka'bah* is reflected in the profile of the building objects.

Figure 44: A picture showing examples of some columns erected during the Ottoman reconstruction phase. (Source: Associated Constructing Engineers, *Extension and Construction*, p.64)
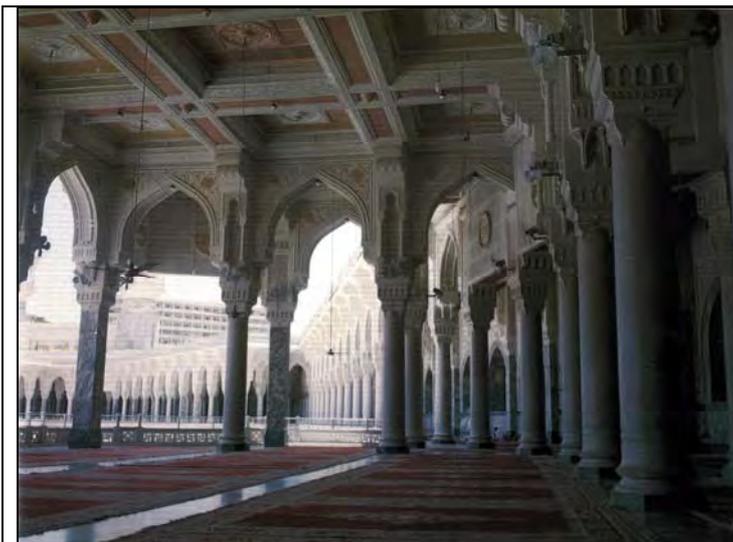
Figure 45: A picture of a prayer hall at the Holy Mosque showing the simple decoration of the ceiling. (Source: Associated Constructing Engineers, *Extension and Construction*, p.78)

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41. Associated Constructing Engineers, *The Extension*, p. 49.
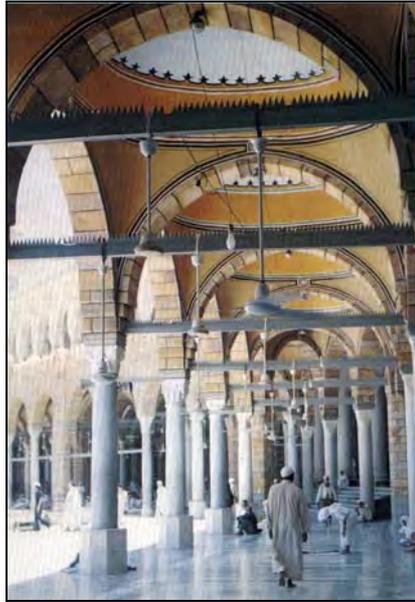
Figure 46: A picture of the Ottoman expansion building showing the building characters. (Source: Associated Constructing Engineers, *Extension and Construction*, p.37)

In the decoration work, however, the full range of the Islamic art vocabulary, such as arabesques and calligraphy, is employed, which add a unique and precious quality to the atmosphere inside and around the building. Moreover, the use of the arcades in the prayer hall and circulation spaces give a relaxed feeling which help prayers to focus on their religious duties. As it shown in Figure 13 and 14, the concept of the ceiling decoration is guided by simplicity. It is a combination of simple square - grid geometry with a limited, subdued colour scheme (pale pink and ochre tones. That blend with the gold leaf of the calligraphy.)

The decorative language of the second Saudi Arabian expansion, the King Fahad expansion, is based on that of the first one, except where more-up-to date techniques were employed, showing the high level of care given to this building. Hamed Abbass described the design approach underlying the second expansion of the Holy Mosque as follows:

> "The best materials, craftsmen and technology were used in all the architectural elements of the Holy Mosque elements including brass work chandeliers, glass wave, crowns of columns, lamps, interlaced wooden screens and cornice. Materials include gold, brass, glass, rock crystal, Sag wood, Moroccan pine wood, yellow aluminum, ornamented artificial stone, marble, granite, ceramics, stucco etc."[42]

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42. Abbass, H., *The Story of the Great Expansion*, 1996, p.410
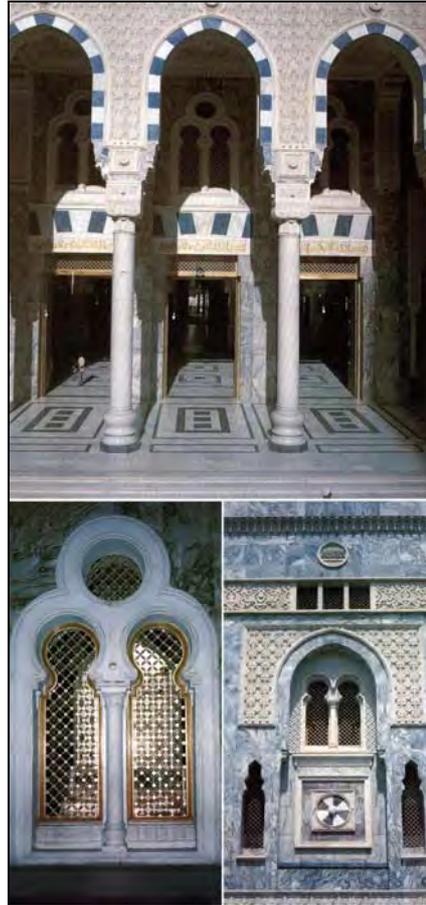
Figure 47: Images of the architectural character of the first Saudi Arabian expansion.
(Source: Associated Constructing Engineers, *Extension and Construction*, p.63/77)

The domes, which are shown in Figure 16, rest on stalactite pendentives incorporating Sag wooden windows set within frames of artificial granite. The stalactites, also made from artificial granite, are gilded. The use of soft green, white, brown and other colors of the artificial granite in the walls and arches, as Figure 17 shows, helps create a unique atmosphere conducive to meditation and prayers.
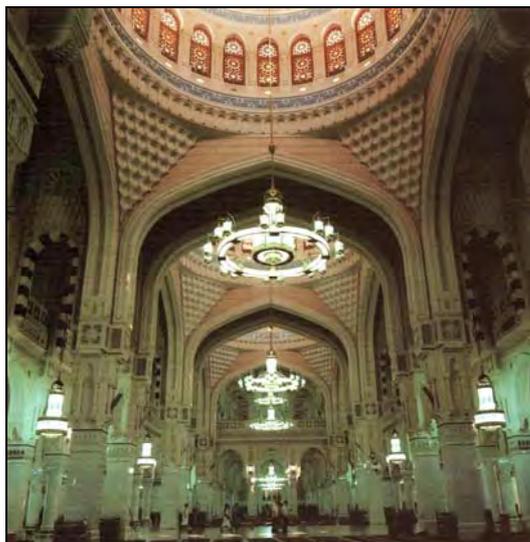
Figure 48: A picture showing the dome of the new Saudi Arabian expansion.
(Source: Abass, H., The Story of the Great Expansion, p.378)

At the same time, no expanse was spared to employ the latest technology to create a comfortable environment. For example, the new air-conditioning system of the Holy Mosque is, according to Hamed Abbass, one of the largest single system in the world. He added:

> "It is regarded the first of its kind in the world as to its characteristics and location of its application, for: the importance of the place to large number of people over the world, the area of occupy that exceeds two hundreds seventeen thousands square meters the location of the air cooling system are open on many side and the location of the central cooling stations at distance from the site which is about 450 meters."[43]
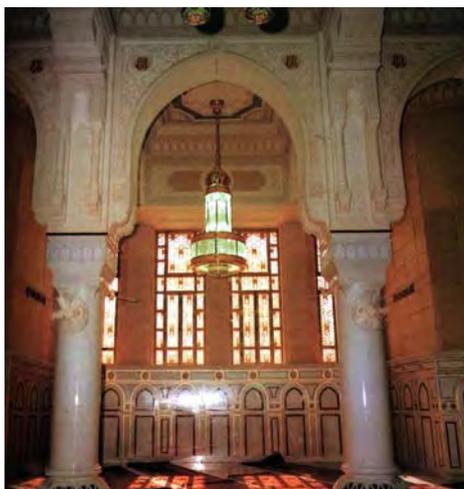
Figure 49: A picture showing the use of different colours of stone on the walls as well as the air-conditioning grilles at the Holy Mosque's columns bases. (Source: Abass, H., The Story of the Great Expansion, p.405)

The air conditioning system is cleverly integrated with the decorative scheme. The column bases and capitals serve as cooling units where the cool air is push into the space through openings at the heads of the square columns, and the hot air extracted through openings at the bases of the circular columns, as is shown in Figure 17.

The Sacred *Ka'bah* had received special attention from Muslim leaders throughout history. The highest degree of care was bestowed at its maintenance and reconstruction work, as was described above. However, the Kiswa, which is the black cover of the Sacred *Ka'bah*, has had equally high attention paid to it as well. It is thought that the Sacred *Ka'bah* was covered by a special cloth right from the beginning.[44] The Kiswa process got its formal aspect at the time of Qusai,[45] when all

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43. *ibid*, p388
44. There are different theories. Some historians believe that Ismail (pbuH) was the first person to have covered the Sacred Kabah. Others claim that Adnan, the grandfather of the Prophet Mohammed (pbuH), is the one who did it which is a third view is that it was Asa'd AlHemyari, King of the Yemen, was the first who covered the Sacred Kabah.
45. One of the Prophet Mohammaed (pbuH) grandfathers.

Arabian tribes agreed to share the cost of covering this Holy object. However, it been recorded that there were people who paid for the cost of the Kiswa alone; the first being Nutaila Ibnat Habab, wife of the first grandfather of the Prophet Mohammed (pbuH) AbdulMutalibthe.[46]

After the start of the Islam, the Sacred *Ka'bah* was covered by the Prophet Mohammed (pbuH) with the Yemenis cloths. Omar then Ottoman covered it with Gubati (a special kind of expensive cloth), then AlHajaj cover it with white silk brocade[47]. Maintaining the Kiswa became one of duties of the Muslim leader since that time. Mulaibari adds: that the Kiswa was made from white brocade until late in the sixth Arabian century when AlNaser LedinAllah covered it with black brocade.[48] Since then , the Sacred *Ka'bah* was looked after by a Yemeni king, then an Egyptian leader, all adopting the practice of covering it annually by order. During the Ottoman Empire, the *Kiswa* remained as one of the duties of the Egyptian leader until 1214A.H. In 1221A.H. it been covered by The Old Saud, A Saudi King in the first Saudi Kingdom, when the *Kiswa* been late from Egypt for about seven years.[49] Then, the *Kiswa* duties again went to Egypt until 1343 A.H. when the Egyptian *Kiswa* had been rejected to Cairo by King AbdulAziz for political reasons.[50] During this period, it been reported that some time the *Kiswa* caravan could not came to Makkah which cause the delay in the ceremony of the changing. Therefore, in the 1345A.H. (1925A.D.) King AbdulAziz gave an order to build a factory for the *Kiswa* of the Sacred *Ka'bah* in Makkah. The Kiswa had made in this factory for about twelve years, until Egypt send another *Kiswa* again to cover the Sacred *Ka'bah*.

In 1382A.H. (1962 A.D.), Egypt refused to send the *Kiswa* which encouraged the Saudi Arabian government to reactivated the *Kiswa* factory in Makkah. Since then the *Kiswa* is being produced in a factory in Makkah which is unique for the quality of its craft work.[51] The *Kiswa* has traditionally been decorated with calligraphy of Arabian words, quoting religious sayings (See Figure 18). In addition, the *Hezam*, the belt of the *Kiswa*, is heavily decorated with calligraphy art with verses from the Holy Quran

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46. Abbass, H., *The Story of the Great Expansion*, 1996, p.106
47. Mulaibari, A., *AlMuntaqa Fi Akhbar Umm AlQura*, p.143.
48. One of the Abbasid leaders.
49. Abbass, H., *The Story of the Great Expansion*, 1996, p.109
50. *ibid*, p.109
51. Mulaibari, A., *AlMuntaqa Fi Akhbar Umm AlQura*, p.144

created in a golden fiber. This technique also has been use for the *Sacred Gate* curtain shown in Figure 19.

