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A Study On The Thermal Performance Of Traditional Courtyard Houses Of Lucknow In Summer

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ABSTRACT

Ancient architecture, all over the world, had many characteristics which led to thermal comfort. With the prevailing energy crisis there has been a renewed interest in those aspects of architecture which contributed to thermal comfort in a building with minimum expenditure of energy. The traditional residential buildings in Lucknow (a North Indian city) have employed some ingenious natural and passive techniques in order to maintain thermal comfort within the building, particularly during the hottest hour of the day. In this paper the thermal performance of two traditional courtyard houses with reference to their natural and passive cooling techniques has been analysed.

Keywords: Courtyard Houses, Lucknow, Natural Cooling, Traditional

INTRODUCTION

History has shown us that architectural built forms have evolved in response to the climate, lifestyle and availability of building materials. Although housing typologies are a result of multiple determinants, climate and culture are the two most important determinants (Rapoport 1969). The basic form of the traditional building employs a combination of mass, shade and ventilation, which let the building breathe in harmony with nature and permit the best range of comfort, condition for occupants inside. The traditional buildings of the past are the best pointers in this regard and constitute outstanding evidence of being climate responsive energy conscious buildings. The traditional houses of Lucknow are climatically responsive buildings evolved from centuries of experience and observations of climate and nature. The traditional residential buildings in Lucknow have employed some ingenious natural and passive features and techniques in order to maintain thermal comfort within the building. In spite of the hot long summer with the dry bulb temperature of up to 45°C, human comfort was achieved in those traditional buildings by the utilization of natural and passive cooling techniques.

The aim of this paper is to evaluate the Traditional architecture of Lucknow, in terms of their building physics and their thermal performance in summers. This paper shows that such a building environment acts as a living organism that is inherently sustainable through the use of various bioclimatic concepts applied in its original construction, is tightly integrated with the landscape and has a minimum waste of resources. The subsequent analysis is based on evaluation of specific vernacular dwelling types and their response to climate, based on passive design principles that are responsible for the bioclimatic character of the settlement.
BIOCLIMATIC CONCEPTS AND BUILDING PHYSICS

Bioclimatic design, by definition, satisfies the needs of human beings (thermal, luminous and acoustics). It considers climatic conditions, uses techniques and materials available in the region and attempts to integrate the building with its surroundings. Moreover, bioclimatic design relies on building physics, which is the ability and knowledge of how to allow sunlight, heat, and airflow through the building envelope when necessary, at certain moments of each day and month of the year (Szokolay 2004).

The traditional architecture of Lucknow may be defined as bioclimatic since, it can be argued, the traditional builder of Lucknow understood bioclimatic concepts, aspects of building physics, and the strong relationship between site, climate and building that made him aware of the consequences of design choices. The ways traditional architecture of Lucknow considers the effects of climatic conditions on the buildings’ envelope suggests knowledge of the building physics at an empirical level. This empirical knowledge pertains to basic concepts of thermal properties and of heat transfer, air movement and solar geometry.

LUCKNOW: THE STUDY CONTEXT

The city of Lucknow is situated in the plains of Northern India, on the banks of river Gomti. It lies near the tropic of cancer at 26.52°N Latitude and 80.56°E Longitude at an elevation of 111m from the Mean Sea Level. It is the capital of Uttar Pradesh, the most populous state of India. The historical city is famous for its rich Nawabi culture, traditions and their richly carved buildings. The Nawabs of Lucknow not only built fine structures in traditional styles and experimented in European ones, but also created a novel hybrid style, which was an amalgamation of both Indian and European elements (Tandan 2001). The indigenous architecture evolved through the entire spectrum from individual building to settlement pattern, responds through form, thermal mass, spatial hierarchy, activity pattern, material and construction.

Climate of Lucknow

Lucknow lies within the composite climate category, having four main seasons, the summer, which is hot and fairly dry, the monsoon, which is less hot but humid, a period of moderate temperatures and humidity, and a slightly cold winter period. The climatic data of last twenty years published by the Central Building Research Institute, Roorkee is summarized below: (CBRI 1969).

Air Temperature: The monthly mean maximum temperature during the hottest month (May) is 41.2°C and the monthly mean minimum temperature during the coldest month (Jan) of the year is 8.9°C.

Relative Humidity: The relative humidity during summer can be less than 25% and during the most humid months the relative humidity is in the range of 78% to 82%, whereas the air temperature is in the range of 32.5°C to 34°C.

Rainfall: The rainfall starts with the arrival of the Monsoon in the middle of June. The regular rainy season continues up to the middle of September. The total annual rainfall is 940 mm.

Solar Radiation and Sunshine: The sky is mostly clear throughout the year. The average solar radiation on a horizontal surface in June is 20.2 MJ/m² day. Lucknow experiences
8 to 10 hours of sunshine for eight months from October to June and 5 to 6 hours during the remaining three months. The sky remains normally overcast during the rainy season.

**Wind Speed:** The wind speed is in the range of 3.4 to 5 km/hour from May to September. The predominant wind direction is east.

**Town Layout and Street Pattern**

In the absence of technological influence of electricity supply, mechanized transport and modern building construction techniques, the builders of the Medieval Indian town of Lucknow have done a remarkable job of creating an urban environment that is in tune with nature and provide for more than just the basic needs of the inhabitants. The city has two discernible entities viz.: the older habitations in the central part, and the newer settlements all around it. The older areas of the city (largely south of the Gomti River such as Kaiser Bagh, Chowk, Nakkhas etc.) are characterized by high density and pre-colonial settlement structures. The oldest dense settlements and relatively newer areas built during colonial period make up the core of the city. The older urban settlement was compact and mostly planned around courtyards with respect to the climate and the need for social interactions. The outer and peripheral have primarily been settled in the post-independence period. The urban fabric is very tightly knit in the old city so much that the street feels like an elongated courtyard carved out of a dense building mass (Sinha and Kant 2000). The streets in the older settlements are narrow and winding. The width of streets varies from 3 m to 5 m. Due to slight meanderings; there are no views down the entire length of the streets. Streets act as linkages, activity and interaction spaces. The height of the building compared with the width of the streets is large to create shaded environment for the pedestrians and social activities on the streets.

**House Form**

Lucknow has its own traditions and culture, which was largely influenced by the religion and beliefs of the people. The traditional houses of Lucknow were built with three main considerations i.e. privacy, the segregation between men and women and response to the hot climate. These factors have a great influence on the design of the houses people live in. Depending upon the socio-economic status of inhabitants there are two types of traditional residential buildings. The first type of traditional houses consists of kothis, havelis and palaces, which were commissioned by the Nawabs and their courtiers. These were examples of outstanding Nawabi domestic architecture. Their plan forms and their stylistic character were subjected to wide variations from one Nawabi authority to another. The second type of house belongs to the middle-income people. The house plan and design is characterized by a courtyard type house, sometimes with an underground level. The houses open on narrow streets through a hierarchy of spaces such as verandah, entrance lobby etc. that become the interface between the street and the house. The buildings are two to three storeys in height, frequented with a balcony on the first or second floor. This house type can be considered as generic traditional house of Lucknow. It consists of a simple plan with a verandah and a courtyard surrounded by rooms on all sides. The upper storey comprises one or two rooms with terraces, balconies and pavilions.

**Building Construction and Material**

The most common building material used in traditional houses of Lucknow is lakhauri bricks and lime. The thick masonry walls are constructed with lakhauri bricks and mortar of lime and surkhi. The thickness of masonry walls generally varies from 45cm to 90 cm. The walls are sometimes pointed or mostly finished with lime and stucco plaster. The
elevation of a typical traditional house is treated with stucco on motifs and floral patterns made up of lime plaster. The dressing of doors and windows is done with standard runs of mouldings made up of lime mortar. Two types of construction are used for roofs and floors. One method used is by laying closely spaced timber beams covered with reed or grass matting and a thick layer (30-45 cm) of lime concrete on top. The second type of roof construction comprises of jack arch vaulted ceiling of bricks on steel girders covered with thick lime concrete with brick ballasts. In both cases the roofs and floor are finished with lime and cement plaster.

THERMAL PERFORMANCE OF TRADITIONAL COURTYARD HOUSES IN SUMMER

The study involves identification of various natural and passive design features that have been employed in the traditional houses in old settlement of Lucknow. The research involves the study of thermal performance through on-site monitoring of two courtyard houses in summer, so as analyze the natural and passive cooling techniques employed in traditional courtyard houses of Lucknow. Both quantitative and qualitative methods of gathering data were used. These included (a) Recording of the physical form and construction systems of the buildings and settlements. (b) Recording the thermal performance in two traditional houses during summer. The temperature and relative humidity were measured outside the building and in different indoor spaces for every two hours for a complete one-day cycle for each building with the help of digital thermo hygrometer.

CASE STUDY 1: RIZVI HOUSE

This is a traditional courtyard house in Chowk at Lucknow, built around 1915, basically to serve the purpose of 'Janana Imambara' or ladies mourning place (Fig. 1). The mourning still takes place at the time of Moharram (first month of Islamic calendar) in the Majlisi or the ‘mourning hall’ and for the rest of the time of the year the Majlisi is used as a living room. It is double storey building with a small central courtyard of dimension 7.05m X 6.4m surrounded by living rooms on three sides and entrance on the north side of the courtyard (Fig. 2). The Majlisi is a double height hall, which opens to three imambaras in the front and two mosques at both level on its right and a room on its left (Fig. 3).

Passive Features of Rizvi House

The layout of the house is slightly shifted towards west maintaining the NE-SW orientation (Fig. 4). The maximum openings and the entrance are on the NE side i.e. the windward direction. There are few openings on south east side and no openings on southwest side. The absence of the openings on exterior surfaces helps in reducing heat gains. The main entrance opens into the narrow shaded street, which induces cool air from the street into the building. The courtyard facilitates shaded spaces and facilitates ventilation in the interiors through the openings facing the courtyard. The projection of eaves in the courtyard provides shade from direct solar radiation into the rooms, which opens into the courtyard. The jharokhas on the northern face of the building catch
prevailing wind and hence provides air circulation into the rooms at first floor. The walls on the ground floor are 90 cm thick and on the first floor the wall thickness decreases to 60 cm. The masonry walls are constructed with lakho ri bricks and finished with lime plaster. The roof is 36 cm thick constructed of jack arch with lakho ri bricks on steel girders and finished with lime concrete. The massive walls and heavy roofs offer greater thermal resistance and hence increase the time lag. The exterior and interior of the building is white washed which helps in reflecting solar radiation.

![Diagram of Rizvi House](image)

**Fig. 4:** Ground floor and First floor plan of Rizvi House

Thermal Performance of Rizvi House in summer

The Figure 5 shows the thermal performance of the different spaces in the building and outside the building in summer. The temperature in the room on the north side was found to be more stable as compared to other rooms. The outdoor temperature fluctuation was in the order of 17-18°C whereas the indoor temperature fluctuation was around 5-6°C. The maximum indoor temperature was 8-9°C lower than the corresponding outdoor temperature. While the outdoor air temperatures changed from 25°C to 43°C, the air temperature in the courtyard fluctuated from 26°C to 33°C. This was due to the small double height shaded courtyard, which induces cool air inside the rooms and ensures ventilation through the building even during the calm outdoor condition. The outdoor relative humidity varies from 22% to 55%, but the relative humidity in different spaces varied from 32% to 45%, which was within the comfort zone (Fig. 5).

![Graph of Summer temperature profile and Relative Humidity](image)

**Graph 1:** Summer temperature profile and Relative Humidity in Rizvi House
CASE STUDY 2: QAI SER JAHAN HOUSE

This is a courtyard house of late Mrs. Qaiser Jahan Begum, which is around 125 years old. The house opens into a narrow street (Fig. 6) through an entrance lobby, which also opens directly into the courtyard. The square shaped courtyard of dimensions 10.75m X 10.0m is centrally located, enclosed by rooms on three sides and an entrance on the west side. The eastern side of the courtyard has a double height hall (Fig. 7) and on the other three sides are single height structures. The double height hall opens into an Imambara and two bedrooms. This double height hall is also used as a ‘mourning place’ during Moharram. The building configuration of Qaiser Jahan House is shown in Fig. 8 and 9.

![Fig. 6: Entrance opening in a narrow street](image1)

![Fig. 7: Double Height hall with timber ceiling](image2)

![Fig. 8: Ground Floor Plan of Qaiser Jahan House.](image3)
Passive features of Qaiser Jahan House

The house opens into the narrow street, which is shaded by the balcony and projections of the buildings on both sides. The entrance of a house is through a lobby, which opens into a central courtyard. As the courtyard gets heated up during the day the hotter air rises and denser, cool air, which is drawn from the shaded streets, rushes into the courtyard and hence induces ventilation in the interiors of the surrounding rooms (Fig. 10). The absence of the openings on exterior surfaces helps in reducing heat gains. The double height entrance on the south west side provides shade to the building from the afternoon sun. The walls are 60 cm and constructed of lakhori bricks finished with lime surkhi plaster. The roof is 45 cm thick constructed of brick ballast mixed with lime surkhi mortar laid on timber planks supported by timber beams. The massive walls, heavy roof and timber ceiling offer greater thermal insulation and increase the thermal time lag. The ventilators near the ceiling facilitate stack effect and extract the warm air from the rooms. There is also evaporative cooling due to vegetation in surroundings (Fig. 11). The exterior of the building is plastered with lime mortar and whitewashed, which reflects the solar radiation to some extent.

Thermal performance of Kaiser Jahan House in summer

The Figure 12 shows the thermal performance of the different spaces in the house and outside the building on 6th June. The outdoor temperature fluctuation was in the order of 12-13°C whereas the indoor temperature fluctuation was around 4-5°C. The maximum indoor temperature was 9-10°C lower than the corresponding outdoor temperature. While the outdoor air temperatures changed from 22°C to 44°C, the air temperature in the courtyard fluctuated from 24°C to 34°C. The temperature in the courtyard of Qaiser Jahan House was found to be a little greater than Rizvi House in the afternoon and a little less than in the early morning. This can be attributed to the bigger size of courtyard in Qaiser Jahan House as compared to that of Rizvi House. The outdoor relative
humidity varies from 20% to 56%, but the relative humidity in different spaces varied from 31% to 46%, which was within the comfort zone (Fig. 12). The overall relative humidity in this case was less as compared to Rizvi House because of its bigger courtyard and more cross ventilation in the rooms.

![Graph 2: Summer Temperature profile and Relative Humidity in Qaiser Jahan House](image)

**INFERENCES**

The analysis of the experiments infer that the traditional courtyard houses of Lucknow respond most appropriately to the composite climate in terms of material selection, spatial organization, construction techniques and use of passive design features. After studying the traditional courtyard houses in detail, the following inferences can be drawn:

1. The traditional houses are clustered together, separated only by narrow shaded streets. The street orientation ensures that the building facades are either shaded by overhangs, balconies, jharokhas, chajjas projections, or by the opposite building. Due to the shadow patterns, the building receives minimum radiation from direct solar exposure, which results in reducing peak heat flux into the building.

2. There are many comfortable spaces available in the houses that allow different kinds of activities. The verandah served as a buffer space between the interiors and the outside environment. The buffer spaces dissipate the outside heat before entering into the interiors.

3. There is a time lag due to heavy thermal mass i.e. thick masonry wall and heavy roof construction system found in traditional houses of Lucknow. The time lag of the whole system is around 10 hrs. This allows comfort at all times of the day. The temperature difference created was almost around 12°C. This meant when the temperature on summer noon outside is around 45°C, the inside temperatures would be around 35°C.

4. The courtyard system ensures ventilation through the building even during the calm outdoor conditions. The courtyards are open to sky or partially shaded with overhangs. This also provides shaded spaces which results in reducing heat gain. Due to the incident solar radiation in the courtyard, the air in the courtyard becomes warmer and rises up. To replace it, cool air from the ground level flows through the openings of the room, thus producing the air flow. During the night, the process is reversed. The cooled surface air of the roof sinks down to the court and this cooled air enter the living spaces through the low level openings and leaves through higher level openings.

5. The greater ceiling height increases the volume of the enclosed space, taking more time for the internal air mass to get heated up.
6. The openings such as windows, ventilators and skylight provided cross ventilation, by creating stack effect. The ventilation apertures such as jharokhas, jaalis induces forced ventilation into the interiors of the buildings.

7. The vegetation near the vicinity of the building reduces the heat gain by shading the building from direct solar radiation and cooled the interiors by evapotranspiration. The other landscape elements such as fountain, baoli (an underground step well or water tank) provided thermal comfort by lowering the air temperature due to evaporative cooling.

CONCLUSIONS

It is clear from the study that an appropriate use of materials, spatial organization, construction techniques and passive design features could bring about the much-desired comfortable environment inside the house. The analysis of the passive design features used to control the indoor environment inside the traditional courtyard houses of Lucknow present a surprising fact that most of the passive design measures prescribed by the modern designers, energy conservationists, environmentalists and climatologists are already incorporated in these age old structures. Natural cooling can be achieved by proper orientation of building, appropriate layout, good landscape design, proper shading devices, properly designed roof, overhangs, external surface finish and vertical shadings using best orientation with respect to sun and wind.

The principles of good thermal design used in traditional buildings are still valid today and it would still be possible for modern designers and architects to incorporate these design principles in buildings, which are suitable for modern day living to conserve energy and provide better thermal comfort. It is important for an architect to understand how to blend lessons from traditional heritage with modern technology in building design. Incorporation of such techniques would certainly reduce our dependency on artificial means for thermal comfort and minimize the environmental problems due to excessive consumption of energy and other natural resources. Hence it is essential to take the wisdom of the traditional architecture and evolve a built form, which will be more humanized, more climate responsive and more environmental friendly buildings of tomorrow.

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Analisis Korelasi Terhadap Keretakan Bangunan: Kajian Kes Terhadap Rumah Teres Di Pusat Bandar Puchong, Selangor

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ABSTRAK


Kata kunci: Impak, pembinaan, bangunan, retak, pemeriksaan visual

PENGENALAN


Oleh yang demikian, pemilik-pemilik bangunan terbabit menuntut pihak pemaju pembinaan baru tersebut bertanggungjawab dan membaik pulih keretakan bangunan yang berlaku. Pemilik-pemilik bangunan juga menuntut jaminan keselamatan bangunan dan harta benda mereka sepanjang kerja baik pulih dijalankan jika pihak pemaju pembinaan baru tersebut bersetuju untuk membaik semula keretakan bangunan yang berlaku. Di samping itu, pemilik-pemilik bangunan turut menuntut beberapa kos dan ganti rugi seperti kos pengangkutan pindah rumah baru, kos sewa rumah baru, ganti rugi tidak selesa dan sebagainya akibat keretakan bangunan tersebut. Pemilik-pemilik bangunan
juga mendakwa masalah keretakan bangunan tersebut telah mengganggu aktiviti kehidupan sehari-hari serta menjejaskan imej dan nilai pasaran semasa bangunan mereka.

Pihak pemaju pembinaan baru tersebut pula dipertanggungjawabkan untuk memenuhi tuntutan daripada pemilik-pemilik bangunan terbabit termasuklah membaih pulih keretakan bangunan serta membayar kos perpindahan dan ganti rugi tidak selesa. Pihak pemaju pembinaan baru menyanyangkan dakwa pemilik-pemilik bangunan terbabit iaitu kerja pembinaan baru tersebut tidak menyebabkan keretakan bangunan sekitar berlaku. Apa yang pasti, kerja pembinaan baru tersebut tergandlal seketika apabila perintah berhenti kerja (stop work order) pembinaan dikeluarkan oleh MPSJ susulan aduan yang diterima daripada pemilik-pemilik bangunan terbabit.

Selain itu, pemilik-pemilik bangunan terbabit meluahkan kebimbangan tentang kestabilan struktur bangunan mereka sama ada bangunan selamat untuk didiami baik semasa kerja pembinaan baru tersebut sedang berjalan mahupun selepas pembinaan siap dijalankan. Pemilik-pemilik bangunan juga tidak mempercayai laporan teknikal yang dikeluarkan oleh pihak pemaju pembinaan baru yang mengesahkan bahawa struktur bangunan sekitar adalah stabil sepanjang kerja pembinaan baru tersebut dijalankan. MPSJ sebagai PBT bertanggungjawab untuk menyelesaikan kes aduan yang diterima daripada pemilik-pemilik bangunan di Taman Wawasan, Pusat Bandar Puchong terbabit tentang impak kerja pembinaan baru berhampiran terhadap fizikal bangunan mereka.

Sehubungan itu, kajian ini dijalankan bagi mengenal pasti jenis-jenis keretakan bangunan di Taman Wawasan, Pusat Bandar Puchong terlibat seperti yang didakwa oleh pemilik-pemilik bangunan terbabit.

KERANGKA TEORETIKAL KERETAKAN BANGUNAN

Retak bermaksud garis yang nampak pada benda keras yang menunjukkan ia akan pecah atau belah (Dewan Bahasa dan Pustaka 2007) atau penurunan ketegaran purata sesuatu bahan binaan (Tahmasebinia 2008). Bagi bangunan, keretakan yang berlaku mungkin menunjukkan ketidakstabilan struktur namun kebanyakkannya walaupun kelihatan agak serius ia hanya memberi sedikit kesan atau langsung tidak memberi kesan terhadap kestabilan atau prestasi bangunan selain rupa bentuk (Carrilion 2001).

KERETAKAN BANGUNAN

Input
  Ara
  Komponen
  Lokasi
  Elemen
  Babagian

Medium
  Bangunan
  Pemeriksaan visual

Output
  Jenis keretakan bangunan

Retak
  Bentuk
  Lebar

Rajah 1: Kerangka teoretikal keretakan bangunan

METODOLOGI

Kajian ini dijalankan terhadap sebuah kes aduan yang diterima oleh MPSJ daripada pemilik-pemilik bangunan di Taman Wawasan, Pusat Bandar Puchong tentang impak kerja pembinaan baru berhampiran terhadap fizikal bangunan mereka. Tujuan kajian ini dijalankan adalah mengenal pasti jenis-jenis keretakan bangunan terlibat seperti yang didakwa oleh pemilik-pemilik bangunan terbabit.


Oleh sebab sampel sebanyak 28 buah bangunan, adalah kurang daripada 50 korelasi Spearman digunakan untuk mengukur hubung kait antara variabel-variabel kajian. Koefisien korelasi atau kekuatan hubungan adalah berdasarkan julat antara -1.0 hingga +1.0. Nilai 0 pula menunjukkan tiada hubungan langsung antara variabel-variabel kajian. Bagi menginterpretasi kesignifikan korelasi antara variabel-variabel yang terlibat maka nilai p dirujuk iaitu terdapat hubungan signifikan apabila nilai p ≤ 0.01 atau ≤ 0.05 (Foster 2001).

PERBINCANGAN PENEMUAN

Berdasarkan pemeriksaan visual yang dilakukan terhadap 28 buah bangunan kajian, didapati sebanyak 5 buah bangunan mempunyai bahagian bangunan asal sahaja iaitu tiada pembesaran atau penyambungan dilakukan pada bangunan asal tersebut.

### Jadual 1: Taburan frekuensi retak bagi setiap bangunan kajian.

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Berdasarkan Jadual 1, didapti frekuensi retak adalah semakin kecil apabila lebar retak semakin besar. Peratusan kategori lebar retak sangat kecil adalah paling tinggi iaitu sebanyak 61.3% diikuti retak kecil 20.0%, retak sederhana 12.8%, retak besar 3.2% dan retak sangat besar 2.6% bagi keseluruhan bangunan kajian.

Di samping itu, didapti kategori lebar retak sangat besar berlaku sama ada pada elemen dinding atau lantai di bahagian bangunan tambahan Rumah 13, Rumah 14, Rumah 15, Rumah 16, Rumah 18 dan Rumah 19. Tinjauan awal yang dilakukan
terhadap kawasan pembinaan baru berhampiran mendapat terdapat kerja-kerja pengorekan tanah di bahagian belakang deretan bangunan-bangunan tersebut. Oleh itu, retak sangat besar tersebut dijangka berpunca daripada pergerakan tanah akibat perubahan kandungan air impak kerja-kerja pengorekan dan impak gegaran daripada hentakan mesin cerucuk pembinaan baru berhampiran. Walau bagaimanapun, Rumah 17 tidak terdapat kategori lebar retak sangat besar pada elemen bangunannya dijangka disebabkan oleh reka bentuk dan kerja pembinaan bahagian bangunan tambahan yang berkualiti. Maklumat-maklumat dan dokumen-dokumen awal yang diperoleh menunjukkan dalam deretan tujuh buah bangunan tersebut, didapati hanya Rumah 17 sahaja yang mempunyai kelulusan pelan bangunan bagi sambungan dan ubah suaijarumah kediamandari padaMP SJ.


**Jadual 2:** Koefisien korelasi antara aras-aras bangunan kajian.

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Korelasi adalah signifikan pada aras keertian 0.05.

Berdasarkan Jadual 2, tiada hubungan signifikan antara tingkat bawah dan tingkat atas bangunan. Ini bermaksud, keretakan yang berlaku di tingkat bawah tidak mempengaruhi keretakan yang berlaku di tingkat atas bangunan. Jadual 3 pula menunjukkan koefisien korelasi antara komponen-komponen bangunan bagi keseluruhan bangunan kajian ini.
**Jadual 3:** Koefisien korelasi antara komponen-komponen bangunan kajian.

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**. Korelasi adalah signifikan pada aras keertian 0.01.
*. Korelasi adalah signifikan pada aras keertian 0.05.

Rajah 2: Lakaran pelan lantai tingkat bawah Rumah 11.

Berdasarkan Rajah 2, komponen-komponen bangunan yang bersebelahan antara satu sama lain berkongsi beberapa elemen bangunan yang sama seperti dinding, rasuk dan tiang. Oleh itu, apabila berlaku keretakan sepanjang sambungan di antara dinding dengan rasuk di ruang tamu, keretakan juga berlaku sepanjang sambungan di antara dinding dengan rasuk di dapur kerana kedua-dua komponen tersebut berkongsi dinding dan rasuk menggalas beban yang sama. Walau bagaimanapun, keretakan yang berlaku bukanlah retak tembus dan dijangka berpunca daripada perbezaan koefisien pengembangan bahan-bahan binaan tersebut.

Di samping itu, didapat terdapat hubungan signifikan antara ruang keluarga dengan bilik 1, ruang keluarga dengan bilik 2 dan bilik 2 dengan bilik 3. Ini disebabkan oleh kedudukan komponen-komponen tersebut adalah bersebelahan antara satu sama lain di tingkat atas bangunan. Tingkat atas bangunan mengandungi komponen ruang keluarga, bilik 1, bilik 2, bilik 3, tandas 1 dan tandas 2. Rajah 3 menunjukkan contoh lakaran pelan lantai tingkat atas salah sebuah bangunan kajian iaitu Rumah 11.
Berdasarkan Jadual 3 juga, didapati tiada hubungan signifikan antara mana-mana komponen tingkat bawah dengan komponen tingkat atas bangunan dan ini sejajar dengan koefisien korelasi seperti dalam Jadual 2 iaitu tiada hubungan signifikan antara aras-aras bangunan. Jadual 4 pula menunjukkan koefisien korelasi antara lokasi-lokasi bangunan bagi keseluruhan bangunan kajian ini.

**Jadual 4**: Koefisien korelasi antara lokasi-lokasi bangunan kajian.

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Korelasi adalah signifikan pada aras keertian 0.05.

Berdasarkan Jadual 4, didapati tiada hubungan signifikan antara luaran dan dalaman bangunan. Ini bermaksud, keretakan yang berlaku di dalam tidak mempengaruhi keretakan yang berlaku di luar bangunan. Keretakan paling banyak berlaku di dalam bangunan iaitu sebanyak 364 retak berbanding di luar bangunan iaitu sebanyak 135 retak.
Ini dijangka berpunca daripada agen perosak bangunan seperti air lebih banyak terdapat di dalam berbanding di luar bangunan. Penggunaan bangunan seperti manusia, paip bocor, air pembersihan serta kemasukan air ke dalam bangunan seperti air hujan yang masuk melalui bumbung, dinding atau secara tidak langsung melalui penyerapan telah menyumbang kepada kelembapan di dalam bangunan. Masalah kelembapan ini telah menyebabkan pengembangan dan pengecutan bahan-bahan binaan dan menghasilkan retak. Jadual 5 pula menunjukkan koefisien korelasi antara elemen-elemen bangunan bagi keseluruhan bangunan kajian ini.
**Jadual 5**: Koefisien korelasi antara elemen-elemen bangunan kajian.

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</tbody>
</table>

**. Korelasi adalah signifikan pada aras keertian 0.01.
*. Korelasi adalah signifikan pada aras keertian 0.05.
Berdasarkan Jadual 5, didapati terdapat hubungan yang signifikan antara dinding dengan lantai, rasuk dengan tiang dan tiang dengan lantai. Ini disebabkan oleh elemen-elemen bangunan ini adalah struktur utama menggalas beban yang bersambung antara satu sama lain. Sebagai contoh, keretakan berlaku sepanjang sambungan di antara dinding dengan lantai, sepanjang sambungan di antara rasuk dengan tiang dan sepanjang sambungan di antara tiang dengan lantai. Jadual 6 pula menunjukkan koefisien korelasi antara bahagian-bahagian bangunan bagi keseluruhan bangunan kajian ini.

### Jadual 6: Koefisien korelasi antara bahagian-bahagian bangunan kajian.

<table>
<thead>
<tr>
<th></th>
<th>Asal Koefisien korelasi</th>
<th>Asal Nilai p</th>
<th>Tambahan/ubah suai Koefisien korelasi</th>
<th>Tambahan/ubah suai Nilai p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
<td>1.000</td>
<td>.118</td>
<td>.567</td>
<td>.</td>
</tr>
<tr>
<td>Tambahan/ubah suai</td>
<td>.118</td>
<td>1.000</td>
<td>.567</td>
<td>.</td>
</tr>
</tbody>
</table>

Korelasi adalah signifikan pada aras keertian 0.05.


Sesungguhnya, tahap keretakan yang berlaku pada bahagian bangunan asal bagi kesemua 28 buah bangunan kajian adalah retak estetik yang hanya memberi kesan terhadap rupa bentuk bangunan. Walau bagaimanapun, dijangka tahap keretakan yang berlaku pada bahagian bangunan tambahan bagi 6 buah bangunan kajian adalah retak kestabilan yang memberi kesan terhadap integriti struktur bangunan tambahan tersebut.

**KESIMPULAN DAN CADANGAN**


Berdasarkan pemikiran visual bangunan yang dilakukan, didapati kesemua bangunan kajian mengalami keretakan pada beberapa lokasi, struktur dan elemen bangunan dengan beberapa tahap, bentuk dan lebar keretakan seperti yang didakwa oleh pemilik-pemilik bangunan terbabit. Walau bagaimanapun, punca primer keretakan bangunan yang berlaku adalah sukar ditentukan. Terdapat kenyataan daripada pemilik bangunan contohnya “... dahulu dinding rumah saya hanya mengalami keretakan sepanjang 1.0 m tetapi apabila kerja pembinaan baru berhampiran tersebut dijalankan, keretakan dinding rumah saya telah bertambah menjadi sepanjang 2.0 m”.

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Apabila dakwaan seperti ini timbul, banyak masa dibazirkan hanya untuk menentukan kesahihan kenyataan tersebut.

Oleh itu, dicadangkan MPSJ mewujudkan satu garis panduan di peringkat tempatan iaitu bagi setiap pembinaan baru yang akan dijalankan mestilah dihasilkan terlebih dahulu laporan keadaan bangunan-bangunan sedia ada di sekitarnya. Garis panduan ini perlu diwujudkan oleh MPSJ khasnya dan PBT amnya bagi menangani kes aduan sebegini yang mungkin akan berlaku lagi sejajar dengan jangkaan pertumbuhan kukuh industri pembinaan dalam tempoh akhir Rancangan Malaysia Kesembilan (2008-2010).

**RUJUKAN**


Financial Management Practices: An Assessment Of Malaysian Construction Companies

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ABSTRACT

This study aims to explore the financial management practices of Malaysian construction companies using financial ratio analysis. Financial ratios are statistical yardsticks that relate two numbers generally taken from a company's income statement, balance sheet, or both, enabling us to make relative comparisons of company performance over time as well as to compare performance across different companies. Earlier studies on the impact of financial factors on the failure of construction projects point out that bad financial management and the lack of capital are the main determinants of construction failure. Construction industries face failures not only in developing countries but also worldwide. The failure scenario also occurs to the construction industry in Malaysia. As such, the failure rate of construction companies in Malaysia is also high. According to the Construction Industry Development Board, Malaysia (CIDB), 11,321 construction companies were classified as dormant or non-active from January 2006 to August 2008. There are very few listed successful contractors in Malaysia, and most of the construction projects are not completed within the original schedule. The reasons for the failure are directly related to financial factors. In this case study, 17 financial ratios were used as measurement tools to measure the financial performance of construction companies. Six construction contractors from the medium and large categories were selected for the case studies. It was found that most of the construction companies did not have sufficient cash capital to finance their construction works, enjoyed low profit margin from the construction projects, and were highly dependent on debt capital to finance their construction costs. There was a lack of monitoring system for the cash flow and project costs. It was observed that construction companies put themselves up for failure without effective financial practices.

Keywords: Contracting firms, financial practices and construction failure

INTRODUCTION

The construction industry plays an important role in enhancing economic performance of a country. In the Malaysian economy, average contribution of construction industry to GDP is an average of 3% annually. Even the industry's contribution is small in terms of percentage to GDP (see Table 1) compared to other economic sectors. However, the importance of sector is validated if judged in relation to its role in economic development. As mentioned by Abdullah (1990), the construction industry provides critical backward and forward linkages to support the development of other economic sectors. In Malaysia, the government plays an active role in promoting construction (Jaafar et al., 2001). For example, in its Ninth Malaysia Plan, the Malaysian Government allocated a total of RM200 billion for the industry to sustain its growth (Malaysian Economy Report, 2007).
Table 1: Contribution to GDP by economic sectors (average 2006-2010)

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>51.8</td>
<td>53.2</td>
<td>54.3</td>
<td>55.1</td>
<td>58.5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>31.1</td>
<td>30.3</td>
<td>29.6</td>
<td>29.5</td>
<td>26.2</td>
</tr>
<tr>
<td>Agriculture</td>
<td>7.9</td>
<td>7.7</td>
<td>7.5</td>
<td>7.4</td>
<td>7.6</td>
</tr>
<tr>
<td>Mining</td>
<td>8.8</td>
<td>8.6</td>
<td>8.4</td>
<td>8.1</td>
<td>7.9</td>
</tr>
<tr>
<td>Construction</td>
<td>3.1</td>
<td>3.0</td>
<td>3.0</td>
<td>2.9</td>
<td>3.2</td>
</tr>
</tbody>
</table>


However, in terms of business survival, the construction industry has constantly experienced a relatively high proportion of business failure compared to other industries (Yin, 2006). According to the Construction Industry Development Board (CIDB) of Malaysia, a total of 11,321 construction firms were classified as dormant and non-active from January 2006 to August 2008. This figure lends strong support to a statement made by Yin (2006), where he mentioned that there existed only a small number of successful listed construction contractors in Malaysia. Further, it has generally been observed that a significant number construction projects are not completed within the original schedule.

PROBLEM OF STATEMENT

Earlier studies on the impact of financial factors to the failure of the construction firms identified that bad financial management and lack of capital are the main determinants of the construction failure (Kangari, 1988). A recent study by Yin (2006) claimed that most contractors do not have sufficient capital to finance their undertakings. Contractors generally do not have fixed assets like most manufacturers, and they usually own construction equipment rather than lands or buildings. Unfortunately, banks do not accept these moving assets as acceptable collateral for loans. Without bank financing, contractors will obviously find it more difficult to undertake their projects. Financial problems faced by contractors are also due to low profit margins from projects. Oftentimes, contractors always have to produce good work at the cheapest price because of the open tender system. Although the system is the best way to ensure the completion of any project at the lowest price, it is the most difficult obstacle any contractor would be forced to hurdle in this very competitive world.

Whereas, Hwee et al. (2002) revealed the important role of cash flow management in the construction industry. Cash flow is the most important factor influencing profitability when a construction project is in progress. For many years, the construction industry has suffered a proportionally high bankruptcy rate than other industries. One of the major causes of bankruptcy is inadequate cash resources. Findings by Sambasivan and Soon (2007) mentioned that construction work involves huge amounts of money, and most of the contractors find it very difficult to bear the heavy daily construction expenses when the payments are delayed. Work progress can be delayed due to late payments of clients. This leads to inadequate cash flow that should otherwise support construction expenses especially that of contractors who are not financially sound. These findings give strong support to the conclusion made by Hwee et al. (2002) above.

A recent study by Lin (2008) shows empirical evidence that Malaysian construction industry is highly dependent on banks in order to survive. Figure 1 shows the total amount of financing that the construction industry availed itself for the years 2001 to 2005. In 2005, the total amount of loans granted to the construction industry...
amounted to RM 25.26 billion as compared to RM 23.29 billion and RM 21.71 billion in 2004 and 2003, respectively.

**Graph 1:** Total amount of financing to the construction industry (2001-2005) by 14 commercial banks.

Study by Lin (2008) has provided a support of the findings by Jaafar (2004) revealed empirically the significant value for debt capital is very strong. This indicates that debt capital is the most important capital source for contracting firms. As mentioned by McMahon’s (2000) the bigger the firm, the greater is its dependence on debt (cited from Jaafar (2005). Without sound debt management, firms may not be able to generate income through their operations, which then lead to low profit and equity capital (Jaafar, 2005)

Consequently, many loans to the construction firms become non-performing, which is commonly referred to as un-collectable (Lin,2007). Table 2 shows the amount of loans and non-performing loans (NPLs) by contractors for the year 2004 and 2005. The total amount of NPLs at the financial year of 2005 showed an increasing trend from RM 2,703,285,000.00 in 2004 to RM 4,681,328,000.00 increased by 73.17 %. According to Nihon (2001), the increase in NPLs can also be due to the increase in bankruptcy.

**Table 2:** Amount NPLs to bank by construction industry for 2004 and 2005

<table>
<thead>
<tr>
<th>Commercial bank</th>
<th>2004</th>
<th>2005</th>
<th>%</th>
<th>2004</th>
<th>2005</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan (RM’00)</td>
<td>24,698,854</td>
<td>26,586,508</td>
<td>73.17%</td>
<td>NPL (RM’00)</td>
<td>2,703,285</td>
<td>4,681,328,328</td>
</tr>
</tbody>
</table>

Source: (Lin, 2008).

A recent study by Enshassi et al. (2006) also illustrates that the depending on bank loan and paying high interest (i.e. cost of capital), cash flow mis-management, lack of capital and low profit margin due to tough competition are the main failure factors of the contracting firms.
Previous researchers have selected business failure as their focal point. Peterson (2005) illustrates that failure is directly related to a company's financial weakness. As suggested by Edum-Fotwe (1996), construction firms must undertake regular performance evaluation to ensure the adoption of timely and appropriate strategies to sustain the business. Kangari (1992) suggests that understanding the causes and symptoms of business failure will help in identifying early warnings of an impending financial crisis. Cannon and Hillebrandt (1991) emphasize that financial aspect, particularly financial ratio, is a significant analysis that often presents a signal to a company's business (cited from Edum-Fotwe et al. 1995).

RESEARCH OBJECTIVE

By examining the sizeable number of business failure in the construction industry, this study is conducted in a timely manner to evaluate the financial health of local companies using financial ratio analysis. Financial ratio analysis is a method used for predicting company failure in the construction industry. It is hoped that by determining the early signs of financial trouble, contractors can develop effective financial plans to defend their companies against failure.

FINANCIAL RATIO ANALYSIS

This section will examine ratio analyses commonly employed for measuring performance of a company, regardless of its industrial segment. Focus is likewise placed on recommended target ratios for the construction industry. According to Moyer et al. (2007), financial ratios analysis is used to address three main purposes. First, it is used as an analytical tool in identifying the strengths and weaknesses of the firm as well as to assess its viability as an ongoing enterprise or to determine whether a satisfactory return can be earned for the risk taken. Second, financial ratios are useful as monitoring tools for ensuring the company objectives are compatible with its resources. Third, financial ratios play a very effective role in planning to achieve the company's goals. Financial ratio is a relationship that indicates a firm's activities. Financial ratios enable an analyst to make a comparison of a firm's financial condition over time or in relation to other firms. McNamee (1985) pointed out that information not clearly identifiable from the raw data can be readily revealed by expressing several figures from financial statements in the form of ratios. Therefore, financial ratio analyses are generally applied for various corporate appraisals, particularly, in strategic management activities that seek to address the future survival of a construction business. On the other hand, Edum-Fotwe et al. (1995) highlighted the role of financial ratios analysis as a very quick and effective way of obtaining an insight into a company's operations and performance. The use of financial ratios by construction companies can provide an early warning mechanism that should serve as an effective monitoring tool for avoiding continued poor corporate performance or eventual insolvency. Ratios models have been developed for application in both construction and non-construction industries.

Various financial ratios and financial models have been proposed in the search for solution to various financial situations. For example, Z-Score discriminant model (1968) and Zeta model (1977) were introduced by Altman, focusing on legally bankrupt firms; Kangari (1992) presents the multiple linear regression model (MLR) by using financial ratios to assess financial performance and grade of a construction company. Multiple attributed decision making (MADM) and entropy method are recently applied by Hsieh and Wang (2001) in identifying critical financial ratios for Taiwan's property development firms in recession. Meanwhile, regression analysis (RA) on five selected financial ratios has been recently employed by Hung et al. (2002) to identify firm-specific determinants of capital structure among property developers and contractors.
in Hong Kong. Xu and Wang (2007) have used three prediction models [i.e., support vector machines (SVMs), logistic regression (LR), and multiple discriminant analysis (MDA)] as financial failure tools to evaluate the input/output of corporation.

However, as mentioned by Lasher (2003), the best competitive information for ratio analysis generally is a comparison of traditional ratios with an industry average. As stated by EdumbFotwe et al. (1995), traditional ratio analysis involves calculating single ratio values by employing any two financial figures. Singh and Tiong (2005) highlighted a number of researchers have developed financial ratio models for predicting financial soundness or bankruptcy of non-construction and construction firms. Application of these financial models essentially consists of calculating ratios for an individual company and comparing these with the industry’s average to predict financial failure of a company or to formulate inter-company comparisons.

Furthermore, Peterson (2005) suggests the use of industry average and range as a comparative point for ratio analysis to obtain an accurate picture of a company’s financial health. He has employed 17 financial ratios to evaluate financial performance for construction companies (see table 3). Subsequently, Table 4 presents 17 types of industry average and range used for commercial construction companies. Commercial construction includes establishment of multifamily housing, hotel, industry buildings, warehouses, and other commercial construction.

**Table 3**: Seventeen typical financial ratio for construction companies

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Definition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quick ratio (QR)</td>
<td>(Cash + Accounts Receivable) / Current Liabilities</td>
<td>QR is a measurement of company’s ability to pay short term liabilities with cash or other near cash assets. The calculation of QR should not include account receivable in form of retention because often retention cannot be converted to cash quickly. QR 1 to 1 or greater is considered liquid. The company with a ratio below 1 to 1 Need to convert inventory or other current and long term assets to cash or raise cash through debt. QR more than 1.5 :1 may be an indication that the company has too much cash and should be investing its capital elsewhere.</td>
</tr>
<tr>
<td>2. Current Ratio (CR)</td>
<td>Current Assets/ Current Liabilities</td>
<td>CR is a measurement of company’s ability to used current assets to pay for current liabilities. A CR of 2.0 to 1.0 is considered a strong indication that the company is able to pay its current liabilities. If a company’s CR less than 1:1 it is an indication that the company does not expect to receive enough revenue to pay its Current liabilities. The company needs to sell long term asset or raise cash through debt or equity financing.</td>
</tr>
<tr>
<td>3. Current Liabilities to Net Worth Ratio</td>
<td>Current liabilities/ Net Worth</td>
<td>It is a measurement of the risk that short term creditors are taking by extending credit to the company. If the company’s current liabilities</td>
</tr>
<tr>
<td>4. Debt to Equity Ratio</td>
<td>Total liabilities/ Net worth</td>
<td>greater than the company’s net worth, the short term creditors would have more capital at risk. It is also known as the debt to worth ratio or total liabilities to net worth ratio. The desired range for the debt to equity ratio is less than 2 to 1. If the debt to equity ratio exceeds 2 to 1, one begins to question whether the company can service its debt.</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>5. Fixed Assets to Net Worth Ratio.</td>
<td>Net fixed assets/ Net Worth</td>
<td>It is a measurement of the amount of the owner’s equity that is tied up in fixed assets, such as construction equipment, building and vehicles. A high number indicates a company has a heavy investment in fixed assets.</td>
</tr>
<tr>
<td>6. Current Assets to Total Assets Ratio</td>
<td>Current assets/ Total Assets</td>
<td>It is a measurement of how liquid a construction company’s assets are. A company with high ratio would have most of its assets in the form of current assets and would be very liquid.</td>
</tr>
<tr>
<td>7. Collection Period.</td>
<td>Accounts Receivable (365)/ Revenue.</td>
<td>It is a measurement of the average time it take a company to collect its account receivable. The CP is also a measure of how long the company’s capital is being used to finance client’s construction project. To calculate the CP ratio is better for the construction company to exclude the account receivable there are in form of retention sum. Retention sum is the portion of account receivable that will not be able to release until the completion of the project. The CP should be less than 45 days.</td>
</tr>
<tr>
<td>8. Average Age of Accounts Payable</td>
<td>Accounts payable (365)/(material + Subcontract)</td>
<td>It is represents the average time to take a company to pay its bills and is a measure of how extensively a company is using trade financing. When the average age of the account payable is greater than 45 days this is an indication that the company is slow to pay its bill. If the average age of the account less than 20 days, it is an indication that the company is using less trade financing. If the average is equal to collection period, indicates that the company is using its suppliers and subcontractors to fund the construction works.</td>
</tr>
<tr>
<td>9. Assets to Revenue Ratio</td>
<td></td>
<td>It’s a measurement of how efficiently the company is using its assets. It also know as the assets to sales ratio.</td>
</tr>
<tr>
<td>10. Working Capital Turns (WCT)</td>
<td>Total Assets/ Revenues</td>
<td>It’s a measurement of how efficiently a</td>
</tr>
<tr>
<td></td>
<td>Formula</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11.</td>
<td>Accounts Payable To revenue ratio</td>
<td>The WCT is also known as revenues to net working capital ratio, the firm with high number of turns is undercapitalized and need to reduce its level of sales or increase the availability of current assets.</td>
</tr>
<tr>
<td>12.</td>
<td>Gross profit margin</td>
<td>It’s a measurement of how much a company is using its suppliers and subcontractors as a source of funds. The higher the percentage the greater the funding the company is receiving from it suppliers or subcontractors.</td>
</tr>
<tr>
<td>13.</td>
<td>General overhead ratio</td>
<td>The gross profit margin is the percentage of the revenue left after paying construction costs and equipment costs.</td>
</tr>
<tr>
<td>14.</td>
<td>After tax profit margin ratio</td>
<td>It is the percentage of the revenue used to pay the general overhead expenses or administrative costs.</td>
</tr>
<tr>
<td>15.</td>
<td>Return on Assets</td>
<td>It is the percentage of the revenues that become profit after deduction of tax.</td>
</tr>
<tr>
<td>16.</td>
<td>Return on Equity</td>
<td>It is the measurement of how efficiently a construction company is using its assets. Efficiently run companies will have a high returned on assets.</td>
</tr>
<tr>
<td>17.</td>
<td>Degree of fixed assets newness</td>
<td>It is also known as return on investment for shareholders.</td>
</tr>
</tbody>
</table>

**Source:** Peterson (2005)
Table 4: Presents seventeen types of industry average and range used for commercial construction companies.

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Industry Average (Median)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Current ratio (CR)</td>
<td>1.5:1</td>
<td>3.1:1 to 1.2:1</td>
</tr>
<tr>
<td>2. Quick ratio (QR)</td>
<td>1.2:1</td>
<td>2.1:1 to 0.6:1</td>
</tr>
<tr>
<td>3. Current liabilities-to-net worth ratio (CL/NW)</td>
<td>1.12:1</td>
<td>0.32:1 to 2.4:1</td>
</tr>
<tr>
<td>4. Debt-to-equity ratio (DER)</td>
<td>1.3:1</td>
<td>0.5:1 to 2.7:1</td>
</tr>
<tr>
<td>5. Fixed assets-to-net worth ratio (FA/NW)</td>
<td>0.24:1</td>
<td>0.08:1 to .64:1</td>
</tr>
<tr>
<td>6. Current assets-to-total assets ratio (CA/TA)</td>
<td>-</td>
<td>0.70:1 and 0.80:1</td>
</tr>
<tr>
<td>7. Collection period (CP)</td>
<td>48 days</td>
<td>22 days to 75 days</td>
</tr>
<tr>
<td>8. Average age of accounts payable (AAAP)</td>
<td>45 days</td>
<td>-</td>
</tr>
<tr>
<td>9. Assets-to-revenue ratio (ARR)</td>
<td>29%</td>
<td>19 % to 55 %</td>
</tr>
<tr>
<td>10 Working capital turns (WCT)</td>
<td>12.1:1</td>
<td>23:1 to 6.1:1</td>
</tr>
<tr>
<td>11. Accounts payable-to-revenue ratio (APRR)</td>
<td>7.9 %</td>
<td>2.9 % to 13.0 %</td>
</tr>
<tr>
<td>12. Gross profit margin (GPM)</td>
<td>17 %</td>
<td>-</td>
</tr>
<tr>
<td>13. General overhead ratio (GOR)</td>
<td>Less 10 %</td>
<td>-</td>
</tr>
<tr>
<td>14. After tax profit margin (ATPM)</td>
<td>2.2 %</td>
<td>8.7 % to 0.6 %</td>
</tr>
<tr>
<td>15. Return on assets (ROA)</td>
<td>6.5 %</td>
<td>21.7% to 2.0%</td>
</tr>
<tr>
<td>16. Return on equity (ROE)</td>
<td>16.7 %</td>
<td>53 % to 5.4 %</td>
</tr>
<tr>
<td>17. Degree of fixed asset newness (DFAN)</td>
<td>-</td>
<td>60 % to 40 %</td>
</tr>
</tbody>
</table>

Source: Peterson (2005)
The proper selection of financial ratios is significant in avoiding information overlaps. According to Hsieh and Wang (2001), in performing ratio analysis, a task often underemphasized is the selection of appropriate ratios to be used. In a multi-criteria decision-making framework, poor quality of criteria selection such as financial ratios will consequently undermine the quality of evaluation.

In evaluating financial performance (Moyer et al., 2007), five basic categories of financial ratios are identified, and different groups of ratios are used for different aspects of a firm’s operations. These ratio groupings include the following:

1. **Liquidity ratios**: Indicate a firm’s capability to meet short-term financial obligations
2. **Asset management ratios**: Indicate how efficiently a firm is using its assets to generate income.
3. **Financial management leverage ratios**: Indicate a firm’s capacity to meet short and long-term debt obligations, and how risky is the firm’s financial structure.
4. **Profitability ratios**: Measure how effectively a firm’s management generates profit from its investments.
5. **Market-based ratios**: Measure the financial market’s evaluation of a company’s performance.

As mentioned by Moyer et al. (2007), it is unnecessary to include all ratios when performing a ratio analysis. Choice of ratios depends on the current needs or objectives of the individual. For example, suppliers and short-term creditors are likely to be concerned with a company’s current liquidity, while shareholders may place greater premium on high profitability ratios to determine the amount of investment return. Meanwhile, bankers are inclined to display greater interest in profitability and leverage ratios prior to approving any loan application.

Recently, Singh and Tiong (2005) highlighted that the right selection of financial ratios is significant to avoid information overlaps. If all ratios were selected, the assessment results could be the same.

**METHODOLOGY OF STUDY**

This research proposed a qualitative method using traditional ratio analysis to evaluate the financial health of construction contractors. As mentioned by Laser (2003), the best competitive information for ratio analysis generally involves a comparison between traditional ratios and an industry average. The paper was based on data extracted from case studies of six representative large- and medium-sized construction contractors in Malaysia. Annual financial reports of selected construction companies for three years (2005, 2006, and 2007) were thoroughly studied.

A total of 17 financial ratios, as proposed by Peterson (2005), were employed as measurement performance tools. Subsequently, in interpreting these ratios, typical median (industry average) and typical range were used to compare a company’s annual average ratios for three years. Industry average and range were patterned after the work of Peterson (2005), which was based from Dun & Bradstreet Inc. According to Peterson, the industry average is a cutoff point to demonstrate whether companies are above or under industry average. Typical range was based on upper and lower quartiles, representing the range of values for which half of the construction company falls within, with 25% of companies performing better than the range and 25% performing below the range.
The second phase of data collection involved an interview process with representatives from these six respondent companies. The interview plan was provided to the respondents in advance, approximately a week prior to the interview, thus allowing them to prepare for the interview. The purpose of interview was for contractors to provide a reason for findings derived from the ratios analysis.

During both phases, careful investigation on the clay bricks of the fortress was carried out. Measurements, colours and overall profile of the bricks were recorded. The brick samples were taken from the walls, buttresses and the gate. The bricks were found to be much smaller than present day bricks. They measure 9 inches in length, 4 inches wide and 2 inches in thickness. (230mm x 110mm x 50mm). Their sizes and colours were about the same as that found at Kota Ngah Ibrahim bin Long Jaafar, another fortress built at Matang, Taiping. With a thickness of about 2 inches (50mm), these brick samples can be considered as typical old bricks used in many heritage buildings in Malaysia (Ahmad, A.G., 2004). Photographs on the work done and detailed conditions of the walls were recorded.

**FINDINGS AND DISCUSSION**

The table below shows the results of the average ratios for the six selected construction companies (see Table 5).

**Table 5: A summary of 17 financial ratios for the six selected construction companies.**

<table>
<thead>
<tr>
<th>No</th>
<th>Ratios</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CR</td>
<td>1.12:1</td>
<td>1.05:1</td>
<td>0.97:1</td>
<td>1.35:1</td>
<td>1.07:1</td>
<td>1.34:1</td>
<td>1.5:1</td>
<td>3.1 to 1.2</td>
</tr>
<tr>
<td>2</td>
<td>QR</td>
<td>0.66:1</td>
<td>0.52:1</td>
<td>0.60:1</td>
<td>0.69:1</td>
<td>1.10:1</td>
<td>0.91:1</td>
<td>1.2:1</td>
<td>2.1 To 0.6</td>
</tr>
<tr>
<td>3</td>
<td>CL/NW</td>
<td>6.47:1</td>
<td>9.06:1</td>
<td>7.59:1</td>
<td>14.62:1</td>
<td>2.43:1</td>
<td>3.84:1</td>
<td>1.12:1</td>
<td>0.32 To 2.4</td>
</tr>
<tr>
<td>4</td>
<td>DER</td>
<td>6.68:1</td>
<td>9.41:1</td>
<td>8.19:1</td>
<td>37.53:1</td>
<td>2.53:1</td>
<td>3.84:1</td>
<td>1.3</td>
<td>0.5 To 2.7</td>
</tr>
<tr>
<td>5</td>
<td>FA/NW</td>
<td>0.66:1</td>
<td>0.71:1</td>
<td>1.65:1</td>
<td>9.28:1</td>
<td>35%</td>
<td>0.16:1</td>
<td>0.24:1</td>
<td>0.08 To 0.64</td>
</tr>
<tr>
<td>6</td>
<td>CA/TA</td>
<td>0.899:1</td>
<td>0.93:1</td>
<td>0.77:1</td>
<td>0.71:1</td>
<td>0.90:1</td>
<td>0.96:1</td>
<td>-</td>
<td>0.70 To 0.80</td>
</tr>
<tr>
<td>7</td>
<td>CP</td>
<td>47 days</td>
<td>83 days</td>
<td>8.7 days</td>
<td>127 days</td>
<td>22 days</td>
<td>39 days</td>
<td>48 days</td>
<td>22 days To 75 days</td>
</tr>
<tr>
<td>8</td>
<td>AAAP</td>
<td>63 days</td>
<td>94 days</td>
<td>89 days</td>
<td>146 days</td>
<td>38 days</td>
<td>94 days</td>
<td>45 days</td>
<td>19% To 55%</td>
</tr>
<tr>
<td>9</td>
<td>ARR</td>
<td>42 %</td>
<td>49 %</td>
<td>71.7 %</td>
<td>96.3%</td>
<td>16.7%</td>
<td>35.5%</td>
<td>29%</td>
<td>19% To 55%</td>
</tr>
<tr>
<td>10</td>
<td>WCT</td>
<td>43.7:1</td>
<td>3.4:1</td>
<td>33:1</td>
<td>(0.02) :1</td>
<td>26.9 :1</td>
<td>22.9 :1</td>
<td>12.1</td>
<td>23 To 6.1</td>
</tr>
<tr>
<td>11</td>
<td>APRR</td>
<td>14.1 %</td>
<td>21.4 %</td>
<td>24.8 %</td>
<td>24.3 %</td>
<td>8.74%</td>
<td>22.8%</td>
<td>7.9%</td>
<td>2.9% To 13.0%</td>
</tr>
</tbody>
</table>
Financial ratios are the best tools to measure the financial performance of contracting firms. Ratio analysis provides a very quick and effective way of obtaining insight into a company’s operations and performance. Good construction financial management includes monitoring the critical financial ratios and comparing these to those of other companies in the industry. These ratios can also provide insights into a company’s capability to pay bills, how efficiently it uses its financial resources, its profitability, and its capital structure. There are several common ratios used by previous researchers to evaluate the financial health of a construction company.

Previous researchers (Singh and Tiong 2005; Edumb-Fotwe et al., 1995; Moyer et al., 2007; Ocal et al., 2005) summarized ratio analysis by grouping to avoid information overlap. For this case study, the interpretation of financial ratios was grouped into four broad categories (see Table 6 below).

**Table 6: Summary of the 17 financial ratios**

<table>
<thead>
<tr>
<th>N o</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Liquidity ratios</td>
</tr>
<tr>
<td></td>
<td>1. Current (CR)</td>
</tr>
<tr>
<td></td>
<td>2. Quick (QR)</td>
</tr>
<tr>
<td>2</td>
<td>Profitability ratios</td>
</tr>
<tr>
<td></td>
<td>1. Gross profit margin (GPM)</td>
</tr>
<tr>
<td></td>
<td>2. After-tax profit margin (ATPM)</td>
</tr>
<tr>
<td></td>
<td>3. Return on assets (ROA)</td>
</tr>
<tr>
<td></td>
<td>4. Return on equity(ROE)</td>
</tr>
<tr>
<td>3</td>
<td>Leverage/debt ratios</td>
</tr>
<tr>
<td></td>
<td>1. Current liabilities to net worth (CL/NW)</td>
</tr>
<tr>
<td></td>
<td>2. Debt to equity (DER)</td>
</tr>
<tr>
<td></td>
<td>3. Average age of account payable (AAAP)</td>
</tr>
<tr>
<td></td>
<td>4. Account payable to revenue ratio (APRR)</td>
</tr>
<tr>
<td>4</td>
<td>Efficiency ratios/Assets management ratios</td>
</tr>
<tr>
<td></td>
<td>1. Fixed assets-to-net worth ratio (FA/NW)</td>
</tr>
<tr>
<td></td>
<td>2. Current assets-to-total assets ratio (CA/TA)</td>
</tr>
<tr>
<td></td>
<td>3. Average Collection Period (CP)</td>
</tr>
<tr>
<td></td>
<td>4. General Overhead Ratio (GOR)</td>
</tr>
<tr>
<td></td>
<td>5. Assets-to-revenue ratio (ARR)</td>
</tr>
<tr>
<td></td>
<td>6. Working capital turn (WCT)</td>
</tr>
</tbody>
</table>
7. Degree of fixed assets newness (DFAN)

1. Liquidity Ratios

Table 7: Average liquidity ratios of six selected construction companies.

<table>
<thead>
<tr>
<th>No</th>
<th>Ratios</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CR</td>
<td>1.12:1</td>
<td>1.05:1</td>
<td>0.97:1</td>
<td>1.35:1</td>
<td>1.07:1</td>
<td>1.34:1</td>
<td>1.5:1</td>
<td>3.1 to 1.2</td>
</tr>
<tr>
<td>2</td>
<td>QR</td>
<td>0.66:1</td>
<td>0.52:1</td>
<td>0.60:1</td>
<td>0.69:1</td>
<td>1.10:1</td>
<td>0.91:1</td>
<td>1.2:1</td>
<td>2.1 to 0.6</td>
</tr>
</tbody>
</table>

Results revealed that companies’ liquidity ratios (CR and QR) were worse compared with the industry average. The companies’ CR, which was less than 1.5:1, indicates that they possessed insufficient capital to finance construction projects. Thus, they may face financial problems at any time in the future. However, overall CR, which was above 1:1 except for Company C, indicates that the companies were capable of meeting their short-term obligations. CR of Company C, which was less than 1:1, indicates insufficiency of its current assets in meeting its short-term obligations.

Quick ratios (QR), which were less than the industry average of 1.2:1, revealed that the company was unable to meet its short-term cash needs and compelled to increase cash either through debt financing or liquefying assets. However, QR for all the companies remained to be within the range of 2.1:1 to 0.6:1, with the exception of Company B, whose QR was 0.52:1, slightly lower than the minimum range (see Table 7).

A few factors contribute to these situations. Few respondents provided a handful of reasons, such as the company’s expansion program that required greater capital, delay in receiving progress payment from clients, and lack of cash flow monitoring system. As mentioned by one respondent (A), his company experienced lack of capital because of the company’s expansion program. The company began its business with a small paid-up capital. Additionally, results from the interviews indicate that majority of construction companies have utilized assets as their paid-up capital. Only a small percentage of cash was utilized as paid-up capital. Revalued of company assets (fixed assets) appeared to be a normal practice for construction companies to boost paid-up capital, even if in reality the company did not increase its cash capital. For example, Company C increased its paid-up capital to RM 4 million from an initial RM 350,000 by revaluing its assets and adding a certain amount of non-existing assets for to increase the value of its fixed assets and paid-up capital. The objective behind this move is to demonstrate that they have the capability and high paid-up capital to bid for large projects. According to the company, securing a bank loan is extremely difficult because contractors generally do not possess fixed assets like majority of manufacturers. Contractors normally do not have land and buildings in their portfolio; instead, they have construction equipment. Unfortunately, banks do not
accept these moving assets as loan collateral. However, in the absence of bank financing, contractors are obviously faced with difficulty in undertaking business.

According to respondent B, delay in progress payment was a major hurdle as well, influencing a company’s cash position. Respondents C and E likewise described the same situation. Three main causes of delayed payment include delay in processing for approval, bureaucracy, and technical problems. As mentioned by respondent C, insufficient working capital resulted from a delay in finalizing the final account by clients. All respondents stated that it took a considerable amount of time for the client to process the final claim; on average, it takes over a year to settle the final payment. A portion of money that belongs to the company would be placed on hold for a certain period until the client finalized the final payment. According to respondent A, most contracts specify that the final account should be closed three months following the project’s completion.

Lack of cash flow monitoring system was another major issue that contributed to the financial problem. Projected cash flow was not properly managed by respondents because of the lack of experienced staff. All respondents used their own approach to manage their cash flow. As mentioned by the respondents, preparing projected cash flow for each project was not a major issue, as the important thing was implementation. In the absence of sufficient cash and talented staff, implementation will be a challenge.

All respondents agreed with the research finding, which explained that cash was not utilized accordingly. Specifically, respondent C mentioned that it was impossible for the company to implement the 'one project-one account' system because of lack of cash and the use of the same creditors for each project. Thus, the rescue plan must be implemented by distributing money fairly to all creditors to ensure that each project progressed well. As mentioned by respondent B, if the company made payments on the basis of projects, only a number of creditors or sub-contractors would receive their payment. Thus, the rescue plan was a sound strategy for ensuring that all projects would run smoothly.

2. Profitability Ratios

Table 8: Average profitability ratios of six selected construction companies.

<table>
<thead>
<tr>
<th>N o</th>
<th>Ratios</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>GPM</td>
<td>4.7 %</td>
<td>10.6 %</td>
<td>6.96 %</td>
<td>11.98 %</td>
<td>9.06 %</td>
<td>7.52 %</td>
<td>17 %</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>ATPM</td>
<td>0.78 %</td>
<td>(0.14) %</td>
<td>1.17 %</td>
<td>(5.56) %</td>
<td>0.24 %</td>
<td>(0.48) %</td>
<td>2.2%</td>
<td>8.7% to 0.6%</td>
</tr>
<tr>
<td>5</td>
<td>ROA</td>
<td>1.8 %</td>
<td>(0.97) %</td>
<td>2.07 %</td>
<td>(7.4) %</td>
<td>1.69 %</td>
<td>(1.28) %</td>
<td>6.5%</td>
<td>21.7% to 2.0%</td>
</tr>
<tr>
<td>6</td>
<td>ROE</td>
<td>16.1 %</td>
<td>(10.5) %</td>
<td>20.25 %</td>
<td>(72.6)</td>
<td>4.5%</td>
<td>(2.45) %</td>
<td>16.7%</td>
<td>53% to 5.4%</td>
</tr>
</tbody>
</table>

Profitability ratios presented in Table 8 include gross profit margin, net profit after tax, return on assets, and return on equity. Figures shown were below the industry average, helping to explain that the companies enjoyed low profit margins. This lower gross profit margin (GPM) suggests that the companies shouldered high
construction project costs. Minimum GPM suggests that construction was 17% of the total contract. However, all GPMs of the six companies were below the suggested rate. As mentioned by the respondents, low contract price was the major problem faced by contracting firms. It resulted from the open tender system, which forced contractors to bid at the lowest price. Normally, gross profit margin ranged between 5% to 10%. If the companies mark up profit to over 10%, the possibility of winning the tender was quite slim. Further, as stated by respondent D, the number of contractors was considerably higher than the available jobs. The company preferred to assign a lower price for the tender as it needed the job to sustain the business. Thus, high competition was identified as a major cause for low profit margin. According to respondent C, delay in project completion was a major factor contributing to low profit margin, where extra cost would be incurred because of project delay. Further, respondent E mentioned the escalating prices of materials, which affect profits as well.

Majority of respondents likewise agreed that high dependence on debt capital would reduce profit. Interest charge and high price of purchasing materials through credit facilities would reduce the percentage of company profit. However, according to respondents A and C, the situation normally applies for a new company. For established and well-known construction companies, credit charges and interest rate would be lower.

The result likewise revealed that after-tax profit margin (ATPM) was lower than the recommended industry average of 2.2%. Practically, a lower ATPM was directly affected by lower GPM and high overhead expenses. Therefore, companies must work on their profitability either by cutting costs or by increasing overhead markup. Majority of respondents did not agree with the finding that loss experienced by construction companies resulted from weaknesses in controlling costs. According to respondent C, weaknesses in controlling cost contributed only slightly to company loss. Respondent C argued that the main reason behind higher construction cost was the delay in project completion. Costs would increase according to the period of delay, which was calculated based on the number of days involved. Further, Respondent A mentioned that poor planning could be an additional problem. This would force the company into a desperate situation and create unnecessary costs.

Return on assets (ROA) is used to measure efficiency of a construction company using their assets. Efficient companies will have high ROA. Results revealed that overall ROAs for the six companies were below the industry average. Findings likewise revealed that the companies were inefficient in managing their assets. Suggested industry average for ROA is 6.5%. Return on equity (ROE) appeared to be riskier and lower than the industry average of 16.7%. However, Company C exhibited above-industry performance in its ROE. Majority of respondents did not agree with the finding that lower ROA resulted from the lack of financial management. Again, they argued that the open tender system was the backbone of the problem. As mentioned before, lack of capital was another major issue that contributed to low margin return in assets investment. Without ample working capital, the project would be delayed, subsequently affecting company profit. However, it was difficult to measure actual ROA of the company as majority of construction companies increased the value of company assets to increase their paid-up capital.
3. Leverage / Gearing Ratios

Table 9: Average leverage ratios of six selected construction companies.

<table>
<thead>
<tr>
<th>No</th>
<th>Ratios</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>CL/NW</td>
<td>6.47:1</td>
<td>9.06:1</td>
<td>7.59:1</td>
<td>14.62:1</td>
<td>2.43:1</td>
<td>3.84:1</td>
<td>1.12:1</td>
<td>0.32 to 2.4</td>
</tr>
<tr>
<td>8</td>
<td>DER</td>
<td>6.68:1</td>
<td>9.41:1</td>
<td>8.19:1</td>
<td>37.53:1</td>
<td>2.53:1</td>
<td>3.84:1</td>
<td>1.3</td>
<td>0.5 to 2.7</td>
</tr>
<tr>
<td>9</td>
<td>AAAP</td>
<td>63 days</td>
<td>94 days</td>
<td>89 days</td>
<td>146 days</td>
<td>38 days</td>
<td>94 days</td>
<td>45 days</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>APRR</td>
<td>14.1 %</td>
<td>21.4 %</td>
<td>24.8 %</td>
<td>24.3 %</td>
<td>8.74%</td>
<td>22.8%</td>
<td>7.9%</td>
<td>2.9% to 13.0%</td>
</tr>
</tbody>
</table>

There are several types of financial leverage ratios (see Table 9), including current liabilities-to-net worth ratio (CL/NW), debt-to-equity ratio (DER), average age of accounts payable (AAAP), and accounts payable-to-revenue ratio (APRR). Financial leverage ratios revealed that construction companies relied on debts to perform their construction projects. CL/NW for the companies appeared worse than the industry average. CL/NW ratio was a measurement of the risk that short-term creditors assume by extending credit to a company. A higher ratio indicates intensive use of suppliers and sub-contractor’s credit for project financing. All CL/NW ratios of the six construction companies were not only worse than the industry average of 1.2:1 but were higher than the upper range of 2.4:1 as well, which applies to a commercial construction company. The high CL/NW ratio serves a warning sign that a contractor is in trouble, posing a high risk of default to short-term creditors. A high DER indicates that the risk assumed by all creditors (short- and long-term creditors) is higher compared to the risk shouldered by the construction company. It likewise measures the proportion of a company equity financed by credit facilities.

The DER of the six selected construction companies was considerably higher compared with the suggested industry average of 1.3:1. This indicates that the companies were highly dependent on debt capital. As mentioned by respondent E, it was a normal practice in the construction industry for contractors to avoid using their own cash to finance projects. They would find creditors to support the construction cost despite having sufficient funds. However, majority of respondents strongly agreed that high dependence on creditors resulted from the lack of cash to fulfill the current need of the project. Majority agreed that they began their business with small initial capital and small amount of cash.

Respondent A stated that construction companies cannot dependent highly on advanced payment and progress payment to manage costs because the amount given for advance payment can only support construction costs to a certain extent, usually the initial stage of the project. As mentioned by Company C, the practice of giving advance payment for contractors may appear sound in theory. In reality, however, before a contractor can claim advance payment, they must pay a certain amount to the bank to cover bank charges and collateral, which is normally equal to over 30% of the advance payment. Thus, the company can merely use 70% or less of the total...
advanced payment. Another important challenge is that it will take two to three months for the bank to process the loan. As mentioned by respondents B and E, another alternative to expedite the process of obtaining advance payment is by using insurance guarantee. However, the premium is higher than the bank guarantee, and contractors need to pay by cash, thus translating into an extra burden cost for the company. Delay in progress payment is likewise a major issue mentioned by all respondents.

AAAPs of the companies were higher than their collection period (CP) as well. This is an indication that companies were highly dependent on the sub-contractors’ and suppliers’ capital to fund their construction costs; payment to these parties were slow. This research used APRR to measure how often companies used their suppliers and sub-contractors as source of funds. Results from the financial analysis illustrated the high ratios of APRR compared to the industry average. This demonstrated that the higher the percentage, the greater the company was being funded by its suppliers and subcontractors.

As mentioned by respondent A, back-to-back payment is a normal practice in the construction industry. However, a number of suppliers and sub-contractors must be paid in advance or according to the progress of the project. In reality, back-to-back payment is practiced in construction industry because of lack of capital on the part of the company. In general, majority of construction companies cannot sustain the business without strong credit support from suppliers or creditors. Other respondents likewise agreed that lack of capital was the main reason for contractors to be highly dependent on debt capital to finance their projects.