The evidence of history, therefore, shows that a wonderful environment has been created over time, one which is continually renewed with the very best that the art and architecture of a particular period can offer towards creating an inspiring religious atmosphere.
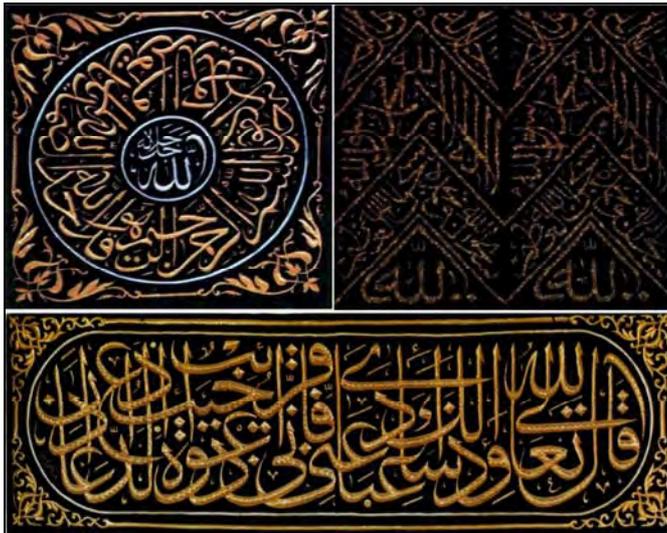
Figure 50: A collection of some of the calligraphy used on the Sacred *Ka'bah*. (Source: Associated Constructing Engineers, *Extension and Construction*, p.67)

Figure 51: A picture showing the golden calligraphy at the Kiswa of the Sacred *Ka'bah*. (Source: Abass, H., The Story of the Great Expansion, p.405)

Appendix C: Glossary of Arabic Terms

This thesis contain many Arabic words that have been used to identify things, places or activities especially related to Muslim culture. This Appendix will identify those words and explain their meaning. It been sorted in alphabetical order follows:

_____

- **Adhan**

  The call to Salat (prayer), pronounced loudly to indicate that the time of praying is due. It goes as follows: *Allahu Akbar, Allah Akbar, Allahu Akbar, Allah Akbar, Ash-hadu an la ilaha illallah, Ash-hadu an la ilaha illallah, Ash-hadu an Muhammed Rasul-Ullah, Ash-hadu an Muhammed Rasul-Ullah, Haiya alas-Sala, Haiya alas-Sala, Haiya alal-Falah, Haiya alal-Falah, Allahu Akbar, Allahu Akbar, La ilaha illallah.*

- **AlMarwa**

  A mountain in Makkah, neighbouring the Sacred Mosque. The one who performs Umrah or Hajj should walk seven times between it and AsSafa, and that is called Sa'i.

- **AlMultazam**

  The part of the Sacred *Ka'bah* wall that lies between the Black Stone and its gate. *Abdullah Ibn Amro Ibn AlA'ss, mAbpwt, said: "He circumambulated and when he finished he went to the place between the Sacred Ka'bah gate and the Black Stone and he said: I swear by Allah, the Almighty, this is the place where I saw Prophet Mohammed, pbuH, stand at (Eltazam)."*

- **Assafa**

  A mountain in Makkah, neighbouring the Sacred Mosque. The one who performs Umrah or Hajj should walk seven times between it and AlMarwa and that is called Sa'i.

- **Bab Annabi**

  It is the gate number 22 at AlMasa'a.

- **Bab Assalam**

  It is the gate number 24 at AlMasa'a. It been narrated that Prophet Mohammed, *pbuH*, entered from this gate.

- **Bab Bani Shaiba**

  It is the gate that the Prophet Mohammed, pbuH, entered from when he solved the problem of putting the Black Stone in its place before Islam during the reconstruction of the Sacred *Ka'bah* by Quraish. It was originally located inside Sahen Al-Mataf on the north east side of the Holy *Ka'bah*.

- **Dark Marble Line**

  It is a dark brown line from the eastern corner of the Holy *Ka'bah* (The Black Stone corner) toward the Holy Mosque building to indicate the Tawaf starting point.

- **Doa'a** °

  Invocation, asking Allah, the Almighty, for good things.

- **Hajj**

  Pilgrimage to Makkah. It is the answer of Prophet Ibrahem, pbuH, call as Allah, the Almighty, said in the Holy Qura'n: *"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)."* [22:27]

- *Hijr* **Ismail**

  An enclosure part or the unroofed portion of the *Ka'bah* which at present is in the form of a compound towards the north of the *Ka'bah*. For more information.

- **Imam**

  The person who leads others in the Salat (prayers) or the Muslim caliph (or ruler).

- **mAbpwh-t**   ‒   /

  May Allah Be Pleased With Him/Her-Them. It is normally used when any of the Prophet Mohammed's (pbuH) friends are mentioned.

- **Makkah**

  The Sacred City that hold the Holy Mosque. For more information.

- *Maqam Abraham*

  Maqam means Location, position, locality; station; saint's tomb, sacred place.[52] The Stone on which *Abraham* stood while he was building the Sacred *Ka'bah.*

- **Mu'adhin**

  A caller who pronounces the A dhan loudly calling people to come and perform the Salat (prayer).

- **Ottoman Rawag**

  The Ottoman building which surround Sahen Al-Mataf.

- **pbuH-T**   ‒   /

  Peace be upon Him/Her-Them. It is used after the name of a prophet.

- **Qiblah**

  The direction towards that all Muslims face in Salat (prayer) and that direction is towards the *Ka'bah* in Makkah (Saudi Arabia).

- **Quraish**

  One of the greatest tribes in Arabia in the pre-Islamic period of Ignorance. Prophet Mohammed, pbuH, belonged to this tribe, which had great power spiritually and economically both before and after Islam came.

- **Rak'ah** ركعة

  The Salat (prayer) of Muslims consists of Rak'at (singular-Rak'ah, which is unit of prayer and consists of one standing, one bowing and two prostrations).

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[52] . Groom, N., A dictionary of Arabic……………., 1983, p. 175

- **Sa'i سعي**

  The walking for seven times between the mountains of As-Safa and AlMarwah in Makkah during the performance of Hajj or Umrah.

- **Sahen Al-Mataf صحن المطاف**

  A place of circuiting or circumambulation.[53] Within the only courtyard in the Sacred Mosque which contain the Sacred *Ka'bah*.

- **Salat صلاة**

  Prayer.

- **Tawaf الطواف**

  The circumambulation of the *Ka'bah*. Going around the Sacred *Ka'bah* seven times anti-clock wise; it starts near the Black stone (from the Dark Marble Line) go to the right direction. Al-Azragi narriated that: it is said that when *Abraham* finished from building the Sacred *Ka'bah*, Jebra'il came and said: now, go round it seven times. *Abraham* did so with *Ismai'l*, touching all corners. When they finished seven rounds they prayed two-raka'at behaind *Maqam*. Also, Abdullah Ibn Omar said: when Prophet Mohammed (pbuH) arrived, he circled the house – the Sacred *Ka'bah* – seven times then he prayed behind the *Maqam*. After that He makes Sa'i between As-Safa and Al-Marwah.

- **The Black Stone الحجر الأسود**

  It is the eastern corner of the Sacred *Ka'bah*. It is a Holy Stone, for more information.

- **The Sacred Ka'bah الكعبة المشرفة**

  A square stone room inside the Sacred Mosque towards which all Muslims face in Salat (prayer).

- **The Sacred Mosque المسجد الحرام**

  It is the Muslims' Holiest place that contains the Sacred *Ka'bah*. It is located in Makkah. (see chapter 4.)

- **Umrah عمرة**

  A visit to Makkah during which one performs the *Tawaf* round the *Ka'bah* and the Sa'y between As-Safa and Al-Marwah.

- **Wudu وضوء**

  Ablution, which comprises washing the face and the hands up to the elbows, wiping the head and ears with fingers, and washing the feet up to ankles for the purpose of offering prayers or doing circumambulation round the Ka'bah.

- **Yemeni corner الركن اليماني**

  It is the southern corner of the Holy *Ka'bah* which face Yemen.

- **Zamzam Well بئر زَمْزَمْ**

  It is a Holy water springing in the Holy Mosque.

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53 . Groom, N., A dictionary of Arabic……………., 1983,p.187

Appendix D: Observational data Obtained Through Space Syntax.

Data Collected using the Space Syntax method at the entrance gates at the Holy Mosque for a period of one hour.

Approach:

Counting people is one of the most important steps in order to test the accuracy of the Space Syntax software result which predicts the value of pedestrian movement. The Holy Mosque has more than one hundred gates that serve the whole building. Those gates include four major gates, which comprise of three gates each, and five bridges lead from the north side of the Holy Mosque to the upper floor. This research was supported by the Custodian of the Two Holy Mosque Institute of Hajj Research. More than two hundreds undergraduate students from Saudi Arabian universities were hired in order to finish this work over a short period of time (see next page). The task was organized as follow:

1. Each student worked on one gate. The major gates had three students.

2. They counted people entering the Holy Mosque for one hour.

3. They counted people leaving from the Holy Mosque for one hour.

4. All the counting processes were done at the exactly same time for at gates.

5. Some other students counted people in other special places within the Holy Mosque such as Zamzam well and *Hijr* Ismail.

Timing:

This work took place on three occasions in order to cover the whole of the Muslim calendar year:

1. On the 28th of Ramadan 1422 A.H., in order to sample the Ramadan season.

2. On the 12th of Dul-Hijjah 1422 A.H., in order to sample the Hajj season.

3. On the 8th of Safar 1423 A.H., this cover off-peak time.

Data:

Table 7 Data at all gates for the Ramadan occasion

Gate Number	Persons entering	Persons exiting
1A	6348	5996
1B	8800	10221
1C	3075	2880
2	1023	3452
3	2423	1787
4	2702	2253
5	5495	4034
6	2674	3107
7	4400	4040
8	1616	1701
9	1770	1077
10	4680	3661
11	3184	5601
14	1204	4311
15	867	4398
16	380	2914
17	3099	987
18	1203	2035
19	2685	688
20	2966	2712
21	2394	3670
22	3726	2614
23	2856	3394
24	4358	2844
25	2658	3334
26	2198	1685
27	1277	482
28	2578	3724
29	2391	406
30	1859	590
31	1433	1058
32	1234	1258
33	1082	888

35	2356	3748
36	956	1477
38	3996	1684
40	1135	970
41	1437	1416
42	871	2963
43	1191	1427
45a	1436	3882
45b	6404	4308
45c	3124	2253
46	1791	1542
47	1484	3032
48	1680	1201
49	1448	2050
51	698	1700
52	589	1748
53	435	763
54	335	406
55	328	488
56	3120	3086
57	3600	3175
58	1461	1968
59	1877	1659
60	770	1246
62a	675	1657
62b	1261	2194
62c	338	2236
64	3172	5159
65	1500	3057
66	3980	2170
67	133	605
68	1842	1273
69	1686	134
70	1889	2457
71	1243	975
72	740	3205
73	2685	4190
74	1732	5435
78	896	1191