4. Efficiency Ratios

**Table 10: Average efficiency.**

<table>
<thead>
<tr>
<th>No</th>
<th>Ratios</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
<th>Company D</th>
<th>Company E</th>
<th>Company F</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>FA/NW</td>
<td>0.66:1 or 66%</td>
<td>0.71:1 or 71%</td>
<td>1.65:1 or 165%</td>
<td>9.28:1 or 928%</td>
<td>0.35:1 or 35%</td>
<td>0.16:1 or 16%</td>
<td>0.24:1 or 24%</td>
<td>0.08 to 0.64</td>
</tr>
<tr>
<td>12</td>
<td>CA/TA</td>
<td>0.899:1</td>
<td>0.93:1</td>
<td>0.77:1</td>
<td>0.71:1</td>
<td>0.90:1</td>
<td>0.96:1</td>
<td>-</td>
<td>0.70 to 0.80</td>
</tr>
<tr>
<td>13</td>
<td>CP</td>
<td>47 days</td>
<td>83 days</td>
<td>87 days</td>
<td>127 days</td>
<td>22 days</td>
<td>39 days</td>
<td>48 days</td>
<td>22 days to 75 days</td>
</tr>
<tr>
<td>14</td>
<td>GOR</td>
<td>3.2 %</td>
<td>8.97 %</td>
<td>5.29 %</td>
<td>17.85 %</td>
<td>8.27 %</td>
<td>9.26 %</td>
<td>Less than 10%</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>ARR</td>
<td>42 %</td>
<td>49 %</td>
<td>71.7 %</td>
<td>96.3 %</td>
<td>16.7 %</td>
<td>35.5 %</td>
<td>29%</td>
<td>19% to 55%</td>
</tr>
<tr>
<td>16</td>
<td>WCT</td>
<td>43.7:1</td>
<td>3.4:1</td>
<td>33:1</td>
<td>(0.02):1</td>
<td>26.9:1</td>
<td>22.9:1</td>
<td>12.1</td>
<td>23 to 6.1</td>
</tr>
<tr>
<td>17</td>
<td>DFAN</td>
<td>85.6 %</td>
<td>74.1 %</td>
<td>87.2 %</td>
<td>88.7%</td>
<td>85%</td>
<td>83.8 %</td>
<td>-</td>
<td>60% to 40%</td>
</tr>
</tbody>
</table>

Efficiency ratios are indicators of managerial capabilities to utilize the companies’ assets effectively. Efficiency ratios served as an extremely useful group in judging the performance of companies. Moyer et al. (2007) classified this group as
asset management ratios. An asset management ratio indicates how much a firm has invested in a particular type of asset relative to the revenue produced by the asset. The study examined seven types of asset management ratios (see Table 10) in judging a company's performance. FA/NW ratios were a measurement of the amount of a company’s equity tied in fixed assets. A high ratio indicates that a company had a heavy investment in fixed assets. The suggested industry average for FA/NW ratio was 24%. Majority of the construction companies had a high ratio of investment in fixed assets, with the exception of Company F, which could maintain its ratio below the industry average.

As mentioned by respondent A, the company inflated its fixed assets to obtain a higher loan from bank. Thus, the ratio mentioned in audited account was considerably lower than the actual. According to respondent C, the company revalued its fixed assets to increase paid-up capital. Respondents B and D mentioned that the ratio of company’s fixed assets was higher by reason of its business activities, which involved supplying machinery to construction sites.

The most important issue for a construction company was the collection period (CP). The suggestion rate of CP for construction companies was 48 days. CP was a measurement of how long company capital was used to finance a project. Average CP of Companies B, C, and D appeared to be worse than the industry average. This was a strong indication that these companies faced difficulties in acquiring progress payment. According to the respondents A, D, and E, delay in the collection period resulted from delay in processing the progress payment by the client. Respondent B added that bureaucracy was a major problem that influenced delay in processing the progress payment. Lack of efficiency on the part of the client’s representative was a contributing factor to the problem.

However, all six companies maintained that their GOR was within the suggested rate of lower than 10%. ARR was likewise related to how efficient the company used its assets. Companies with an ARR above the upper end of the typical range (above 55%) considered to have performed excessive work for their assets. ARR of Company C was below the lower end of the typical range, indicating that the company was under-utilizing its assets.

WCT is used to measure a company’s efficiency in utilizing its working capital. WCTs of companies A, B, E, and F were worse than the industry average of 12.1:1; these companies can be considered undercapitalized. All respondents agreed that insufficient cash flow of the project was a major issue. Volume of undertaken projects always exceeded the company’s capacity. However, they argued that there was a need to seize opportunities, as there was no guarantee of future projects. WCT of Company D indicates a negative working capital. As mentioned by respondent D, the negative working capital resulted from the loss carried forward from previous years.

DFAN is a measurement of newness of the companies’ fixed assets. The result revealed that all DFAN ratios were above the maximum range of 60%. According to Peterson (2005), a company with a degree of fixed asset newness ratio greater than 60% indicates that it possesses a significant number of new equipment, which is often accompanied by a large loan payment and investment of capital in equipment. Fixed assets require a constant stream of income to offset their loss in value and monthly installment servicing. According to respondents B and D, ratio of company’s fixed assets was high because of business activities, which involved supplying machinery to construction sites.
CONCLUSIONS

Based on the above ratio analysis, the overall performance of the construction companies was below industry average. Their liquidity ratios were less than the industry average, indicating insufficient cash and capital to finance their construction works. Their profitability ratios were also below the industry average, illustrating that they enjoyed low profit margins. Their debt ratio was higher than the industry average, indicating that they were highly dependent on debt capital to perform their businesses. The average maturity of the companies’ accounts payable was also greater than their collection period, indicating that they normally used sub-contractors’ and suppliers’ capital to fund construction costs and that they were slow to pay the bills. These results strongly support the previous findings on the impact of financial factors on the failure of construction companies. Bad financial management and lack of capital have been identified to be the main determinants of the failure of construction companies.

Overall, this study has proven that the four groups of financial ratios—liquidity, profitability, leverage, and efficiency—strongly correlate in determining the success or failure of contracting firms.

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ABSTRACT

The purpose of this study is to investigate ways to increase the illumination level of interior zones in the apartment dwelling spaces of Tehran. This is due to the significant decrease of day lighting into the current apartment buildings of Tehran. The study will also analyze the application of the traditional elements to introducing daylight into the spaces as well as its spatial relationship to traditional Iranian culture. The lack of space and windows area in the current apartments design layout has created dark shadowy area in the central parts of the plan due to its long and narrow layout. This research will determine the extent of natural day lighting penetration which is conducive for interior. Comparison will be made between traditional architecture of Iran with the contemporary to map out similarities and its relationship to Iranian culture and lifestyle. The area of study was divided into two zones; public and private. The study revealed that installation of transparent partitions or porous walls between the spaces that are close to façade and public zones and reconfiguring the internal layout can enhance day lighting penetration into the deeper portion of the interior spaces. This strategy can be also applied to private zone, with visual and acoustical privacy being the main decisive consideration. In conclusion, bringing the daylight back to the dwellings of Iran is no more using transparent facades and wide openings. Because this style threatens the privacy of the building and it is in contrast with the Islamic culture. Re-using the traditional strategies in modern way might be helpful to keep the heritage of traditional architecture of Iran as well as saving the energies and approaching to sustainable design.

Keywords: Day lighting, Dwelling, Iranian architecture, Transparency, Advanced daylight system, high-rise apartments

INTRODUCTION

Natural light is the primary source of lighting in a building, due to the lower costs and the permanent source which it has. It is suggested for buildings to be designed in a way to use as much day light as they can, and create a little heat and electricity waste. The most effective role of daylight strategies and the way it enters the building is through window and different forms of apertures. The design of windows is in constant development, both in the form of the aperture through which the daylight comes and in the nature of glass or transparent material permitting the light to enter. According to Philips, "Windows do more than let in light and are often associated with solar shielding and ventilation" [7].

Traditional architecture of Iran has been a subject scrutiny for decades, and by such researches many mysterious tricks are discovered with which architects are able to create meaningful spaces. Besides its functional aspect, day lighting was important in traditional architecture due to the spiritual and decorative aspect. Day lighting was that mixed with other elements of architecture that no one could separate or omit it [2]. In today’s architecture of Iran, through the years, natural lighting is missed and is no
longer playing a key role in designing the apartments. Nowadays, natural lighting is just a source for brightening the space based on criterions. Bringing back the spirit of space through natural light in apartments of Iran, based on traditional architecture that is in concord with Iranian culture, is what people need nowadays. Through all documents from traditional architecture and so many evidences, traditional architecture was a human axis architecture that tried to supply every human's need [8].

Although in contemporary architecture there have been too many outstanding projects that are based on Iran's culture or architecture, this paper tries to focus on interior parts that are left light-less, and it do not have enough spatial quality.

By analyzing different dwelling plans of contemporary architecture of Tehran city, it is comprehensive that there are too many problems that have caused the lack of day lighting inside the building. The improper orientation of the building toward sunlight, the shrinkage of window area and building area as well, are some of these problems. This research is formed based on creating a suitable living area for people in order to increase the family gatherings in the bright areas since people are more likely to gather in bright spaces. Unfortunately the lack of such spaces is felt in small apartments in the city of Tehran. The procedure of this study is first clarifying the problems of contemporary architecture of Iran from the aspect of day lighting. Secondly, the study is going to extract new elements for interior parts of the house from traditional architecture of Iran and of course use modern lighting methods as well. After that, applying new alternatives inside the dwelling plan, in order to pass the light to the inner layers, and separation of public and private areas without conflicting cultural aspects will be the next step.

**LIGHTING DESIGN STRATEGIES OF TRADITIONAL BUILDINGS IN IRAN**

Buildings in traditional architecture of Iran were all based on special principles, which were not eliminating. All these buildings were built in order to fulfill people's requirements. That is why among principles of Iranian traditional architecture, to be in accordance with people's need is a noticeable issue. Different spaces that people used in a city, public or private, had a special behavior toward natural lighting. It seems like they were such openings, inviting day lighting in to the space to create variegate spaces. In Bazaars, mosques, public bathhouses and other urban elements, these behaviors toward light are evident. In the following section, several public spaces and the way they welcomed light, as well as some private spaces will be discussed.

**Employing of Lighting Strategies in Public Spaces**

In traditional cities, bazaars were an important public space, which were mostly in central areas of the city. Most of the important buildings and political centers of the city were formed close to Bazaar. Besides the economical function, it was the most important part of the city and worked as such an axis. The *masjid jame*, i.e. the main mosque of the city was next to bazaar. In addition, the main public bathhouse of the city, which was used by the well-known people, was there as well. The architecture of this area was as significant as its function. Mosque was the most articulated practical architecture, which was the element of God's house and the place for prayers. Natural light was used in these buildings as well. Although Bazaars and public bathhouses are roofed spaces, there are functional usages of them for passing the light and creating movement and rhythm. In table below, there are different openings of traditional architecture, which introduces the daylight from different apertures. (Fig 1)
Stage Two

**Fig 1:** Different day light components in traditional public buildings of Iran, which shows how much light they brought into the space and what was the production of this lighting.

**Employing Daylight Strategies in Private Spaces**

The spatial characteristics of traditional Iranian houses reflect natural, geographical, and cultural needs. An important aspect of the traditional Iranian house is its adaptation to the harsh climate of the central parts of the country. Notable climatic problems are harsh sunlight and temperature in the summer; diurnal fluctuations of temperature; low humidity; limited water supplies; and dusty, sandy winds. In areas of Iran with a hot and arid climate, special traditional designs found solutions to these problems. Therefore, the urban design and architectural style show evidence of these solutions [9]. The majorities of traditional houses are introverted, or look inwards. All the spaces were arranged around an open, rectangular courtyard that formed the link between different areas of the house. The arrangement follows certain geometrical rules.

**Spatial Arrangement**

The spatial order was collecting different spaces after each other because of two reasons. First is passing the light with a specific sequence that was prepared in a way to keep the privacy of the building. After passing the courtyard as an open space, there are usually semi-open/semi-closed spaces. These spaces were also semi-public/semi-
private that was suitable spaces for family gatherings that had the potential to be expanded to each other. These spaces were unrestricted to open spaces and blocked were by a closed space. That is why these areas are also called covered areas. Closed spaces are for rooms and private areas for individuals. Closed spaces are closed from three sides and open from one side, which is in relation with open or covered area. Installation of transparent elements, porous walls and other light passing elements helps these areas to reach natural light and get some portion of it. (Fig 2 & 3)

**Fig 2:** Typology of spatial arrangement in traditional architecture of Iran

*The outline of a traditional dwelling space, formed around a rectangular courtyard*
Fig 3: The analyzing of two steps for bringing light in to deeper layers of the plan, step 1 is spatial arrangement around open space; step 2 is using transparent façade and partitions in internal layers of building, in order to pass the light and avoid light obstruction into the space.

Traditional Elements

The Iranian architecture has been one of the sustainable architectures from both energetic and development aspects. In the illustration below a traditional house of Iran is shown, in which different space qualities and daylight elements are completely introduced. (Fig 4)
Fig 4: Different openings and day light strategies of traditional architecture of Iran through open, closed and covered elements
PRELIMINARY DILAPIDATION STUDIES

In the above plan the indoor area of the house is divided in to three degrees from lighting aspect. The first layer is the one, which is close to the openings and gets the day light from central courtyard directly. This space has the most potential to pass the light to the other spaces. The second layer, which is shown darker, is the area that gets the light from the first part and is using the natural day light as well. This space works as a mediate space for sharing the light. The third part is the one that gets the light from the intermediate area and from the small apertures on the ceiling. Because the light that is brightening this part is not as powerful as the part 1, due to its situation, it cannot get as much light as it needs; so there are many apertures on the top and around the ceiling, which can compensate the lack of daylight. This type of design shows the deep thoughts on providing bright areas with enough natural light. In the section below these divided areas are shown clearly. (Fig 5)

![Diagram showing different lighting strength in a section of a traditional house, application of ceiling as a day lighting strategy](image1)

**Fig 5:** Different lighting strength in a section of a traditional house, application of ceiling as a day lighting strategy

Other transparent element that was useful in light reflection and passing the light to the internal layers was water. Pool houses in traditional dwellings were usually in a layer around which different functions formed. These spaces had the ability to get the light from two sides, one was the open space or covered area and the second one was the roof. As far as these spaces have high altitudes, they have the chance to get the light from the apertures around the dome. The light from above is reflected after touching the water in the pool and brightens the area around.

![Diagram showing dome apertures passing the light and pool reflecting lights](image2)

**Fig 6:** The section of a pool house
By reviewing traditional architecture, it is evident that day light was an important element and it really created sense and meaning for the space. Different transparent spaces passed the light to other areas. Different elements in traditional architecture were responsible for passing the light and introducing it to other layers. Lack of day light in contemporary architecture is due to insufficient knowledge of traditional architecture. By studying contemporary architecture and extracting the useful elements of traditional architecture, this problem will be solved.

STUDY OF DAY LIGHTING AND TRANSPARENCY IN CONTEMPORARY ARCHITECTURE OF IRAN, STATING THE PROBLEM

Since 90 years ago, contemporary architecture of Iran has been transformed to what is seen now due to technological changes in the country. These changes were because of too many attributes such as, the decrease of family population, rise of consumerism and the consequent decrease in the consumption of the local materials. The shrinkage of the presence of nature in the dwelling area just as in the margin; and finally, using electricity and variegate lighting systems instead of day lighting and oily lights [6]. All changes that were mentioned result in the loss of principles of traditional architecture of Iran, and the monotonic spaces of the house. Height alteration, open, and closeness of spaces, space sequences and many other cases are forgotten and lost. Day lighting in contemporary architecture is limited to façade windows from only one or two sides. (Fig 7)

![Diagram showing the reduction of lighting amount, during housing transformation in Iran from A to C](image)

**Fig 7:** The reduction of lighting amount, during housing transformation in Iran from A to C

A: day lighting in traditional housing, no neighbors obstruct the day light
B: day lighting in apartments with neighbors that obstruct the day light from two sides
C: day lighting in high rise, small apartments, and one unit next to others can reach the light from only on facade

Following the advent of modernism in Iran, the fabulous architecture of the country transformed to copies of western architecture. Although it became successful in a number of cases, those architects who went abroad to study didn’t know anything about Iranian culture and style; so they started to expand the new copying style. The full glass facades became the fashionable style of buildings but the usage of these styles was not in order and in a proper situation. In modern or in a better word, in contemporary architecture of Iran (especially in housing), transparency can be divided into two groups; Transparent spaces and transparent elements. At homes, the definition and application of transparency has limited only to transparent facades or using transparent surfaces at the top of the buildings. However transparency has other functions as well. Transparency in dwellings of Iran, has the most usage in the level of façade, has the most use. Bringing the whole light in, using new reflective glasses, has
gained the meaning of modernism and new architecture in Iran. People by observing these factors, classify the building as modern, no matter what the quality, or what they may encounter inside the building. The differences between traditional architecture and today’s life style have caused a tendency to modern architecture. Feature imitations from Europe or western architecture have made big holes in today’s architecture of Iran [4].

In the contemporary period, traditional houses were largely abandoned while apartment buildings became more prevalent. In the new type of residence, each household had smaller living areas and a shared courtyard (as opposed to the individual courtyard of traditional houses), which belongs to all families living in an apartment building. New building regulation, which allows buildings to cover 60% of the land parcel and left 40% for open space, had a great effect on the spatial organisation of houses as well as on urban design. The central courtyard is now located in the front and multi-storeyed apartment buildings became the dominant type of preferred housing [10]. The increase of land price and population has completely transformed the patterns of dwelling plans in Iran. The average size of housing units has been around 80 square meters over the past five years. At present, the average price of a housing unit in urban areas is about 10 times the annual income of an urban household. Average construction cost for 1m² of urban residential buildings in the first half of 2008 was $350 dollars [1].

Another problem, which is as important as the cultural conflicts, is the climate. Iran is a large country with a wide range of climates. Tehran, as the metropolitan capital of Iran, is cold in winters and hot during summers. Due to this situation, glassy facades are not suitable because of the direct sunlight of summer and heat waste in winters. The heat loss and heat gain are both problems that cause lots of inconvenience from the dwelling area. The solution of these problems should include these problems as well. These changes in constructing areas has caused the decrease of light getting facades and made it limited to small openings and windows; for this reason the dark areas in houses appear. In Iran and especially in the city of Tehran, there have been so many attempts on having a modern city and using so many elements to make it perfect but because of the blind imitations of western architecture, so many conflicts have occurred. As Bianca conveys, there are some structural conflicts between traditional Islamic concepts and modern Western planning methods. Some examples of the conflict are different concepts of community structure, planning, and architectural forms [3]. The cultural conflict is the most important one. Most of Iranian people are Muslim and their habits and beliefs are mostly Islamic;
However, their appearance has changed. The privacy is one thing that through all these glassy facades and wide-open windows is lost.

**ANALYSIS**

Through all issues mentioned above, a comparison about bringing the light in to the building between traditional architecture and contemporary one might be useful. According to Haeri, the most considering difference between past and present is the changing of dwelling plans that are compared as following. (Fig 9)

**Fig 9:** the transformation of housing plan, during one century, reduction of façade and daylight
Source: Author, [6]
From the comparison above, it is evident that traditional architecture was trying to give more value to humanity and fulfill man’s requirements. Creating different kinds of space for different functions, which was also flexible and had the potential to be expanded for specific ceremonies, was one of the abilities of this architecture. Daylight and the connection with nature was one of the sub principles of traditional architecture. Having different kinds of openings and creating different spatial qualities, needing different level of luminance, can describe how much they paid attention to people’s feelings and the way they used to live. After about a century, the differences in building a house have been clarified. By analyzing these changes, the missed points that have caused the lack of light inside the houses, and the decrease of light getting surface in a house will be defined. By reviewing the transformation of dwelling plans, the decrease of sunlight façade will be determined. In this paper the gap between traditional and contemporary architecture, that has caused the lack of day light in the building, will be bridged in two steps. (Fig 10)

The first step is the spatial arrangement that is the division of a house into different lighting zones. These zones are separated areas with various functions and activities that need different amounts of daylight. The second group can be introducing the priorities of getting the light, which would be logical due to the shrinkage of dwelling spaces. Many buildings have a range of activities that have visual tasks and therefore different illumination needs. The nearest areas to the skin of building have the most chance for the best day lighting. If activities are zoned so that those that need the light are placed near the skin and those that do not are placed in the interior, then amount of relatively expensive skin and glazed openings can be reduced because of a smaller skin/volume ratio. The rate of electric light use, and thus heat gains are reduced [5].

The second step is, using different spaces, as transparent ones and use them for passing the natural light. This means that by zoning a dwelling, it is tried to get the daylight and give all the areas as much day light as possible. These zones and some functions do have the potential to pass the light to other spaces. For instance, kitchen as a permanent function, which cannot be omitted in a dwelling plan, has this condition. This means that this type of functions that need the natural light in the first place and are part of the public area can work as transparent areas. In a dwelling, there are different functions such as bedrooms, kitchen, toilets and bathrooms, storage room, living room, dining room, etc. These functions are placed in a specific lighting zone of the house that if this arrangement is right, most of lighting problems will be solved. Today’s apartments are limited by many units; therefore reaching the day light is limited to only a few openings on the façade, causing the dark zones inside the house. Introducing the light zones in a dwelling in this section can be divided in two groups. Other zones are those that will not lose their functionality without natural light accessibility. (Fig 11)
A: Bedrooms and other functions in the private district, have the priority to access the daylight, and be in a position to get the direct natural light

B: the Public area, which contains living room, TV room, sitting room, dining room, and kitchen. This area needs the day light as much as the private zone; these functions have to be in a direct relation with the light

C: In-between zone is the area that contains staircase, bathrooms, and toilets, corridors and storage room that dose not need the day light, and can get the light by a mediator, however, bathrooms and storage rooms do not even need that amount of day light.

Fig 11: Different lighting zones in a dwelling space, functional

After separating these two areas, it is time to put each space in its suitable place, which means that all bedrooms, kitchen, living room, or dining room have to be on the façade of the building or in the place that has the most luminance level. However through the shrinkage of dwelling areas, this fact is not possible. On the other hand, there must be another zoning to make some boundaries and make this zoning processes logical. In order to enhance the penetration of day lighting into different spaces of a dwelling plan, it is proposed to divide the plan in to three zones, and extract the zones with potential of being the transparent space. In these spaces and the other zones there will be the utilization of different suggesting elements for expanding the natural lighting inside the dwelling area. These three zones are as following:

− Public zone, with requirement of daylight
− Private zone, with requirement of daylight
− The zone of relevant spaces and services.

By determination of these zones and considering the cultural aspects -the visual and acoustical privacy of the private zone- installation of the suitable partitions would not be difficult. When one space in placed in the public space, close to the facade, and there is no need to be visually concealed, there is this chance to enhance the extent of the day lighting penetration to the other public functions next to this area. For the private zones, still there is this chance however the installed elements should be appropriate due to the cultural needs. Through these changes more spaces in the dwelling area can get portion of daylight that means less daylight is obstructed by the partition walls and unsuitable arrangements of the plan.
CONCLUSIONS

As far as the importance of natural light in human’s life is concerned; there have been severe attempts in architecture for bringing in the daylight. Traditional architecture of Iran is enriched of variegated openings, apertures and meaningfulness of the space. In contrast, contemporary architecture in the field of dwelling apartments is mostly empty of any spatial meaning. Today’s apartment lacks brightness and enough openings, which besides the building quality is a result of the lack of land size and increase in land prices. A small apartment in a street is surrounded by other buildings, and can reach the suitable light only from one side. Appearing dark areas in central layers of the house causes the discomfort and usage of artificial lighting during the day and this is the emblem of today’s apartments of Iran. Placing the functions that need the natural light on the façade of the building and using the light from public area that are adjacent to the façade were the main aims of this study. Transforming public spaces to transparent areas causes the light to be led to the internal layers, hence increasing the usage of daylight instead of artificial light during the day. In figure below, the elements that are suitable for introducing day lighting into the public spaces are investigated.

<table>
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<th>Possible Partitions</th>
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<td><img src="image2.png" alt="Image" /></td>
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<td><img src="image3.png" alt="Image" /></td>
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<tr>
<td>- Transparent partitions, porous walls.</td>
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<tr>
<td>- Useful in public spaces, in order to separate and pass the light</td>
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**Fig 12:** Different transparent partitions that are suitable for public zones

In the public spaces, different functions such as bedroom, bathrooms and other private areas are included. These spaces as mentioned before need the day light directly but they cannot pass it to the other spaces through the suggested elements in public spaces. These spaces have to be covered due to the compulsory cultural issues. The privacy of
the bedroom would be threatened if the walls around it are transparent so the partitions that are shown in the figure below are suggested in these spaces.

<table>
<thead>
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<th>Possible Partitions</th>
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<tr>
<td>Private Spaces</td>
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- Openings in high altitude, porous partitions with colorful glasses, movable and flexible partitions
- Useful in semi private and private spaces, in order to pass the light and keep the whole privacy

**Fig 13**: Suggestive elements for private and semi private areas that are fixed movable and translucent in some cases

In conclusion, by applying these types of elements that mostly have the taste of traditional architecture of Iran, the extent of daylight penetration is enhanced and no more space would obstruct the daylight. This situation also concerned about the privacy which is the main decisive consideration of this paper.
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Pendekatan Sistem Pengukuran Kualiti Perumahan di Malaysia

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ABSTRAK

Melalui Pelan Induk Industri Pembinaan (CIMP), Kerajaan Malaysia telah meletakkan usaha yang banyak dalam melangkah ke arah matlamat menjadikan industri pembinaan bertaraf antarabangsa menjelang tahun 2015. Terkesan dengan perubahan dan pengemaskinian sistem dan syarat-syarat baru yang diberikan oleh kerajaan dan badan-badan terbabit ialah sektor perumahan. Untuk menjadi produk yang kompetitif, sektor perumahan harus bergerak seiring dengan mempertingkatkan lagi nilai komersial dan kualiti pembinaannya. Bertitik tolak disinilah, sebuah kerangka kualiti pembinaan perumahan dihasilkan bagi memastikan projek pembinaan dapat bermula dengan langkah yang betul dan akhirnya menghasilkan produk atau fasiliti yang menepati kehendak pengguna yang menepati konsep ‘do the first thing right’.

Kata kunci: Perumahan baru, kualiti, pengurusan, pembinaan.

PENGENALAN

Berlainan dengan kecacatan baru, Richardson (2001) mengatakan keusangan adalah proses semulajadi yang tidak dapat dielakkan walaupun telah direkabentuk dengan baik dan telah melalui proses pemilihan yang rapi. Manakala kecacatan pembinaan pula timbul melalui kurangnya perhatian atau pengetahuan dalam spesifikasi atau hasil kerja (workmanship). Ia timbul disebabkan oleh kesilapan atau perlanggaran kontrak atau pengabaian oleh jurukerja atau kontraktor yang terlibat (Richardson, 2001).

Bermula dari 1999, Georgiou telah memperincikan masalah kecacatan bangunan dalam 3 aspek iaitu (Georgiou, Love, & Smith, 1999):

1. Teknikal- Merujuk kepada pengurangan kebolehan hasil pembuatan atau bahan yang digunakan terhadap elemen sehingga memberi kesan kepada kefungsian struktur atau elemen tersebut,
2. Estetik- Merujuk kepada pengurangan kesan terhadap penampilan disebabkan oleh bahan atau elemen bangunan yang tidak kemas atau tidak betul,

Pertindihan dilihat telah berlaku pada aspek kefungsian di mana, makna kefungsian di sini terlalu am iaitu aspek kefungsian sebenarnya adalah kesan susulan yang disebabkan oleh aspek teknikal atau aspek estatik. Sebagai contoh mudah, bagi kecacatan teknikal ialah pemasangan paip yang tidak rapi menyebabkan paip gagal berfungsi sewajarnya dan seterusnya bocor. Oleh itu, kefungsian sebenarnya boleh diserapkan ke dalam aspek teknikal dan estetik kerana, sekiranya sesuatu elemen gagal menunjukkan kefungsianannya, elemen tersebut dikatakan cacat (Pheng & Wee, 2001).

“A failure is a departure from good practice, which may or may not be corrected before the building is handed over. A defect, on the other hand, is a shortfall in performance which manifests itself once the building is operational.”


Kecacatan teknikal pula biasanya tidak dapat dikesan atau diketahui dengan pandangan mata kasar, melalui pemeriksaan mahupun ujian-ujian rutin sewaktu peringkat penyerahan. Ia juga dikenali sebagai kecacatan pendam (latent defect) (Chong WaibKiong & SuibPheng, 2005) yang mana kecacatan jenis ini tidak diketahui atau dikesan apabila pembeli mula memasuki rumah baru mereka kerana kebanyakkan kecacatan pendam hanya muncul setelah peringkat kepenghunian (C. Wai-Kiong & Sui-Pheng, 2006). Misalnya pemendapan lantai di bahagian dapur atau beranda depan setelah 5 tahun rumah diduduki. Kecacatan jenis ini boleh diibaratkan sebagai bom masa. Ia merupakan masalah yang boleh meletup pada bila-bila masa yang mana ia adalah sesuatu yang tidak dapat diketahui atau diramalkan secara tepat di peringkat awal kepenghunian.

Kajian tentang kecacatan rumah baru siap ini merupakan isu global terutamanya bagi perumahan teres yang juga dikenali sebagai projek bangunan perumahan pukal (Mass house building projects-MHBPs) yang mewakili salah satu sektor terbesar dalam industri pembinaan dalam kebanyakan ekonomi negara-negara membangun (Ahadzie, Proverbs, & Olomolaiye, 2008). Terdapat beberapa laporan lain telah direkodkan di negara-negara seperti Turki dengan masalah tahap kualiti pembinaan yang rendah pada projek perumahan pukal, kajian oleh Aynuz Kazaz and M. Talat

PEMBENTUKAN SISTEM PENGUKURAN KUALITI PEMBINAAN DI MALAYSIA

Pembangunan tahap kesedaran masyarakat terhadap kualiti yang kian meningkat mendesak pembekal memberikan produk yang dapat memenuhi kehendak tersebut. Situasi ini menuntut setiap pekerja untuk terus meningkatkan segala sesuatu yang dilakukan untuk kepentingan pelanggan (Gunasekaran, Goyal, Martikainen, & Yli-Olli, 1998). Dari itu, mereka harus faham setiap proses kerja yang dilakukan dan mampu untuk meramal kesan proses tersebut terhadap produk akhir kerja mereka. Sekiranya produk tidak memenuhi kehendak pelanggan, proses kerja harus dilihat semula, punca kesilapan harus dikenalpasti dan pembetulan harus dibuat agar kualiti produk yang seterusnya dapat dipertingkatkan. Senario ini dapat diaplikasikan dengan ideal dalam industri pembuatan, namun, sukar untuk industri pembinaan (S.P. Low & Tan, 1996). Ini adalah kerana sifat industri pembinaan itu sendiri adalah unik dari satu projek ke satu projek yang lain seperti yang dikatakan oleh Tay:

However, unlike other industries, the construction industry is characterized by activities which are discontinuous, dispersed, diverse and distinct, i.e. the four “D”s ..........by (Tay, 1994).


CONQUAS 21

Untuk mendapatkan satu sistem penilaian kualiti yang standard untuk projek pembinaan

Untuk menyediakan satu sistem yang bersifat objektif dan boleh diukur untuk menentukan tahap kualiti pembinaan projek bangunan di Singapura. Seperti dengan mengukur tahap workmanship dan spesifikasi pada produk binaan dengan menggunakan pendekapan persampelan yang bersesuaian yang boleh mewakili keseluruhan projek.

Untuk membantu penilaian kualiti agar dapat dilaksanakan dengan lebih bersistematisik mengikut had masa dan kos yang ditentukan dan dalam proses, kenaikan dan tahap kualiti dalam pembinaan (C. M. Low, 1991)

Setahun selepas CONQUAS diimplementasikan, satu skim premium telah diperkenalkan untuk memberi tender keuntungan sehingga 5 peratus atau $ 5 juta (mana-mana yang terendah) dalam tender pembangunan sektor awam kepada kontraktor yang mencapai skor yang tinggi secara konsisten. Had purata skor yang perlu dicapai oleh kontraktor secara konsisten adalah 65 mata dan ke atas. Untuk setiap mata yang melebihi skor purata tersebut, akan diberi premium sebanyak 0.2 peratus sehingga negatif maksimum 5 peratus (Miles & Neala, 1991). Skim ini dilihat berjaya menjadi insentif dan galakkan kepada kontraktor untuk berusaha mencapai kualiti yang tinggi. Walaupun jumlah premium hanya sebahagian kecil daripada harga tender, insentif ini melihatkan kesan yang memberangsangkan. Ini terbukti apabila skor CONQUAS yang diperolehi, rata-ratanya telah meningkat secara stabil dan jumlah kontraktor yang berada dalam senarai premium juga meningkat sejak skim premium ini diperkenalkan (Kam & Tang, 1997).

Penilaian CONQUAS terbahagi kepada 3 bahagian iaitu:

- Kerja-kerja struktur (40 peratus) – yang mencakupi acuan, besi tetulang, kualiti konkrit dan kemasan konkrit dll.
- Kerja-kerja arkitek (50 peratus)- yang mencakupi lantai, dinding, siling, pintu, tingkap, bumbung dan dll.
- Kerja-kerja luaran (10 peratus)- yang mencakupi laluan pejalan kaki, perparitan, kolam renang dan lain-lain.

Pemeriksaan dibuat mengikut fasa projek seperti pemeriksaan bagi kerja-kerja struktur di buat sewaktu peringkat pembinaan, manakala pemeriksaan kerja-kerja arkitek dan kerja-kerja luaran buat peringkat pembinaan sebelum (CIDB, 1989).

Menggunakan mekanisma ini, kualiti projek bangunan di Singapura menampakkan peningkatan yang menggalakkan dari semasa ke semasa (Sui Pheng Low, 2001) dan sistem ini telah menjadi pengasas dan contoh bagi negara-negara lain dalam menghasilkan sistem pengukuran kualiti mereka masing-masing sebagai contoh Hong Kong (HKHA, 1996), Malaysia (CIDB, 2001b) dan kini, UK sedang dalam peringkat kajian (Chileshe & Sim, 2007) kesediaan industri mereka mengadaptasikan sistem seperti ini.

PASS 1990

Industri pembinaan di Hong Kong telah lama dikaitkan dengan kualiti pembinaan yang lemah (Kam & Tang, 1998). Kebayakan kes berlaku pada perumahan awam yang dibina oleh pihak kerajaan lantaran Hong Kong Housing Authority (HKHA) mula merangka langkah kawalan dengan antaranya mewajibkan kontraktor untuk mendapatkan sijil ISO 9000 terlebih dahulu sebelum memasuki tender dan mengimplimentasikan PASS sebagai alat penilaian kualiti pembinaan.


Penilaian output dan input, masing-masing menyumbang peratusan tertentu dalam menentukan jumlah skor PASS iaitu 75% dan 25%. Sebaliknya, penilaian penyengaran pula tiada memberi apa-apa pemberat kerana penilaian ini hanya digunakan bagi menentukan penalti yang akan dikenakan terhadap kontraktor sekiranya berlaku sebarang masalah sepanjang tempoh penyengaran. Oleh itu, penilaian dibuat selepas bangunan diduduki iaitu sewaktu bangunan masih dalam tempoh tanggungan kecacatan secara berkala iaitu penilaian sukuan. Penilaian ini merangkumi:

- Kerja-kerja yang masih belum diselesaikan oleh kontraktor
- Perlaksanaan kerja-kerja baikpulih dan
- Pengurusan, tindakbalas dan dokumentasi terhadap aduan pembeli.

Output merupakan komponen terbesar sekali yang menyumbang sebanyak 75% dalam penentuan skor PASS. Ia menilai kualiti terhadap output akhir kerja-kerja bangunan. Penilaian ini dipecahkan lagi kepada beberapa sub-pecahan iaitu:
• Kerja-kerja struktur (35%) = penilaian terhadap aspek perancang (falsework), acuan, kerja-kerja tetulang, amalan pengkonkritan, kualiti konkrit dan kemasan konkrit

• Kerja-kerja arkitek (35%) = penilaian dibuat terhadap elemen dan kemasan termasuk lantai, dinding, tingkap, pemasangan komponen elektrik, pemasangan perpaipan dan bukaan tingkap

• Kerja-kerja luar (10%) = penilaian terhadap jalan, laluan kecemasan, laluan pejalan kaki, saliran, susur gajah (laluan pejalan kaki berbumbung)

• Tanggungjawab am (20%) = tanggungjawab kontraktor terhadap kerjanya mengikut kontrak seperti mengutamakan faktor keselamatan di tapak bina dan lain-lain

Manakala input pula hanya menyumbang sebanyak 25% sahaja dan ia menilai kebolehan aspek pengurusan seperti penyusunan organisasi, proses komunikasi, pengurusan sumber, koordinasi dan kawalan, dokumentasi dan aspek pengaturcaraan (Kam & Tang, 1997).

Kontraktor dimaklumkan tidak lebih dari sehari setengah sebelum lawatan penilaian dibuat. Dengan adanya lawatan berkala ini, proses CQI dapat dilaksanakan dan keputusan dari penilaian ini dapat membantu mengawal pihak kontraktor dari berterusan melakukan kesilapan dalam melaksanakan projek. Dengan ini, projek akan lebih terjamin akan tahap kualitinya kerana langkah kawalan dapat dibuat dari semasa ke semasa.


QLASSIC


• Menanda aras kualiti kerja dalam industri pembinaan.
• Mengadakan satu sistem yang standard untuk menilai kualiti kerja kerja-kerja pembinaan.
• Menilai kualiti kerja suatu kerja pembinaan berdasarkan kepada standard yang berkenaan.
• Digunakan sebagai suatu criteria untuk menilai prestasi kontraktor berdasarkan kepada kualiti kerja.
• Mengumpul data untuk analisa statistik.
Penilaian QLASSIC dibuat melalui pemeriksaan tapak dan mengikut prinsip first time inspection iaitu sebarang kerja pembinaan yang diperbetulkan selepas suatu penilaian dijalankan tidak akan dinilai semula. Objektif prinsip ini adalah untuk menggalakkan kontraktor untuk "Buat Kerja Dengan Betul Pada Kali Pertama Dan Buat Kerja Dengan Betul Setiap Kali". Penilaian hendaklah dijalankan oleh penilaian QLASSIC yang berkelayan sahaja iaitu yang berdaftar, terlatih dan telah lulus latihan yang dikendalikan oleh pihak CIDB.


- Kerja-kerja arkitek- yang mencakupi lantai, dinding, siling, pintu, tingkap, bumbung longkang perimeter, apron dan lain-lain. Penilaian dijalankan selepas suatu projek telah siap sepenuhnya iaitu setelah projek mendapat CPC (Certificate of Practical Completion) dan sebelum diserahkan kepada pemilik projek.
- Kerja-kerja mekanikal dan elektrikal - yang mencakupi kerja-kerja elektrikal, pelindung api, sanitari, pendawaian asas M&E dan ventilasi. Penialaian dibuat semasa projek dalam peringkat pembinaan.
- Kerja-kerja luaran- yang merangkumi elemen binaan seperti perparitan, jalanraya, parker, merumput, laluan pejalan kaki, taman permainan, pagar, kolam renang dan sub stesen elektrik. Penilaian dibuat setelah projek siap sepenuhnya iaitu selepas projek mendapat CPC dan sebelum diserahkan kepada pemilik projek.

CIS 7 juga menetapkan garispanduan untuk mengira sampel penilaian bagi kerja-kerja struktur, arkitek, M&E dan kerja-kerja luaran. Seperti CONQUAS 21, peratusan bagi setiap komponen adalah berbeza bergantung kepada kategori bangunan seperti dalam Jadual 3.

KUALITI DALAM PENGURUSAN PROJEK


KERANGKA TEORI MODEL KUALITI PROJEK PEMBINAAN PERUMAHAN

Dalam membangukan instrumen kualiti projek pembinaan, kerangka konseptual seperti dalam Rajah 2 adalah dicadangkan. Jadual 4 menunjukkan 10 sorotan literatur utama yang digunakan dalam membangunkan kerangka konseptual ini. 2 peringkat proses terlibat dalam kerangka ini iaitu pertama ialah peringkat konstruk dan yang kedua adalah peringkat dimensi. 3 konstruk yang dikenalpasti adalah inisiasi, perancangan dan rekabentuk dan perlaksanaan. Manakala 34 dimensi yang telah dikenalpasti dan akan dibincangkan dalam bahagian seterusnya.

Konstruk Inisiasi

Keperluan projek adalah kunci yang menentukan kualiti dalam proses pembinaan. Melalui sastera yang luas, 34 faktor telah dikenalpasti dan telah dikategorikan dalam 3 kumpulan proses. Kumpulan proses pertama yang penting yang telah disediakan adalah kumpulan proses inisiasi. Tujuh faktor yang yang termasuk kumpulan ini adalah penglibatan pelanggan dalam taklimat projek; pembentukan polisi dan prosidur; peranan dan tanggung jawab yang jelas bagi setiap pihak; ketepatan anggaran kos; kaedah perolehan yang digunakan; kaedah tender yang digunakan dan kepimpinan pihak pengurus.


KONSTRUK PERANCANGAN DAN REKABENTUK
Pada tahap kedua, dua elemen penting perlu dipertimbangkan. Pertama adalah perancangan dan diikut dengan rekabentuk. Pada peringkat ini, penglibatan pelanggan masih diperlukan untuk mengesahkan dan memberikan input yang diperlukan untuk memastikan projek berada pada landasan yang betul bagi mengelakkan kerja semula. Perancangan dokumentasi yang baik boleh membantu kemajuan kerja berjalan lancar, mengoptimumkan penggunaan sumber dan meminimumkan kejutan dengan menyediakan perancangan dan langkah-langkah kawalan terlebih dahulu.

KONSTRUK PERLAKSANAAN


Kestabilan dan hubungan jangka panjang kerja yang erat antara kontraktor dan subkontraktor juga dapat memberikan sumbangan terhadap prestasi kualiti yang baik. Dalam projek-projek pembinaan, kerjasama dan koordinasi yang baik antara semua pihak bukanlah pilihan tapi keharusan. Kontraktor harus mengembangkan hubungan kerja yang baik dan mewujudkan pendekatan saling memberi keuntungan dengan subkontraktor mereka daripada mengambil langkah mengelak dan menolak risiko kepada pihak lain (Xiao & Proverbs, 2002). Hubungan kerja yang rapat ini membolehkan masing-masing mendapat kebaikan dan seterusnya meningkatkan produktiviti kerja. Selain dari itu, kemahiran teknikal dan pengurusan dari peringkat kakitangan teknikal hingga ke peringkat pengurusan atasan juga memberikan kesan

KESIMPULAN

Mempromosikan kualiti dalam industri pembinaan adalah faktor kejayaan kritikal yang ke lapan dalam CIMP dan telah dikenalpasti oleh sebagai elemen yang penting dalam memacu industri pembinaan Malaysia ke arah salah satu industry terbaik dunia menjelang tahun 2015. Lantaran, kerangka kualiti ini diharapkan dapat menyumbang manfaat untuk memperbaiki tahap kualiti perumahan di Malaysia.

Projek pembinaan perumahan semakin rancak membangun terutamanya di kawasan Lembah Klang. Walau bagaimanapun, masih terdapat ruang penambahbaikan boleh dilakukan bagi membantu pengguna mendapatkan fasiliti yang berkualiti. Kualiti merupakan satu dari 9 cabang pengurusan projek dan bagi mencapai produk ataupun servis yang berkualiti, usaha dan komitmen ke arahnya adalah penting. Langkah ini boleh dimulakan dengan mengenalpasti faktor yang boleh memberi kesan kepada kualiti produk. Berdasarkan sorotan literatur, kerangka teori penyelidikan ini telah mengenalpasti 34 dimensi yang mampu mempengaruhi kualiti projek perumahan di Malaysia. Dimensi ini telah dikelaskan kepada 3 kumpulan proses atau konstruksi iaitu inisiasi, perancangan dan perlaksanaan.

Jadual 1: Aduan yang diterima oleh Kementerian Perumahan dan Kerajaan Tempatan

<table>
<thead>
<tr>
<th>No.</th>
<th>Types Of Complaints/States</th>
<th>SGR</th>
<th>P.L.S</th>
<th>P.P</th>
<th>PRK</th>
<th>KED</th>
<th>N.S</th>
<th>MEL</th>
<th>JOH</th>
<th>W.P</th>
<th>KEL</th>
<th>TRG</th>
<th>PHG</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Defective Workmanship</td>
<td>82</td>
<td>0</td>
<td>28</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td>18</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>212</td>
</tr>
<tr>
<td>2</td>
<td>Compensation</td>
<td>124</td>
<td>0</td>
<td>28</td>
<td>14</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>68</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>247</td>
</tr>
<tr>
<td>3</td>
<td>Payment</td>
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<td>0</td>
<td>15</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>7</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>CFO</td>
<td>47</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>28</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>95</td>
</tr>
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<td>5</td>
<td>Late Delivery Of Houses</td>
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<td>38</td>
<td>24</td>
<td>16</td>
<td>24</td>
<td>14</td>
<td>24</td>
<td>63</td>
<td>12</td>
<td>1</td>
<td>16</td>
<td>348</td>
</tr>
<tr>
<td>6</td>
<td>Interest</td>
<td>40</td>
<td>0</td>
<td>4</td>
<td>1</td>
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<td>5</td>
<td>17</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>59</td>
</tr>
<tr>
<td>7</td>
<td>Not Conforming To Plan</td>
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<td>6</td>
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<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
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<td>Deposit/Ownership</td>
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<td>5</td>
<td>2</td>
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<td>1</td>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>11</td>
<td>Infrastructure</td>
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<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>Contravene Act/Regulations</td>
<td>12</td>
<td>0</td>
<td>15</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>58</td>
</tr>
<tr>
<td>13</td>
<td>Others</td>
<td>177</td>
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<td>59</td>
<td>27</td>
<td>16</td>
<td>9</td>
<td>0</td>
<td>5</td>
<td>33</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>348</td>
</tr>
</tbody>
</table>

Total 656  2160  110  72  84  42  83  441  23  9  85  1823

Sumber: (Kementerian Perumahan dan Kerajaan Tempatan, 2001)
**Jadual 2:** Jadual pemberat yang diperuntukan mengikut komponen dan kategori bangunan CONQUAS

<table>
<thead>
<tr>
<th>Komponen</th>
<th>Kategori A</th>
<th>Kategori B</th>
<th>Kategori C</th>
<th>Kategori D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerja-kerja struktur (%)</td>
<td>30</td>
<td>35</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Kerja-kerja arkitektural (%)</td>
<td>50</td>
<td>55</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>Kerja-kerja M&amp;E (%)</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Skor CONQUAS (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Kategori bangunan tersebut terdiri daripada:-

3. Kategori C (Bangunan awam) – Perumahan awam.
4. Kategori D (Bangunan awam istimewa) – Perumahan bertanah
5. Sumber: (Chileshe & Sim, 2007)

**Jadual 3:** Jadual pemberat yang diperuntukan mengikut komponen dan kategori bangunan QLASSIC.

<table>
<thead>
<tr>
<th>Komponen</th>
<th>Kategori A</th>
<th>Kategori B</th>
<th>Kategori C</th>
<th>Kategori D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerja-kerja struktur (%)</td>
<td>25</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Kerja-kerja arkitektural (%)</td>
<td>60</td>
<td>50</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>Kerja-kerja M&amp;E (%)</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Kerja-kerja luaran (%)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Jumlah Skor (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Kategori bangunan tersebut terdiri daripada:-

3. Kategori C (Bangunan awam) – Bangunan Pejabat, Sekolah dan lain-lain bangunan dan fasiliti yang dibina untuk kegunaan awam.
4. Kategori D (Bangunan awam istimewa) – Hospital dan Lapangan Terbang sahaja

**Sumber:** CIDB website QLASSIC
Jadual 4: Senarai sorotan kajian literatur sebagai rujukan utama.

<table>
<thead>
<tr>
<th>No.</th>
<th>Negara</th>
<th>Tahun</th>
<th>Penulis/ Penyelidik</th>
<th>Tajuk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Singapura</td>
<td>1997</td>
<td>S.P. Low</td>
<td>A Book of Five Rings : the Samurai Way to Achieving Construction Quality</td>
</tr>
<tr>
<td>2</td>
<td>Egypt</td>
<td>1998</td>
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<td>R. Thomas, Marton Maroszeky, Khalid Karim, S. Davis and D. McGeorge</td>
<td>The Importance of Project Culture in Achieving Quality Outcomes in Construction</td>
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Rajah 1: Komponen Penilaian PASS

Sumber: (Diubahsuai dari Kam dan Tang 1997).
Rajah 2: Kerangka Kualiti Pembinaan Perumahan

Sumber: Kajian ini (2009)
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Current Use And Needs Of Ict In Malaysian Building Industry: 
The Industry Perspective

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ABSTRACT

Recent years, industrial in Malaysia have attempted to utilize Information and communication technology (ICT) as an enabling technology, in order to reduce the problems of communication and information sharing within the building industry. Due to the diversity of building projects and the richness of information within the involved processes, these studies were carried out to identify the current level of implementation of ICT, generally in Malaysia and specifically within the building industry. Contributing factors which drive ICT practice in the future are said to be driven by industrialisation, economic transformation, advancement in technology as well as the magnitude of construction activities and building industry markets towards globalizations in ICT development.

Keywords: Information Communication Technology, Building, Malaysia

INTRODUCTION

Information and communication technology (ICT) has an important role in transforming project visualisation into physical reality, from designing building and construction plans to accelerating towards the checking and approval process. The construction industry needs a single point of access to all information relevant to the industry. Thus, a construction industry portal is an essential tool in meeting the knowledge requirements of all the stakeholders and key players in the industry such as contractors, suppliers, clients or developers, regulatory authorities, professionals, academia, students, financiers and the general public (NST, 2007). According to Ming (2000), information and communication technology (ICT) plays significant function towards a success of any business organization. The importance of ICT is not only of their function, but also as a reference of a former construction lifestyle. In addition, Egan (1998) outlined that it is believed that the primary mechanism to increase productivity in the construction industry is to have more efficient information management in designing and constructing any major facility and demands on the daily needs by the project participants to substantially exchange data and information which requires close coordination among organizations and individuals in order to obtain the cost, time and quality goals of a construction project (Toole, 2003). ICT plays an important role in helping the construction industry to handle the highly complexity of its products and overwhelming demands of its clients and regulators (Betts, 1999; Liston et al., 2000). Several research conducted by Rivard, (2000), Arif and Karam, (2001), Samuelson, (2002) Lim et al., (2002) Sarshar & Isikdag, (2004) and Goh, (2005) evaluating the effect of ICT on construction industries found that implementation of ICT results in improving construction productivity. The development of modern object oriented ICT combined as a well defined information structure and efficient communication in the manufacturing industry is lacking although it is proven to be an efficient tool and supports the integration of processes for product development,
production, materials supply and maintenance. Rivard, 2000; Whyte et al. (2002) in their studies show that numerous research have been conducted to determine various factors that clarify the reluctance of the construction industry to adapt and use ICTs. Among these factors, three of them are best to describe the overall attitude of construction firms towards ICTs. First, Ba'ckblom et al. (2003) concluded that besides the common technical and financial problems, cultural and psychological factors have also been recognised to hinder the use of ICTs. Secondly, the construction professionals are proven to be the common hinder because they feel satisfied with the traditional business methods and tools instead of using ICT (Doherty, 1997, Samuelson, 2002). Thirdly, the construction firms require ICT solution in terms of work done which is none at the moment (Egbu and Botterill, 2002). RICS, (1998) on the other hand indicates that there were concerns in the past few years on the role and future of the ICT practice. However, Samuelson (2002) argues that the low adoption of ICTs by contractors are because the lack of effective applications for the core businesses when compared with their counterparts. For instance, there is almost no empirical evidence relative to ICT use in Turkish construction industry.

A limited number of semi-structured interviews on the current usage of ICT and the importance of the future of ICT application conducted by Sarshar and Isikdag (2004) shows that 60% of the organizations applied ICT as a strategic tool to help maintain their future business strategy whereas another 40% of them believed that ICT use maybe important in the future success of their organizations. Others essential applications of ICT that can contribute to the future performance of the industry are multimedia applications (55%), groupware applications (50%), integration of software (36%) and digital catalog (36%). In addition, Ahmad et al (1995) believed that IT has great potential in the construction industry due to the dynamic nature of construction processes, interdependence of various participating entities and the need for teamwork, flexibility and a high degree of coordination.

Malaysia, on the economic development and transformation country has initiated the environment for the development of the construction industry and supported growth in construction development projects. Furthermore, it is clearly stipulated in the Ninth Malaysia Plan that ICT applications in construction development projects are vital. Nevertheless, the environments and role of ICT practice have changed and evolved along with the country's rapid economic development. The implications on the development of the technology rely on the future prospects and changes of the development. According to a survey result on World’s First Global ICT Ranking by ITU (2002), Malaysia was the first among top five countries in Asia-Pacific that rapidly develop the ICT technologies especially in construction industry. RICS indicated that many clients are crucial of traditional method of management in construction project and requires different and more extensive range of approach (Page et al. 2004). Based on informal evidence, the development and current situation of ICT practice in Malaysia is believed to be coherent with the findings by ITU. Therefore, an accountable understanding of the current situation together with the future apprehension of the ICT practice is demanded in order to aspire the future challenges and needs.

**METHODOLOGY**

The study began with a comprehensive literature review by focusing on identifying the international research perspectives on the needs of ICT in construction or building industry. In order to determine the current usage of ICTs, a mixed method approach of quantitative and qualitative research was adopted. The use of questionnaires provides one of the most economical and efficient ways to gather such information. Robson (1993) noted that the survey method is one of the ways to obtain a standard and stable collection of data from a specific population. A mail questionnaire survey was identified
as the most suitable method, through which respondents could be approached most easily and with minimum cost (Sarantakos, 1988). The mail survey was not only the easiest approach to obtaining research data but it has also been identified as the most popular method for such purposes in Malaysia, even though the chances of obtaining good response rate are still very low (Ahmad, 2003).

A semi-structured self-administered postal questionnaire survey and semi-structured interviews were employed as the data collection instrument. A ‘simple random sampling’ was used to select 300 building organization from the database of the Construction Industry Development Board Malaysia. Four different level of organisations were selected form the database which is the government organization, professional institutions, major construction contractors and academicians. This is done to ensure that all relevant parties involved in the building industry are covered intended to give a bigger spectrum of results. An interview session were later conducted to five personnel for each category to add more information about the application of ICT tools in the organisations. Data organisation, category generation, constructing and presenting explanations were done as a descriptive data analysis.

DISCUSSION OF FINDINGS

The survey results are presented into the structure of general respondent background, availability and usage of ICT, current scenario of practicing ICT and also the benefit and impact of ICT generally.

Respondent background

The level of Computer’s Literacy
Form the study, current level of computer literacy between the respondent’s is in the expected percentage where as 50% of the respondent’s have the computer literacy more than 10 years and mostly their learning started from school.

![Figure 1: The level of computer’s literacy](image-url)
Availability and usage of ICT

a. **Computer used in the organization**
From the result of analysis below, we can find that all the respondents of 20 person used ICT in the organization. Most organization use ICT such as computers and software to follow up the technology needed.

![Figure 2: Computer usage in the organization](image)

b. **Internet usage in the organization**
From the result, we can find that all the respondents of 20 person used internet in the organization. Most organization use internet to find more information other than use the old fashion way from books and article. This information can be obtained easily from the internet.

![Figure 3: Internet usage in the organization](image)

c. **Internet connection that been used in the organization**
From the result of analysis below, we can find that organization is using various types of internet connection. But most of the organization use cable and wireless connection to suit the use of computers and laptop. Cable connection is providing faster connection than the other connection. Second is the broadband, it is because broadband is the latest technology to be use at any pc and laptop. It is also provided the same fast connection as cable and wireless. Dial up connection is the least use in the organization. It is because dial up connection is not as fast connection as the other connection.
d. **Type of computer software that been used in the organization**

From the result of analysis, we can find that most respondents use basic software such as Microsoft Office in the organization. Microsoft Office provides several of service such as Microsoft Words, Microsoft Excel, Microsoft Power Point and Microsoft Publisher that help the organization through the process of writing reports, make calculation and presentation. Second of the list is the use of Microsoft Project that most of the construction company use in their organization to manage their project more efficiently. The least of software is being use is the CAD. It is because not many personnel know how to use the software because it involves training. CAD software provides in making building plans and 3D.

![Figure 4: Internet connection that been used in the organization](image)

![Figure 5: Computer software that been used in the organization](image)

e. **Technology usage in the organization**

From the analysis below, it shows that the use of LAN technology is widely used in organization. It is because, local are including a small physical area like a home, office or small group of buildings. It covers the two most common technologies currently in use that are Ethernet over twisted pair cabling and Wi-Fi. The second usage of technology is intranet that widely use in organization. It consists of internet protocol technologies in a private computer network to make sure that any information or operational systems within an organization are securely shared. Merely within organization's website but perhaps covers more of the organization's information technology infrastructure. The internet
protocol can also support a number of private websites and become a vital component and centre point of internal communication and collaboration.

![Figure 6: Technology usage in the organization](image)

f. **Used of ICT in the organization**
From the result of analysis, we can find that most the respondents use laptop with internet access in the organization. It is because laptop is more convenient than using normal pc. Normal pc cannot be carried out to other places while laptop can be carried to other places. Most of the personnel owned cellular phone in the organization to follow up with other personnel. While the least of respondent use of PDA. It is convenient in managing the own person schedule.

![Figure 7: Used of ICT in the organization](image)

Current scenario of practicing ICT

a. **ICT implementation reason in the organization**
From the result of analysis below, we can find that organization implements ICT in their organization because of client demand in the technology world. It is important for employees know how to use ICT in the organization. Some of the organization use ICT to compete with other competitors. It is because it is important to finished work early so that client is impressed with the work done. Some organization makes it a compulsory for employees to learn ICT. It is because it is essential for them to have knowledge in ICT in order to improve their working environment.
b. **ICT support service to the organization**

From the result of analysis below, we can find that most organization provides their own ICT to the employees. Organizations will employ personnel that are good in ICT repairing work. It is also save time and cost in term of their making it in-house rather than outsourcing that involves more cost. While some organization use outsource contract ICT support to make a repairing work if needed. It is because their organization has the budget for them to outsource the repairing work and also they did not have the personnel that are trained for repairing ICT.

![Figure 8: ICT Implementation reason in the organization](image)

![Figure 9: ICT support services in the organization](image)

c. **Major weakness in the current ICT system**

From the result of analysis below, we can find that most of the respondents have lack of accessibility in ICT of their organization. It is because most organization prevents and blocks them from using the internet access. The increase of social networking prevent them from perform on their working environment. But not all internet access is not effective for working purpose, therefore, organization need to identify the website url that can be access through out the working environment. Long maintenance time is also the weakness of ICT. It is because personnel that maintain the ICT product need time to do maintaining work to the ICT product. The least weakness is the system utility that not every ICT product complies with the latest ICT software. It needed to be upgraded and it involves time and money.
**Figure 10**: Major weaknesses in the current ICT system

d. **Satisfaction of the present ICT systems provided in the organization**
From the result of analysis below, we can find that most of the respondents are satisfied with present ICT systems provided by the organization. It is because the organization provided full upgrading work to the system and does a training program as their strategic measurement to improve productivity of the organization. The employees that are not satisfied with the ICT system provided in the organization. While the least of the employees are very satisfied with the ICT system it is because they provide software beyond basic to employees.

**Figure 11**: Satisfaction of the present ICT systems provided in the organization

**The advantage and impact of ICT**

a. **Factors affecting the adoption and use of ICT**
From the result of analysis below, we can find that most of the respondents saw the affecting of ICT to the organization because of technological demands. Follow by availability of software and customer demands and size of firm. The least from the above list are level of computer literacy and influence of competition
CONCLUSIONS

The society and economy today is going towards globalisation which highly depending on the creation, management and distribution of Information Technology (IT) resources. The significance to develop an IT strategy for strategic advantage has been realized by many organizations nowadays. Besides, it can also act as competitive weapon for an organization by upgrading operational efficiency, managerial effectiveness, making product and service innovations and increasing bargaining power over particular customers and suppliers. The application of ICT in Malaysia is going rapidly. From the study, the current used of ICT is generally more towards the management and administration but specifically, in the construction or building industry, the system is more to the replacement of the conventional method in a way of...

Figure 12: Factors affecting the adoption and use of ICT

b. The benefits and impact of implementing ICT
From the result of analysis below, we can find that most the respondents answered that ICT improves work quality. Follow by make complex tasks easier when using ICT, saves more time, and improve productivity. While others answered by using ICT they minimized cost of operation of the organization.

Figure 13: Factors affecting the adoption and use of ICT
planning the entire construction project. Therefore, by induction of software for the whole element in the construction or building industry could be more efficient and sustainable. Factors that determined the growth of ICT implementation in the future are country’s industrialization drive, structural transformation of the economy, future technology breakthroughs, the significance and importance of ICT in future construction activities and increased globalization of construction markets.

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Krisis Perumahan Moden Masyarakat Orang Asli Di
Semenanjung Malaysia Menghapuskan Identiti Warisan: Satu
Analisis Literatur

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ABSTRAK


Key words: krisis, perumahan moden, Orang Asli. Semenanjung Malaysia.

PENGENALAN

Rumah kediaman merupakan tempat perlindungan bagi memenuhi keperluan asas kepada pembangunan fizikal bagi sesuatu institusi kekeluargaan dan pembangunan modal insan kepada masyarakat Orang Asli. Pihak kerajaan sememangnya bersimpati dengan nasib dan keadaan masyarakat Orang Asli yang jauh ketinggalan dari arus kemodenan sebagaimana rakyat Malaysia lain kecuali. Tanpa bantuan dari pihak kerajaan sememangnya mereka bukan sahaja tidak dapat bersaing tetapi jauh ketinggalan dalam pembentukan tamadun mereka. Namun begitu melalui tinjauan yang telah dilakukan terdapat sebilangan besar masyarakat Orang Asli telah membina ruangan tambahan bersebelahan dengan rumah bantuan PPRT dan tinggal diruang tambahan ini manakala rumah bantuan PPRT ini dijadikan tempat menyimpan barang-barang. Ada juga segelintir yang menyewakan kepada orang lain dan lebih menyediakan rumah bantuan Program Perumahan Rakyat Termiskin (PPRT) ini ditinggalkan dan dibiarakan begitu sahaja, kembali ke dalam hutan dan membina penempatan mereka mengikut citarasa mereka sendiri. Ini merupakan gambaran yang sinis yang telah diberikan oleh masyarakat Orang Asli untuk suatu rumah kediaman yang disediakan daripada program PPRT tersebut. Mereka bukan sahaja diperkenalkan juga dengan cara pembangunan yang moden, malah diperkenalkan juga cara kehidupan moden yang janggal kerana sesetengah pihak
beranggapan bahawa amalan hidup masyarakat yang berteraskan sistem tradisional sebagai punca kemunduran dan kemiskinan yang terus membelenggu mereka (Khairul Hisyam Kamaruddin, 2005).

Persoalannnya adakah masyarakat Orang Asli ini menolak kemodenan dan langsung tidak tahu menghargai bantuan rumah kediaman yang diberikan atau adakah bantuan rumah kediaman tersebut tidak menepati kehendak dari segi keselesaan dan cara hidup mereka. Pengaruh kemodenan serta minat ke arah penyepaduan dengan masyarakat arus perdana dihukum banyak menghakis atau menghilangkan identiti mereka sebagai masyarakat Orang Asli seperti yang dimiliki pada hari ini (Hood Salleh et al, 2004).

LATARBELAKANG RINGKAS ORANG ASLI DI SEMENANJUNG MALAYSIA.


Jadual 1: Suku Kaum Masyarakat Orang Asli Semenanjung Malaysia.

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Sumber: Jabatan Hal Ehwal Orang Asli, 2006


PERMASALAHAN PERUMAHAN MODEN KEPADA MASYARAKAT ORANG ASLI

Keselesaan Hawa Dalam Rumah


Faktor iklim yang mempengaruhi keselesaan hawa adalah angin dan pengudaraan. Daripada tinjauan yang dijalankan ke atas perumahan PPRT tidak mempunyai pengudaraan yang baik kerana kurangnya bukaan yang membenarkan pengaliran udara keluar masuk ke dalam secara rawak rumah tersebut. Berbeza dengan rumah tradisional Orang Asli yang menggunakan pelan terbuka tanpa dinding pembahagi dan penggunaan dinding yang bernafas serta lantai rumah yang jarang mengalakkan peredaran udara ke dalam rumah. Selain daripada itu penggunaan bahan binaan yang menyerap haba juga merupakan akibat ketidakseimbangan hawa kepada perumahan PPRT ini di mana bumbung zink bera lun yang bertindak sebagai penyebab haba ke bahagian dalam rumah dan penggunaan dinding bata konkrit menyerap haba pada waktu siang dan membebaskan haba ke dalam rumah pada waktu malam.

Rajah 1: Perbandingan pengudaraan bagi (a) rumah moden dan (b) rumah warisan.

Sumber: Lim Jee Yuan, 1987

Permasalahan keselesaan hawa pada perumahan moden juga boleh disebabkan oleh sinaran matahari secara terus. Susunatur penempatan perumahan yang tidak mengambil kira orientasi matahari akan menyebabkan jumlah luas permukaan dinding yang terdedah kepada sinaran matahari secara terus adalah tinggi keadaan ini akan membebaskan haba ke dalam rumah. Jika diperhatikan pada rumah warisan masyarakat Orang Asli, jumlah luas permukaan dinding yang terdedah kepada sinaran matahari adalah kecil, terdapat cucur atap yang menjadi penghadang kepada sinaran matahari terus kepada dinding rumah. Keadaan ini dapat mengurangkan pembebasan haba daripada sinaran matahari terus ke dalam rumah melalui dinding.
Perbandingan yang tidak mengambil kira arah matahari serta rekabentuk bumbungnya menyebabkan dinding luar rumah terdedah kepada sinaran matahari yang maksimum (a) rumah warisan dan (b) rumah moden.


Keserasian Tatatur Ruang dan Gaya Hidup

Masyarakat Orang Asli seperti yang diketahui terdiri daripada pelbagai suku kaum yang menetap di pelbagai wilayah dan kedaerahan. Setiap suku kaum ini mengamalkan cara hidup yang berbeza antara satu sama lain. Sebagaimana masyarakat lain yang mempunyai budayanya yang tersendiri begitu juga dengan masyarakat Orang Asli sungguh pun mereka agak ketinggalan tamadun berbanding dengan tamadun lainnya tetapi mereka juga menunjukkan peningkatan dalam membangunkan kehidupan mereka, masyarakat Orang Asli juga mempunyai garis penduangan, pantang larang, kepercayaan dan amalan kehidupan yang mewarnai perjalanan kehidupan mereka. Budaya inilah yang berperanan mencorakkan gaya perwatakan seni bina rumah kediaman dan penempatan setiap suku kaum Orang Asli tersebut.

Oleh yang demikian ruang merupakan gabungan antara corak kehidupan dan budaya seterusnya membentuk satu simbiosis yang menjadi unsur utama dalam perancangan pembinaan rumah. Namun begitu gabungan ini tidak dihiraukan dalam perlaksanaan pembinaan perumahan moden untuk masyarakat Orang Asli ini. Walaupun pelbagai bantuan dalam bentuk pembinaan telah diberikan kepada masyarakat Orang Asli tetapi adakah yang tidak dapat membantu dalam pembangunan tamadun mereka kerana tidak dapat menepati kehendak budaya dan keperluan hidup mereka. Maka wujudlah kritikan sinis bagi menunjukkan penolakan mereka terhadap pembangunan ini.

Rajah 2: Perbandingan yang tidak mengambil kira arah matahari serta rekabentuk bumbungnya menyebabkan dinding luar rumah terdedah kepada sinaran matahari yang maksimum (a) rumah warisan dan (b) rumah moden.

Rajah 3: (a) Menunjukkan ruang tambahan yang dibina bersebelahan rumah moden dan (b) menunjukkan penambahan ruang dibahagian belakang rumah moden.
Masyarakat Orang Asli mempunyai cara hidup mereka yang tersendiri, mereka banyak menghabiskan masa seharian mereka di luar rumah berbanding di dalam rumah. Ruang dalam hanya digunakan untuk berehat, tidur dan makan sahaja. Adakala mereka gemar duduk di serambi atau bangsal rumah untuk berehat-rehat bagi orang dewasa dan juga menjadi tempat permainan bagi kanak-kanak. Tetapi apa yang berlaku pada rekabentuk perumahan moden yang disediakan untuk masyarakat Orang Asli langsung tidak mengambil kira soal gaya hidup masyarakat Orang Asli dan tidak menyediakan kemudahan ruang sebegitu dalam rekabentuk rumah kediaman moden. Masyarakat Orang Asli seolah-olah terpaksa tinggal didalam rumah batu yang panas dan menyekat pandangan mereka dengan dinding konkrit yang legap dan bukaan tingkap yang minima. Lantaran daripada itu kebanyakan masyarakat Orang Asli telah membina ruang tambahan sendiri seperti pondok rehat atau bangsal. Tindakan sebegitu merupakan kritikan sinis yang menunjukkan penolakan terhadap pembinaan perumahan moden.

**Rajah 4**: Menunjukkan ruang serambi rumah yang digunakan untuk berehat-rehat.

**Rajah 5**: menunjukkan ruang dalam rumah Orang Asli

**Rajah 6**: gambarfoto (a) dan (b) menunjukkan salah satu contoh bentuk perumahan moden yang disediakan kepada masyarakat Orang Asli kelihatan kaku dan tidak mengikut budaya serta kehidupan mereka.
Penyatuan Kehidupan Orang Asli dengan Alam

Masyarakat Orang Asli sememangnya tidak dapat dipisahkan dengan alam semulajadi. Keserasian cara hidup yang berharmoni dengan alam sekitar membolehkan mereka mengetahui di mana tanah yang sesuai untuk bertani, hasil hutan yang bermanfaat dan cara pemeliharaan sepatutnya dibuat sebagai menghormati sumbangan alam kepada kehidupan mereka (Rusli Zaenal, 2002). Oleh itu nilai-nilai dan pengetahuan warisan masyarakat Orang Asli berperanan penting dalam pengurusan alam sekitar dan pembangunan disebabkan pengetahuan dan amalan warisan mereka yang bersifat lestari.

“Indigenous people and their communities and other local communities, have a vital role in environmental management and development because of their knowledge and traditional practices. States should recognize and duly support their identity, culture and interest and enable their effective participation in the achievement on sustainable development”. (Earth Submit, 1992:13)

Rajah 7 : Penebangan hutan untuk pembangunan perumahan moden masyarakat Orang Asli mengundang kepada pemanasan persekitaran dan hakisan tanah.

Penyatuan masyarakat Orang Asli dengan alam sudah sebatai kerana kegiatan yang dijalankan oleh mereka lazimnya di dalam hutan. Dengan penempatan baru ini secara langsung telah menyekat kegiatan mereka kerana kebanyakkan kawasan yang menjadi sumber mendapatkan makanan hasil daripada kutipan hasil hutan telah diterokai menjadi menempatkan baru. Penempatan baru dan perumahan moden dengan dinding bata konkrit bagaikan menyekat pandangan mereka kepada alam semulajadi.

Penempatan baru yang telah dibangunkan oleh pihak kerajaan atas nama pembangunan kemodenan ini tanpa mengambil kira faktor alam semulajadi dengan penebangan hutan secara berleluasa, tanah tinggi ditarik dan diratakan, aliran air disekat dan pelbagai pencabulan alam dilakukan dengan sewenang-wenangnya secara tidak langsung telah menyebabkan ketidakseimbangan ekosistem dan lebih membahayakan lagi boleh menyebabkan bencana alam.