79a	5740	6940
79b	2250	6317
79c	3500	5110
80	1798	2494
81	522	2456
82	2565	4200
84	2128	5611
85	743	1977
86	772	285
87	890	1089
88	1255	1690
89	876	864
90	1409	796
91	4970	8362
92	2604	4967
93	979	1092
94	2905	4765
95	1311	1863
AlMarwa Bridge	2375	5241
AzZobair Bridge	1657	1547
AlNadwa Bridge	2819	3119
AlMahdi Bridge	770	867
AlMadina Bridge	2290	2929
Zamam Male	3954	3746
Zamam Female	1095	2333
Hijr Ismail	602	456

Table 8 Data at all gates for the Hajj occasion

Gate Number	Persons entering	Persons exiting
1A	4398	8832
1B	7549	11897
1C	4621	5829
2	1023	3254
3	2453	4657
4	1987	2356
5	4365	5743
6	2006	2154
7	1643	2003
8	1778	2234
9	3319	2756
10	4236	5239
11	8824	11351
14	4123	5487
15	5421	6897
16	3598	4926
17	4689	5965
18	5167	6453
19	5765	6486
20	5238	7974
21	4024	4754
22	11678	13567
23	9521	11423
24	12320	13758
25	4127	5763
26	3134	4576
27	3654	5896
28	2765	7865
29	923	821
30	3129	9453
31	1652	10569
32	1254	11225
33	3245	8324
35	1243	4231
36	1423	6342
38	1342	6198

40	762	973
41	297	901
42	263	985
43	201	503
45A	3265	3921
45B	3765	4291
45C	2749	3892
46	213	423
47	2413	3523
48	2623	3321
49	2201	3012
51	2947	3945
52	2013	2190
53	1932	2239
54	2145	2634
55	1232	2121
56	1611	2573
57	2231	3821
58	1321	2131
59	1213	2231
60	654	967
62A	3214	4674
62B	5432	6745
62C	4372	5721
64	1238	1965
65	1025	1522
66	1003	1423
67	942	2375
68	985	2275
69	1325	2131
70	3257	4867
71	2319	4175
72	2865	4785
73	1785	3854
74	1254	2754
78	723	2131
79A	3154	5623
79B	7823	8231
79C	4562	4235

80	642	1967
81	422	1563
82	421	1210
84	1321	2678
85	1002	2316
86	2003	3754
87	2376	4023
88	1123	2531
89	2276	4210
90	1562	3264
91	1846	8364
92	1378	6342
93	1328	2131
94	1759	4287
95	785	1783
AlMarwa Bridge	312	7983
AzZobair Bridge	967	4673
AlNadwa Bridge	687	3987
AlMahdi Bridge	1003	5813
AlMadina Bridge	1897	6734
Zamzam Male	2722	4765
Zamzam Female	2034	3764
Hijr Ismail	227	264

Table 9 Data at all gates for the Ramadan occasion

Gate Number	Persons entering	Persons exiting
1B	18	11
5	9	5
10	5	6
11	12	11
17	3	2
20	9	4
22	14	12
23	9	7
24	13	11
28	4	3
31	3	8
32	2	5
45B	6	4
49	3	2
58	2	2
62B	7	6
64	3	2
71	2	2
79B	7	6
86	5	3
94	9	8
AlMarwa Bridge	4	2
AlNadwa Bridge	3	3
Zamzam Male	13	12
Zamzam Female	9	6
Hijr Ismail	6	5

Appendix E: The Quran Verses used in the Dissertation

The translation of the Quran used in this dissertation is *the English Translation of the Meanings of the Holy Quran and Commentary* that has been issued by *King Fahd Quran Complex at Madinah* (1990). All verses quoted and referred to in the dissertation are included in this appendix:

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2 Surat AlBaqarah   ٢ سورة البقرة

وإذ جعلنا البيت مثابةً للناس وأمناً واتخذوا من مقام إبراهيم مصلى وعهدنا إلى إبراهيم وإسماعيل أن طهرا

بيتي للطائفين والعاكفين والركّع السجود   ﴿١٢٥﴾

"And (remember) when We made the House (the Ka'bah at Makkah) a place of resort for mankind and a place of safety. And take you (people) the Maqâm (place) of Ibrâhîm (Abraham) [or the stone on which Ibrâhîm (Abraham), pbuH, stood while he was building the Ka'bah] as a place of prayer (for some of your prayers, e.g. two Rak'at after the Tawâf of the Ka'bahat Makkah), and We commanded Ibrâhîm (Abraham) and Ismâ'îl (Ishmael) that they should purify My House (the Ka'bah at Makkah) for those who are circumambulating it, or staying (I'tikâf), or bowing or prostrating themselves (there, in prayer)." [2:125], p.125/132

وإذ قال إبراهيم رب اجعل هذا بلداً آمناً وارزق أهله من الثمرات من آمن منهم بالله واليوم الآخر قال ومن

كفر فأمتعه قليلاً ثم أضطره إلى عذاب النار وبئس المصير   ﴿١٢٦﴾

And (remember) when Ibrâhîm (Abraham) said, "My Lord, make this city (Makkah) a place of security and provide its people with fruits, such of them as believe in Allâh and the Last Day." He (Allâh) answered: "As for him who disbelieves, I shall leave him in contentment for a while, then I shall compel him to the torment of the Fire, and worst indeed is that destination!"" [2 :126], p.31

وإذ يرفع إبراهيم القواعد من البيت وإسماعيل ربنا تقبل منا إنك أنت السميع العليم   ﴿١٢٧﴾   ربنا واجعلنا

مسلمين لك ومن ذريتنا أمة مسلمة وأرنا مناسكنا وتب علينا إنك أنت التواب الرحيم   ﴿١٢٨﴾   ربنا وابعث فيهم

رسولاً منهم يتلوا عليهم آياتك ويعلمهم الكتاب والحكمة ويزكيهم إنك أنت العزيز الحكيم﴿١٢٩﴾

"And (remember) when Ibrâhîm (Abraham) and (his son) Ismâ'îl (Ishmael) were raising the foundations of the House (the Ka'bah at Makkah), (saying), "Our Lord! Accept (this service) from us. Verily! You are the All-Hearer, the All-Knower" Our Lord! And make us submissive unto You and of our offspring a nation submissive unto You, and show us our Manâsik (all the ceremonies of pilgrimage - Hajjand 'Umrah), and accept our repentance. Truly, You are the One Who accepts repentance, the Most Merciful. Our Lord! Send a mongst them a Messenger of their own (and indeed Allâh answered their invocation by sending Muhammad, pbuH), who shall recite unto them Your Verses and instruct them in the Book (this Qur'ân) and Al-Hikmah (full knowledge of the Islâmic laws and jurisprudence or wisdom or

Prophethood), and purify them. Verily! You are the All-Mighty, the All-Wise."[2:127-129], p.356

قد نرى تقلب وجهك في السماء فلنولينك قبلة ترضاها فول وجهك شطر المسجد الحرام وحيث ما كنتم فولوا وجوهكم شطره وإن الذين أوتوا الكتاب ليعلمون انه الحق من ربهم وما الله بغافل عما يعملون ﴿١٤٤﴾

"Verily! We have seen the turning of your (Muhammad's,pbuH) face towards the heaven. Surely, We shall turn you to a Qiblah (prayer direction) that shall please you, so turn your face in the direction of Al-Masjid-al-Harâm (at Makkah). And wheresoever you people are, turn your faces (in prayer) in that direction. Certainly, the people who were given the Scripture (i.e. Jews and the Christians) know well that, that (your turning towards the direction of the Ka'bah at Makkah in prayers) is the truth from their Lord. And Allâh is not unaware of what they do." [2:144], p.117/354

يا أيها الذين آمنوا كلوا من طيبات ما رزقناكم واشكروا لله إن كنتم إياه تعبدون ﴿١٧٢﴾ إنما حرم عليكم الميتة والدم ولحم الخنزير وما أهل لغير الله فمن اضطر غير باغ ولا عاد فلا إثم عليه إن الله غفور رحيم ﴿١٧٣﴾

"O you who believe (in the Oneness of Allâh - Islâmic Monotheism)! Eat of the lawful things that We have provided you with, and be grateful to Allâh, if it is indeed He Whom you worship. He has forbidden you only the Maitah (dead animals), and blood, and the flesh of swine, and that which is slaughtered as a sacrifice for others than Allâh (or has been slaughtered for idols, on which Allâh's Name has not been mentioned while slaughtering). But if one is forced by necessity without wilful disobedience nor transgressing due limits, then there is no sin on him. Truly, Allâh is Oft-Forgiving, Most Merciful." [2:172-173], p.60

وأنفقوا في سبيل الله ولا تلقوا بأيديكم إلى التهلكة وأحسنوا إن الله يحب المحسنين ﴿١٩٥﴾

"And spend in the Cause of Allâh (i.e. Jihâd of all kinds) and do not throw yourselves into destruction (by not spending your wealth in the Cause of Allâh), and do good. Truly, Allâh loves Al-Muhsinûn (the good-doers)." [2:195], p.30

يسألونك عن الشهر الحرام قتال فيه قل قتال فيه كبير وصد عن سبيل الله وكفر به والمسجد الحرام وإخراج أهله منه أكبر عند الله والفتنة أكبر من القتل ولا يزالون يقاتلونكم حتى يردوكم عن دينكم إن استطاعوا ومن يرتدد منكم عن دينه فيمت وهو كافر فأولئك أصحاب النار هم فيها خالدون ﴿٢١٧﴾

"They ask you concerning fighting in the Sacred Months (i.e. 1st, 7th, 11th and 12th months of the Islâmic calendar). Say "Fighting therein is a great (transgression) but a greater (transgression) with Allâh is to prevent mankind from following the Way of Allâh, to disbelieve in Him, to prevent access to Al-Masjid-Al-Harâm (at Makkah), and to drive out its inhabitants, and Al-Fitnah is worse than killing. And they will never cease fighting you until they turn you back from your religion (Islâmic Monotheism) if they can. And whosoever of you turns back from his religion and dies as a disbeliever, then his deeds will be lost in this life and in the Hereafter, and they will be the dwellers of the Fire. They will abide therein forever."" [2:217], p.31

3 Al-i-Imran Surat   ٣ سورة آل عمران

إن أول بيت وضع للناس للذي ببكة مباركاً وهدى للعالمين ﴿ ٩٦ ﴾

"And thus We have revealed to you (O Muhammad, pbuH) a Qur'ân in Arabic that you may warn the Mother of the Towns (Makkah) and all around it, and warn (them) of the Day of Assembling of which there is no doubt: when a party will be in Paradise (those who believed in Allâh and followed what Allâh's Messenger, pbuH, brought them) and a party in the blazing Fire (Hell) (those who disbelieved in Allâh and followed not what Allâh's Messenger, pbuH, brought them)." [3:96], p.81

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فيه آيات بينات مقام إبراهيم ومن دخله كان آمناً ولله على الناس حج البيت من استطاع إليه سبيلاً ومن كفر

فإن الله غني عن العالمين ﴿ ٩٧ ﴾

"In it are manifest signs (for example), the Maqâm (place) of Ibrâhîm (Abraham); whosoever enters it, he attains security. And Hajj (pilgrimage to Makkah) to the House (Ka'bah) is a duty that mankind owes to Allâh, those who can afford the expenses (for one's conveyance, provision and residence); and whoever disbelieves [i.e. denies Hajj (pilgrimage to Makkah), then he is a disbeliever of Allâh], then Allâh stands not in need of any of the 'Âlamîn (mankind, jinn and all that exists)" [3:97], p.31

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واعتصموا بحبل الله جيعاً ولا تفرقوا واذكروا نعمت الله عليكم إذ كنتم أعداءً فألف بين قلوبكم فأصبحتم