Sungguhpun masyarakat Orang Asli dikatakan lemah dalam pembinaan tamadun tetapi mereka mempunyai kesedaran dalam memelihara alam semulajadi dan ini dapat dilihat melalui pembinaan rumah masyarakat Orang Asli. Penempatan masyarakat Orang Asli dengan cara warisan langsung tidak menjejaskan bentuk asal muka bumi alam semulajadi seperti yang digambarkan di dalam rajah 7. Keupayaan Orang Asli dalam pengurusan sumber alam dan pembangunan masyarakat melalui terjemahan pengetahuan tradisional sepatutnya digunakan dalam membina kerangka pembangunan masyarakat lestari. Sebagai contoh masyarakat Orang Asli terdahulu telah membangunkan senibina yang sedikit pun tidak
mencemarkan alam malahan seni bina yang dihasilkan seolah-olah bersatu dengan alam

![Gambar (a)](image1)

![Gambar (b)](image2)

**Rajah 8:** Rekabentuk rumah Orang Asli di Tapah menunjukkan pembinaannya yang dibuat tanpa merosakkan bentuk asal muka bumi dan alam.

**Susunatur Penempatan Masyarakat Orang Asli**


Di dalam sesebuah penempatan masyarakat Orang Asli lazimnya mereka mempunyai ikatan persaudaraan yang rapat ataupun dianggota oleh ahli keluarga dan diketuai oleh orang yang paling tua yang berpengalaman dan mempunyai pengetahuan dalam kebatinan dan pembomohan yang dikenali sebagai batin. Batin bertindak sebagai ketua di dalam sesebuah kelompok, dan sangat dihormati oleh anggota bawahannya. Keadaan ini memperlihatkan semangat kejiranan yang kuat kerana masing-masing mempunyai ikatan persaudaraan yang kuat. Amalan seperti bergotong-royong dalam sesuatu pekerjaan amat di titik beratkan. Begitu juga dengan pembinaan rumah, di mana kebiasaannya masyarakat Orang Asli membina rumah secara bergotong-royong tanpa bantuan dari luar dan dapat disiapkan dalam masa yang singkat.


**AMALAN-AMALAN WARISAN MASYARAKAT ORANG ASLI**

Sebilangan besar masyarakat Orang Asli masih lagi mengamalkan adat resam dan kepercayaan kepada animisme iaitu kepercayaan kepada semangat dan penunggu yang dikatakan menjadi tempat mereka meminta pertolongan. Lantaran daripada itu kebanyakkah daripada mereka masih lagi berpegang teguh dan menjadi amalan bagi mereka untuk menjalankan upacara-upacara adat sama ada upacara berjampi,
upacara bersewang, jamuan pada hari-hari kepercayaan tertentu mengikut suku kaum masing-masing dan pelbagai lagi.


Bagi masyarakat Orang Asli dari Semelait, mereka mempunyai temasya dan keramaian seperti berselang dan berderai iaitu memanggil orang ramai untuk membuat sesuatu pekerjaan secara bergotong-royong seperti membuka ladang baru, membuat rumah dan sebagainya setelah kerja siap mereka mengadakan kenduri kecil dan ‘Tarian Balai’.

Rajah 9: Upacara Sewang menyambut tetamu di Kg. Perjek yang melibatkan pelbagai lapisan masyarakat Orang Asli.

Sumber: Khairul Hisyam Kamaruddin, 2005.

Seperti mana pembinaan rumah warisan Melayu yang mempunyai adat dan pantang larang dalam pembinaannya begitu juga dengan masyarakat Orang Asli mereka juga mempunyai adat dan pantang larang dalam pembinaan rumah. Bagi masyarakat Orang Asli sebelum membina rumah pemilihan tapak adalah perkara yang utama untuk menentukan sama ada tapak rumah itu baik ataupun tidak. Hal ini kerana masyarakat Orang Asli percaya bahawa tapak rumah yang tidak baik akan
mendatangkan keburukan dan penyakit kepada penghuninya. Bagaimana proses pemilihan tapak dan mendirikan rumah tersebut.

PENGHAPUSAN IDENTITI ORANG ASLI MELALUI PEMBANGUNAN PERUMAHAN MODEN

Rumah adalah medium yang melahirkan kebudayaan dan cara hidup sesuatu masyarakat. Secara ringkasnya rumah dibina oleh penggunanya sendiri mengikut keperluan asas mereka dengan pemahaman yang baik terhadap keadaan alam semulajadi dan menggabungkannya dengan cara kehidupan dan kebudayaan mereka (Lim Jee Yuan, 1989). Rumah kediaman perlu dibangunkan berdasarkan kepada amalan kehidupan penghuninya serta persekitarannya. Kesan langsung yang dapat dilihat daripada pembangunan perumahan moden kepada masyarakat Orang Asli ini adalah hilangnya identiti asal mereka kerana pembangunan perumahan moden inilah yang telah menghakis amalan sehari-hari yang berpandukan ilmu pengetahuan warisan yang selama ini diamalkan dan diturunkan kepada generasi ke generasi.

Melalui kenyataan di atas dapatlah diketahui bahawa rumah adalah tempat penyambung warisan kebudayaan, jika rumah yang dibina tidak berlandaskan kepada kebudayaan sesuatu masyarakat maka kebudayaan baru akan wujud dan menghakis kebudayaan lama sekaligus dapat menghapuskan identiti sesuatu masyarakat. Keadaan ini juga terjadi kepada penempatan baru bagi suku kaum Temuan di Bukit Lanjan, di mana mereka menghadapi krisis identiti berikutan dengan penempatan baru telah memaksa mereka bersaing dengan arus pemodenan seperti yang dinyatakan oleh Shanti Ganesan seperti berikut:

"Their Surrounding is not the only thing they feel is lost to them. The Temuan people have also have rituals and traditions that are distinct to their ethnic group and those are slowly dying. The dwindling of their culture is mainly due to modernisation, inevitable as the new generation immerses into city life and learn and trendier way of living." (Shanti Ganesan, 2009)

Berasaskan kepada kenyataan di atas, jika pembangunan tanpa kawalan ini terus berlaku tanpa usaha yang giat bagi membendungnya oleh pihak tertentu, dikhuatiri mereka akan terus mundur, hilang identiti dan ilmu pengetahuan yang berharga untuk diwarisi dan dipelajari generasi yang akan datang. Senario yang timbul atas dasar pemodenan dan pembangunan nampaknya merugikan dan menghakis nilai-nilai hidup masyarakat yang lestari kerana tumpuan yang berlebihan kepada pembangunan ekonomi menjadikan institusi sosial kampung Orang Asli serta perihal pengurusan dan pemeliharaan sumber-sumber semulajadi diabaikan terutama untuk generasi yang akan datang (Khairul Hisyam Kamaruddin, 2005). Dalam situasi yang belum bersedia dan mundur, dikhuatiri masyarakat Orang Asli akan terus tercicir di dalam persaingan tersebut atau membuat tindakan untuk memenuhi tuntutan perubahan dengan cara yang tidak lestari.

KESIMPULAN

Rumah kediaman perlu dibangunkan berdasarkan kepada amalan kehidupan penghuninya serta persekitaran di mana ianya dibangunkan. Kesimpulannya kita tidak boleh mengambil model pembangunan rumah kediaman dari tempat lain yang masyarakatnya memiliki budaya dan cara kehidupan yang cukup berbeza lalu diberikan model pembangunan tersebut kepada masyarakat Orang Asli di Semenanjung Malaysia dengan harapan mereka juga akan maju sebagaimana pemilik model pembangunan tersebut. Ini adalah pandangan yang meleset dan bertentangan dengan gagasan pembangunan dalam amalan senibina. Melalui senario yang telah dibincangkan di atas adalah jelas menunjukkan masyarakat Orang Asli pada...
hakikatnya menolak pendekatan pembangunan yang telah ditawarkan kepada mereka dan sudah sewajarnya kita perlu mencari suatu pendekatan yang lebih menepati citarasa mereka sekeriannya kita benar-benar ingin membantu mereka. Dalam hal ini suatu kerangka strategi pembangunan lestari masyarakat Orang Asli perlu dibentuk melalui kajian terhadap umsur-unsur ilmu pengetahuan dan amalan-amalan warisan yang lestari berpandukan amalan semasa masyarakat yang boleh digabung bersama pendekatan masa kini di dalam pembangunan sosio-ekonomi supaya dapat digunakan sebagai asas kerangka strategi pembangunan lestari komuniti Orang Asli di masa akan datang.

RUJUKAN


A Study On Causes Of Accident And Prevention In Malaysian Construction Industry

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ABSTRACT

The construction industry is a dynamic and innovative industry that delivers building and infrastructure for all aspects of commercial and domestic activity. This dynamic and innovative industry faced with safety challenges on a project-by-project and day-by-day basis. Hence, this research objective is to identify the causes of accident happened in construction sites and measures order to improve the safety performance. Eighty sets of closed-ended questionnaire were distributed to the relevant respondents such as site manager, site safety officer, contractor, project manager and others. The results from 30 completed questionnaires form a database for the descriptive and ranking analysis on causes and also prevention of accident. The finding of this study reveals that accidents are generally causes by unsafe act and unsafe condition besides others sub causes which are indirectly cause to the accidents happen. Accidents can be result from combination of contributing causes one or more than that. The main causes of the construction accidents are the human element, poor site management, failure to use personal protective equipments and unsafe equipment used in construction works.

Keywords: Accident, Construction Projects, Malaysia, Prevention,

INTRODUCTION

Rahim (2008) defined an accident as an event that which is out off any planning, desirable, expectation or controlled. People would normally pay more attention to the accident that result in injuries (Hinze, 1997). An accident does not means that it is necessarily cause an injury but it also destroy the tools and materials. Accident is an undesired event, which results in physical injury or property damage, usually resulting from contact with a source of energy above the ability of the body or structure to withstand it. According to Ridley (1986), 99% of the accidents happen are due to either unsafe acts or unsafe conditions or both. All accidents should be of concern regardless of the nature of the loss or damage. Precaution should be taken to avoid and minimize the future accidents. The statistics from NSTP (2000) shown that the increase number of construction accidents by 5.6 percent from 4,406 cases in 1995 to 4,654 cases in 2003. In addition, the fatality rate has increased by 58.3 per cent from 60 cases in 1995 to 95 cases in 2003. The fatality rate from construction accidents are among the highest compared to the overall industry.

Therefore, this paper discussed about the causes of accident and prevention taking to minimize the risk of accident in the construction industry. Accident in construction has result in undesired injury, property damage and interruption. In order to minimize the number of accidents, there is a need to identify where and how risks arise. The rationale for conducting this study is to improve the management of safety and health in construction projects.
CAUSES OF ACCIDENTS IN CONSTRUCTION INDUSTRY

Abdelhamid and Everett (2000) conducted a study on the causes of accidents in the USA construction industry and classified them into two main factors, which are human and physical factors. According to Tam et al (2004), the causes of accidents were the poor safety awareness from top leaders, lack of training, lack of organizational commitment, lack of technical guidance, uncontrolled operation, unwillingness to input resources for safety, lack of certified skill labour, unsafe equipment, lack of first aid measures, lack of rigorous enforcement of safety regulation, lack of personal protective equipment (PPE), lack of protection in material transportation and storage, lack of teamwork spirits, shortage of safety management manual, lack of innovative technology and poor information flow.

From the studies and research that carried out by the several researchers, it could be concluded that the unsafe acts and unsafe condition are categories to immediate or primary causes of accidents, because they are the most obvious causes and are usually directly involved or present at the moment the accident happen. According to Holt (2001), secondary causes are the failures of the management system to anticipate, and include lack of training, maintenance, adequate job planning and instruction, and not having safe systems of work in place. Some of the primary and secondary causes of the accidents are discuss further as follow.

Using Defective Equipment

Using defective equipment and tools also an unsafe act since it can directly cause any injured to workers (Holt, 2001). Accidents using defective equipment occur due to it poor performance. According to Toole (2002), poor management of safety equipment acquisition and maintenance will result in more injuries.

Failure to Use Personal Protective Equipment

Working without wearing any personal protective equipment (PPE) may highly increase the probability for getting any undesired injured. According to Dorji and Hadikusumo (2006), many workers refuse to wear PPE with various reasons such as feel uncomfortable with the gears while performing their job at site and consider it as an obstacle to their work output. The International Labour Organization (1996) revealed that some of the workers felt uncomfortable while wearing any types of PPE and it indirectly decreases their work performance.

Human Factor

Drinking alcohol or taking drugs may increase workers’ unawareness and cause serious accidents. Michaud (1995) revealed that by taking any kinds of drugs or alcohol during their works will affect the capability of the decision making. Hence, they are not able to act in good way and always lead to wrong decision-making and unsafe working. Minter (2002) stated that drugs and alcohol are the root cause or contributing cause of many accidents on the job every year.

Poor Site Management

According to Holt (2001), construction site is one of the most dangerous or risky places that can present many hazards to workers when they are performing construction related tasks. The practice of housekeeping involves proper storage, use, cleanup, and disposal of the various materials used during construction. Federated (2007)
stated that poor housekeeping causes a lot impact such as wasting time, energy, and materials as well as increase fire hazards and injuries.

Lack of Commitment

In order to ensure the effectiveness of the safety policy, Holt (2001) revealed that both management and employees have to be actively involved and committed. In the research of Sawacha et al. (1999), it is found that companies with effective safety committees are more likely to take steps that improve safety performance than those without. Working with lack of concentration and commitment could cause distraction and result in an accident.

Besides that, the accidents happen in construction site also cause by working without authority, failure to warn others of danger, missing platform guardrails, inadequate fire warning systems, excessive noise, poor illumination, financial restrictions, lack of education, restricted training, poor quality control system, group attitudes, work overload, industry tradition, society attitude to risk-taking and commercial or financial pressure between contractors.

Model based on these theories are used to predict and prevent accidents. Rahim (2008) revealed that most accident occurs from a combination of several influential causes and one or more unsafe acts and unsafe condition. Several theories of accident causation have evolved that attempt to explain the occurrence of accidents. The theories are Domino theory, Multiple causation theory and Human factor theory.

Theories of Accident Causation

Several theories of accident causation have evolved that attempt to explain the occurrence of accidents. Model based on these theories are used to predict and prevent accidents.

Sequence of Events- Domino Theory

The ‘Domino Theory’ attributed to Heinrich (1958) is based on the theory that a chain or sequence of events can be listed in chronological order to show the events leading up to an accident. Each event may have more than one cause, i.e. multicausal. Heinrich (1958) stated that the occurrence of an injury accident invariably results from a completed sequence of factors culminating in the accident itself. Heinrich (1958) noted that there are five stages to five dominoes standing on edge in a line next to each other, so that when the first domino falls it automatically knocks down its neighbour which in turn knocks down its neighbour and so on. Removal of any one of the first four will break the sequence and so prevent the injury.

Multiple Causation Theory

Multi causality refers to the fact that there may be more than one cause to any accident. Each of these multi-causes is equivalent to the third domino in the Heinrich (1958) theory and can represent an unsafe act or condition or situation. Each of these can itself have multi-causes and the process during accident investigation of following each branch back to its root is known as ‘fault tree analysis’.

The theory of multi causation is that the contributing causes combine together in a random fashion to result in an accident. During accident investigation, there is a need to identify as many of these causes as possible. In reality, the accident model is an amalgam of both the domino and multi causality theories.
The theory of multi causality has its basis in epidemiology. Gordon (1949) points out that accidental injury could be considered with epidemiological techniques. Gordon (1949) believed that if the characteristics of the ‘host’ (accident victim), of the agent (the injury deliverer), and of the supporting ‘environment’ could be described in detail, more understanding of accident is the result of a complex and random interaction between the host, the agent and the environment.

Human Factors Theory

The human factors theory of accident causation attributes accidents to a chain of events ultimately caused by human error. It consists of the following three broad factors that lead to human error. The factors are overload, inappropriate response, and inappropriate activities. These factors are summarized in the Figure 1 below.

![Figure 1: Factors that cause human errors.](image)

ACCIDENT PREVENTION

The construction site is one of the most dangerous places. All the activities can cause different accident happened and these often result in deaths or injuries. Therefore, accident prevention should be done to decrease the rate of the accidents. Holt (2001) stated that accident prevention in construction is not just a matter of setting up a list of rules and making safety inspection, but is required to have a system for managing health and safety which meets and complies with the law. The safety measure that discussed in this paper are safety and health rules, regulation and policy, personal protective equipment, housekeeping, fire prevention and fire extinguishers, tool inspection, emergency procedures, safety bulletin board, construction safety meeting, first aid training and incident investigation.

Safety and Health Rules, Regulations, Policies

According to CSAO (1993), a health and safety policy is a written statement of principles and goals embodying the company's commitment to workplace health and safety. Safety policy demonstrates top management's commitment to ensure safe working environment and methods at every single construction sites. In Malaysia, The Department of Occupational Safety and Health (DOSH) and other government
agencies have regulations that set down the legal requirements to ensure the safety and health of all the workers at the place of work.

Fire Prevention or Fire Extinguishers

According to Holt (2001), there are two methods of dealing with fire in construction work; preventing it happening and controlling the consequences if it should happen. Both require equal attention during the planning process. The three ingredients of fire are fuel, oxygen and a source of ignition. By removing any one of them and there will be no fire. Much of fire prevention takes place at the planning stage, where simple rules apply:

- Use less flammable materials
- Minimum the quantity of flammables on site
- Store flammable solids, liquids and gases safely, separated from each other and from oxygen cylinders or oxidising materials.
- Make sure that rubbish is removed regularly
- Ban smoking in appropriate areas

Emergency Procedures

Gibb (2000) revealed that the most obvious emergency is fire. The safety plan should contain an appropriate emergency plan, written to cover the detailed arrangements on a project. Other potential emergency situations which may require the emergency plan include flooding and multiple injuries from any cause. A more common form of emergency is the need to evacuate an injured person especially from the most inaccessible area of the project. Emergency plan can shorten the duration taken between an injury occurring and arrival at a treatment centre. This should always be evaluated and reassessed as construction work proceeds.

Planning for emergencies begins with the purpose of minimizing their likelihood. The aim of publishing an emergency plan is to ensure that everyone on site can be alerted in an emergency, and knows the emergency signal and also the action should be taken. All the emergency routes must be identified, signed, adequately lit and kept clear. When planning emergency procedures, routes and exits, the following should be taken into account:

- Size and characteristics of the site and the work being done
- Way to raise the alarm under those conditions
- Plant and equipment being used in site
- Quantity of people are likely to be present (size of the exits)
- Properties of substances likely to be present
- Location of the nearest emergency services and their capabilities
- Access to the site for emergency services

Safety Bulletin Board

According to the Washington State Dept. of Labor and Industries, the purpose of the safety bulletin board is to increase employee’s safety awareness and pass on the company’s message. It is the place where the employer communicates policies and procedures to employees. Most of the latest information will be displaying on this board. Therefore, it is an effective way to communicate information among employees and employers. An attractive bulletin board can help promote safety in the workplace.
Safety information and policies and procedures that posted on the bulletin board provide a continuous point of reference that employees come to depend on.

Construction Safety Meeting

Cheung (2005) revealed that inaugural meeting or initial work meeting should be carried out and attended by the entire professionals include the safety advisors and inspecting engineer. During the meeting, there will be a briefing on safety policy and also the details of the safety plan. Commencement of any site works only if getting approval from the inspecting engineer. Besides that, safety manager and safety officer are appointed as required by the contract. Approval of the appointment of the safety staff was also required from the inspecting engineer.

Incident Investigation

Petersen (1978) revealed that the investigation of accident is the most difficulty in accident prevention. There should be a defined procedure for investigating all accidents. Checklist and format form are use in collecting and record all the important details. Normally, the management team of the project will be involved. They will be the people who involved in the investigation and also reporting the procedure for less serious accidents. Workers’ representatives may also be involved as part of the investigating team. The following are essential tools used during the investigation of accidents:

- Report form, possibly a checklist as a routine prompt for basic questions
- Notebook or pad of paper
- Tape recorder for on-site comments or to assist in interviews
- Camera — Polaroid instant-picture cameras are useful
- Measuring tape, which should be long enough and robust
- Special equipment in relation to the particular investigation, e.g. meters, plans, video recorder

From the viewpoint of prevention, the purpose of the investigation and report is to establish whether a recurrence can be prevented or it effects lessened, by the introduction of safeguards, procedures, training and information.

Personal Protective Equipment (PPE)

There are several types of PPE and each of them have its different functions, which including hearing protection, eye protection, respiratory protection, protection of the skin, and general protection in the form of protective clothing, and safety helmets, harnesses and lifelines. According to Holt (2001), personal protective equipment (PPE) has limitation. It does not eliminate a hazard if the PPE fails and the failure is not detected. Therefore, the equipment must be selected appropriately and accordingly to its use and its condition has to be monitored. Workers are required to be trained before using any types of the safety equipment.

Housekeeping

According to Federated (2007), good housekeeping in any construction site is a vital function that can improve overall safety performance by reducing the accidents from happen. A good housekeeping program should be well planned and coordinated as well as regularly practice. This is a continuous process which involved in everyone in workplace. Many accidents are credited to the other causes, such as tripping or slipping which are actually results of unsafe condition due to the poor housekeeping.
Good housekeeping is the essential to a safe working place. Therefore, some consideration should be made in order to create a successful housekeeping program.

**Tool Inspection**

Cheung (2005) states that safety inspection were conducted on weekly and also daily to ensure the all the devices and equipments are well functioning and are in the good condition. According to the guidelines that been established by the OHS regulation (2001) inspection and testing should be done by a qualified person. All the equipments and machinery have to be completely inspected before come into operation such as personal protective equipment (PPE), hand tools and portable tools and equipment.

**First Aid Training, Equipment and Procedures**

According to OHS regulation (2001), first aid is important and required in every workplace. First aid provides the initial and immediate help to a person who suffering an injury and also prevent the injury from become worse. Employers are required to provide a first aid station where it is accessible at all the time in the workplace. Training generally includes the mandatory topic such as emergency scene management, severe bleeding and rescuer CPR.

**RESEARCH METHODOLOGY**

The research is conducted in four stages which include research proposal, literature review, data collection and processing and the last stage conclusion. Two types of data are collected in this research, which are primary data and secondary data. Primary data is obtained from questionnaire survey while secondary data obtain from published materials such as books, journal, and internet resources. Topic selection is done in early stage and problem related to the respective research area is identified. In this study, the problem statement that had been identified is the increasing of the construction accidents. Literature review is the secondary data that can be getting from the published books, articles, journals as well as online resources. The literature review provides information and also the definition in the research. Since this research is done through quantitative approach, the questionnaire is design to be the most suitable method in data collection. There are 80 sets of closed-ended questionnaire sent out to obtain the primary data. Then, the data is analysis by using the Statistical Package for the social science (SPSS) software. Last but not least, findings from the research were concluded and future recommendations are suggested at the final stage.

**DATA ANALYSIS AND DISCUSSION**

All of the data that collected from the questionnaire survey are formulated and analysis by using the SPSS software. Generally, mean score is used to rank the variables of the causes of accidents and the safety measure in this research. Table 1 shows the Ranking of variables causes that affect the occurrence of accident while Table 2 shows the ranking of the variables of the accident prevention.
Table 1: Ranking of variables causes that affect the occurrence of accident.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Variables</th>
<th>Mean, (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Human factor</td>
<td>4.50</td>
</tr>
<tr>
<td>2</td>
<td>Poor site management</td>
<td>4.50</td>
</tr>
<tr>
<td>3</td>
<td>Failure to use PPE</td>
<td>4.43</td>
</tr>
<tr>
<td>4</td>
<td>Unsafe equipment</td>
<td>4.30</td>
</tr>
<tr>
<td>5</td>
<td>Poor quality control system</td>
<td>4.23</td>
</tr>
<tr>
<td>6</td>
<td>Lack of commitment</td>
<td>4.03</td>
</tr>
<tr>
<td>7</td>
<td>Lack of education</td>
<td>3.90</td>
</tr>
<tr>
<td>8</td>
<td>Commercial pressure between contractor</td>
<td>3.83</td>
</tr>
<tr>
<td>9</td>
<td>Working without authority</td>
<td>3.80</td>
</tr>
<tr>
<td>10</td>
<td>Missing platform guardrails</td>
<td>3.77</td>
</tr>
<tr>
<td>11</td>
<td>Restricted training</td>
<td>3.73</td>
</tr>
<tr>
<td>12</td>
<td>Work overload</td>
<td>3.67</td>
</tr>
<tr>
<td>13</td>
<td>Financial restrictions</td>
<td>3.67</td>
</tr>
<tr>
<td>14</td>
<td>Group attitudes</td>
<td>3.60</td>
</tr>
<tr>
<td>15</td>
<td>Failure to warn others of danger</td>
<td>3.40</td>
</tr>
<tr>
<td>16</td>
<td>Society attitudes to risk-taking</td>
<td>3.20</td>
</tr>
<tr>
<td>17</td>
<td>Inadequate fire warning system</td>
<td>3.13</td>
</tr>
<tr>
<td>18</td>
<td>Industry tradition</td>
<td>3.10</td>
</tr>
<tr>
<td>19</td>
<td>Poor illumination</td>
<td>2.67</td>
</tr>
<tr>
<td>20</td>
<td>Excessive noise</td>
<td>2.60</td>
</tr>
</tbody>
</table>

Table 2: Ranking of the variables of accident prevention

<table>
<thead>
<tr>
<th>Rank</th>
<th>Variables</th>
<th>Mean,</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Personal protective equipment</td>
<td>4.73</td>
</tr>
<tr>
<td>2</td>
<td>Tool inspection</td>
<td>4.60</td>
</tr>
<tr>
<td>3</td>
<td>Safety and health rules, regulations and policy</td>
<td>4.57</td>
</tr>
<tr>
<td>4</td>
<td>Housekeeping</td>
<td>4.50</td>
</tr>
<tr>
<td>5</td>
<td>First aid training, equipment and procedures</td>
<td>4.30</td>
</tr>
<tr>
<td>6</td>
<td>Incident investigation</td>
<td>4.13</td>
</tr>
<tr>
<td>7</td>
<td>Emergency procedures</td>
<td>3.77</td>
</tr>
<tr>
<td>8</td>
<td>Construction safety meeting</td>
<td>3.67</td>
</tr>
<tr>
<td>9</td>
<td>Safety bulletin board</td>
<td>3.60</td>
</tr>
<tr>
<td>10</td>
<td>Fire prevention/ fire extinguishers</td>
<td>3.50</td>
</tr>
</tbody>
</table>

From the data that been collected, most of the respondent indicates that the causes of the accident are most properly due to human element factors and poor site management. There are in the same as well as the highest rank among those causes. Then, it is follow consequently by failure to use or wear PPE, used unsafe equipment, poor quality control system, lack of commitment and education. The ranking shows that accidents in the construction site are more related to primary cause. The human element factor (unsafe act) and poor site management (unsafe condition) are categorized as primary causes. According to Holt (2001), primary causes are directly involved and present when accidents happen. Nevertheless, secondary causes such
as poor quality control system and lack of commitment and education also contributed to the occurrence of accident.

Based on Table 2, the personal protective equipment plays very important roles in accident prevention. This means that accident can be reduce and minimize to the lowest rate by using the PPE during construction works. PPE provided protection in the form of protective clothing, helmets, harnesses and also lifeline. Regularly tools inspection can help to improve the safety at construction site by avoiding the workers to use defective machinery and equipment. Workers may cause in injury when they used the equipment which are not well performing.

CONCLUSIONS

From the result, it shown that most of the accidents happened is due to unsafe act and unsafe condition which are human element, poor site management and failure to used PPE. Moreover, management system and social pressures also indirectly cause accidents happen. Both of them are categorized as secondary causes. There is several safety measure used in order to reduce or minimize the rate of the accident happened. Personal protective equipment is most commonly safety measure used to prevent injury from the accidents. Other safety measures identified in this study are tool inspection, safety and health rules, regulations and policy, housekeeping, first aid training, equipment and procedures, incident investigation, emergency procedures, construction safety meeting, safety bulletin board and fire extinguishers.

Safety measure is the method used to improve the safety performance at any workplace. Effective safety measure can result in decreasing of rate of the accidents happen. This research found that the frequencies of the accidents that present at most of the selected project are less than 5 cases. In conclusion, the safety measure used in the site will directly affect the safety performance in every single construction project.

REFERENCES


The Effect of Balcony to Enhance the Natural Ventilation of Terrace Houses in the Tropical Climate of Malaysia

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ABSTRACT

Utilizing natural ventilation is one of the parameters to achieving a sustainable building. Natural ventilation in terrace houses is of primary importance especially in a tropical country with hot and humid climate like Malaysia. Apart from the use of window and door opening, a balcony is an alternative architectural element as a wind scoop for scooping the air into a building to allow for better ventilation in naturally ventilated buildings. In this study, double store terrace house is selected in Kuala Lumpur. The aim of the study to analyze the effect of balcony to enhance natural ventilation and also, proved that the balcony could be used as transitional space to control and induce the outdoor air flow into indoor spaces of terrace house. This analysis used IES <Virtual Environment > 6.0, MacroFlo simulation method which measured Volume flow, temperature, humidity, natural vent gain of the terrace house model. Unlike previous studies, the finding indicates that using the balcony in terrace houses in warm and humid climate like Malaysia cannot be workable to increase the natural ventilation. Discussion and recommendations are made regarding future researches in this area.

Key words: Balcony, Airflow, Natural ventilation, IES <VE>, MacroFlo Simulation, warm-humid, Terrace house

INTRODUCTION

Natural ventilation cooling strategies can improve comfort and occupant satisfaction, and greatly reduce energy costs, reduce negative environmental impacts. Ventilation in a dwelling serves the basic function of providing health and comfort (Prianto & Depecker, 2003). Natural ventilation is defined as passively supplying outdoor air to a building interior for ventilation (Hamdy & Fikry, 1998) and cooling (Chungloo & Limmeechokchai, 2007). Natural ventilation systems rely on pressure differences to move fresh air through buildings (Walker, 2005). Pressure differences can be caused by wind or the buoyancy effect created by temperature differences (Feustel, 1999; Mistriotis, Arcidiacono, Picuno, Bot, & Scarascia-Mugnozza, 1997) or differences in humidity (Mears, Smith, & Wentz, 2001).

Natural ventilation can replace all or part of a mechanical system (Emmerich, Dols, & Axley, 2001). Most importantly, natural ventilation strategies improve indoor air quality and improve occupant comfort, which translates directly to healthier, more productive building occupants (Yuan, 2007).

Passive cooling is one of the most difficult problems to solve in tropical climatic regions (Nugroho & Ahmad, 2005). According to (Rajeh, 1994) “there is a lack of emphasis of local authorities in Malaysia to regulate sufficient ventilation, low outside wind velocity and building design disregard the need of cross ventilation have resulted houses having poor natural ventilation of less than 1.0 m/s air movement in the interior.
spaces." In warm climates, especially where the humidity is high, comfort depends not only on the rate of fresh air supply in room, but even more on the speed at which the air moves across the occupants thereby promoting cooling evaporation (Prianto & Depecker, 2002). It is possible to gain natural ventilation in the building with proper design, the building location, navigation, utilization of appropriate strategies, and existed potentials of the building. Besides doors or windows that enhances natural ventilation (Raja, Nicol, McCartney, & Humphreys, 2001) balcony is the other element to make the wind to be flow inside the building. In either case, the amount of ventilation will depend critically on the size and placement of openings in the building (Chakraborty & Fonseca, ; Kalantar, 2009).

It is useful to think of a natural ventilation system as a circuit, with equal consideration given to supply and exhaust. In passive design, Cross air ventilation is one of the important factors. A cross ventilation occurs when opening all the indoor and balcony windows during natural ventilation ("Hawaii Commercial Building Guidelines for Energy Efficiency," 2004). One reason for using openings in design, balcony configuration, and internal division is the great influences it has on inducing air speed inside the building. Of course it seems plausible to consider that all design variables are interdependent that have an influence on interior airflow of the building (E. Prianto & P. Depecker, 2002).

In the architectural perspective, balconies contribute to the shape and articulation of buildings. With consideration of different design approach, balconies could become great architectural element (Mohamed, Prasad, & Tahir 2008). The balcony can be recognized as a horizontal shading device, but it needs to be protected in tropical climate from the splash of rain (Harimi, Potty, & Ming, 2007) and wind scoop for scooping the air into a building (E. Prianto & P. Depecker, 2002). Balconies can help improve safety and make a lively spaces around the buildings in order to have private overlooking view and balconies also sometimes rise the monetary value of residential building (Chau, Wong, & Yiu, 2004; Landscapes et al.).

Incorporation of natural ventilation is an integral part of the Malay traditional house design. Naturally ventilated "Anjung" or porch in front of houses Malaysian similarity with the balcony that allows a comfortable open space, where there is no wall. In addition to providing a comfortable space to relax and entertain guests, acts of "Anjung" as a buffer, helping to avoid drastic changes in microclimatic conditions, and act together with the envelope filter for the space inside the warm and humid outside (Bay, 2005; Hassan, Emalgalfta, & Hassan, 2009).

In Malaysia, the need for balcony to induce indoor natural ventilation is pertinent whole year round. (Mohamed, Prasad, & Tahir, 2008) using the local natural wind for indoor natural ventilation is one of building adaptations to its local environment. According to (Larsen & Heiselberg, 2008) the amount of air passing through window opening will depend on the wind speed, temperature inside and outside of room, wind direction; turbulence characteristics in the wind, the pressure variations.

THE SITE CONDITIONS

The summary of the site conditions is a tropical country (Malaysia), which has a warm and humid climate through the year. ASHRAE design weather database is the base of IES <VE> and for this case the location selected Kuala Lumpur/subang weather. The latitude is 3º 12’ N and the longitude is 101º 55’ E and the height above sea level is 37.8 m. the mean Dry-Bulb temperature ranges from 26.41°C to 27.89°C and the mean relative humidity is almost uniformly high at about 79.3% to 84.2% and is similar to that of the year (Figure 1). It is essential to know the geographical
conditions of Malaysia in order to understand its wind climate. Malaysia is made up of two major sectors: the Peninsula and the eastern sectors (Sarawak and Sabah) in the northern part of the island of Borneo. Both of these breezes can reach a maximum average speed of about 3 m/s and are able to overshadow the monsoons in some areas. The prevailing north-easterly winds are too strong to let the land breeze develop along the east coast and the sea breeze along the west coast. Since the south-west monsoons are not as strong as those from the northeast, a reversal situation may also occur, but only for a limited period. The IES <VE> wind data for Kuala Lumpur/Subang also shows that the common directions of prevailing wind are from north (N), north-west (NW) and south (S) as shown in (figure 2). The mean wind speed ranges from $1.1\text{m/s}$ to $1.9\text{m/s}$ and the mean wind direction ranges between $91.6^\circ$ to $213.9^\circ$ are different.

RESEARCH METHODS AND FINDINGS

In this study, a double story terrace house was selected in Kuala Lumpur with a built-up area 124 m². Model A is with balcony and model B is without balcony. Both models are of the same plan and characteristic. The ground floor plan consists of multi-purpose area. The 1st floor consists of family areas (kitchen, living area, dining area, a bedroom and toilet). The 2nd floor comprises family areas (living area, master bedroom, 2 bedrooms, a toilet and 2 bathrooms). The 3rd floor is the staircase (Table 1).

Today balcony designing is one of the popular elements in terrace houses in Malaysia and for this study, location of balcony is in the north side of the terrace house model at 1st and 2nd floor. The size of balcony, width 3870 mm and length 2400 mm. The height of Balcony railing 800 mm and it was without any wing walls. Balcony in 1st floor is connected to kitchen through a door. On the other hand, the balcony in the 2nd floor is linked with bedroom 2. This research is divided into two main stages. First, is the research design; second, using the sample of a terrace housing plan and making a 3D modeling of terrace house and measured by IES <Virtual Environment > 6.0 simulation. The experimental conditions are the location of balcony, internal and external air temperature, wind speed and wind direction. In order to achieve the aforementioned set of objectives, the following steps are suggested: set the location and climate data in IES <VE> software set the windows opening in Marcelo and simulation of terrace house model for achieve a natural ventilation analysis. For this study, the climate data of Malaysia with Kuala Lumpur/ Subang weather data will be adopted to present of analysis, and to determine trend of monthly dry bulb temperature, wind speed and wind direction, relative humidity available for natural ventilation in terrace house.

Climate data consist of annual climate data and dry bulb temperature. The effect of balcony interaction for natural ventilation is quite difficult to be determined by analytical means. The simplest means is to investigate by using computer simulations of both the climate data and buildings. The IES <VE> is the instrument that is used to model the building. A typical unit of a terrace house model is built to a scale of 1:100 (Figure 1).
The testing of the models exclusively is divided into two parts to ease the comparison between terrace house with balcony and without balcony. MacroFlo is part of IES <VE> simulation, and the MacroFlo view provides facilities for the preparation of input data for the MacroFlo bulk air flow simulation program. The simulation program itself is run from within the ApacheHVAC.