بنعمته إخواناً وكنتم على شفا حفرة من النار فأنقذكم منها كذلك يبين الله لكم آياته لعلكم تهتدون ﴿ ١٠٣ ﴾

"And hold fast, all of you together, to the Rope of Allâh (i.e. this Qur'ân), and be not divided among yourselves, and remember Allâh's Favour on you, for you were enemies one to another but He joined your hearts together, so that, by His Grace, you became brethren (in Islâmic Faith), and you were on the brink of a pit of Fire, and He saved you from it. Thus Allâh makes His Ayât (proofs, evidence, verses, lessons, signs, revelations, etc.,) clear to you, that you may be guided.." [3:103], p.65

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6 Surat Al-Ana'am   ٦ سورة الأنعام

قُلْ إِنَّنِي هَدَانِي رَبِّي إِلَى صِرَاطٍ مُسْتَقِيمٍ دِينًا قِيَمًا مِلَّةَ إِبْرَاهِيمَ حَنِيفًا وَمَا كَانَ مِنَ الْمُشْرِكِينَ﴿١٦١﴾ قُلْ إِنَّ

صَلَاتِي وَنُسُكِي وَمَحْيَايَ وَمَمَاتِي لِلَّهِ رَبِّ الْعَالَمِينَ﴿١٦٢﴾ لَا شَرِيكَ لَهُ وَبِذَلِكَ أُمِرْتُ وَأَنَا أَوَّلُ الْمُسْلِمِينَ﴿١٦٣﴾ قُلْ

أَغَيْرَ اللَّهِ أَبْغِي رَبًّا وَهُوَ رَبُّ كُلِّ شَيْءٍ وَلَا تَكْسِبُ كُلُّ نَفْسٍ إِلَّا عَلَيْهَا وَلَا تَزِرُ وَازِرَةٌ وِزْرَ أُخْرَى ثُمَّ إِلَى رَبِّكُمْ

مَرْجِعُكُمْ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ فِيهِ تَخْتَلِفُونَ﴿١٦٤﴾ وَهُوَ الَّذِي جَعَلَكُمْ خَلَائِفَ الْأَرْضِ وَرَفَعَ بَعْضَكُمْ فَوْقَ بَعْضٍ

دَرَجَاتٍ لِيَبْلُوَكُمْ فِي مَا آتَاكُمْ إِنَّ رَبَّكَ سَرِيعُ الْعِقَابِ وَإِنَّهُ لَغَفُورٌ رَحِيمٌ﴿١٦٥﴾

" Say (O Muhammad, pbuH): "Truly, my Lord has guided me to a Straight Path, a right religion, the religion of Ibrâhîm (Abraham), Hanîfa [i.e. the true Islâmic Monotheism - to believe in One God (Allâh i.e. to worship none but Allâh, Alone)] and he was not of Al-Mushrikûn Say (O Muhammad, pbuH): "Verily, my Salât (prayer), my sacrifice, my living, and my dying are for Allâh, the Lord of the 'Âlamîn (mankind, jinn and all that exists). He has no partner. And of this I have been

commanded, and I am the first of the Muslims. Say: "Shall I seek a lord other than Allâh, while He is the Lord of all things? No person earns any (sin) except against himself (only), and no bearer of burdens shall bear the burden of another. Then unto your Lord is your return, so He will tell you that wherein you have been differing." And it is He Who has made you generations coming after generations, replacing each other on the earth. And He has raised you in ranks, some above others that He may try you in that which He has bestowed on you. Surely your Lord is Swift in retribution, and certainly He is Oft-Forgiving, Most Merciful." [6:161-165], p.73

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7 Surat Al-A'raf   ٧ سورة الأعراف

قل أمر ربي بالقسط وأقيموا وجوهكم عند كل مسجد وادعوه مخلصين له الدين كما بدأكم تعودون ﴿٢٩﴾

"Say (O Muhammad, pbuH): My Lord has commanded justice and (said) that you should face Him only (i.e. worship none but Allâh and face the Qiblah, i.e. the Ka'bah at Makkah during prayers) in every place of worship, in prayers (and not to face other false deities and idols), and invoke Him only making your religion sincere to Him (by not joining in worship any partner with Him and with the intention that you are doing your deeds for Allâh's sake only). As He brought you (into being) in the beginning, so shall you be brought into being [on the Day of Resurrection in two groups, one as a blessed one (believers), and the other as a wretched one (disbelievers)]." [7:29], p.80

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9 Surat At-Tauba   ٩ سورة التّوبة

أجعلتم سقاية الحاج وعمارة المسجد الحرام كمن آمن بالله واليوم الآخر وجاهد في سبيل الله لا يستوون عند

الله والله لا يهدي القوم الظالمين ﴿١٩﴾

"Do you consider the providing of drinking water to the pilgrims and the maintenance of Al-Masjidal-Harâm (at Makkah) as equal to the worth of those who believe in Allâh and the Last Day, and strive hard and fight in the Cause of Allâh? They are not equal before Allâh. And Allâh guides not those people who are the Zâlimûn (polytheists and wrong-doers)." [9:19], p.81

لا تقم فيه أبداً لمسجد أسس على التقوى من أول يوم أحق أن تقوم فيه فيه رجال يحبون أن يتطهروا والله

يحب المطهرين ﴿١٠٨﴾ أفمن أسس بنيانه على تقوى من الله ورضوان خير أمن أسس بنيانه على شفا جرف هار فانهار

به في نار جهنم والله لا يهدي القوم الظالمين ﴿١٠٩﴾

"Never stand you therein. Verily, the mosque whose foundation was laid from the first day on piety is more worthy that you stand therein (to pray). In it are men who love to clean and to purify themselves. And Allâh loves those who make themselves clean and pure [i.e. who clean their private parts with dust (which has the properties of soap) and water from urine and stools, after answering the call of nature]. Is it then he who laid the foundation of his building on piety to Allâh and His Good Pleasure better, or he who laid the foundation of his building on the brink of an undetermined precipice ready to crumble down, so that it crumbled to pieces with him into the Fire of Hell. And Allâh guides not the people who are the Zâlimûn (cruel, violent, proud, polytheist and wrong-doer)." [9:108-109], p. 53

<div dir="rtl">

22 Surat Al-Hajj   ٢٢ سورة الحج

إن الذين كفروا ويصدون عن المسجد الحرام الذي جعلناه للناس سواء العاكف فيه والباد ومن يرد فيه بإلحاد

بظلم نذقه من عذاب أليم ﴿٢٥﴾

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"Verily, those who disbelieved and hinder (men) from the Path of Allâh, and from Al-Masjid-al-Harâm (at Makkah) which We have made (open) to (all) men, the dweller in it and the visitor from the country are equal there [as regards its sanctity and pilgrimage (Hajj and 'Umrah)] – and whoever inclines to evil actions therein or to do wrong (i.e. practise polytheism and leave Islâmic Monotheism), him We shall cause to taste from a painful torment." [22:25], p.118/355

<div dir="rtl">

وإذ بوأنا لإبراهيم مكان البيت أن لا تشرك بي شيئاً وطهر بيتي للطائفين والقائمين والركع السجود ﴿٢٦﴾

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"And (remember) when We showed Ibrâhîm (Abraham) the site of the (Sacred) House (the Ka'bah at Makkah) (saying): "Associate not anything (in worship) with Me, [Lâ ilâha illallâh (none has the right to be worshipped but Allâh) - Islâmic Monotheism], and sanctify My House for those who circumambulate it, and those who stand up (for prayer), and those who bow (submit themselves with humility and obedience to Allâh), and make prostration (in prayer);" [22:26], p. 280

<div dir="rtl">

وأذن في الناس بالحج يأتوك رجالاً وعلى كل ضامر يأتين من كل فج عميق ﴿٢٧﴾

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"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)." [22:27], p.2/385

<div dir="rtl">

23 Surat An-Mu'minun   ٢٣ سورة المؤمنون

قد أفلح المؤمنون ﴿١﴾ الذين هم في صلاتهم خاشعون ﴿٢﴾

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"Successful indeed are the believers. Those who offer their Salât (prayers) with all solemnity and full submissiveness." [23:1-2], p.19

<div dir="rtl">

29 Surat Al-Ankabut   ٢٩ سورة العنكبوت

أولم يروا أنا جعلنا حرماً آمناً ويتخطف الناس من حولهم أفبالباطل يؤمنون وبنعمة الله يكفرون ﴿٦٧﴾

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"Have they not seen that We have made (Makkah) a secure sanctuary, while men are being snatched away from all around them? Then do they believe in Bâtil (falsehood – polytheism, idols and all deities other than Allâh), and deny (become ingrate for) the Graces of Allâh?" [29:67], p.31

<div dir="rtl">

42 Surat Ash-Shura   ٤٢ سورة الشورى

وكذلك أوحينا إليك قرآناً عربياً لتنذر أم القرى ومن حولها وتنذر يوم الجمع لا ريب فيه فريق في الجنة وفريق

في السعير ﴿٧﴾

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"And thus We have revealed to you (O Muhammad, pbuH) a Qur'ân in Arabic that you may warn the Mother of the Towns (Makkah) and all around it, and warn (them) of the Day of Assembling of which there is no doubt: when a party will be in Paradise (those who believed in Allâh and followed what Allâh's Messenger, pbuH, brought them) and a party in the blazing Fire (Hell) (those who disbelieved in Allâh and followed not what Allâh's Messenger, pbuH, brought them)." [42:7], p.99

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51 Surat Az-Zariyat   ٥١ سورة الذاريات

وما خلقت الجن والإنس إلا ليعبدون ﴿٥٦﴾

"And I (Allâh) created not the jinn and mankind except that they should worship Me (Alone)." [51:56], p.81

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105 Surat Al-Fil   ١٠٥ سورة الفيل

ألم تر كيف فعل ربك بأصحاب الفيل ﴿١﴾ ألم يجعل كيدهم في تضليل ﴿٢﴾ وأرسل عليهم طيراً أبابيل ﴿٣﴾

ترميهم بحجارة من سجيل ﴿٤﴾ فجعلهم كعصف مأكول ﴿٥﴾

"Have you (O Muhammad, pbuH) not seen how your Lord dealt with the owners of the Elephant? [The Elephant army which came from Yemen under the command of Abrahah Al-Ashram intending to destroy the Ka'bah at Makkah]. Did He not make their plot go astray? And He sent against them birds, in flocks,Striking them with stones of Sijjîl (baked clay). And He made them like (an empty field of) stalks (of which the corn has been eaten up by cattle)." [105:1-4], p.349

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106 Surat Quraish   ١٠٦ سورة قريـش

لإيلاف قريش ﴿١﴾ إيلافهم رحلة الشتاء والصيف ﴿٢﴾ فليعبدوا رب هذا البيت ﴿٣﴾ الذي أطعمهم من جوع

وآمنهم من خوف ﴿٤﴾

"(It is a great Grace from Allâh) for the protection of the Quraish, (And with all those Allâh's Grace and Protections, We cause) the (Quraish) caravans to set forth safe in winter (to the south) and in summer (to the north without any fear),So let them worship (Allâh) the Lord of this House (the Ka'bah in Makkah), (He) Who has fed them against hunger, and has made them safe from fear.." [106:1-4], p.97

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Appendix F: Saying of the Prophet Mohammed (pbuH) used in the dissertation

Saying of Prophet Mohammed (pbuH) with its original translation in Arabic language:

المسجد

عن أبي أمامة رضي الله عنه أن رسول الله صلى الله عليه وسلم قال: «فُضِّلْتُ بأربع، وذكر منها جعلت الأرض لأمتي مسجداً وطهوراً»[54].

1. Abi Umama, mAbpwh, said: the Prophet Mohammed, pbuH, said: "I was better than others by four things: (He said one of them) it had been preferred to my *followers that the land is a mosque and clean.*", p.81

مكة

قال رسول الله صلى الله عليه وسلم: "كل نبي من الأنبياء، عليهم السلام إذا كذبه قومه خرج من بين أظهرهم إلى مكة، وما من نبي هرب من أمنه إلا هرب إلى مكة فعبد الله تعالى حتى أتاه اليقين."[55]

2. As it narrated that Prophet Mohammed, pbuH, said: *"Every one of the prophets, pbuT, when his followers left him, he leave them toward Makkah; and every Prophet who escape from his community, he escaped toward Makkah and lived their until death."* , p.355

قال صلى الله عليه وسلم: "ما على الأرض بلدة يستجاب فيها الدعاء في خمسة عشر موضعاً إلا مكة."[56]

3. It was been narrated that Prophet Mohammed, pbuH, said: *"The only place where the Doa'a is answerable on fifteen places is Makkah."*, p.117

عن عبد الله بن عباس رضي الله عنهما قال قال رسول الله صلى الله عليه وسلم: "إن الله عز وجل حرم مكة، لا تحل لأحد قبلي، ولا تحل لأحد بعدي، لا تختلى خلاها، ولا يعضد شجرها، ولا ينفر صيدها، ولا تحل لقطتها إلا لمنشد."[57]

4. Ibn Abbas, mAbpwt, narrated that Prophet Mohammed – pbuh – said: *"Narrated by Ibn `Abbās, mAbpwt, The Prophet said, "Allāh has made Makkah a sanctuary (sacred place) and it was a sanctuary before me and will be so after me. It was made legal for me (to fight in it) for a few hours of the day. None is allowed to uproot its thorny shrubs, or to cut its trees, or to chase its game, or to pick up its fallen things except a person who announces it publicly."* , p.349

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54. AlZarkashi, Mohammed., E'Lam AlSajed BeAhkam AlMasajed, 1996, p27.
55. AlBasri, H., Resalat AlHassan AlBasri, p.63.
56. *ibid*, p.65.
57. AlFakihi, M., Akhbar Makkah, 1988, p.2/250

روي أن رسول الله ﷺ قال: "خير بلدة على وجه الأرض وأحبها إلى الله تعالى مكة."[58]

5. It have been narrated that Prophet Mohammed, pbuH, said: *"The best place on the earth to Allah, the Almighty, is Makkah."*, p.118,354

قال رسول الله صلى الله عليه وسلم "من صلى فيها – مكة – صلاة رفعت له مائة ألف صلاة."[59]

6. It was been narrated that Prophet Mohammed, pbuH, said: *"Whoever prays a single prayer in Makkah Allah, the Allmighty, will multiply it to one hundred thousand prayer."*, p.118

المسجد الحرام

قال صلى الله عليه وسلم: "لا تُشد الرحال إلا إلى ثلاثة مساجد، مسجدي هذا، والمسجد الحرام، والمسجد الأقصى."[60]

7. It was been narrated that Prophet Mohammed, pbuH, said:*"The preparation for a trip could not be don except to three places: The Sacred Mosque, My mosque this, Jerusalem mosque."*, p.74.

عطاء بن أبي رباح يقول: بينما ابن الزبير رضي الله عنهما يخطبنا إذ قال: قال صلى الله عليه وسلم: صلاة في مسجدي هذا أفضل من ألف صلاة فيما سواه إلا المسجد الحرام وصلاة في المسجد الحرام تفضل بمائة. قال عطاء: فكأنه مائة ألف قال: قلت يا أبا محمد هذا الفضل الذي تذكر في المسجد الحرام وحده أو في الحرم قال: لا بل في الحرم فإن الحرم كله مسجد.

8. Ataa narrated said that while Ibn AlZubair was giving his speech he said: Prophet Mohammed, pbuH, said: *" A prayer at My mosque this is better than a thousand prayers any where except the Holy Mosque and a prayer at the Holy Mosque better a hundred. Atta'a said: As f one hundred thousands. I asked: Oh, Mohammed's father, this virtue you said for the Holy Mosque or all over the Haram of Makkah. He – Ibn AzZubair- answered: No, it is for all over the Haram of Makkah."*, p.97

عن أبي هريرة رضي الله عنه قال قال رسول الله صلى الله عليه وسلم: "صلاة بالمسجد الحرام أفضل من صلاة بمسجدي هذا مئة مرة وصلاة بمسجدي أفضل من صلاة في أي مكان ألف مرة."

9. It was narrated by Abu Hurairah, mAbpwh, that Prophet, pbuH, said: *"a prayer at the Holy Mosque is better than a prayer in my mosque hundred times and a prayer in my mosque, the Prophet Mosque in Madinah, is better than a prayer in any place thousand times"*, p.105,133,363

قال رسول الله صلى الله عليه وسلم: "إن حول الكعبة قبر ثلاثمائة نبي."[61]

10. It was been narrated that Prophet Mohammed, pbuH, said: *"Around the Sacred Ka'bah, there are three hundreds Prophets' graves."* , p.355

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58. AlBasri, H., Resalat AlHassan AlBasri, p.62.
59. *ibid*, p.64.
60. *ibid*, p.64.
61. *ibid*, p.63.

قال رسول الله صلى الله عليه وسلم: "قبر الأنبياء نوح وشعيب وصالح عليهم السلام بين زمزم والمقام ."⁶²

11. It was been narrated that Prophet Mohammed, pbuH, said: *"the grave of Prophets Nooh, Shoaib and Saleh ,pbuT, between Zamzam and the Maqam."*, p.355

الكعبة

روت عائشة بنت أبي بكر الصديق رضي الله عنه أنها أرادت أن تدخل الكعبة فلم تستطع فأخذها رسول الله صلى الله عليه وسلم إلى حجر إسماعيل عليه السلام وقال: إذا أردت أن تدخلي الكعبة فأدخلي هذا المكان فإن قريش لم يملك من المال ما يكفي لبني كامل الكعبة فلم يدخلوا حجر إسماعيل لها . »

12. It's revealed that Aishah (mabpwh) – one of Prophet Mohammed wives – said:*"I wanted to enter the Holy Ka'bah to pray inside it but I couldn't, the Prophet Mohammed (pbuh) took me to Hijir Ismai'l and said: 'If you want to go inside the Holy Ka'bah, and then enter this place Quraish didn't have enough money to build the whole Holy Ka'bah so they didn't include Hijir Ismai'l in the building."*, p. 122,362

الطواف

أخبر عطاء أن رسول الله صلى الله عليه وسلم طاف على ناقته. ⁶³

13. Ataa narrated that prophet Mohammed, pbuH, *circummabulated while He was riding his camel.*, p. 132.

روى عبدالله بن عباس رضي الله عنه أن رسول الله صلى الله عليه وسلم طاف على ناقته في آخر حجه واستلم الركن بمحجنه.

14. Narrated Ibn Abaas, mAbpwT, said: *The Prophet performed Tawaf of the Ka'bah riding a camel in his last Hajj and touched the (Black Stone) Corner with a bent-headed stick.*

زمزم

عن عبدالله بن عباس رضي الله عنهما قال قال رسول الله صلى الله عليه وسلم: "يرحم الله أم إسماعيل، لو تركت زمزم لكانت زمزم عيناً معيناً . "⁶⁴

15. Ibn Abaas narrated that prophet Mohammed, pbuH, said :*"May Allah be pleased with Ismai'l's mother, if she left Zamzam it became a wide spring."*, p.123.

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62. *ibid*, p.63.
63. AlFakihi, M., Akhbar Makkah, 1988, p.1/103.
64. *ibid*, p.2/6.

السلوك

عن حذيفة بن اليمان رضي الله عنه قال كان رسول الله صلى الله عليه وسلم عندما يذهب إلى فراشه بالليل يضع يده تحت خده ويقول: "بإسمك اللهم أموت وأحيا" وعندما يستيقظ يقول: "الحمد لله الذي أحيانا بعدما أماتنا وإليه النشور."

16. It was narrated by Hudhaifa Ibin Al-Yaman, mAbpwh: *When the Prophet, pbuH, went to bed at night, he would put his hand below his cheek and would say: "Bismika Allahuma amutu wa ahya"*[65] *and when he got up he would say: "Al-hamdu lillahil-ladhi ahyana ba'da ma amatana wa ilaihinnushur."*[66]/ [67], p.67.

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عن جابر رضي الله عنه قال قال رسول الله صلى الله عليه وسلم: "من أكل من هذه الشجرة (البصل والثوم) فلا يقربن مسجدنا، فإن الملائكة تتأذى مما يتأذى منه الناس."

17. It was narrated by Jabir, mAbpwh, that Allah's messenger, pbuH, said: *"If anyone eats of this offensive tree (onion and garlic) he must not approach our mosque, for the angels are harmed by the same things as human beings."*[68], p.60

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عن أبي هريرة رضي الله عنه قال: قال رسول الله صلى الله عليه وسلم: "لخلوف فم الصائم أطيب عند الله من ريح المسك."

18. It was narrated by Abi Hurairah, mAbpwh, that Allah's messenger, pbuH, said: *"To the fasting mouth smell a more pleasant at the God from the musk smell."*, p.60

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عن أبي هريرة رضي الله عنه قال: قال رسول الله صلى الله عليه وسلم: "لولا أشق على أمتي لأمرتهم بالسواك عند كل صلاة."

19. It was narrated by Abi Hurairah, mAbpwh, the Prophet Mohammed, pbuH, said: *"If it weren't from I am difficult on my nation a lanrthm by the stick, Siwak, is at each prayer."*, p.60

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عن النعمان بن بشير رضي الله عنه قال قال رسول الله صلى الله عليه وسلم: "مثل المؤمنين في توادهم وتراحمهم وتعاطفهم كمثل الجسد الواحد إذا اشتكى منه عضو تداعى له سائر الجسد بالسهر والحمى."

20. It was narrated by An-Numan bin Bashir, mAbpwh, : The Prophet, pbuH, said, *"You see the believers as regards their being merciful among themselves and showing love among themselves and being kind among themselves resembling one body, so that, if any part of the body is not well then the whole body shares the sleeplessness (insomnia) and fever with it."*[69], p.61

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عن أبي هريرة رضي الله عنه قال: قال صلى الله عليه وسلم: "وسطوا الإمام وسدوا الخلل."

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65 . with Your Name I die and live.
66 . All thanks and praises be to Allah, Who has given us life after causing us to die (i.e., sleep); and unto Him is the Resurrection.
67 . Az-Zubadi,Zain-ud-Din A. , The Translation of the ..., 1994, p. 973
68 . Alavi, Khalid, Role of the…, 1990, p. 6
69 . Az-Zubadi,Zain-ud-Din A. , The Translation of the ..., 1994, p.955

21. It was narrated by Abi Hurairah, mAbpwh, that Prophet Mohammed, pbuH, said: "*Centre the Imam and fill the gaps*", p.61

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قال صلى الله عليه وسلم :"المسلم للمسلم كالبنيان ."

22. It was been narrated that Prophet Mohammed, pbuH, said: "*Muslim to Muslim as a building.*", p.61

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روي أن عمر بن الخطاب رضي الله عنه قال عندما قبل الحجر الأسود: والله، إني لأعلم أنك حجر لا تضر ولا تنفع ولولا أني رأيت رسول الله، قبلك ما قبلتك .