**Table 1**: Space area and volume of terrace house models (IES <VE>)

<table>
<thead>
<tr>
<th>Room Name</th>
<th>Floor Area (m²)</th>
<th>Volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staircase</td>
<td>10.8</td>
<td>35.7</td>
</tr>
<tr>
<td>Store</td>
<td>4.7</td>
<td>14.1</td>
</tr>
<tr>
<td>Balcony</td>
<td>9.1</td>
<td>27.2</td>
</tr>
<tr>
<td>Bed room1</td>
<td>10.9</td>
<td>32.7</td>
</tr>
<tr>
<td>Kitchen</td>
<td>23.3</td>
<td>69.8</td>
</tr>
<tr>
<td>Store</td>
<td>3.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Toilet1</td>
<td>4.1</td>
<td>12.4</td>
</tr>
<tr>
<td>Staircase</td>
<td>13.5</td>
<td>40.4</td>
</tr>
<tr>
<td>Dining room</td>
<td>19.8</td>
<td>59.3</td>
</tr>
<tr>
<td>Living room</td>
<td>29.1</td>
<td>87.4</td>
</tr>
<tr>
<td>Bed room3</td>
<td>15.3</td>
<td>45.9</td>
</tr>
<tr>
<td>Bed room2</td>
<td>23.2</td>
<td>69.7</td>
</tr>
<tr>
<td>Toilet2</td>
<td>4.1</td>
<td>12.4</td>
</tr>
<tr>
<td>Staircase</td>
<td>10.8</td>
<td>32.5</td>
</tr>
<tr>
<td>Bathroom</td>
<td>2.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Master Bedroom</td>
<td>29.1</td>
<td>87.4</td>
</tr>
<tr>
<td>Living area</td>
<td>15.8</td>
<td>47.5</td>
</tr>
<tr>
<td>Balcony</td>
<td>9.1</td>
<td>27.2</td>
</tr>
<tr>
<td>Multipurpose space</td>
<td>101.8</td>
<td>305.4</td>
</tr>
<tr>
<td>Staircase</td>
<td>13.5</td>
<td>40.4</td>
</tr>
</tbody>
</table>
MacroFlo is a program for analysing infiltration and natural ventilation in buildings ("Integrated Building Analysis Software System," 2010). It uses a zonal airflow model to calculate bulk air movement in and through the building, driven by wind and buoyancy induced pressures. The preparation of MacroFlo input data in the MacroFlo view consists of setting the airflow characteristics of openings in the building (windows, doors and holes). This task is closely analogous to the task of setting construction data for building elements in the Apache view and its sole purpose is the setting of airflow data for openings. MacroFlo simulates airflow driven by wind pressure and buoyancy forces. This capability allows you to carry out studies of natural ventilation.

Air Flows Calculated by MacroFlo Simulation

In this part, natural ventilation variables will be assessed and compared for each model. The calculation of airflow rates by MacroFlo simulation show that: (Figure 2-3).

1. Internal volume flow in and out

Volume flow in, is the volume flow that enters through a MacroFlo opening and volume flow out is the volume flow leaving through a MacroFlo opening. The output data of MacroFlo simulation shows how much volume flow enters and leaving through windows of kitchen at 1st floor and windows of bedroom 2 at 2nd floor. Additionally, it shows the maximum and mean volume flow in and out each of models monthly. In the 1st floor (kitchen) the minimum and maximum average volume flow in, in the model A has 498.4 l/s minimum average volume flow in July, and 1226.1 l/s maximum average...
in December. Minimum average of the model B is 796.6 l/s in July, and 2102.7 l/s in December respectively. In the 2nd floor (bedroom 2) the minimum and maximum average volume flow in, in the model A has 323.7 l/s in May, 450.9 l/s in February and the model B 482.1 l/s in January, 890 l/s of December respectively. The minimum and maximum average volume flow in, at 1st floor (kitchen) are annually 805.9 l/s in model A and 1276.1 l/s in model B respectively. The minimum and maximum average volume flow in, at 2nd floor (bedroom 2) are annually 372 l/s in model A and 659.4 l/s in model B. The standard division of 1st floor in different models are as below: model A: 207.5 and model B: 393.5. The standard division of 2nd floor are 119 in model A and 118.6 in model B.

In the 1st floor (kitchen) the minimum and maximum average volume flow out, in the model A has 465.4 l/s minimum average volume flow out November, and 1474.5 l/s maximum average in July. Minimum average of the model B is 630.5 l/s in November, and 1669.7 l/s in July respectively. In the 2nd floor (bedroom 2) the minimum and maximum average volume flow out, in the model A has 385 l/s in February, 516.9 l/s in July and the model B 501.5 l/s in December, 672.1 l/s of July respectively. The minimum and maximum average volume flow out, at 1st floor (kitchen) are annually 832.3 l/s in model A and 1044.1 l/s in model B respectively. The minimum and maximum average volume flow in, at 2nd floor (bedroom 2) are annually 443.4 l/s in model A and 572.5 l/s in model B. The standard division of 1st floor in different models are as below: model A: 297.1 and model B: 309.3. The standard division of 2nd floor are 38.2 in model A and 56.8 in model B.

2. Internal air temperature

Air temperature is the mean temperature of the air in the room. The analyze result shows the maximum, minimum and mean of monthly air temperature of each model. Additionally, it shows the mean air temperature annually in total net residential area in the 1st floor and 2nd floor of models. The minimum average and maximum average air temperature in 1st floor, in model A it is 26.82°C in December, and 26.54°C in June. in model B it is 26.76°C in December, and 28.47°C in June. In the 2nd floor the minimum and maximum average air temperature, in model A it is 26.98°C in December, and 28.64°C in June; in model B, minimum average is 26.93°C in December, and maximum average is 28.58°C in June. The minimum and maximum average annually of air temperature, at 1st floor are 27.65°C in model A and 27.72°C in model B. The annual minimum and maximum average of air temperature, at 2nd floor is 27.72°C in model B and 27.79°C in model A. The standard division of 1st floor is 0.45 and the standard division of 2nd floor is 0.45.

3. Internal relative humidity

Relative humidity is the water vapour pressure of the air expressed as a percentage of the saturation vapour pressure. The analyze result shows the maximum, minimum and mean of monthly relative humidity of each model. Additionally, it shows the mean relative humidity annually in total net residential area in the 1st floor and 2nd floor of models. The minimum average and maximum average humidity annually in 1st floor, in model A it is 76.43% in June, and 81.54% in October. In model B it is 76.68% in June, and 81.86% in October. In the 2nd floor the minimum and maximum average humidity annually, in model A it is 76.43% in June, and 81.54% in October. In model B it is 76.68% in June, and 81.86% in October. In the 2nd floor the minimum and maximum average humidity annually, in model A it is 76.43% in June, and 81.54% in October. In model B it is 76.68% in June, and 81.86% in October. The minimum and maximum average annually of relative humidity annually, at 1st floor are 78.82% in model B and 79.68% in model A respectively. The annual minimum and maximum average of relative humidity annually, at 2nd floor is 79.18% in model A and 79.39% in model B. The standard division of 1st floor in different models are as below:
A: 1.61 and model B: 1.60. The standard division of 2\(^{nd}\) floor are 1.62 in model A and 1.58 in model B.

4. Internal natural vent gain

Natural vent gain is the sensible heat gain (or negative loss) from natural ventilation air exchanges. The result shows the maximum, minimum and mean of monthly natural vent gain of each model. Additionally, it shows the mean natural vent gain annually in total net residential area in the 1\(^{st}\) floor and 2\(^{nd}\) floor of models. The minimum average and maximum average natural vent gain in 1\(^{st}\) floor, in model A it is -0.06\(^{kw}\) in January and November, and -0.035\(^{kw}\) in December. In model B it is -0.053\(^{kw}\) in January and November, and -0.029\(^{kw}\) in December. In the 2\(^{nd}\) floor the minimum and maximum average natural vent gain, in model A it is -0.067\(^{kw}\) in January and November, and -0.044\(^{kw}\) in December. The minimum and maximum average annually of natural vent gain, at 1\(^{st}\) floor are -0.061\(^{kw}\) in model A and -0.041\(^{kw}\) in model A respectively. The annual minimum and maximum average of natural vent gain annually, at 2\(^{nd}\) floor is -0.054\(^{kw}\) in model A and -0.047\(^{kw}\) in model B. The standard division of 1\(^{st}\) floor in different models are as below: model A: 0.009 and model B: 0.007. The standard division of 2\(^{nd}\) floor are 0.005 in model A and 0.009 in model B.

RESULTS OF THE STUDY

The analyzing result of annually average of each variable of total net residential area of 1\(^{st}\) floor and 2\(^{nd}\) floor of the model A and model B. Furthermore, show the amount of ratios of each model and each variable to compare the result of variables.

i. As a result the compare 1\(^{st}\) floor of the model A and B shows the ratio of volume in and out, in kitchen area of 1\(^{st}\) floor are 63% and out 80% and shows that volume flow through a windows opening of the kitchen area in Model A less than the model B. Air temperature ratio is 99% and balcony can be only 1% decrease air temperature of the model A. Relative humidity ratio is 101% and balcony could not be decreases humidity. Natural vent gain ratio is 67% and shows that the natural vent gain in model A less than model B and balcony cannot increase a natural vent gain in 1st floor of terrace house.

ii. The ratio of volume in and out, in 2\(^{nd}\) floor are 56% and out 77% and shows that volume flow through a windows opening of the bed room2 area in Model A less than the model B. Air temperature ratio is 100% and effect of balcony doesn’t have a any difference to decrease air temperature of the terrace house. Relative humidity ratio is 100% and balcony doesn’t have a any effect to decreases it. Natural vent gain ratio is 115% and shows that the natural vent gain in model A 15% more than model B.

DISCUSSION OF THE STUDY

This study aims to determine the effect of balcony on natural ventilation in terrace houses in the warm and humid climate of Malaysia. The case study has been identified in Kuala Lumpur. The results are consistent with findings of past studies by (Chand, Bhargava, & Krishak, 1998; Mohamed et al., 2008; Prianto & Depecker, 2002, 2003) which have successfully recognized that the balcony has a good strategy to increase natural ventilation inside buildings. In addition, they found that, the identify windows opening and balcony designs are helpful in increasing natural indoor air movement but not for internal division modification and they must be taken into consideration on designing dwelling in tropical humid region. They also found out that the opening design, balcony configuration, and internal division have great influences on inducing air speed inside the building. It is reasonable to consider all design variables are interdependent and have an influence on interior airflow, but it is also useful to observe the influence of a design variable on its own to take its effects into consideration.
CONCLUSION

In conclusion, attempts to conclude the research by summarizing the major findings of the research mentioned above. To consider objectives of this study, MacroFlo was conducted in a terrace house model during a year and environmental factors such as: air temperature, relative humidity, volume airflow and natural vent gain were recorded.

i. The founding of this study, result from MacroFlo analysis showed that the balcony in variables cannot be practical for increasing the natural ventilation in 1st floor and 2nd floor of the terrace house model A.

ii. To develop using the balcony design towards improving indoor air movement in terrace houses of Malaysia’s wind condition was performed using the balcony; the result of comparing the model A and B shows that, the volume flow through a windows opening of the both floors, the model A is less than model B.

iii. To study the effect of natural ventilation on thermal comfort of Malaysian terrace housing by enhancing the natural ventilation through the establishment of the balcony was measured, the comparison between Model A and B revealed the ratio of variables of this study: using the balcony in warm–humid weather like Malaysia, cannot have a better effect on natural ventilation of the terrace house.

iv. To analyze the effect on natural ventilation with the introduction of balcony in terrace housing of Malaysia. Balcony in this research cannot be usable as transitional space to control and induce the outdoor air flow into indoor spaces of terrace house and increase the natural ventilation of the terrace house in warm-humid climate like Malaysia.

This research has revealed two significant findings. Firstly, the introduction of the balcony is significantly produced natural ventilation. However, unlike previous studies, the finding indicates that using the balcony in terrace houses in warm and humid climate like Malaysia cannot be workable to increase the natural ventilation. Secondly, utilizing of windows opening can help to direct incoming wind to the inside the building and improving indoor air movement inside the building. In this study opening of windows in both side of terrace house can be help to create cross air ventilation.

In conclusion care should be taken for designing balcony of terrace house in order to provide natural ventilation in some areas for future studies are highlighted as follows:

i. To investigate on the effectiveness of the balcony on natural ventilation in terrace houses of warm and humid region, new researches can be done on new layout for terrace house with different form of balcony design, for example utilizing of wing wall in balcony design is recommend.

ii. Further investigations are required to determine the effects of the proposed natural ventilation strategy on different wind direction and location of balcony in terrace houses.

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Significance of Community in Malaysian Higher Education Institutions Sustainability

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ABSTRACT

Since the environmental movement began, attention has also been focused on the institutions of higher learning. The first document on campus sustainability, the Talloires Declaration which has been ratified by 413 universities, including University Malaya, has addressed the concept of community sustainability. This article is a position paper where its objective is to highlight the importance of community in sustainable Malaysian higher educational institutions. In carrying out this study, it has employed archival analyses method, reviewing different scholars’ articles, dissertations, and tools, and The Ninth Malaysia Plan (RMK9), besides addressing the challenges of Malaysian educational system. Further validation of the finding has been done by questionnaire survey method. In this regard the various approaches have been perused deeply to figure out how they have addressed community and the effects on campus sustainability. The result indicates that community and campus sustainability have a linear relationship. In the context of Malaysian higher education institutions, it is one of the most important aspects and is in high priority. The result could be a reference for researchers, institutions and universities that are working on topics related to sustainability in higher education.

Keywords: Sustainability, Higher Education, Community

INTRODUCTION

Sustainability as a topic that has been proposed in many conferences and agendas has gained the attention of many scholars, academicians, policymakers and business runners (Prugh, Constansa et al. 2000). However, the progress particularly in higher education is not only unsatisfactory (Lozano Garcia, Kevany et al. 2006) but also, according to Jenks- Jay (2000), has been extremely slow and frustrating. Shriberg (2002) declares that despite the activist call for sustainability in higher education, the result is not satisfactory. Based on the most popular definition of sustainability, which was suggested by Brundtland (1987), in the Common Future report, "sustainable development is a development that meets the needs of present without compromising the ability of next generation to meet their own needs", this issue at first addresses the needs of people. The concept encompasses three dimensions of needs; environmental, social and economic (Swart, Raskin et al. 2004). Universities are key institutions that can contribute to sustainability in different ways. The first officially statement in campus sustainability is Talloires Declaration in 1990 (ULSF, 1990). This declaration was signed in an international conference in Talloires, France which is a ten-point action plan for incorporating sustainability and environmental literacy among universities which was signed by presidents, rectors, and vice chancellors of universities from all regions of the world (ibid). Talloires Declaration depicts the scientists’ concern about the unprecedented scale and speed of environmental degradation, and the depletion of natural resources and the significance of universities in combating the unsatisfactory situations.
Sustainable Higher Education (SHE), has been defined by Velazquez et al (2006, p. 812) “a higher educational institution, as a whole or as a part, that addresses, involves, and promotes on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable lifestyles.” According to Saadatian et al, (2009) Malaysia has already recognized the concept of SHE and embarked into action by taking different initiatives in different rubrics such as 1) Sustainability in Policy, Planning, and Administration, 2) Courses and Curricula, 3) Research and Scholarship, 4) University’s Operation, and 5) Outreach and Services. The aim of this paper is to highlight the significance of community in sustainable Malaysian higher educational institutions.

BACKGROUND STUDY

Malaysia is a country that has achieved a high ranking in sustainability in the world by getting the second highest seat among Asian countries (Nine Malaysia Plan, 2006). It ranked 38 among 146 countries worldwide. In the fourth part of National mission of The Ninth Malaysia Plan, improvement of standard and sustainability of quality of life has been considered as one of the fundamental needs of the country.

Sustainable Higher Education In Malaysia And Its Challenges

Malaysia is a country that has achieved a high ranking in sustainability in the world by getting the second highest seat among Asian countries (Nine Malaysia Plan, 2006). It ranked 38 among 146 countries worldwide. In the fourth part of National mission of The Ninth Malaysia Plan, improvement of standard and sustainability of quality of life has been considered as one of the fundamental needs of the country. Malaysia has been active in SHE since its commencement. University Malaya is one of the 413 signatories of Talloires Declaration which was composed as a first official statement of university administrators of a commitment to SHE in the year 1990 at an international conference in Talloires, France (ULSF, 2010).

However education system in this country varies from other parts of the world due to different socio-political background. Hence it is essential to look at it in details. Education is an important portfolio in the Malaysian government structure, as reflected by the fact that all Prime Ministers, excluding the first Prime Minister, have been the Education Minister (Gerard et al, 1997). Malaysia has its own particular challenges in its higher education institutions, such as racial polarization, gender issues, and poor command of English as the major medium of international communication.

1. Racial Polarization

Malaysia has many different ethnic groups. According to Department of Statistic Malaysia Official website (2009), the population of Malaysia is 28.4 million. Based on the world fact book (2008) the proportion are; Malay 50.4%, Chinese 23.7%, indigenous 11%, Indian 7.1% and others 7.8%. Racial polarization is a reality and is very prevalent in the Malaysian higher education system, whereby students tend to group together according to their ethnic background (Malaysian National News Agency, 2008). Several interviews were conducted with the highest management of several Malaysian universities, namely UM, UKM, USM, and UPM. These interviews and observations over a period of three years, between December 2006 to December 2009, have ratified the existence of this challenge (Saadatian et al, 2009). Malaysian universities have taken many initiatives to
bring about integration of all ethnic groups together such as organizing cultural shows, sport carnivals as in figure 1, student orientations, competitions, and supporting 1Malaysia programmed which is a programmed aimed at enhancing solidarity and unity among all ethnic groups. For example various ethnic students of Universiti Putra Malaysia on 17th January 2010 gathered to commemorate Indian festival called Ponggal (UPM, 2010) as in figure 2.

![Figure 1](image1.png)

**Figure 1:** Malaysian Universities try to depolarize ethnical group by arranging different social event in campuses.

![Figure 2](image2.png)

**Figure 2:** UPM students of different races attend ponggal. (Source UPM website, 2010)

2. Gender issues

Based on Dr. Richard Leete’s report for United Nations Development Program (2004), Malaysia's ranking in the UNDP gender index was not as high as it should be. The ratio between female to men in Malaysian Universities, except Polytechnic, is 2:1. Generally there are more female in campuses. The gender imbalance does not satisfy the world standards. Besides this imbalance proportion not only endanger the future job market of the country but also create some problems in terms of campus management. This can be observed even in the simplest subjects in campuses such as possessing the same number of toilets for males and females which the former is being underutilized and the latter is over utilized.

3. Poor command of English language

Another challenge in Malaysian Higher Education institutions is poor command of English as an international medium which can connect all people together apart from their ethnic group and their own mother tongue (Pandian, 2002). The observations of the authors for
the time span of three years and several interviews which was conducted among university high authorities and experienced lecturers ratified that poor command of English is very prevalent not only among international students but also among local students and even university staffs.

Sustainable Higher Education (SHE)

The first campus sustainability assessment was an audit performed in University of California, Los Angeles (UCLA) in 1988 (Creighton, 1988). However, in international level it started from Talloires Declaration in France as a first official statement, with more than 265 universities as signatories in 1990 and proceeded to Johannesburg Summit in 2002. Consecutively, the importance of education in aiding societies to move towards sustainability, worldwide, was emphasized. To support this agenda United Nation Educational, Scientific and Cultural Organization (UNESCO) took the first initiative on a worldwide basis to foster this trend. A framework entitled Decade of Education for Sustainable Development, officially launched in January 2005 and is expected to be completed by December 2014 (Lozano et al, 2006). The universities can bear responsibilities for knowledge and awareness enhancement of university’s stakeholders while boosting the current technologies and tools toward sustainability. They can have an influential role in other local organizations through partnerships, working for more sustainable life (Barnes and Phillips, 2000). Many popular books like Ecodemia (Keniry,1995), Earth In Mind: On Education, Environment and the Human Prospect (Orr 1994), Greening the Ivory tower (Creighton 1998) and Sustainability on Campus: Stories and Strategies for Change (Peggy F. Barlett, W. et al. 2004) have addressed the importance of this topic.

Approaches to Sustainable Higher Education

Ten different approaches have become popular in campus sustainability especially in North America and Canada. Their popularity is based on Google hit for a span of six month every month four times as shown in the following figure. Among those ten, four most popular ones will be discussed and analyzed.
A simple audit in University of California, Los Angeles (UCLA) in 1988
MacLean's Magazine Annual Guide to Canadian Universities
Canadian Centre for Policy Alternatives Missing Pieces Reports I, II, and III in 1999
National Wildlife Federation of the State of the Campus Environment
Good Company’s Sustainable Pathways Toolkit
Campus Sustainability Assessment Review Project
Penn State Indicators Report
Association for the Advancement of Sustainability in Higher Education Sustainability Tracking, Assessment and Rating System "STARS"
University Leaders for a Sustainable Future Sustainability Assessment Questionnaire "(SAQ)"
Campus Sustainability Assessment Framework, "CSAF"

Figure 3: Mean Number of its in Google search for each approach for a period of 6 months between Jan 2009-Jun 2009 (every months four times)

1. Association for the Advancement of Sustainability in Higher Education’s approach (AASHE)

This approach as a new approach has gained the interest of many higher education institutions. AASHE is an association, which has been founded in 2006 with a mission to promote sustainability in future campuses (STARS, 2008). This institute has proposed a rating system, which is called Sustainability Tracking Assessment and Rating Systems STAR.

2. University Leaders for Sustainable Future approach (ULSF)

Association of University Leaders for a Sustainable Future is an institute, which tries to support sustainability at colleges and universities worldwide via publications, research, and assessment (ULSF, 1992). It works as the Secretariat for signatories of the Talloires Declaration. More than 350 university rectors in more than 40 countries have signed this Declaration (Ibid), including University Malaya.

3. Campus Sustainable Assessment Framework approach (CSAF)

Campus Sustainability Assessment Framework was created by the Sierra Youth Coalition and Lindsay Cole (2003) in Royal Roads University. CSAF is a systematic formula being used in analyzing the “sustainability” of Canadian campus.

4. Penn State Indicators Reports approach (2000)

Penn State Green Destiny Council in USA has performed this approach at first in 1998 and completed in 2000. A team of 30 undergraduates and graduated students and several faculty members and professional conducted this approach.

METHODOLOGY

Archival method and document analyses have been selected as the main methodology of the study. Hence several important and popular approaches of SHE have been perused deeply and its relationships to community have been identified. Since Malaysia has recently started to work on SHE issues, The Ninth Malaysian Plan and Malaysian education system challenges have also been studied. Observations and interviews have been employed to validate the Malaysian higher education’s challenges. For validating the
finding a questionnaire survey (using Likert scale) was conducted among the Malaysian professional in the realm of sustainable higher education who were attending 3rd International Conference on Sustainability in Higher Education, which took place in Penang, Malaysia on 20 – 22 November 2009.

Validation

Analyzing the data using SPSS software led to the same result which archival research had already presented. See figure 10,11,12, 13

ROLE OF COMMUNITY IN CAMPUS SUSTAINABILITY

Campuses have a direct relationship with their neighborhoods community and their own community has an essential role in its sustainability rating. In the first document of campus sustainability, Talloires Declaration (1990), this issue was considered in the sixth statement of that document. AASHE has categorized different subject pertaining sustainability in three groups. These are 1- Education and Research, 2- Operation 3- Administration and Finance. Community Relationship and Partnership, as a topic with direct effect in campus sustainability, has been suggested in Administration and Finance part. Those six items are

1-Community service infrastructure (AF Credit13)
2-Student participation in Community Service (AF Credit14)
3-Student Hours Contributed in Community Service (AF Credit 15)
4-Financial Incentive for Public Service Careers (AF Credit 16)
5- Outreach and Partnerships Carnegie Designation (AF Credit 17).

Based on the AASHE points it is observed that the most important issue in Administration and Finance is Community. For calculating the importance of different issues the following formula has been used : (I=P/(TP) where

I= Importance of issue
P=Possible points of any issue
TP=Total Points of that the actors in the same category.

A: Planning, B: TrademarkLicening, C: Sustainability Infrastructure
D: Investment Community E: Diversity Access and Affordability F: Human Resources G:
University Leaders for Sustainable Future (ULSF) has provided a set of questionnaire for evaluating the level of sustainability in a higher education institution. It has divided actors into seven groups, namely: 1- Curriculum, 2- Research and Scholarship, 3-Operations 4- Faculty and Staff Development and Rewards 5- Outreachs and Services 6- Student opportunities, and finally 7- Institutional Mission and Structure. Among these groups, two groups directly address community related issues. Outreach and Services focuses the relationship between Community Sustainability and Higher Education Supports in its local and surrounding region. Student Opportunities category, focus on the opportunities which has been provided for student's group as a small community. In the Faculty and Staff Development and Rewards category, two out of three questions have addressed the issues, which finally affect that regional community (ULFS, 1999).

If we assume the number of questions as an indicator for the importance of that issue, and assume Outreach and Services and Student Opportunity as a community indicator the significance of community is made obvious. By using the formula \( I = \frac{NQ}{TNQ} \), where

\( I \) = Importance of issue  
\( NQ \) = number of questions in that field  
\( TNQ \) = Total number of questions

The result illustrates the significance of community as shown in Figure 5.

Figure 4: The Importance of different subjects in Campus sustainability based on AASHE (STARS ver5)'s points in Administration and Finance Group

Figure 5: The importance of different subjects in campus sustainability based on Sustainable Assessment questionnaire of ULSF

Lindsay Cole, (2003) in Royal Roads University in Canada has proposed Campus Sustainability Assessment Framework (CSAF) which has been constituted based on several different indicators. These are People and Ecosystem. Ecosystem includes 1- Air, 2- Water, 3- Land 4-Material and 5-Energy. People comprises of 1-Knowledge, 2- Community, 3-Governance, 4-Health and 5-Wealth and Economy.
Addressing the term Community in a separate group is an index for showing its importance. As much as a topic is more important, it attracts more attention of people (Ann Renninger, 2003).

If we assume the number of indicators as an index for importance of this issue, the result will indicate that Community Sustainability is the most important issue for achieving sustainability in CSAF. By using the formula \( Ip = \frac{Npi}{Tnpi} \), where:

\( Ip = \) Importance of an issue in People category  
\( Npi = \) Total number of indicators in people category

The result as shown in Figure 6 will appear.

![Figure 6](image)

**Figure 6**: The importance of different subjects in CSAF based on the ratio of specific group indicators to all people’s group indicators

The results indicate that even in Campus sustainability assessment framework, community activities is functioning a very important role in the process of assessment. Penn State Indicator Reports starts the Community issue by this slogan: "All Stakeholders in the university – student, faculty, staff, administrators, trustees, parents, and the public..."
have a right to expect that the university will strive to be a civil community of learning; all have an obligation to make it happen. By using the formula \( \text{Ip} = \frac{\text{Npi}}{\text{Tnpi}} \), where:

- \( \text{Ip} \) = Importance of an issue in People category
- \( \text{Npi} \) = Total number of indicators in people category

The result as shown in Figure 8 will appear

![Figure 8](image.png)

A: Decision Making  B: Built and Environment  C: Energy  D: Food  E: Material  F: Transport  
G: Water  H: Land  I: Research and Scholarship  J: Community

**Figure 8**: The importance of different subjects in campus sustainability based on Penn State Indicator Report

The figure above shows how important is the Community issue in comparison to the other actors in this approach. Penn State has declared that they have emphasized more on community since they believe it is one of the important efforts that should be concentrated constantly. It articulates that maintaining a sustainable campus requires maintaining a healthy community. More over it emphasizes on the role of education for having students in a successful and responsible life as part of a society.

**QUESTIONNAIRE SURVEY**

The study employed another validation method to capture the opinion of Malaysian experts who are working in the realm of sustainable higher education across the country. Figure 9 shows The 3rd International Conference on Sustainability in Higher Education, which took place in Penang, Malaysia on 20 – 22 November 2009, was selected as the venue to conduct the questionnaire survey.

![Figure 9](image2.png)

**Figure 9**: 3rd International Conference on Sustainability in Higher Education 2009
Questionnaire

Altogether 59 papers were submitted and 112 experts attended the conference. A random sample method was used according to Mitra and Lankford’s formula, where population = 114, Percentage=50, Confidence interval= 12.54 and confidence level considered 95% as a result, N = 40. Hence 43 questionnaires were distributed out of which 40 were returned. The questionnaire objective was to grasp the perception of experts on the importance of different aspects of sustainable campus. Variable as in Appendix 1. A descriptive analysis of the questionnaire results are shown in Appendix 1.

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

Reliability Coefficients
N of Cases = 40.0                    N of Items = 2
Alpha = .9743 which is acceptable

Validation diagrams (Perception of experts)

This part is the result of analyses of the opinion of experts in the realm of SHE who ratified the importance of community aspect by voting %97.5 as “strongly agree”. It shows that the experts are aware of the structure and challenges of Malaysian Higher Education and the role of Campus Community in contributing to Sustainable Higher Education.

Figure 10: Percentage of strongly agree on different subjects.
DISCUSSION

As sustainability is concerned with social, economic, and environmental issues, all of these concerns should be addressed sufficiently and fairly. However, on different countries those differ from each other. In this regard the most important documents in national and international level which can identify the most important subjects have to be reviewed. Hence employment of an archival analyses methodology should lead to an acceptable result. Comparative analyses on frequency of referring to different approaches using Google search engine as an indicator, lead us to find out which approach has been used widely. It has been argued that comparative statistical analysis of the four most popular sustainable campus approaches, has given proof of the importance of community related topics in campus sustainability. In this comparison Community’s importance values in ULSF approach; 25%, CSAF; 24%, Pen state Report; 15.10%, STARS 24% are the first highest importance values comparing to the Second highest values which are 24%, 21%, 12.10%, 18% (see: figures 4, 5, 6, 7, 8).

The existing of social challenges in Malaysian education system, such as the existence of ethnic-based polarization and imbalance of gender enrolment in higher education, seems to be a strong barrier to SHE trend in the country. Finally, The Nine Malaysia Plan focus is more on social issues than environment or economic. Malaysian professional opinion imparts that community is the most important issue in sustaining Malaysian Higher Education where 97.5% of sample population declared their strong support of addressing the subject of community in research and initiatives. All of these together do reflect that Malaysian higher education institution needs to become more sustainable particularly in community issues.
CONCLUSION

In higher education institutions, community emerges as an effective actor, implying an important role in its total sustainability. In Malaysia the focus of The Ninth Malaysia Plan is more on social aspects rather than economic or environmental issues. It has been concluded for starting to work or fulfilling a research on sustainable higher education particularly in Malaysia focusing on community issues is a logical decision. The Malaysian experts believe in the community aspect is the most important issue which should be addressed very fast. It goes without saying Universities and colleges through community services, volunteerism, engagement, partnership, not only enhance their own sustainability level but also empower the student leadership skills.

REFERENCES


Penn state indicators report (2000). Steps Toward A Sustainable University, Penn State Center for Sustainability.


ULSF (1999). University Leaders for Sustainable Future, Sustainable Assessment Questionnaire


APPENDIX

Please indicate your opinion with each of these Statements in the context of Malaysian Public Universities.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Volume 3, 2010 126 ISSN: 1985-6881
1- Researching and working on knowledge will be very necessary activity for fostering Malaysian Higher Education towards sustainability
2- Researching and working on community will be very necessary activity for fostering Malaysian Higher Education towards sustainability
3- Researching and working on governance will be very necessary activity for fostering Malaysian Higher Education towards sustainability
4- Researching and working on economy and wealth will be very necessary activity for fostering Malaysian Higher Education towards sustainability
5- Researching and working on well-being, health will be very necessary activity for fostering Malaysian Higher Education towards sustainability
6- Researching and working on air will be very necessary activity for fostering Malaysian Higher Education towards sustainability
7- Researching and working on water will be very necessary activity for fostering Malaysian Higher Education towards sustainability
8- Researching and working on land will be very necessary activity for fostering Malaysian Higher Education towards sustainability
9- Researching and working on material will be very necessary activity for fostering Malaysian Higher Education towards sustainability
10- Researching and working on energy will be very necessary activity for fostering Malaysian Higher Education towards sustainability
11- Energy is an essential issue in an higher education learning
Descriptive analyses on the questionnaire result

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<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
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<td>1.00</td>
<td>3.00</td>
<td>1.8750</td>
<td>.0630</td>
<td>.163</td>
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<td>Community will be very necessary</td>
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<td>1.00</td>
<td>1.00</td>
<td>2.00</td>
<td>1.0250</td>
<td>.0250</td>
<td>.025</td>
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<td>1.00</td>
<td>3.00</td>
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<td>.230</td>
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<td>.163</td>
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<td>Well-being, health will be very necessary</td>
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<td>Land will be very</td>
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<td>.122</td>
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<td>necessary</td>
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<td>1.00</td>
<td>3.00</td>
<td>1.9000</td>
<td>.0599</td>
<td>.37893</td>
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<td>3.00</td>
<td>1.2500</td>
<td>.0780</td>
<td>.49355</td>
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<tr>
<td>Energy is an essential</td>
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<td>1.00</td>
<td>3.00</td>
<td>1.2750</td>
<td>.0800</td>
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<td>Valid N (listwise)</td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Reliability of the results
Energy Saving Opportunities and Challenges
(Case study: Universiti Teknologi PETRONAS)

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ABSTRACT
The Building Energy Index (BEI) reported for Universiti Teknologi PETRONAS (UTP) shows that the campus has not performed as low energy building. Inefficient electric fixtures installed and low awareness levels on energy conservation among occupants are consider being the major cause. The aim of this paper is to investigate the root cause of the excessive electricity consumption of UTP buildings and analyzing the impact of human behavior. Two surveys: building survey and questionnaire survey are proposed to achieve these objectives. The building survey is used to gather information pertaining energy consumption in UTP. Due to the restricted availability of data, 3 buildings namely Building 13, 14 and Pocket C were selected to represent the whole UTP. The questionnaires were distributed among the end-users of the three buildings to determine information regarding energy consumption from their perspective. The results established that building survey, energy apportions and performance monitoring approach is a suitable method to investigate the root cause and potential solution to retrofit the UTP buildings. Finally, by identifying all the possible challenges, opportunities on energy saving is identified for retrofitting to significantly reduce the overall BEI of UTP buildings.

Keywords: Building Energy Index, Energy Challenge, Energy Efficiency, Energy Saving Opportunities.

INTRODUCTION
Buildings are accountable for uses many resources and energy; therefore buildings have significant and continually increasing impact on the environment (Castro et al., 2008). Through energy conservation, environment can be preserved and cost savings can also be made. Dan et al. (2007) has reported that an essential element of the sustainable building is the encouragement of efficiency and the rational use of energy.

Honeywell Pte Ltd did the energy audit assessment in University Technology PETRONAS (UTP), it was starting from 25 October 2008 to 3 November 2008 the cooling load performance have been monitored (Xavier, 2008). The reported shows that the total estimated existing energy consumption of AHU’s and MV fans per year in UTP is 5,576,090 kWh/Year which equals to RM 1,672,827/Year at RM 0.30/kWh for year 2008. According to Shaarani (2009), BEI of UTP for the year 2007 is 287 kWh/m2 for the year 2007. This is an indicator that UTP is way too far from the good energy management.

The high cost to be paid due to high energy consumption in cooling the building has triggered the authority to find the root cause of this energy matter. High cooling demand due to inefficient devices and fixtures used were suspected to be the major cause. Besides, human behaviors towards energy consumption were suspected to contribute a lot in inefficient of energy usage. As to be in line with international and
government calls for energy efficient building, retrofitting ideas were come as the main solution.

High cost to be bear due to inefficient and out-of-control energy consumption is highly unfavorable. Building Energy Index calculated by Shaaran (2009) is more than the average BEI of 285 kWh/m2/year in Malaysia and too much exceeding the BEI for Low Energy Office of 135 kWh/m2/year. Even UTP has its own Gas District Cooling (GDC) Plant to supply chilled water and electricity to all its buildings, the over-used of electricity is still considered as bad attitude since high energy consumption results in high emissions of the green house gasses in order to generate the electricity. Focus narrowed to human behavior and thermal comfort due to complaints received regarding unsatisfied thermal comfort inside academic area. Electric devices and fixtures installed are believed to be inefficient based on too much heat generated and too high intensity light production. Observations on human behavior also show lack of concern and awareness towards the importance of energy savings and efficiency amongst the UTP students and staffs.