23. It been narrated that Omar Ibn Al-Khatab, mAbpwh, said when he kissed the Black Stone: "*I know that you are only a stone and can neither do harm nor bring benefit. Had I not seen Allah's Messenger, pbuH, kissing you, I would not have kissed you.*", p.138

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قال عمر بن الخطاب رضي الله عنه : « إن رسول الله صلى الله عليه وسلم قال: ياعمر إنك رجل قوي، لا تزاحم على الحجر فتؤذي الضعيف، إن وجدت خُلوةً فأستلمه، وإلا فأستقبله فهلّل وكبّر » ⁷⁰ .

24. Omar Ibn AlKhatab, mAbpwh, said: that Prophet Mohammed, pbuH, said: "*Oh, Omar, you are a strong man. So, do not crowd on the stone – the Black Stone – you may harm other people. If you find it with no crowd kiss it or stand forward it and say AllahuAkbar.*", p.138

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قال عبدالله بن عباس رضي الله عنهما : « سمع النبي صلى الله عليه وسلم وراءه زجراً شديداً وضرباً للإبل فأشار بصوته إليهم وقال: أيها الناس عليكم السكينة . . . . . » ⁷¹ .

25. Abdullah Ibn Abaas, mAbpwT, said: that Prophet Mohammed, pbuH, heard a shout after him and hitting camels, and he told them: "*Oh people, be patient.*", p.88

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70. AlSedais, A., Overcrowding at the Holy Mosque, 2003, p.1/37.
71. *ibid*, p.1/36.

Appendix G: Samples of Interviews.

As explained in Chapters 2 and 8, twelve people have been interview in order to obtain additional information on aspects of history and current management of the Holy Mosque. The full list of people interviewed as follow:

- *Shaikh Prof. Abdul Wahab Abo Sulaiman.* A professor at Umm AlQura University, a member of staff of senior committee in Saudi Arabia.

- *Shaikh Dr. Yousif Al Qaradawi*. The Dean of AshSharea'a College, Qatar University and the General Mufti of the State of Qatar.

- *Dr. Usama F. Al Bar.* The dean of the Custodian of the Two Holy Mosques Institute of Hajj Research.

- *Dr. Sami Barhamin.* The general secretary of Makkah Development High Authority.

- *Dr. Majdi Hariri.* The Former general manager of the Hajj Research Centre.

- The Former General Commander of the Holy Mosque Force.

- *Professor. Ahmed Al-Badawi Tahaa.* Transportation professor at the Custodian of the Two Holy Mosques Institute of Hajj Research.

- *Engineer. Rashad Al-Hemli.* The General Supervisor of the Two Holy Mosques project, The Saudi Bin Ladin Group.

- *Ahmad Ruzman bin Ahmad Razali*. The General Manager of Tabog Haji, the Malaysian governmental agent that responsible for Hajj services.

- *Brigadier Mohammed J. S. Jamal Al-lail.* The Former leader of the Saudi Arabian Emergency Force.

- *Dr. Samir A. Aashi.* The Head of the Urban Studies at the Custodian of the Two Holy Mosques Institute of Hajj Research.

- *Engineer. Hossam Abdul Salam.* Traffic engineer at the Custodian of the Two Holy Mosques Institute of Hajj Research.

This Appendix contains some samples from those interviews which have special relevance to the topic.

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Sheikh, Dr. Yousef AlQaradawi   Thursday 11th Ramadan 1422   00:45

The Dean of AshSharea'a College, Qatar University and the General Mufti of the State of Qatar

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Q. Allah, the almighty, said "whoever enter it, he is safe". What dose it mean?

A. It means that war fare is strongly prohibited in this mosque.

Q. Are there a specific gate recommended for people to enter or exit from?

A. The best option does not meant causing difficulties, even if it has been narrated that the Prophet (pbuH) did enter or exit from a specific gate, it does not mean going around the Holy Mosque at overcrowd times to reach that gate.

Q. Are there places that are better than others inside the Holy Mosque to pray at?

A. Praying better is always in foremost lines. However, worshippers should not force themselves and pushing others to reach the front lines.

Q. Is the Holy Mosque's surrounding open area considered as part of the Holy Mosque?

A. Yes, and whoever prays with the Holy Mosque's Imam he is praying at the Holy Mosque. However, whoever prays in Makkah is considered to be praying in the Holy Mosque, unless praying with the Holy Mosque Imam, which is better than praying at any other mosque in Makkah.

Q. What about the Dark Marble Line that identify the Tawaf starting point?

A. It been put in to help the worshippers. Yet, they need not obey it.

Q. What is the Islamic opinion regarding circumambulation and Sa'i on the upper floor and roof terrace?

A. It is O.K. and worshippers could perform it on those floors, but it could be difficult for them because of the extra distance for circumambulating on upper and roof terrace.

Engineer. Rashad AlHemli   Monday 28.11.1423 11:00 A.M.

The General Supervisor of the Two Holy Mosques project, The Saudi Bin Ladin Group

Q. There are many places at the Holy Mosque which have been defined by religious customs. *Abraham Maqam* is one of them, How do you define its place during and after the removed of the surrounding building?.

A. *Abraham Maqam* has never been moved from its place since placed there by Omar Ibn AlKhatab (mAbpwh). When King Faisal decided to remove the shelter with a support of the scholars, we (The Saudi Bin Ladin Construction Company) removed the building and exchanged it with a 180X180cm. transparent glass case.

Q. What about the Dark Marble Line that indicates the Tawaf starting point?

A. It was not there in the past, the Presidency of the Holy Mosque Service decided to have that line. The line drawn from the Sacred *Ka'bah* to the Holy Mosque building was feel it would be better if it is removed.

Q. Is the Zamzam well entrance at Mataf area causes any problems?

A. Yes, and some studies have been done suggesting that it is better if it moved to the Eastern open area.

Q. Slipping on the marble surface at the circumambulation area is a big issue at the Holy Mosque, what is the solution in your opinion?

A. This is caused by the type of the marble used in that special area, it is from Greece, very white, unique and very fragile (lost percent is 60%) and its thickness is about 8cm. therefore, hammering will not be good solution. Also, it would loose its reflective properties, but it should be kept dry at all time.

A former Holy Mosque Force's Commander   Mon. 1/1/1422 -26/3/2001 11:30 A.M.

Q. Overcrowding at the Holy mosque is one of the main problems, which we have to find a solution for, Does it mean that there are not enough gates?

A. The number of the gates is sufficient for the normal usage, but at the peak times during Hajj and Ramadan these need to be more. And at the emergency time we could have several gates that could open automatically.

Q. What about escalators?

A. We have seven external escalators and two interior ones at king Fahad gate, but the late are only one direction. The escalators help a lot, but we have problems with some pilgrims, especially with the older pilgrims who can not use it. The escalators take people to the second and roof floors and it could be stopped when the floors are full.

Q. Why is there overcrowding?

A. The crowding is of depend on three main categories. That cause by:

- The limited number of the gates.

- The limited width of the gates.

- The behaviour of people.

Q. In your opinion, how much time is needed to evacuate the holy mosque in case of an emergency?

A. Between 10—20 minutes.

Q. Do you have problems with people going in as well as going out?

A. Going out is the main problem, but we have the same problem going on during Hajj days, Holy days, and Fridays.

Q. From your background, which part of the Holy Mosque is the most crowded area?

A. We have crowding at all gates even therefore King Fahad, King AbdulAziz, and AlSafa gates are the most crowded gates at the Holy Mosque.

Q. What about AlMas'a?

A. We use to close most of the gates along AlMas'a in order to stop cross movement with the people who walk in, so the crowd go to the bridges.

Q. The crowding in the interior courtyard is another issue. Do you think that the Zamzam fountain entrance is one of the causes of this?

A. The entrance causes some of the problems especially on 10/12/13 of the month of Hajj, because it stops the pilgrims and during the prayers there is a huge crowd. I see that it would be better to move it from the courtyard.

Q. What about the women praying area?

A. It is under study from the Institute and the Presidency of the Two Holy Mosques Affairs. Women have used that place for a long time. The Presidency wants to keep them in the same place. Everybody has a right to get into the interior courtyard. The problem appears at the peak time during Hajj and the last days of Ramadan. At those times we inform all worshippers, including the women to leave the area in order to use all place for Tawaf.

Q. When its rains slipping is a very big problem in the interior courtyard. How do you solve this problem?

A. There are a lots of studies of this problem made for us by the Presidency, and the Institute to find different solutions options. The options are to roughen the surface area in walking places or to use tough plastic sheeting during the rain period only. We inform the people to be careful and we also dry the place directly after the rain.

Q. In the past the doors for the stairs of the roof terrace floor used to be closed, what about now?

A. We have a good communication with the Presidency, and at this year we opened the doors for a long period. We opened from 20/11 until 30/12.

Q. We know that there are some clinics inside the Holy Mosque, what about other services?

A. There are five clinics during Hajj, Ramadan, Holy days, and Fridays. Also there are teams from Red Crescent, the civil defence (fire fighter) who work with us and use our controlling room and their station is so close from us. The fire station is close to the Holy Mosque.

Ahmad Ruzman bin Ahmad Razali

General Manager — Tabug Haji   Fri. 5/1/1422 -30/3/2001 15:00

Q. In safety issues what do you teach your pilgrims?

A. We at Tabug Haji — the governmental dep. For Hajj in Malaysia — teach our pilgrims. We have our own training program regarding to Hajj and the facilities in Saudi Arabia. First of all we train them on the locations of the buildings where they stay always in relation to the Holy Mosque. For example: if they stay in Ajyad we tell them to use King AbdulAziZ gate to enter the Holy mosque and if they get lost they have to ask about King AbdulAZiZ gate then from that point go strait to the buildings you live in. And if they get lost they have to ask the assistance about King AbdulAZiZ gate, then from that point go to your home. For those people who read we did give them maps showing the Holy Mosque in relation to their homes. We still have very old people (elder) 70 — 80 years old. For those people, they know how to go to the Holy mosque because they will follow other people before prayers and we teach them how to come back. They have to know from where they come in and how that refer to the Holy *Ka'bah*, which corner from *Ka'bah*. For Example, if they stay in AlGhaza they have to look for the Black Rock. That, because they can't remember the gates' names. When they are outside they could recognize the gates' numbers which are easy to remember. When they still get lost we teach them to go back to the Holy mosque because they will find some of our members who work inside the Holy mosque looking for missing and lost people. In case they get thirsty, we tell them to go back to the Holy Mosque because they will find a lot of Zmzm water every where. Which is good to have it all around the mosque by Saudi government. The police

officers in next to the gates are very nice and friendly. They don't speak our language and they still can communicate with our people. Regarding to the safety in the Holy Mosque, we are never forget to teach our pilgrims about it as best as we can.

Q. Did you educate them about emergencies and how to evacuate from the Holy Mosque?

A. In that aspect, we don't want to alarm or to make them worry about the Holy Mosque, because no body want to have an emergency their. But we did teach our pilgrims that in case some thing happen, if you are inside the Holy Mosque please stay inside and if you are outside the Holy Mosque please go back to your home. And if you see any crowd or gathering please be aware from it, because if tell them about emergency they will be worry and they will stay at their home until Arafat day.

Q. Your training program lasts for how long?

A. The training program is a complete program not only about safety. And it goes for thirteen weekends. One-weekend session is about safety issues. Most of the sessions about the religious worship.

Q. Did you build a model of the site?

A. We did use the stadiums, big mosques, big yards, public squares, piazzas, and we have our own training centre, where we have a big mosque and some spaces for that particular guidance. We teach them a lot of things such as how to make Tawaf and how to throw to Jamarat and so on.

Q. How many years have you worked for Tabug Haji?

A. I worked for Tabug Haji for thirteen years.

Q. What problems do you recognize, or did you notice from your pilgrims?

A. I will tell you the three thing that I recognize and notice from our pilgrims:

- The crowd inside the Holy Mosque could confuse the people to see and to recognize the sign.

- The lost of people when they come out from the Holy Mosque.

▪ Some complain about the mix in prayer places between sexes.

Q. If the crowd is a problem, why you don't you teach your pilgrims to stay for 10-15 minutes after prayers so that they will not find a crowed on the gates?

A. In our customs we have to make Doa'a — asking Allah — after each prayer for 10 minutes. We never go out after prayers directly.

Q. Do you think that Zamzam entrance, in the courtyard is a problem?

A. No, it's ok. And most of our pilgrims want to go inside Zamzam.

Q. Do you have any recommendation?

A. Yes, I have three recommendations:

▪ Some security people on Safa to move people who want to set on the rock.

▪ Putting a rail next to the black rock to put the people who want to kiss the rock in order.

▪ The rain is a big problem in the courtyard because a lot of people slipping before the workers remove the water off.

Appendix H: Questionnaires Forms.

As it was described in Chapter 2 and 8, this questionnaire has been translated into three languages, Arabic, French and Urdu, in addition to the English version. This appendix includes an empty form in each language plus a completed form in English language. It has been included so as to help the reader better to understand the kinds of question asked. In addition, a sample of the statistical analysis table (78 pages in total) has been added.

								Filler code no.			

Filler code no.
Date
Time

Questionnaire form no. _____

Please circle the number for correct answer.

First: General Information.

1	Nationality							
2	Sex	1	Male	2	Female			
3	Age	1	25 or less	2	26-35	3	36-45	4	46 or over
4	Marital status	1	Single	2	Married			
5	Education level	1	Illiterate	2	Read & write	3	Elementary
		4	Secondary	5	High school	6	University
		7	Higher education				

Second: Preparing and Coming to the Holy Mosque.

6	Did you come to the Holy Mosque	1	alone? Go to question no. 10
		2	with your friends?.
		3	With your family?
		4	With your group?

7	We are			persons			
8	Are there women with you?	1	Yes , there are		woman	2	No
9	Are there children with you?	1	Yes , there are		child	2	No

10	Why did you come to the Holy Mosque?	1	Obligatory prayer	2	Tawaf
		3	Go into retreat	4	Regular pray.
		5	Umrah	6	Other (specify) ....

11	Usually, how many times do you come here?	1	5 times a day	2	4 times a day
		3	3 times a day	4	2 times a day
		5	Once a day	6	5 times a week
		7	4 times a week	8	3 times a week
		9	2 times a week	10	Once a week
		11	As circumstance	12	Exceptionally
		13	Don't know.	14	Other (specify) ....

12	Usually, do you come to the Holy Mosque		
	1	A long time before the Azan?	2	At Azan time?
	3	Before Azan?	4	After Azan?
	5	At prayering time?	6	Other? (specify) ....

13	Which is the time you prefer to come to the Holy Mosque?				
	1	At Fajr prayer.	2	At morning time.	3	At Duhr prayer.
	4	At Aasr prayer.	5	After Aasr prayer.	6	At Maghrib prayer.
	7	After Maghrib prayer	8	At Eshaa prayer.	9	After Eshaa prayer.
	10	At midnight	11	Before Fajr prayer.		

14	Why do you come at this time?	1	No crowd.	2	Comfortable weather.
		3	Easy to find a parking space.	4	Off from work.
		5	No appointment at this time	6	Easy to come by bus.
		7	Religious consideration.	8	Other (specify) ....

Third: Entering the Holy Mosque.

15	Is there a particular gate you feel you must enter from?	1	Yes, it's ………..gate.no. …
		2	No .
16	Do you know from which gate you entered today	1	Yes, it's ………..gate.no. …
		2	No .

17	Did you enter from this door because of						
	1	religious consideration?	2	close to my house?	3	close to car parking?	
	4	close to bus station?	5	no crowd?	6	close to shopping area?	
	7	close to women's praying area?	8	Other? (specify)			

Fourth: Exiting from the Holy Mosque.

18	Is there a particular gate you feel you must exit from?	1	Yes, it's ………..gate.no. …	
		2	No .	
19	Do you know from which gate you exited today?	1	Yes, it's ………..gate.no. …	
		2	No .	
20	Is it the gate that you entered from?	1	Yes.	2	No. Go to question no. 23	
21	Did you recognize it easily?	1	Yes.	2	No.	

22	Why did you exit from the gate that you entered from?					
	1	Religious consideration.	2	Close to my house.	3	Close to my praying area.
	4	Close to car parking.	5	Close to bus station.	6	Close to women's praying area.
	7	Close to shopping area.	8	No crowd.	9	Other (specify) ....
23	Why did you not exit from the gate that you entered from?					
	1	Religious consideration.	2	Close to my house.	3	Close to my praying area.
	4	Close to car parking.	5	Close to bus station.	6	Close to women's praying area.
	7	Close to shopping area.	8	No crowd.	9	Other (specify) ....
24	Usually, how long did you take to exit from the Holy Mosque?					
	1	1-3 minutes	2	4-7 minutes	3	8-12 minutes	4	13-20 minutes
	5	21-30 minutes	6	More (specify)			
25	Usually, how long time did you take to ware your chose?					
	1	Less than a minutes	2	2-3 minutes	3	4 minutes or more.		

Fifth: Inside the Holy Mosque.

26	Usually, where do you prefer to prayer?					
	1	Outside the Holy Mosque.	2	In the courtyard	3	On the first floor
	4	Inside but next to the gates	5	On upper floor	6	On the roof.
27	Why do you prayer at that place?					
	1	Religious consideration.		2	Close to women's praying area.	
	3	Away from women's praying area.		4	Close to where I entered.	
	5	Close to where I exit.		6	Comfortable weather.	
	7	No crowd.		8	Ready for prayer.	
	9	Close to Zamzam.	10	All facilities.	11	Other (specify) _____
28	Do you know where the clinics are located?	1	Yes.	2	No. Go to question no. 31
29	Do you prefer to be close to them?	1	Yes.	2	No.
30	Do you know how to get into them?	1	Yes.	2	No.

Sixth: Making Tawaf.

31	Do you make tawaf while you are at the Holy Mosque ?					
	1	Always.	2	Depends on the crowd.	3	Depends on my health.
	4	Depends on weather condition.	4	Depends on time.	6	Other (specify) _____
32	Usually, where do you make tawaf?					
	1	On first floor.	2	On second floor.	3	On the roof.
33	Why?					
	1	Religious consideration.		2	Culture and customs.	
	3	No crowd.		4	Not congested.	
	5	Comfortable weather.	6	Distance.	7	Other (specify) ....
34	Where do you pray after Tawaf?					
	1	Next to the Magam.	2	Close to the Magam.	3	Close to Zamzam well.
	4	In the courtyard.	5	Inside the Holy Mosque.	6	Other (specify) _____
35	Why ?					
	1	Religious consideration.	2	Crowd.	3	Far from women's praying area.
	4	Close from women's praying area.	5	Close to my exit gate.	6	Other (specify) ....

	Seventh: Sa'i.									
36	Usually, where you do your Sa'i?	1	On first floor.	2	On second floor.	3	On the roof.			
37	Why?									
	1	Religious consideration.			2	Culture and customs.				
	3	No crowd.			4	Not congested.				
	5	Comfortable weather.			6	Distance.				
	7	Accessibility.			8	Other (specify)				
38	After the Sa'i, from which gate do you exit?	1	The closest gate to Al-Marwa.							
			2	From where I enter.						
			3	From gate ……………….. no. ………….						
39	Why you exit from that gate.									
	1	Religious consideration.	2	Close to my house.	3	Close to car parking.				
	4	Close to bus station.	5	Close to women's praying area.	6	Close to shopping area.				
	7	No crowd.	8	Closest gate to me.	9	Other (specify)				

	Eighth: Going into retreat at the Holy Mosque.							
40	Do you go into retreat in the Holy Mosque?		1	Yes.	2	No. Go to question no. 43		
41	Why?	1	Religious consideration.		2	Culture and customs.		
		3	I can't rent a place.		4	Facilities available.		
		5	Other (specify)					
42	Where do you go into retreat?	1	First floor.	2	Second Floor.			
43	Why?	1	Religious consideration.		2	Culture and customs.		
		3	Nice and comfortable.		4	Close to my home.		
		5	Close to women's praying area.		6	Other (specify)		
44	For how long do you go into retreat?	1	Less than a minute.	2	One to three days.			
	3	Four to six days.	4	Seven to ten days.	5	More (specify)		

	Ninth: Visiting Zamzam well.						
45	Do you visit Zamzam well?						
	1	Yes, when I'm at the Holy Mosque.	2	Depends on the crowd.			
	3	Occasionally.	4	Rarely.			
	5	My living place is so far.	6	Other (specify)			
46	Do you visit Zamzam well for.						
		1	Religious consideration?	2	culture and customs?		
		3	Close to where you enter?	4	close to where you exit?		
		5	To pray inside.	6	Other? (specify)		
47	Do you find a crowd when you enter Zamzam?	1	Yes.	2	No.		

	Tenth: Additional questions.						
48	Is there a particular place that you feel you must visit in the Holy Mosque?						
		1	Yes, it is				
		2	No. Go to question no. 51				
49	Why do you visit it?	1	Religious consideration.	2	Culture and customs.		
		3	Other (specify)				
50	Is your visit	1	Usually when you are at the Holy Mosque?	2	Dependant on the crowd?		
		3	Occasional?	4	Rarely?		
		5	Other? (specify)				
51	Do you know what you have to do in case of emergency?	1	Yes.	2	No, Go to question no.53		
52	Describe what to do?						
	....						
53	Do you know where you usually sit in the Holy Mosque?		1	Yes.	2	No.	
54	Have you been at the Holy Mosque while raining?		1	Yes.	2	No.	
55	Were chanced slippery problems?	1	Yes.	2	No.		
56	Dose the sun's glare cause you a problem?	1	Yes.	2	No.		

57	Did you find any other problems?
	1 No.
	2 Yes (specify) ....
	....
	....
	....
	....
58	Do you have any additional information?
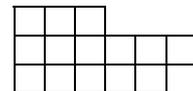
I. Renseignements Généraux

1	Nationalité								
2	Sexe	1	Homme	2	Femme				
3	Age	1	Moins de 25 ans	2	26-35 ans	3	36-45 ans	4	Au dessus de 46 ans
4	Situation familiale	1	Célibataire	2	Marié				
5	Niveau d'étude	1	Illettré	2	Il peut lire et écrire	3	Primaire		
		4	Secondaire	5	Secondaire second cycle	6	Universitaire		
		7	Magistrature						

II. Préparation et arrivée á la Mosquée Sacrée

6	Es-tu arrivé	1	Seul
		2	Accompagné de tes amis
		3	De ta famille
		4	Par ton groupe

7	Nous somme au Nombre de			Personne		
8	Es-tu accompagné des femmes	1	Oui et elle sont au Nombre de		2	Non
9	Des enfants	1	Oui et il sont au Nombre de		2	Non

10	Quel motif justifie ton arrivée a la Mosquée Sacrée	1	Prière obligatoire	2	Tawaf
		3	Retraite spirituelle	4	Prière non obligatoire
		5	Oumra		

11	Combien de fois par jour tu arrives a la Mosquée sacrée ?	1	5 fois	2	4 fois
		3	3 fois	4	2 fois
		5	1 fois	6	5 fois par semaine
		7	4 fois par semaine	8	3 fois par semaine
		9	2 fois par semaine	10	1 fois par semaine
		11	Selon les préocupations	12	Rare fois
		13	Autre motif [précise]		

12	Es-ce d'habitude tu arrives à la Mosquée Sacrée:		
	1 Longtemps avant l'appel ?	2	Au moment d'appel ?
	3 Très peut avant l'appel ?	4	Après l'appel ?
	5 Au moment de la prière ?	6	Autre motif ? [Précise]

13	Quel est le moment convenable pour ton arrivée à Haram ?				
	1 La prière de l'aube?	2	Le matin avant midi ?	3	La prière du midi ?
	4 La prière de l'après midi ?	5	Après la prière de l'après midi?	6	La prière du crépuscule ?
	7 Après le crépuscule ?	8	La prière de Icha	9	Après Icha ?
	10 A minuit ?	11	Avant l'aube ?		