The main objectives of the project are as stated below:

1) To gather information regarding electric fixtures installed that may contributes to high cooling demand in Building 13 and Pocket C.

2) To analyze the impact of human behavior and thermal comfort towards cooling load demands.

3) To propose practical and economically efficient solution or energy saving opportunities to UTP management in order to energy retrofit UTP buildings.

Due to the missing and unavailability of data, the research and study area was limited to Building 13, Building 14 and Pocket C to represent the real situation for whole UTP area. Building 13 and Building 14 were chosen to represent all the academic buildings, while Pocket C was chosen to represent both Pocket C and Pocket D. This project will cover more on the human behavior and thermal comfort. For thermal comfort aspect, it includes investigation on heat generation from all electric fixtures, and surveys on the occupants’ comfort level. Investigation on human behavior was targeted on measuring level of awareness and attitude of human towards energy usage.

RESEARCH METHODOLOGY

Information and Data Gathering

The data that had been collected are:

- University Technology PETRONAS (UTP) Electricity Bills.
- UTP Buildings layout (building 13, 114, and pocket C)
Hypothesis was concluded based on the information analyzed from the data gathered. Due to high cooling demand, inefficient use of energy due to inefficient fixtures use and human behavior was selected to be the hypothesis.

Hazard Analysis

Hazard analysis is conducted before further work processes can be proceeded to ensure a safe work flow is practiced. The analysis is focused on hazard when doing the building survey and working with or testing and electrical equipments.

Building Survey

This method is planned to be conducted to give an insight and self-experience towards the energy consumption of the buildings. In addition, more information regarding energy consumption was acquired from the building survey through inventory activities, occupancy schedules monitoring, human behavior monitoring and questionnaires. It is also to validate the hypothesis assumed during the data gathering stage.

End-use Load Apportioning

The data gained by performing previous methods were used to apportion the total building load into its major end-use loads.

Performance Monitoring

UTP Building System performance was monitored during a visit to UTP Control Room. Readings available or obtained from Control Room were analyzed and used as an indication for UTP building performance. Readings of various building systems obtained from UTP Control Room were compared to MS 1525:2007 to check on the compliance of UTP system to the standard as conclude in Table 1.
Table 1: Indoor Design Condition for Air-Conditioned Space (MS 1525:2007).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Required Design Value</th>
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</thead>
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<tr>
<td>Dry Bulb Temperature</td>
<td>23°C – 26°C</td>
</tr>
<tr>
<td>Minimum Dry Bulb Temperature</td>
<td>22°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>55% - 70%</td>
</tr>
<tr>
<td>Air Movement</td>
<td>0.15 m/s – 0.50 m/s</td>
</tr>
<tr>
<td>Maximum Air Movement</td>
<td>0.7 m/s</td>
</tr>
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</table>

Identification of Energy Saving Measures and Reporting

Based on the field collected data, energy apportioning and the results obtained from performance monitoring, few saving measures were listed. The most practical and effective solution that supported by reliable engineering calculation were suggested

ELECTRICITY IN BUILDING SECTOR

World Electricity Demand and Generation

Stansbury and Mittelsdorf (2001), said that according to USEPA (1996), every kWh of electricity produced produces and average of 680g of carbon dioxide, 5.8 g of SO₂, and 2.5g of NOₓ. It is also noted by EPA that mercury emissions are approximately 0.04 mg/kWh.

Many acts were regulated to restrict and control the emissions of pollutant gas to the air. The regulatory incentives includes Executive Order 12902 (EO 12902), Title IV of the Clean Air Act (Acid Rain Program), EPA's Acid Rain Program Overview etc. In general, all the regulation mandates the reduction of energy consumption that has to be complied and restriction on maximum emission allowed for federal agencies. By strict enforcement of law, the entire mission to reduce GHG emission could be easily accomplished. Thus, to prevent serious implication to the environment, governments have called for sustainable energy development which includes energy conservation and retrofitting to reduce energy demands.

Awareness towards energy conservation and retrofitting had increased, and various steps towards the implementation have started. This is proven by emergence of various energy performances labeling as known as green building rating system. The earliest rating system was Building Research Establishment Environmental Assessment Method (BREEAM) from UK, first used in 1990. The leading rating system in United States is Leadership in Energy and Environmental Design (LEED), created by the US Green Building Council (USGBC). Then, several other countries and regions have developing related spin-offs inspired by BREEAM and LEED (Gowri, 2004).

Electricity in Malaysia

According to Renewable Energy in Asia, Malaysia has recorded total available generating capacity of 19.3 GW at the end of 2003, which is a 23% increase compared to year 2002. In term of electricity generation, 6% of increase has been recorded in the year 2003, with electricity generation of 82,406 GWh. The peak demand for Peninsular Malaysia was 11,329 MW, for Sarawak 609 MW, and for Sabah 461 MW (based on
Based on Economic Planning Unit (2005), in Malaysia The National Petroleum Policy had been formulated in 1975 aims at regulating the oil and gas industries to achieve overall economic development need. It was then followed by The National Energy Policy (NEP) in 1979. NEP is regularly updated to ensure it meets the recent condition. The latest three principal energy policy objectives of NEP as stated in Ministry of Energy, Water and Communication official website are:

1) The Supply Objective
2) The Utilization Objective
3) The Environment Objective

Efficient utilization of energy falls under the utilization objective policy. Under this policy, government is trying to promote the efficient utilization of energy and to discourage wasteful and non-productive patterns of energy consumption.

Energy Audit Assessment Report of UTP prepared by Honeywell Pte Ltd. shows that the total estimated energy consumption equals to RM 1,672,827/Year at RM 0.30 kWh/Year. According to Xavier (2008), the cooling demand of UTP is very high and this is due to unnecessary air intake openings, ineffective operational hours of Secondary Chilled Water Pump (SCHWP) and high water set point.

As calculated by Shaarani (2009), the BEI of UTP is 287 kWh/m². The BEI calculated is too high and it is way too far to meet the government requirement for Low Energy Office (LEO) buildings. BEI for LEO is 135 kWh/m². The high energy consumption was already expected since the same phenomenon happened to almost all schools and universities and it always need to be refurbished.

Due to this matter, the project of UTP Energy Retrofitting is planned to reduce UTP cooling load and energy consumption and thus, to be in line with government calls for energy efficiency.

ENERGY SAVING OPTIONS

Building Retrofitting

According to World Business Council for Sustainable Development (2008), 40% of the total energy demands in almost all countries come from buildings, and will continuously increase rapidly parallel to economic development, population growth and human lifestyle. Thus, by retrofitting a building and adaptation of positive attitude towards energy consumption, percentage of energy demands can significantly be reduced and contributes toward energy efficiency.

For retrofitting method, Erhorn (2007) mentioned that retrofitting actions and measures can be learned from case studies on previous retrofitting action done by others. This is due to similar construction of public-owned buildings and thus, the experiences and improvements can be learned regionally and internationally.
Utilization of Energy Efficiency Equipments

Among the benefits stated in converting to energy-efficient (EE) system is a decrease in cooling demands due to less heat generation by EE system. Especially for lighting system, greater luminescence and colour rendering produced through combination of EE lamp and electronic ballast results in less fixtures needed for sufficient lighting.

Recently, there are many EE lighting product penetrating the markets. Among the well-known EE fixtures are Compact Fluorescent Lights (CFL) and Light Emitting Diode (LED) which are the products of revolutionized energy-efficient lighting. The comparison between conventional Incandescent Light (IL) which have average lamp life only 750 hours with CFL light which can reach average lamp life until 10 000 - 20 000 hours. Since cost-saving is among the significance parameter in evaluating any technology to be adopted, the EE lighting has to be appeared as less costly. Even the price of the CFL is about 10 – 15 times higher than IL, through energy savings and long lamp life, the CFL is able to counter pay the high purchasing cost invested and in long term results in greater cost saving.

HVAC System Improvement

According to ASHRAE (2006), most of the problems regarding Indoor Air Quality (IAQ) were detected due to the Heating, Ventilating and Air-conditioning (HVAC) problems such as system malfunction and improper operation and maintenance. Such disturbance in the HVAC system may results in huge energy wastage by the system.

HVAC system is designed in such a way so that it can supply, mix and circulate fresh air to the interior space of the building to the designated thermal comfort. Thus, the malfunction of HVAC systems will results in poor IAQ which includes relative humidity (RH), carbon concentration, air motion and etc.

RH is the ratio of water that the air holds over the total of water that the air can holds when it was saturated. Larger RH indicates that the air contains much water and cannot receive more water, including the sweat generated by human to cool the body. Such condition results to hot and stuffy feelings too many people even at suitable temperature and will results in unnecessary additional heating. To overcome this, the HVAC system itself has to be well-functioning to maintain the indoor air humidity and thus increasing the energy efficiency of the system and cause energy saving.

Green Building Index (GBI) Management Tools

GBI rating for Non-Residential New Construction (NRNC) building was used as a base for this study since no guideline developed yet for existing building in Malaysia. The GBI Rating is giving rating to building performance start from Platinum (the highest point) to Gold, Silver, and Certified (the lowest point). GBI Assessment Criteria is the further breakdown of the criteria to be assessed for determination of Green Building Index as shown in Figure 2.
For energy efficiency item, progressive reduction on Building Energy Index achieved by assessed building will results in increasing of points. In addition, increasing number of total energy consumption generated by renewable energy also causes increase in points. Lighting zoning was also listed as one of the assessment criteria where each implementation related to lighting zoning such as installation of sensor and individually switched lighting zone will carry 1 point.

For Indoor Air Quality, thermal comfort that designed according to ASHRAE 55 in conjunction with the relevant localized parameter in MS 1525:2007 will carry 1 point. Electric lighting levels also must meet the MS 1525:2007 standard to get the additional 1 point.

RESULTS AND DISCUSSION

Building Energy Index (BEI) per Building

According to Sharip et al. (2007), calculation obtained building 13 and 14 seem to perform well since both values are lower than proposed standard of 136 kWh/m²/yr by the guidelines, which reflects the level of energy efficiency expected to be achieved.

Table 2: Summary on BEI Calculation as per Building.

<table>
<thead>
<tr>
<th>Building 13</th>
<th>Building 14</th>
<th>Pocket C</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEI&lt;sub&gt;13&lt;/sub&gt;= $\frac{376,072}{3,067.859}$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
<td>BEI&lt;sub&gt;14&lt;/sub&gt;= $\frac{376,072}{3,569.396}$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
<td>BEI&lt;sub&gt;C&lt;/sub&gt;= $\frac{301,352}{990.450}$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>$= 122.5$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$= 105.36$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
<td>$= 304.26$ kWh/m&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

However BEI for the Pocket C is 304.26 kWh/m<sup>2</sup>, which exceeds the worst case range of 200-300 kWh/m<sup>2</sup> stated in MS 1525:2007. BEI value that exceeds 240 kWh/m<sup>2</sup> indicates the worst case represents buildings that are among the most energy intensive buildings that might be encountered in Malaysia today. Bulk electricity bills received by UTP are based on annually basis and are summarized in Table 3. The total consumption in year 2008 shows significant reduction of total consumption compared to year 2007.
Table 3: Summary on Annual Total Energy Consumption.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Energy Consumption (kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>26,629,550</td>
</tr>
<tr>
<td>2008</td>
<td>25,982,110</td>
</tr>
<tr>
<td>2009 (in January only)</td>
<td>1,959,281</td>
</tr>
</tbody>
</table>

Source: UTP Property Management and Maintenance Department

Building Survey

Conclusions that can be deduced from the building walk-through survey are:

1. In UTP, humans attitude and awareness towards energy saving and conservation is still low regardless of their position either students, lecturers or staffs. They seem to be unaware or did not really care of the impact of wasteful energy consumption pattern towards the environment.

2. Lighting systems in UTP (for corridor lighting) seems not functioning well since it is opened during the day time. The use of motion sensor should be considered to avoid this kind of energy wastage as being highlighted in GBI assessment tools.

3. UTP lighting system is inefficient based on excess heat generation emitted and high level of intensity and glare produced by the lights. In addition, due to excess heat felt and high level of glare, it is believed that some of the lighting system installed did not meet the requirement of Malaysian Standard on luminance. GBI Assessment Tools is highly encourage lighting standard to comply with the Malaysian Standard or MS 1525:2007 and compliance will results in additional of 1 point.

Energy Survey

GBI Assessment Tools was used as a base in analyzing the data, however for this paper; main focus was given to 2 items under GBI Assessment Tools namely “Energy Efficiency” and “Indoor Air Quality”.

As a result, for energy efficiency, UTP temperature is not consistent, which is too cold for lecturer's offices and quite hot for lecture theatres. This is due to lighting system in Pocket C that produces much heat and cause the theatre to be hot. There are also cases where the AC is not functioning and the classrooms are extremely hot due to no air circulation. UTP concept which is windowless makes the situation worst. All these situation show that UTP AC system is not responsive to temperature changing as it should be as an automated building system.

The result finding is UTP Lighting system at Academic Building is satisfied. However for Pocket C, the light is too intense and produces too much heat. In addition, the corridor lighting is not being turned off even it is day time. It was understands that all UTP lighting should be automated and controlled from the UTP Control Room. Humans / occupants’ attitude toward energy conservation is low. There is no awareness among them even to turn off used appliances including shared electrical appliances. UTP Management seems to be unaware and less effective in handling the energy issues.

As a proof, reported cases of any malfunction device were not immediately solved. In addition, the turned on light during the day time was not even solved until now and it shows like UTP Management do not have control or monitoring system in handling any
malfuction or error in UTP lighting and AC system. All these conclusion obtained from
the survey result has triggered and interview session with Control Room staffs to get
the clear picture of the real situation happening regarding the UTP Control System.

End-Use Load Apportioning

All loose electrical fixtures for Building 13 and 14 have been recorded and the energy
consumption as per year 2008 has been calculated using desktop computation
method. Since total electricity for Building 13 & 14 is 300,858 kWh, percentage of
energy consumed by laboratory equipments from the total electricity consumption of
both buildings is:

\[
\frac{146,769.119 \text{ kW.h}}{300,858 \text{ kWh}} \times 100\% = 49\%
\]

This means that another 51\% is solely comes from electricity that consumed by
occupants for other activities that using the electrical appliances in both building.
Based on this rough calculation, percentage of potential saving can be estimated as
shows in Table 4.

Table 4: Estimation on Potential Saving resulted from Energy Retrofitting.

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage of Electricity Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Equipments and Activities</td>
<td>49%</td>
</tr>
<tr>
<td>Phantom Load</td>
<td>11%</td>
</tr>
<tr>
<td>Lightings and Electrical Appliances in Offices and Classrooms.</td>
<td>20~30</td>
</tr>
<tr>
<td>Potential Savings</td>
<td>10~20</td>
</tr>
</tbody>
</table>

UTP Control Room

Refer to overall observation it can be concluded that:

- UTP automated building system is not fully utilized and maintains to achieve
  energy efficiency system.
- The operator that handling the system seems not really understands about the
  system thoroughly. More training and related course should be provided to
  make them well trained and fully understands about the system. This is
  important to ensure that the operator could detect any of abnormal equipment
  or system conditions so that troubleshooting work can be done.
- Less coordination between related subcontractors in the same engineering
  trade and also interrelated management departments are detected. The well
  coordination of integration of equipment subsystems is vital for automation
  building system as had been stated under clause 9.4b of MS 1525:2007 to
  ensure the improvement of safety, indoor air quality, information management
  and overall system reliability.

ENERGY SAVING CHALLENGES

Human/ Occupants' Self-attitude

Survey done shows that level of awareness among occupants on energy saving is still
very low, which contributes toward the wasteful energy consumption pattern. Existence
of notice seems to be not an effective method to prevent energy wastage. Calls for
energy conservation are just being ignored.
Occupant’s Ignorance

Level of human/occupants’ knowledge on energy efficiency is not measured for this research. However, it is believed that many of the occupants are not really understanding the energy efficient concept which is still prioritised the comfort level of the occupants while trying to reduce an impact to the environment by conserving the energy.

In addition, misconception about GDC System as a non-polluted source of energy may lead to the wasteful energy consumption pattern. The GDC System is actually provided less polluted energy source, but still polluting if wasteful energy consumption pattern continuously being practiced.

High Switching Cost

Based on the price of various EE appliances in the market, it is agreed that the cost is high compared to conventional electrical appliances. Thus, switching cost, especially for a bundle of appliances will cost a very high switching cost. However, study and experimental works had proved that the operating cost is much cheaper due to less electricity used, plus longer life span of EE appliances or equipments. The saving incurred on the operation cost will counter pay the high switching cost.

Lack of enforcement body

There is no enforcement body to enforcing and emphasizing on the energy conservation and energy efficiency issue.

ENERGY SAVING OPPORTUNITIES

Utilization of Energy Efficient Lighting Appliances

High lighting intensity and excess heat emission generated by all lights at lecture theatres shows that the lighting system in lecture theatres are not efficient and lead to wasteful energy consumption pattern. Thus, switching to EE lighting system that meets the illumination standard as in MS 1525:2007 will reduce the energy consumption and increase the productivity level of the occupants.

Design an Obligate Energy Conservation Rules

UTP Management should design and obligate rules that can contribute towards energy conservation. Among the potential rules that can result in huge energy savings are:

1. Turn off all PCs and all lightings if not in used during lunch hour.
2. The last person leaving the lecture theatre or classrooms must turn off the light if there is no other class after that. Lecturers must also cooperate in reminding their students on this rule.
3. All UTP PC must set to shorter interval to change to hibernate or stand by mode when not in use in order to reduce energy consumption.
4. All equipments must be plugged off before went back home to eliminate the phantom load.
Appoint an Energy Master

As a building that have huge air conditioned area, plus that is using automation building system to control the system, UTP should hire an Energy Manager to manage and control any energy issues arise for the UTP Building. The energy Master will also act as a coordinator between all subcontractors of various systems under the building automated system. By that, the problem of poor coordination and integration between all the subcontractors can be solved.

In addition, Energy Master at student level may also be appointed on residential block or classrooms basis to monitor and to enforce the energy saving rules among students.

Ban Unnecessary Electrical Appliances

Based on the survey results discussed in previous section, there are unnecessary electrical appliances were brought to UTP that is just for fulfilling personal needs instead of for teaching and learning purpose and being charged using UTP electricity. These unnecessary items like refrigerator, subwoofer, and coffee maker are not supposed to be brought to UTP. Plus, they will cause high electricity consumption.

Provide Energy Management System (EMS) Course

Training and education is among the best opportunities to equipped occupants with the knowledge regarding the importance of energy conservation and its impact towards the environment. The effectiveness of such courses has been proven by the effectiveness of Health, Safety and Management course in minimizing the accident cases. Thus, it is believe that the EMS course can be effective in minimizing the energy consumption, besides eliminates the wasteful energy consumption pattern.

CONCLUSIONS

Based on data and findings presented in previous chapters, it can be concluded that the high energy consumption of UTP buildings are due to various factors which are:

1. Low awareness level among occupants.
2. Energy inefficient fixtures installed which lead to poor thermal comfort as can be seen when most of temperatures inside UTP buildings are either less or beyond the standard temperature for comfort cooling of 23°C to 26°C as in MS 1525:2007.
3. Irresponsive automated building system.
4. Less coordination between related departments and lack of enforcement on energy efficiency and conservation.

All these lead to wasteful energy consumption pattern which is contrast with government calls towards practical demonstration of working towards realizing the utilization objective. Those above mentioned factors also shows incompliance with GBI Assessment criteria which will results in low points and poor ranking in GBI rating.

Research also reveals the inconsistency of UTP building performance where certain buildings are performed efficiently; while certain buildings are perform inefficiently. This inconsistency is actually leads to poor overall BEI of UTP buildings. Pocket C is among the buildings that perform inefficiently with BEI of 304.26 kWh/m². Huge retrofitting actions need to be done in order to bring down the BEI to propose BEI of energy efficient building of 135 kWh/m² as stated in MS 1525:2007.
Five energy saving opportunities had been identified in order to energy retrofit the UTP buildings and were roughly estimated to cause 10 to 20% of energy saving. Among the energy saving opportunities are:

1. Utilization of energy efficient lighting and appliances
2. Design and obligate energy conservation rules
3. Appoint an Energy Master
4. Ban unnecessary electrical appliances
5. Provide occupants with Energy Management System course.

However, the effectiveness of the above mentioned saving opportunities can only be achieved by full cooperation from both the management and occupants, together with the well managed and fully utilization of advanced building automation system that operated by well-trained and skilled system operators.

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REFERENCES


REDEFINING OPEN SPACES IN JAKARTA:
The Case of Martha Tiahohu and Ayodya Parks in South Jakarta, Indonesia

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ABSTRACT

This paper discusses problems in understanding open space in Indonesia, particularly within public domains of big Indonesian cities. It will crystallize on the issue of ecology through a display of two cases within the South of Jakarta, the capital city of Indonesia. As such, the paper starts from Government Acts and Regulations on national and regional planning and the way they are implemented in city planning, particularly in concerning with the provision of open space in the city. Jakarta the capital city is chosen due to the fact that it has become main reference of all cities planning in the country since sovereignty of the nation in 1947 while South of Jakarta is the chosen case because of its high pace of development until the end of 20th-century.

Keywords: Open space, ecology, city, community

INTRODUCTION

The “Rencana Induk Kota 1965-1985” was the earliest master plan for Jakarta the capital city, being officially launched in 1967. Principally the master plan was intended as land-use planning for building the philosophical objective of which is to protect as well as accommodate human activities being the result of a new demand on world civilization. Hence, it was perceived that such a planning must breathe a harmonious balance between social and economical life of the citizen. With such a high awareness, the plan was ultimately aimed at community’s welfare that mainly consisted of the following objectives:

1. Protection of a quiet and peaceful life.
2. Provision of a healthy and safety living place.
3. Secure earnings through the provision of working places.
4. Provision of adequate recreational areas.
5. Possession of cultural places.
6. Provision of adequate public amenities, modes of communication and transportation.
7. Adequate solutions on disasters

Technically, the master plan consisted of written explanations, mapping, three dimensional plans and models, being predicted for the next 20 years to comprehensively include all activities, i.e. administrative, social, economic and physical. Within the context of the term “green open space”, this master plan cited that it meant the provision of open areas for recreations of the citizen to induce their spirit of daily life, securing fresh air throughout the Municipal Government’s territory.¹

¹ Rencana Induk DKI Jakarta 1965-1985, p.40
However, there was not any mentioning on percentage of area needed to fulfil such objectives in comparison to the total jurisdiction area of the Municipal Government; not even a disclosure on how the evaluation has been done to become the Jakarta's new Master Plan of 1985-2005.

There was guidance in the previous master plan to evaluate all that has been done and achieved by the previous one. It was said that the plan must be able to respond while as well as to new demands brought about by the changing values appearing throughout the previous periods. Which mean that the master plan must be dynamic in confronting such new demands yet there were not any mentioning about human or the citizens being a community of people, not to mention the issue of ecology and environment. However, the master plan said further that the policy to be taken was to have as many alternatives on land-usage as possible in parallel to the provision of green open spaces for the benefit of keeping the environment stable by means of conservation.

It was in the Jakarta's new Master Plan of 1985-2005 that the ideal percentage of green open space was 13.94% out of total area of the city. Article 60 of the new master plan even mentioned the distribution of such a green open space throughout 5 jurisdiction areas of Jakarta, namely the North, South, West, East and Central Jakarta in more details. For the South Jakarta area, it was indicated that the open spaces were mostly to be dedicated to productive as well as decorative plants, public parks and open spaces in high density settlements.

Referring to a higher rank of regulation lined down by the Ministry of Public Works, the term “open space” refers to spaces within cities or large boundaries in the form of areas corridors the usages of which are not to be dedicated for buildings. The regulation states further that a garden city includes children playgrounds, ecological gardens, recreation parks, aesthetic lawns and sports areas whereas the intentions of such a categorization is to beautify the city, reduce its pollution and noise, rehabilitate its micro-climate, provide water absorption and support the comfortable life of its citizens. These intentions are supposed to induce mechanism through which the needs of citizens, especially those of the basic necessities such as food and clothing, housing, health and education; which are the underlining factors in achieving a clean and healthy city.

Hence, there is indeed a changing understanding since 1965 to 2006 concerning with the function of the so-called “green open space”, from a merely triggering factor to provide fresh air in the city to the most important one in supporting the stability of conserving the city’s environment. Since 2006 there has been a growing awareness on city’s open spaces being a place not only to regulate its system of ecology but more than that is to support life system of the community within the city in concerned.

ECOLOGY

Community, in the widest term of the word, has become main issue in the understanding of ecology, particularly its implementation on the life of human within the community as such. It is generally accepted that open spaces within public

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2 ibid, p.112
3 ibid, p.112
4 Jakarta Master Plan 1985-2005, p.21
5 ibid, p.76
6 Buku Ruang Terbuka Hijau, Departemen Pekerjaan Umum, 2006, p.52
7 ibid, pp.76-77
domain reduce air pollution within the city in concerned while trees in such open spaces are considered as lung of the cities that refresh the quality of air which, in turn, enhance the quality of life of its citizen. As far as the community is concerned, it then follows that all organisms and their environment at certain places belong to the units of particular eco-system disregards the size of each. In that sense, ecology is seeking an explanation on similar phenomena within various eco-systems that are different to one another. As such, ecology is inter-disciplinary due to its ultimate objective in finding relations between organisms and the environment in concerned, particularly between physiology, evolution, genetics and behaviour of living objects that includes human. It is, therefore, an inter-active system showing degrees of complexity of certain organizations in concerned.

In connection to the issue of public open space, the term ecology is everything that relates the total life of communities to their particular place, which is the city. Acknowledging the ecology of a city therefore means understanding basic patterns and processes where nature continuously supports human life in each community. Hence, it is more than just an understanding but rather a contextual one. Correspondingly, it is not enough to think about human life in physical terms only but together with his psychological needs; because a comfortable life may only be achieved after a balance fulfilment of both.

PHILOSOPHY OF ENVIRONMENT

The way nature continuously supports human life, on the other hand, is meaningless without an understanding of what the environment is all about. According to Skolimowsky, there are several categorical characteristics of philosophy of environment, namely:

1. Oriented toward the existence of life.
2. Committed to the values of human, nature and the life itself.
3. Containing spiritual discourses.
4. Comprehensive and global.
5. Relating to wisdom.
6. Awareness toward the environment and ecology.
7. Alliance with the economy of quality of life.
8. Awareness toward the politics of life.
9. Deeply concerning with community’s welfare.
10. Clearly communicating individual responsibility.
11. Tolerance toward the trans-physical phenomena.
12. Awareness toward healthy life.

Not all of the characteristics previously mentioned have a close connection to the main issues that are brought about here except for some of them. The philosophy of environment that relates to wisdom, for example, discusses values as a notion that is based on qualitative terms especially during conflicted situations when the otherwise is against community ethos. Paradoxically, it is at the same time the quality that one is looking for after realizing that facts and measurements alone will take one to nowhere. There is, therefore, originality and deep meaning in wisdom that makes it the true knowledge; containing the structural hierarchy of human life cycle.

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8 Tansley, 1935, in MacNaughton &Larry Wolf, 1979
9 Skolimowsky (1981), Filosafat Ilmu Lingkungan (transl.), Bentang Budaya, Yogyakarta, 2004
A deeply concerning with community’s welfare, on the other hand, shows that the philosophy of environment is seriously taking the welfare of community in concerned into consideration because of its unique entities having their own life cycles. Community, in this respect becomes the central part within any discussion concerning human life in a city being the representation of the city itself. The importance of such a representation lays on the fact that community the chain of sequences where aspirations and visions started through individuals. In that sense, community is the means of human existence being spiritual beings that must be taken into consideration in a comprehensive manner, the body as well as soul, to bring them into the feeling of a welfare fulfilment. And then, there is awareness toward healthy life. Health is part of human welfare. When the body is well maintained there will be no obstacles for many kinds of activity up to the maximal condition to be able produce optimal results. Briefly to say, it is such a maximal conditions that actually bring human being into the welfare of his life and hence opening up the discourse that this writing is aiming at.

THE CAPITAL CITY OF JAKARTA

Pollution rate in Jakarta at present is high. With more than 9 million vehicles a day moving around in the city and minimum provision of green open spaces, it is of no surprise to imagine the total amount of carbon monoxide and other toxic gas being inhaled by the citizens every day. This situation is worse by high pacing of tower buildings erected in the city, with minimum open space being left by each in respected areas. Bearing in mind that each large tree with a total leaf surface of 150 square metres is able to absorb 2, 30 kilogram of carbon monoxide while producing 1.70 kg oxygen an hour, it shows the danger of losing every inch of such green open space. Moreover, there is an increasing cost of health in Jakarta due to such air pollution, about 1.8 trillion rupiahs or equivalent to USD 18 million.

Undoubtedly, a city that has healthy citizens will induce maximum man power to support its betterment of life cycle in a continuing manner and that is precisely the main issue within any city. The question, therefore, is how this capital city is able to restore itself into such a condition? In answering such a question, we must come back to the initial thought that human being is part of a living world that does not put any of its meaning in an empty space, because all things that they have made are placed in physical world, between the earth and sky, and hence all man-made things must be rooted in a particular place. This place is precisely where the man-made spaces are located, being a qualitative but total phenomenon that the properties of which cannot be reduced without losing their real conditions. Analytically, the process of understanding such a proposition may be done by following these points:

1. To differentiate natural phenomena form the man-made, that is, between the landscape and dwelling.
2. To differentiate the horizontal from vertical, that is, between the sky and earth in one hand and between the outside and inside. The implication of such a differentiation is spatial, the existential dimension of which is called “space”.
3. To introduce the notion of “character” as being the concrete phenomenon of everyday life, so as to find the spirit of place to living in.

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10 Skolimowsky, op.cit., p.58
11 Iwan Ismaun, Seminar on the Phenomena of Concrete Jungle and Pollution, Jakarta, September 2009
12 Ubaydullah, ibid.
Human being manifests such a place to living by connecting it to nature through 3 basic means, namely:

1. Visualizing an understanding of nature to express the existential base being achieved.
2. Completing existing situation through additions.
3. Symbolizing an understanding of nature and oneself in order to translate both into another medium, hence releasing them from any adjacent situations that tend to treat them as cultural objects and forming more complex situations.

It is such means that bring us to the discourse of public open space, its meanings and characters as well as benefits to the citizens in physical and psychological terms. As such, it is a place of actualization not only for human being but also the trees, with leaves to absorb polluted air and roots to conserve water.

CASE STUDIES

Jakarta was officially declared as the capital city in December 27th, 1949. Kebayoran Baru, where the case studies are located, was formerly an area at the South of Jakarta being developed in 1950 as a satellite to the capital city. The development of Jakarta has become very intense in the seventies that it was necessary to divide its area into 5 municipalities, namely the South, North, West, East and Central Jakarta, and Kebayoran Baru has become part of South Jakarta since then. The case studies in concerned are Martha Tiahahu and Ayodya parks, which are both located at Block M in Kebayoran Baru.

The Martha Tiahahu Park. (Figure 1 – 11)

This park is located at a cross-section of several streets and roads that form the boundary of one of the busiest commercial area in Kebayoran Baru, adjacent to the main local bus terminal of South Jakarta. However, the total area of this park is only 500 square metres being covered by pavement of hard surfaces for approximately two third of such a total area. Large trees are only a few and there are lots of shrubs in the rest of the area. There is a circle pond at the pavement area, with a pole holding a tank that pours water to this pond. Pedestrian pavement encircles the pond, completed by some pre-cast concrete benches for them to take a rest. They are not enough though, and hence many of the passers-by sit on the pond’s edge.

Visitors of this park come from several societies as well as places of origin, not only within the area of Jakarta but also Bekasi, which is now a new satellite town of Jakarta. Taking a rest after shopping or strolling down is not their only objective. Some of them come to this park intentionally for a family picnic, hence they bring along their own food and beverages.

The Ayodya Park. (Figure 13 – 17)

This park is also located in Kebayoran Baru, not so far from the first that has been described earlier. It situated at the junction of 6 streets surrounded by a communal church, mix-area of shopping and offices as well as elite residences. During the development of Kebayoran Baru it was one of the overflow pond areas to prevent Kebayoran Baru from flooding, but such a function was abandoned in the seventies because of illegal small shops built at the outer side of the area and has been permitted by the Prefecture since the eighties. These shops encircled the overflow
pond area and closed its access so that nobody knew what has happened in such a pond. It is recently re-opened by new policy of Jakarta Government to gain more green open space throughout the capital city.

There is a continuous pedestrian path encircling a new re-designed pond while following the contour of this park. Additionally, there is mini amphitheatre on the pond. In comparison to Martha Tiahahu park visitors to this park come from the surrounding area and they seem to go straight from their places to intentionally enjoy what is provided there. Some of the old trees are retained while the new ones are still small and need several years more to grow into a large tree.

DISCUSSION

Kebayoran Baru was formerly planned and designed as the satellite town that contribute green open space to Jakarta the capital city. However, the parks that this town has initially provided as open spaces were forced to alter into places with ecological functions for the citizens recently as shown by the previous examples.

In the case of Martha Tiahahu Park, its total area is relatively small in comparison to the built area of Block M, making it looks like a back yard of dense buildings. Being a place, it is therefore characteristically marked by limited space to hide from the sun while limited facilities for the passers-by to seat down and take a rest for a while reduces the drive to stop and enjoy

what are provided there. The Ayodya Park, on the other hand, looks spacious due to the fact that it is encircled by neighbourhood streets that separate it from surrounding built areas. Hence, people really come to this place to enjoy instead of passing-by.

Total area of these parks is approximately 1.6 hectare whereas the total area of open space in Jakarta is approximately 5.4 hectare. Hence, both of these parks give a significant contribution to the capital city. However, the total area of Jakarta is approximately 66.152 hectare and bearing in mind that according to the standard regulated by the Ministry of Public Works each Indonesian city must retain 30% of its area for green open space, the contribution of these parks to such a standard is therefore very small.

There is a government’s will at present to increase the percentage of green open space in Jakarta to reach 13.94% by the year of 2010. But even that is a step backward in comparison to what has been aimed in the beginning; namely 37.5% in the Master Plan of 1965-1985 and 25.5% in then Master Plan of 1985-2005. Such a decreasing number is mostly caused by intensified development in building coverage and ratio in Jakarta that is now becoming a metropolitan capital city. Hence, it also shows that the issue of green open space has been interpreted merely as the unused or, at least, not yet usable area in the city rather than the true green open space.

It is then back to our concern of organizing a city according to the three main characters of philosophy of environment; the wisdom, welfare and health, for the benefit of the citizens at large, being the systematic framework of providing green open space for the benefit of citizens’ daily life in a city.
CONCLUSIONS

The provision of green open space for citizens is fundamental within the framework of ecological thinking because there is not even the smallest chance to neglect humane needs within the philosophy of environment. The three underlining characteristics of such a philosophy, namely wisdom, welfare and health, become a potential objective in optimizing citizens’ wish for an open space. It is then a necessity to obtain standard frame of thought for its implementation, the ultimate objective of which is to control development programmes of the city in concerned for the benefit of its citizens.

Within the context of rapid development in Jakarta the capital city, easy and practical modes of implementation is urgently needed especially in dense areas of buildings. Some of public parks in Jakarta have already within the Government's possession and hence it is rather easy to be re-organized into ideal parks. However, it is the private open spaces that rather difficult to control. Besides all technical and tangible calculations as well as ratios, now it is the right time to also include intangible thoughts from the sociologists, anthropologists and psychologists due to such a wide range of ways in organizing the green open space should it must include human factor and their social life. Many agendas must still be implemented by the Jakarta municipal governments to achieve the ideal green open space in the city that secure the welfare of its citizens.