14	Pourquoi tu arrives en ce moment ?	1	Pas de bousculade	2	La tempérance de l'atmosphère
		3	Facilite de parking è	4	Clôture de mon service
		5	Je ne suis pas pris des rendez-vous	6	Facilite pour l'arrivée des bus
		7	Considération réligieuse	8	Autre motif ? [Précise]

III . L'entrée a La Mosquée Sacrée

15	Est-ce Que tu tiens compte d'entrer par une porte Précise ?	1	Oui et c'est la porte No.
		2	Non.
16	Est-ce Que tu connais la porte d'entrée Au jourd'hui.	1	Oui et c'est la porte No.
		2	Non.

17		Ton entrée par cette porte est motivée par?						
	1	Considération réligieuse.	2	Proche du logement.	3	Proche de la station des véhicules.		
	4	Proche de la station des bus.	5	Proche de l'oratoire des femmes.	6	Proche du marché.		
	7	Il n'y a pas de bousculade.			8	Autre motif (Précise).		

IV . La sortie de la Mosquée Sacrée :							
18	Est-ce que tu tiens á sortir par une porte Précise .			1	Oui et c'est la porte No.		
				2	Non.		
19	Est-ce que tu connais la porte par laquelle tu es sorti Aujourd'hui.			1	Oui et c'est la porte No.		
				2	Non.		
20	Est-ce que c'est par la même porte que tu étais rentré ?			1	Oui.	2	Non, Passe a la question No. 23.
21	Tu as pu la reconnaitre facilement ?	1	Oui.	2	Non.		
22	Pourquoi es-tu sorti par là où tu étais rentré ?						
	1	Considération religieuse.	2	Proche du logement.	3	Proche de la où je fais ma prière.		
	4	Proche de la station des véhicules.	5	Proche de la station de bus.	6	Proche de l'oratoire des femmes.		
	7	Proche du marché.	8	Il n'y a pas de bousculade.	9	Autre motif (Précise).		
23	Pourquoi tu n'a pas sorti par là où tu étais rentré ?						
	1	Considération réligieuse.	2	Proche du logement.	3	Proche de là ou je fais ma prière.		
	4	Proche de la station des véhicules.	5	Proche de la station de bus.	6	Proche de l'oratoire des femmes.		
	7	Proche du marché.	8	Pas de bousculade.	9	Autre motifs (Précise).		
24	D'habitude tu prends combien de temps pour sortir de la Mosquée Sacrée?						
	1	1 à 3 minutes.	2	4 à 7 minutes.	3	8 à 12 minutes.	4	13 à 20 minutes.
	5	21 à 30 minutes.	6	Autre chose? (Précise).				
25	D'habitude combien de temps tu prends-tu pour porter ta chassure?						
	1	Moins D'une minute.	2	De deux à trois minutes.			3	4 minutes ou plus.

V. A L'intérieur de la Mosquée Sacrée :						
26	Ou est-ce que tu tiens d'habitude faire la prière ? u					
	1	Dans les cours de haram.	2	A l'intérieur près du portail.	3	Dans le ler bâtiment.
	4	Dans la cour de la Mosquée.	5	Au bâtiment du haut.	6	En haut dans la surface.
27	Pourquoi pries tu dans le lieu?					
	1	Considération réligieuse.		2	C'est proche de l'oratoire des femmes.	
	3	C'est loin de l'oratoire des femmes.		4	C'est proche de mon entrée.	
	5	C'est proche de ma sortie		6	A cause de la tempérance de l'atmosphère.	
	7	Puisqu'il n y pas de bousculade.		8	Le lieu est réservé pour la prière.	
	9	C'est proche du Zemzem.		10	Il y-a des tapis de zeme	
	11	Autre motifs (précise).				
28	Est – ce – que tu connais les dispensaires à l'interieur de la Mosquée ? .	1	Oui.	2	Non, Passes a la question No. 31
29	Tiens-tu a prier pries de tes dispensaires?	1	Oui.	2	Non.
30	Sais-tu commenty arriver?	1	Oui.	2	Non.

VI. Le tawaf autour de la Mosquée Sacrée :					
31	Est – ce – que tu tiens faire Tawaf ata Près ence a Haram ?.				
	1	Chaque fois je fais Tawaf.	2	Selon la force des bousculade.	
	3	Selon ma situation sanitaire.	4	Selon l'atmosphère.	
	5	Selon ma présence à Haram.	6	Autre chose (Précise).	
32	A quel étage fais tu le Tawaf ?				
	1	Au rez de chaussée.	2	Dans le batiment du haut.	3	A la derniere surface.

33	Pourquoi ?.				
	1	Considération réligieuse.	2	Coutume ou habitude.	
	3	Il y a moins de bousculade.	4	Pas de bousculade.	
	5	température de l'atmosphère.	6	A cause de la distance	
	7	Autre motif? (Précise).			

34	Où est-ce que tu pries les deux raka de tawaf?				
	1	A maquam	2	Près de maquam.	
	3	Au puit de zemzem.	4	Dans la, cours de haram.	
	5	A l'intérieur de haram.	6	Autre partie? (Précise).	
35	Pourquoi ?				
	1	Precisions religieuses.	2	A,cause des bousculades.	
	3	C'est loin des femmes.	4	C'est proche de l'oratoire des femmes.	
	5	C'est proche de là où je sors.	6	Autre motif? (Précise).	

VII.	Say. (foulet entre safa * marwa).								
36	Sur quel batiment tu fais say ?.	1	Au rez de chaussée.	2	Batiment du haut.	3	A la surface en haut.		
37	Pourquoi?.								
	1	Considération réligieuse.		2	Coutume ou habitude.				
	3	Moins de bousculade.		4	Pas de bousculade.				
	5	température de l'atmosphère.		6	A cause de la distance				
	7	Le lieux est facil a atteinore.		8	Autre motif (Précise).				
38	Par quelle porte sorts-tu après say?		1	Par la porte la plus proche de marwa.				
			2	Par la porte oú j'étais rentré.				
			3	Par une autre porte ? (Précise).				
39	Pourquoi tu étais sorti par cette porte?								
	1	Considération réligieuse.	2	Proche de mon logement.	3	Près de la station des vehicules.
	4	Proche des arrêts de bus.	5	Près de l'oratoire des femmes.	6	Près du marché.
	7	Pas de bousculade.	8	C'était la plus proche de moi.	9	Autre porte? (Précise).

VIII. Retraite spirituelle à la Mosquée Sacrée.						
40	Est-ce-que tu fais la retraite spirituelle à la Mosquée sainte.	1	Oui.	2	Non. Passe à la question No. 45.	
41	Est- ce – que ta retraite spirituelle est à base de?					
		1	Considération réligieuse.	2	Coutume ou habitude.	
		3	J'ai pas la possibilité de louer maison.	4	Puisqu'il y a des services.	
		5	Mon logement est loin.	6	Autre motif? (Précise).	
42	Où est-ce que tu fais cette retraite ?	1	Au rez de chaussée?	2	Au batiment du haut.	
		3	Sous-sol.	4	Dans la surface en haut ?	
43	Pourquoi? 1. Considération réligieuse.		2	Coutume ou habitude.	
	3	Température de l'atmosphère.	4	Proche de mon logement.	
	5	Proche de l'oratoire des femmes.	6	Autre chose? (Précise).	
44	Quelle est-la durée de ta retraite habituellement?.	1	Moins d'une journée.	2	Une journée a 3 jours.	
	3	De 4 a 6 jours.	4	De 7 a 10 jours.	5	Plus ? (Précise).	

IX.	**Le puit de Zemzem.**							
45	Compte-tu visiter le puit de Zemzem?							
	1	Lorsde ta présence à la Mosquée Sacrée.	2	Cela depend de l'intencité de la bousculade.				
	3	Parfois.	4	Rare fois.				
	5	Autre motif? (Précise).						
46	Est-ce-que ta visite au puit Zemzem est à base d'une cause?							
		1	Considération réligieuse.	2	Coutume ou habitude.			
		3	Proche de mon entrée.	4	Proche de ma sortie.			
		5	Pour prier au puit.	6	Autre motif? (Précise).			
47	As-tu affronté de bousculade à ton entrée au puit?	1	Oui.	2	Non.			

XI.	**Questions secondaires.**							
48	y a t'il un lieu précis que tu veux visiter?.							
		1	Oui, c'est le tel.					
		2	Non, passé à la question No. 51.					
49	La cause de la visite.	1	Considération réligieuse.	2	Coutume ou habitude.			
		3	Autre motif ? (Précise).					
50	Est-ce que ta visite est :	1. Systématique ?		2	Selon la bousculade.			
		3	Parfois.	4	Rare fois.			
		5	Autre motif? (Précise).					
51	Saurais-tu comment réagir s`il y a un problème ?		1	Oui.	2	Non. Passe à la question No. 53.		
52	que tu feraistu?							
	…………………………………….……….…………….………….………….………….………….……… …….…………………..							
53	Est-ce que tu peux reconnaître la sortie la plus proche de la place où tu as l'habitude de t'asseoir?	1	Oui.	2	Non.			
54	Est-ce par hazard il y a plu à ta présence à haram ?	1	Oui.	2	Non.			
55	Es-tu déjá tombé parterre?	1	Oui.	2	Non.			
56	Est-ce que les rayons solaires te causent problème?.		1	Oui.	2	Non.		

57	As-tu affronté d'autres problèmes?				
	1	Non.	2	Oui tel	
	……… …… …… ……				
58	As –tu autre chose a ajouter?				
	…… …… …… …… …… …… …… …… …… …… …… ……				

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Résumé
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• Ph.D. in Architecture from Department of Architecture, School of Architecture, Planning and Landscape, University of Newcastle upon Tyne, U.K. , November 2006. "Thesis title: Overcrowding and the Holy Mosque, Makkah, Saudi Arabia."

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Assistance Professor at the College of Engineer and Islamic Architecture, Umm AlQura University.
Member of Board at the National Experimental Establishment of Pilgrims of Turkey Moslems of Europe America & Australia, since 2006.
Head of the Jamarat Scheduling Group at the Coordination Authority of the Tawaef Establishments, since 2006.

HONORS:
• An appreciation award from the Dean of College of Engineering & Islamic Architecture, Umm Al-Qura University, at Makkah, for strain in tidiness Islamic Architecture Department's students Exhibition, in 1992.
• An appreciation award from the Prince of Makkah Region, President of Superior Configuration for Inspection of Pilgrims Transportation, for the success of the trial of transfer pilgrims from ARAFAT to MUZDALIFAH by using vibration buss, in 1996.
• Awarded member from the Dean of College of Architecture and Planning at University of Colorado at Denver at Who's Who among students in American Universities and Colleges, 1999.
• A rewarded member at Tau Sigma Delta for the outstanding students, 1999.
• Jamarat Scheduling Excellency award from the Ministry of Hajj for the scheduling program of the establishement, 2005.