REFERENCES

APPENDIX

Martha Tiahahu Park in South Jakarta

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11
Ayodya Park in South Jakarta

Figure 12

Figure 13  Figure 14  Figure 15

Figure 16  Figure 17
Siting Strategies for Coastal Resort Facilities to Enhance Tourists Experience in Sustainable Coastal Resorts

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ABSTRACT

This paper investigates the planning and design aspects of coastal resorts, specifically the siting of resort facilities; the accommodations, amenities, recreational facilities and the open spaces and their relationship with the environment and community in the coastal tourism development in Malaysia. The contention is that proper siting could enhance the tourists’ experience in the coastal resorts whilst ensuring sustainable tourism development with improved operation lifecycles. The literature reviews on sustainable tourism development, siting, tourists’ experience and role of regulators and policies provides important insights on the manner on how they have influenced the planning of the resorts. It highlights several negative impacts of improper siting towards the environment and local community based on the site observation and exit surveys. This investigation initiates the pathway in formulating new siting strategies that can enhance tourists experience in the resort by integrating the role of the regulators and designers in the way that the policies are being implemented, the strategies used in the current practice and the attributes of the tourists’ experience that shape the design of coastal resorts.

Keywords: Siting, tourists’ experience, sustainable tourism development and coastal tourism development

INTRODUCTION

Tourism, combined with the natural attractions that a country possesses such as the sea, beaches and climates (Jenkins, 1991) can be developed as an industry with high economic value. Consequently, tourism development must be guided by a carefully planned policy and comprehensive planning approach to protect the natural and cultural resources (Goeldner and Ritchie, 2003) and have increasingly focused on two key development issues. The first is the environmental and social impacts caused by uncontrolled or ill-planned development of the coastal resorts. The second issue revolves around the need to integrate sustainable tourism development principles with existing environment and tourism activities through the appropriate planning measures in both the policies and practice to enhance the tourists’ positive experience and meet the demand for more environmentally friendly tourism options.

SUSTAINABLE TOURISM DEVELOPMENT

Consequently, the negative impact towards the environment and socio-cultural factors have emphasized the need for the sustainable tourism development. The Brundlant Report¹³ defines sustainable tourism as:

¹³A historic milestone in international environmental law because it represented the first attempt to integrate economic development and environmental conservation through the concept of sustainable development (WCED, 1987)
‘Development which meets the needs of present tourists and host region while protecting and enhancing opportunity for the future.’ (WCED, 1987: 43)

The concept of sustainable development has achieved virtual global endorsement as the new tourism industry paradigm since the late 1980’s (Gedfrey, 1996). It has been described as a positive approach intended to reduce the tensions and frictions created by the complex interactions between the tourism industry, visitors, environment and the communities which are the hosts to the holidaymakers (Bramwell and Lane, 1993). The discourse on the sustainable tourism development revolves around a central issue on how to manage the natural, built, and socio-cultural resources of the host communities. The objectives are to meet the fundamental criteria of promoting the communities’ economic well being, preserving their natural and socio-cultural capital. The concept of sustainability not only provides good example of how alternative strategies can challenge the dominant assumptions of development (Sneddon, 2000) but also assists in understanding the complex socio-environmental conditions influenced by tourism.

NEW TOURISM DEMAND

The concept has also created the alternative tourism in opposition to the traditional mass tourism as the focus shifts to striving for developing tourism within the broader principles of sustainable development (Inskeep, 1991). This is in line with the increasing demands by tourists for better environmentally sensitive resorts which can be achieved through the appropriate planning strategy. The demand arises from the advanced level of travel experience in the population that leads to a more critical and quality oriented approach, as well as the growing sophistication and rationality of choice. It is also instigated by several factors: an increasing desire to relate to nature and higher levels of environmental consciousness; sensitivity to the quality of life in general; and the increasing effort to learn about different cultures (Schawinger, 1989); and the problems which accompanied the uncontrolled tourism developments.

Recent trend indicates that the resorts are beginning to specialise and reinforce niche marketing with the emergence of environmentally sensitive and specialised resorts, which focus on unique recreational activities and natural attraction. These special interest market segments are likely to flourish in the future as tourists are becoming more sophisticated in their level of environmental consciousness and are increasingly seeking for new opportunities to learn about other cultures and demanding high quality and well planned tourist destinations (Schwarniger, 1984). Thus, the alternative tourism can be regarded as the product of the sustainable approach. In stressing the importance of planning for alternative tourism, Holden (2000) asserts that in neo-liberal economy, regulation of environmental resources will be critical in determining the success of any alternative tourism policy. However, it seemed that there is a big gap in the design of the coastal resorts as demonstrated by the array of resorts that are fragmentally designed resulted from the way the policies and regulations regarding the siting initiated by the government are being implemented and the manner in which the siting is actually being practiced. While the policies are used to regulate the design to meet the goals of development, it is unclear if the existing practice has considered the users’ reflections and the clear intention of the government on the way the resorts should be designed as sustainable resorts.

All the concerns presented above signify the need for a better planning, specifically the siting process for coastal resorts. In relation to the sustainable development, integrating stakeholders such as chief regulators, designers and tourists views is paramount in the siting process as well.
SITING OF RESORTS FACILITIES

The siting or physical setting of the facilities therefore, is an attempt to synergise all the facilities with the tourism activities and the environmental resources. To attract the tourists, resorts should be designed to be as original as possible by adapting the development plan and the scale and design of buildings to reflect the character of the surrounding and climate using techniques wherever possible. The techniques called for environmental integration that includes establishing a good relationship between the resort as a whole and its natural environment (Inskeep, 1991). For Inskeep, the environmental interaction, the institutional practice and tourist experience, the relationship between the arrangement of the facilities and the circulation, and the use of open spaces in the tourism destination play significant role on the place authenticity.

Tourists transform the physical structure of the area visited by them through their distinctive interpretation of the product offered. This means the siting determine the way they interpret the product. For Dietvorst (1989), this group's specific combinations of spatially related attractions and facilities are called 'complexes', which is a spatially differentiated whole and in different spatial scale and can be conceptualised as a system where different product elements and the relations between these elements are established by the tourists' movements. Dietvorst further asserts that the amenities appear to be related with each other where the whole is more attractive than each separate amenity that influences the tourists' spatial experience.

TOURISTS EXPERIENCE AND PLACE MAKING

In relation to the tourists' experience, a good tourist site that promotes positive experience consists of settings that are distinctive and aesthetically pleasing (Pearce et al., 1998), in which many tourism advocates fail to grasp the number of the socio-cultural and ecological factors that negatively affected by tourists (Ryan, 2003). Ryan further argues that this is closely linked to the role of resorts in accommodating the tourists. In terms of design, the resort or tourist destination zone changes both temporally and spatially as the place of interaction between the tourists and the host. It is not simply a geographical entity but also psychological and social zones that exist within a geographical space.

In the above case, the idea of the tourists being temporal in the consumption of resorts is firmly embedded in the tourist's social world and the ways in which the users' experiences are manifested in different ways in the place making concept. For example, some may seek for spiritual refreshment of solitary, natural places (Urry, 1990) and for others may be reflected in the collective experience of sites and destinations (Sharpley, 2002). According to Holt (1995), consuming as ‘integration’ is instrumental in the coastal resorts, where they are able to integrate the self and object, thereby allowing themselves the access to the objects symbolic properties. In reality, tourists or consumers must integrate into the object of consumption or the facilities and the activities to experience the sites. Thu, the authenticity of displayed culture (Theobald, 2004) and the notion of tourists as transnationals community (Duval, 2004) are important considerations in analysing their experience in the coastal resorts.

The way the tourists interpret the positive experience through the siting of the facilities has also raised the importance of integrating the tourists’ reflections and ideologies based on their on-site experience in the particular coastal resort. Tourists’ experiences are a complex combination of factors which shape the feelings and attitude of tourists towards their visits (Page and Dowling, 2002). In this vein, the
tourist’s perspective has also been advocated as essential in achieving a symbiotic relationship between the visitors and resources (Mc Arthur and Hall, 1996). Thus, the tourists’ experience is regarded as an important element in influencing satisfaction in the tourists’ consumptions of the resorts, whereas satisfaction results from the experiential nature of consumptions and contains both perceptions and experiences (Otto and Ritchie, 1996). It can be emphasised at this point that understanding the dimensions which contribute to the tourists’ experience is therefore paramount to quality planning and design as well as contributing to the sustainable resource management in preserving the coastal resorts’ environment.

NEGATIVE ENVIRONMENTAL IMPACT ON COASTAL ZONES

In terms of planning, the incompatible tourism development has affected the profitability of the business through the improper siting process at both the macro and micro planning stages. In terms of siting, the efficiencies of the facilities siting and their impact to the operations of other regional resorts are being questioned at the macro level:

‘...the facilities are freely developed in a haphazard way and this does not result in highly efficient overall structure; secondly, competitive investment ventures are made and are unprofitable because each one ignores what the other one is doing and plans his investment accordingly...’ (AIT, 1974: 57)

The uncontrolled or incompatible development has also resulted in extensive damage to the coastal zones:

‘Hundred miles of coastline has been ruined irremediably and virtually by uncontrolled buildings of hotels, restaurants, bars and houses. Beaches have been divided into unsightly allotments, and noise from the jukebox, fumes from the traffic and sheer human population pay witness to the chaos made of the organisation of his leisure.’ (Young, 1973: 157)

Meanwhile, at the micro level, the above stresses are particularly apparent along the West coast of the Malaysian Peninsula (Wong, 1998) where tourism development is heavily reliant on the beach, island estuary and fluvial environments to provide it with the popular attractions, which lead to negative impacts to these environments (Hall, 2001). Consequently, the importance of the siting of the facilities in mitigating the impact and improve the particular resort’s development lifecycle is imperative. This statement also relates to the concept of ‘Destination’s Lifecycle’ (Butler, 1980) which declares that the unpredictable growth cycles of tourist destinations, which can be positive or negative, calls for developing resorts beyond its maturity stage to remain competitive.

Williams (1987) observes that the ecosystem is the most sensitive to all development which includes the coastal systems, in which the environmental settings that become attractive to tourists are especially vulnerable. The environmental impact includes land degradation and land-use change, as well as the habitat and biodiversity loss resulted directly from the construction of tourism facilities and infrastructure through the clearing of mangroves, wetlands and beaches and the extraction of building materials (Hall, 1996). The more severe impacts of tourism however stem from the infrastructure and construction activities that entailed rather than the recreational activities themselves (Craig-Smith et al., 2006).
Uncontrolled and ill-planned tourism development in constructing the facilities have caused damages to the coastal environment, which include the destruction of natural barriers and changes to the sediment flow patterns and coastal erosion (Gossling, 2002). It also caused the loss of the physical beauty of the coastal area, especially where construction is moving closer to the water mark as a more appealing option for tourists. Tourism development becomes even more damaging as tourists prefer to visit the natural and cultural areas which are exceptionally delicate (Briguglio and Briguglio, 2000; and Kline, 2001). For example, the wetlands have been drained or reclaimed and the coastline has significantly been altered to make way for other facilities. Hotels have been built too close to the beach necessitating the construction of prohibitively costly erosion management structures that often lead to habitat destruction, whilst increase of sediment mobilisation and deterioration in water quality during construction can also be equally significant. Meanwhile, the invasions of tourists to a tourist’s destination can also bring negative impacts to the local communities. The negative social impacts ranged from the irritation to residents, cultural dislocation, introduction of conflicting ideologies, promise of unattainable goals and increase community divisiveness (Mathieson and Walls, 1982).

CURRENT SITING PRACTICE OF COASTAL RESORT IN MALAYSIA: A PERSONAL OBSERVATION

The impacts were observed in the coastal tourism development in Malaysia, which is already aggravated by the impact of unplanned development of coastal resorts and impacts from the coastal environment such as the monsoon effects and coastal erosion (Wong, 1998). In Port Dickson, for instance many of the resorts are constructed either very close to or beyond the shoreline. In investigating the accommodations structure above water it seems that the spaces underneath them are filled with both sedimentary deposit and rubbish. Furthermore, the selection of conventional concrete and brick wall post and beam construction is not profiting the cause either. For this type of heavy construction technique, it requires a major piling work that can negatively affects the water and beach qualities of the coastal zone. In this case, the construction debris is improperly maintained and is being thrown onto the sea (Refer to Figure 1.1).

Figure 1.1: The construction of the accommodation units in Port Dickson which encroached beyond the shoreline using the conventional concrete post and beam construction on concrete piles. Source: Author
Consequently, the unbearable conditions resulted in the spaces being left idle by the tourists who are staying in the resort. The small strip of coastal zone in the resort premise is no longer an attractive place for the tourist to indulge themselves. The spaces underneath the structures are dark and the water is murky with traces of sedimentation as they are not exposed to the sun. Beside this, the other problem caused by the construction is the obstruction of local access along the beach frontage. By building the chalets offshore, it also prevents the continuous access not only for the tourist staying in the resorts but also for the locals who have the rights to use the beach as much as the tourists in the resort. The situation above is also exacerbated by the inefficient discharge of sewage system to the sea. The main outflow piping from the sewage manhole can be seen jutting out towards the sea (Refer to Figure 1.2).

While the system might be perceived to be properly maintained by the management, at a certain extent, the appearance of these pipes might have caused uneasiness to tourists who wish to swim in the sea or to simply enjoy the sun and scenery.

Physically, the urban-scape of Port Dickson has changed enormously from a serene to a congested town filled with many high-rise hotels to cater for tourists. The resorts are now crowded with local and foreign travellers during the peak seasons. While this situation is good for the economy, it has also brought stress to the aesthetic and the maintenance aspects of the resorts. The lack of spaces for development has driven many hotels to extend their buildings towards the sea beyond the allowable coastal setback requirement. In many areas, the coastal zones are reclaimed to make provision for the development of new resorts. These have initiated some stress to the visual appearance of the surroundings and sense of uneasiness by the locals in addition to the negative consequences of this practice that were discussed earlier. In terms of the view, it is safe to say that most hotel rooms are being planned and constructed to directly face the sea but at the same time, they also impose a disadvantage in terms of the view towards the building from the main roads (Refer to Figure 1.3).
From the main roads, all I could see is the corridors that looked like a big chunk of concrete wall layers blocking my view towards the sea. Do we really need the high-rise resorts in such a small beach strips? What is the rational to reclaim the land beyond the existing coastline? How do the locals feel about it? And what do the tourists have to say about this? Furthermore, the deteriorating physical appearance of the resorts can also be regarded as an economic indicator by the virtue of not properly maintaining them. For example, several resorts appear to be in an urgent need for major repainting job as reflected by the unsightly defective walls appearance. Meanwhile, the improperly maintained landscape also reflects to a certain extent the dire financial crisis faced by the coastal resorts in the area.

In Pantai Cenang\textsuperscript{14}, Langkawi, clusters of small resorts filled with the accommodation units and main doors facing each other while the back windows are facing the other resorts in the adjacent boundaries instead of toward the sea. As a result, the only thing that one could see from the inside of the chalet is the other unit’s wall rather than having the luxury to enjoy the natural panorama of the beach and its surroundings. The chalets are also built so close to each other that one can hear the noise originated from the next door units. Moreover, the sizes of the open spaces created in between the units are too small and insufficient for tourists to feel the sense of openness and to be comfortable in the resort.

![Figure 1.4](image)

\textbf{Figure 1.4:} The public are barred from accessing the Malibest Resort (the resort stayed during the site visit) premise in Langkawi Island to reach the beach frontage. This scenario can also be observed in many other adjacent resorts. Source: Author

Another major issue is the manner in which the landscape is being provided in the resort. The lack of landscaping near the beach frontage and the resort’s open space is apparent. Combined with the congested resort’s layouts, these create inhospitable situations to the tourists and locals who want to enjoy the resort or the beach. In a way, the manner in which the accommodations are arranged in the layout also denies the continuous accessibility of tourists and the locals to the beach frontage. The resort is also observed to bar the public from entering it to access the beach frontage (Refer to Figure 1.4). Besides this, there is also danger caused by the insufficient coastal zone setback as observed in the several resorts in many parts of the island. The resorts are being threatened by the coastal erosion because of their locations that are too close to the shoreline. Meanwhile, the use of hard and conventional man-made coastal protection methods such as rubble wall to counter the erosion has caused the loss of beach for swimming, which is both physically and aesthetically unpleasing (Refer to Figure 1.5 and 1.6).

\textsuperscript{14} One of the popular beaches and resorts in the Langkawi Island
There are also a few resorts constructed with insufficient setback; a situation which puts the buildings into risk (Refer to Figure 1.7).

While in other cases, there are traces of several resorts that were swept away by the erosion. This situation also results in the loss of public spaces where tourists can interact with the locals. In addition, several resorts are constructed on steep slopes due to the lack of spaces for extension within the resort’s premise, which is environmentally hazardous (Refer to Figure 1.8). Simultaneously, the practice however, has also resulted in insufficient view towards the sea as they are located further from the main road.
In many ways, the negative consequences to the particular resort’s environment may originate from the external factors other than the location of the facilities itself. The condition is reflected by the ill-planned location of stalls along the road frontage (Refer to Figure 1.9).

In Pangkor Island resort’s beach frontage filled with food and souvenir stalls which are improperly located and designed that eventually disrupt the tourists’ views from the resorts. In addition, the sewerage effluent from the stalls is directed into the sea without a proper drainage system, the situation made worst with the overflowing gasoline used by boats. The smell of the dirty effluents is just unbearable. The local business can be integrated into the design of the resort in a manner that the resorts can be sustainably operated by or supporting the locals through the properly designed commercial space. These spaces can either be integrated into the resort or outside the resorts vicinities with certain connectivity in the planning, which in turn will provide a conducive and comfortable environment for the locals to conduct business as well as interacting with the tourists.

LOCAL COMMUNITIES’ CONCERNS ON THE SITING OF COASTAL RESORTS FACILITIES

Exit surveys were also conducted with the local communities in the case studies areas to understand their views on the consequences of coastal resort development on their lifestyle and also the socio-economic values. The community is described as:

“A mutually supportive, geographically specific, social unit such as village or tribe where people identify themselves as community members and where there is usually some form of communal decision making.” (Mann, 2000: 18)

Communities are dynamic, complex and generally do not have clear boundaries (Richard and Hall, 2000). While it can be considered as a process of change not only
physical but also attitudinal or cultural and it is territorially fixed (Lash and Urry, 1994). It is the relationship between the community, place and power that is relevant to the tourism development. An action ethnography approach in understanding the local views in this study is to produce ethnography of tourism and to make it useful to the respondents in the belief that the subject population have the rights to the social power that comes from the knowledge (May, 1980; and Cole, 2005).

The locals conceded the existence of the public hearing through the newspaper advertisement but were immensely hesitant with the effectiveness of the function. While a group of locals in Langkawi Island acknowledged the effort of the Local Planning Authority and the Department of Environment in conducting the public hearing, they also questioned the effectiveness of the advertisement, the timing on which such event is held and its relevance in getting the views of the locals which is done after the whole design of the resort is completed. On the effectiveness of the advertisement, one of the local argues:

“I seldom read the public advertisement page in the local paper. They are very small and I always missed the article.” (Personal communication with a Local, Langkawi Island, 2007)

The ineffectiveness of conducting the public hearing on the resort developments on which most of the designs have been completed prior to the discussion is expressed by one of the locals as follows:

“Even if there is any hearing on a development prior to the construction, it is not effective for us to give views on the development. They have already completed the design and what is the use of talking about it then. They [the authorities] should at least inform us earlier, that is before any planning is submitted to hear our opinion first.” (Personal communication with a Local, Langkawi Island, 2007)

The locals also point out their anxieties towards the emergence of the foreign major resort players in their areas that includes developers or top levels hotel personnel and those involved in the business servicing the tourism industry such as tourist operators and suppliers. While they expressed their interest in becoming the tourists’ operators and developers, they cited the lack of funds and support from the authority as the main barriers in initiating a resort development. One of local tourist operators in Kuah, Langkawi Island describes:

“It is true that there are a lot of resorts in this island. But only a few locals own them. We want more locals to operate the resorts. We want more incentive from the government in terms of budget allocations and planning assistance from not only the authority but also the specialist from different background. The small resorts are suffering as they are being neglected compared to the big resorts. That is why you see the development of resorts has become very fragmented or too individualistic.” (Personal communication with a Local Resort Operator, Langkawi Island, 2007)
On participating in the business surrounding the tourism industry, many of the locals feel that there should be more opportunities for the locals to participate in the small and medium scale business which is currently very few (Figure 1.10). They cited the lack of facilities and also promotional activities through various tourism agencies as the principal barriers of their participation in the tourism related business activities.

“What we want is the opportunity to do business all year round rather than seasonally in this area. We want the authority and even the tour agents to encourage our local products to the tourists through promotion or by facilitating them to come directly to us without any third party participation.” (Personal communication with a Local stall owner, Langkawi Island, 2008)

There are concerns on the extent of mass tourism and its seasonal effects to the local livelihood and lifestyles around the case study areas. When asked on how the resort has benefited the community in terms of their locations, a Local in Port Dickson explains:

“Without a doubt, tourism has improved our livelihood in terms of providing job opportunities and also beautifying the surroundings. Many of the locals work in the resorts and many are doing business to serve the resorts. But there are just too many hotels in the area, where it will be dirty, and the roads getting congested during the school holidays which caused massive traffic jams. I think we should not build any more hotels around here.” (Personal communication with a Local, Port Dickson, 2008)

The locals are also aware of the importance of the siting of the resort facilities in enhancing the environmental and social experiences in the areas. They singled out the environment as the main asset of a resort that needs to be maintained not only to attract tourists but also as a tool to preserve their lifestyle, as what one of the locals in Pangkor Island points out:

“It is good that there are still many areas that are still not being developed in the island. The island is still green and there are plenty of beach areas for the tourist to enjoy around here. The siting of the resort must facilitate the environmental conservation because without these natural attractions tourist will not come here anymore. More importantly, we will lose our economic benefit from the tourism activities here.”

(Personal communication with a Local, Pangkor Island, 2008)

In terms of the siting, the primary concerns addressed by the local communities are issues pertaining to the socially responsible accessibility and privacy through or within the resort development. They questioned the decisions of the authority in
allowing some of the major resorts to obstruct the locals from accessing the beach from the main roads and to use the resort’s beach frontage. The respondents regarded the coastal zones as their distinctive belongings which should be freely accessed. A Local in Langkawi Island expresses his disappointment on the lack of the socially responsible accessibility in the resort development by stating:

“I used to walk along the shore freely without having to go through all the resorts. Some of the resorts are very private and do not allow the public to enter or trespass their areas. I feel that we have lost many parts of our beaches. They do not belong to us anymore. Even the beautiful views towards the sea are no longer experienced along the seaside.” (Personal communication with a Local, Langkawi Island, 2008)

The above local community’s concerns on the environmental and social consequences through the planning and the siting of the resorts impose a paramount need of appropriate siting strategies that will ensure that they are not being left out from the mainstream of a resort development. The exit surveys above indicate that despite the positive consequences of the tourism development, there are many negative areas of the socio-cultural issues that need to be addressed and integrated in formulating the siting strategies.

POLICIES AND ROLE OF REGULATORS AND DESIGNERS

Formulating a tourism policy establishes the basis for the development and maintenance of tourism at both the national and regional levels. Policies are developed primarily for the environmental and social concerns other than to ensure the economic benefits in all form of tourism. In retrospective, the general approach of this study is that all forms of tourism should be aiming towards sustainable development. The contention is that the term sustainable is ambiguous and should cover all forms of tourism other than the alternative, responsible and appropriate (Nash and Butler, 1990). The principles of sustainable tourism development include the proper siting of the facilities that suit the particular environment and ensuring the benefit of the local community. In this instance, the policies at the national and regional planning levels must consider the alternative forms of tourism with emphasis on the above aim, especially in the areas with traditional cultures and ecologically sensitive environment represented by the three case study sites.

The first considerations to be made by any planning body should be where the resorts facilities that include the accommodations and other infrastructures will be located both at the macro and micro levels. The macro level planning in Malaysia involves the participation of the Federal, State and Local Governmental Agencies in the ‘decentralised’ and ‘top-down’ organisational structure to realise the developments objectives. While the macro level planning is not the major concern of this study, it is important to note that it has major impacts to the planning stages at the micro level. For example, at the micro level where the coastal resorts are being constructed, the policies and guidelines are used to control not only the types and numbers but also the method of constructions and maintenance aspects of the resorts.

While the policy controls and maintains the scale and type of development, it does not mean that the final product will be as intended by the policies. This is due to the nature of the policies which are highly technical and regarded as a formal approach in regulating a design. Certain aspects of design are perceptual which are based on the user’s experience rather than the technical which is not specified by the policies and regulations. Both aspects however, need to be integrated into the more comprehensive siting strategies in the policies and regulations. In this case, the policies and design practice of the resorts could not be regarded as stand-alone
components in the tourism development. They need to be synergised into the policies and regulation with proper control and mechanism by the regulators at each level of the governmental organisations. The policies must not only reflect the national interest but also the goals of the tourism development.

CONCLUSIONS: THE CHALLENGES AHEAD

The precept of the sustainable development; the environmental and social impact; and the enhancement of tourists’ experiences impose a challenge to the sensitivity and creativity of the tourism planners or architects in the process of designing well planned coastal resorts. The potential for mitigating the negative environmental and social impacts from ill-planned development through the sustainable development fuelled by the tourists’ demand for more responsible and environmental friendly options results in the emphasis on the proper siting that can enhance their experience in the coastal resorts. This can be achieved through the provision of the appropriate zoning and physical design features in the spaces created by the siting process and manifested in the strategies which are outlined by the relevant policies and regulations.

Consequently, the challenge is to achieve designs that maximise the siting of the tourism facilities, a very important process in the design and planning of coastal resorts to enhance the tourists’ experience in coastal resorts. The contention is that the physical setting or siting of tourism facilities and open spaces will reduce the environmental impacts and in social relation enhance the tourists’ experience in coastal resorts.

Coastal resorts in Malaysia can be sustainably designed to enhance the tourists’ experience if the appropriate siting strategies are being considered and implemented in the development process. Thus, a renewed approach in formulating the siting strategies incorporating the regulators and designers experience, current practice and attributes of tourists’ experience (Fig. 1.11) is imperative for the planning and design of sustainable coastal resorts.

Fig. 1.11: Sustainable Coastal Resorts
REFERENCES


The Political Ideas Of Islam And Their Influence On Mosque Architecture In Malaysia.

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\begin{abstract}

The main purpose of this paper is to initiate a discourse on how the various perspectives and ideas of ‘political Islam’ influences the design decisions of mosque architecture in Malaysia between the period of 1955 prior to independence and until 1998 when the new city of Putrajaya was unveiled to the public. The paper focuses on three different ideas of political Islam as propounded by the first prime minister of Malaysia Tunku Abdul Rahman, the present prime minister Dr. Mahathir Mohamad and that of the present head of the opposition party, Tuan Guru Abdul Hadi Awang. The three mosques chosen for discussion which are the National Mosque in Kuala Lumpur, the Putra Mosque in Putrajaya and the Rusila Madrasa in Kuala Terengganu represents the ideas of the three politicians respectively.

\textbf{Key words:} Political Ideas, Mosque architecture and influences

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\section*{INTRODUCTION}

During the post independence period, newly independent Muslim countries who were once a former colonial territory such as Indonesia, Pakistan, Algeria, Brunei and others, often felt challenged by their new reputation and by well developed nations. For this matter, these new independent governments main consideration were focused towards developmental activities, to elevate their status and to represent themselves as an advance, progressive and modern state through the erection of new buildings.

Adding to this, they also had an interest to proclaim and legitimize their political position and ruling authority in the eye of the local masses and at the global level. In order to establish this new identity, the state therefore played major role in introducing building programs and restructuring the built environment in the country. This includes the building of state mosques as part of the country’s development agenda. Serageldin (1990 \textsuperscript{17}) mentioned that,’ the construction of huge mosque structures by central government authorities, is to express the state commitment to Islam and to stand as a symbol of national purpose.’ Oleg Grabar who is a scholar in Islamic architecture also added,’……the overriding concern of the post colonial era has been the establishment of a country’s national identity and of signs denoting that identity, as well as symbols connoting it. There are many sides to this concern, but without doubt one of them is how to express the Islamic identity of individuals, groups, or nation states. Within this

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particular concern the mosque plays a central role.’ (Grabar 1997 ; 244) 18 Jackson also added, ‘That is why every new revolutionary social order, anxious to establish its image and acquire public support, produces many commemorative monuments and symbols and public celebrations... not only to please the public but to remind it of what it should believe and how it is to act.’ (Jackson 1980 ; 92)19 Although Jackson did not specifically mentioned religious buildings, in general, he put forth that buildings may also become memorable icon that can reminded individuals on ones position and status in society, as monumental buildings may transcend throughout history and time.

From this, it shows that the state, who is the client for the mosque, seems to utilize mosque for various reasons to suit their political interest as a symbol of their political authority, apart from treating it as a place to conduct prayers and other religious activities. This is projected in the design of the state mosques itself where they are presented in overwhelming appearance on a grand scale which impinged the existing townscape. Even though the mosque uses modern materials and equipped with the latest technology available, its design also somehow still tempered with historic features as well, such as the adaptation of minaret, gateway, mihrab, dome and ornamental features. According to Holod and Khan (1997; 14), these components are essential in contemporary state mosque in order to make the built form stands out as a recognizable symbol and landmark that can be viewed from miles away.

The main purpose of this paper is to initiate a discourse on how the various perspectives and ideas of ‘political Islam’ influences the design decisions of mosque architecture in Malaysia between the period of 1955 prior to independence and until 1998 when the new city of Putrajaya was unveiled to the public.

The paper focuses on three different ideas of political Islam as propounded by the first prime minister of Malaysia Tunku Abdul Rahman, the present prime minister Dr. Mahathir Mohamad and that of the present head of the opposition party, Tuan Guru Abdul Hadi Awang. The three mosques chosen for discussion which are the National Mosque in Kuala Lumpur, the Putra Mosque in Putrajaya and the Rusila Madrasa in Kuala Terengganu represents the ideas of the three politicians respectively.

In brief, the National Mosque represents the idea of Islam in relation to a new country trying to manufacture a Malaysian identity worthy of its multi-religious context with a tinge of pro-Western ‘progressive’ idealism framed within a strong modernistic movement among its early architectural elite. In contrast, the Putra Mosque brazenly declares the dominance of Malay-UMNO politics in the local context and herald the introduction of Malaysia as a global player in the Islam-Western political equation within an atmosphere of an intellectual uncertainty of the local architectural profession. However, the simple, unpretentious and quite resolve of the Rusila Madrasa represents the up and coming force of Islamic ‘fundamentalism’ framed in a mosque not designed by any architect but possessing a socially integrative organic growth.

THE POLITICAL IDEA OF ISLAM

For the purpose of this paper it is necessary to explain the meaning of the phrase ‘political Islam’. The uses of the phrase in actual fact suggest that there is such a thing as a non-political Islam or an apolitical Islam. It must be understood at the outset that Islam is Islam and such use of the phrase must be seen in the light of the users’

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19 Jackson, J.B (1980)The Necessity for Ruins, in Necessity for Ruins and Other Topics, Amherst, Massachusetts, University of Massachusetts Press
ultimate intention in providing an academic discourse. In the Western anthropological or sociological parlance Islam is a ‘religion’ with a belief system and a set ritual with an underlying value system as its foundation. I wish to point out simply that Islam exists in many perspectives consciously or unconsciously realized. For instance, to the Malay community of Malaysia, Islam is but an integrated part of its culture and customs. To ordinary Malays most rituals deemed religious and magical are inherently ‘Islamic’ when such attitudes actually raises deep frowns among religious scholars and academics who know the difference between what the Prophet Muhammad had taught and which are the ‘innovations’ of a particular race. Then again, there are those political masters who would appeal to certain strong uniting and inspiring aspects of Islam in the hope of developing their people or their own agendas without giving much concern over the whole plethora of ‘Islamic values’ as exemplified by the sunnah (the way of the Prophet Muhammad). And yet there are still those deemed ‘sufist’ who integrate various rituals and rationales of other religion into the message of Islam in order to create the idea of an all important ‘inner spirituality’ devoid of concern over the mundane affairs. Finally, there is also the version of Islam that sets itself a nation building agenda using the eternal values of the prophet interpreted within the socio-cultural and technological context of the times. Thus, in one sense, these are all a sample of the different political idea of Islam because it involves a process of inculcating values into a community and not merely as a private worship. With the strict institution of the congregational prayers, Islam assures itself a strong political presence as opposed to those of other religions which had to invent community rituals in order to stay relevant.

The following sections attempts to illuminate how such political ideas of Islam manifest itself into the architecture of the mosque in Malaysia, thus putting a big question mark upon those architects and academics who are striving with the idea of a single unifying idea of ‘Islamic Architecture’.

MASJID NEGARA AND TUNKU ABDUL RAHMAN’S VISION OF ISLAM

Built in the early 1960s, the National Mosque in Kuala Lumpur still stands today as a unique contribution to the idea of mosque architecture as well as a monument to the strife for a national architectural identity. The most distinguishing features of this important monument is the generous floating verandah that forms a horizontal plane hovering shy of the earth surface. There is no mosque to date that has a verandah space that is larger than the loosely enclosed space under the umbrella like roof. The other distinguishing feature is the folded plate roof that departed from the clichéd Indian styled onion domes prevalent in the colonial days prior to independence. The third important feature is its asymmetrical massing which is highly uncharacteristic of monumental state mosques or buildings of that time and the times preceding. The mosque sits relaxed in a site close to the urban fabric rather than on a hill or in the middle of a lake as if in an act of seclusion.
I strongly suspect that the Tunku, in his effort to rally the Malays behind him, chose to project the importance of Islam as a unifying tool. The Malay, before independence was a parochial minded entity loyal only to his or her own particular state. Islam remains one of the strong common features among the Malays and the Tunku set the foundation to make Islam a strong political character not only in local politics but also in the international scene. The decision to build a national monument in the form of a mosque can be seen as a political strategy towards this unifying effort. Coupled with the strong influence of late modernisms that shun symmetry, grandeur and exotic revivalism, the Tunku allowed a ‘progressive’ idea of the mosque in a dynamic but humble expression. The use of courtyards, pilotis and fully ventilated enclosures, make the building calls onto the spirit of the place in its tropicality thus striking a common cord of identity in the newly formed country. Thus the political idea of Islam present in the National Mosque was as a unifying tool of the Malays, a statement of common national identity coupled with a relaxed and ‘progressive’ idea of Islam as a local and international force.

PUTRA MOSQUE AND DR. MAHATHIR’S VISION OF ISLAM

Unveiled in the final decade of the 20th century, the Putra Mosque sits majestically in the center of the shiny new city of Putrajaya, the brainchild of the fourth Prime Minister, Dr. Mahathir Mohamad. Amidst great praises by the tamed mass media and cutting criticism from opposition parties and academics, the new city pushed its way into Malaysia’s history as a prime example of authoritarian decree in a rhetorical idea of a democracy. The design was in hush-hush so much so that much debates and opinions surface only after construction had gone more than half way.

The Putra Mosque is a complete anti-thesis to the National Mosque. As the National Mosque sits in a relaxed asymmetrical mass, the Putra Mosque rises up in a grand fashion with a commanding view of its huge manmade lake. As the former sits within a tight periphery of the urban side of Kuala Lumpur, the latter commands large real estate as a sculptural beacon of the city. The Putra Mosque calls on a foreign eclectic revivalism of Egyptian and Iranian vocabulary in contrast to the modernist garb of the National Mosque. With such architectural attributes there is a different political idea inherent in the structure which can only be understood by realizing the strong personal agendas of Dr. Mahathir Mohamad.

Dr. Mahathir came into power as a no nonsense ‘ultra Malay’ leader with no aristocratic background. He was never placed in his early political career as an ‘Islamist’. As one of the rare early Malay medical practitioner, he brings a clinical approach to political problems with not much concern over old ideas, concepts, customs or even values. His reign on Malaysia’s political scene came with the rising tide of Islamic reformation movement throughout the globe. The Iranian revolution to oust the tyranny of the Shah and the United States set the world in a new order of political equation. The success of Islamic movements in Algeria and Sudan gave
pause to the feudalistic reign of NATO, USA and the USSR. After hundreds of years of decadence, Islam was once again a force to be reckoned with.

History saw Mahathir deftly handling the Islam issue by riding with the wave of reform. His assimilation of the charismatic young idealist, Anwar Ibrahim into the cabinet set the country to be the foremost example of not only a model for Muslim countries to emulate, but also as an alternative idea to that of Western secularized notion of civilization. In a single stroke Mahathir had pushed Malaysia to almost center stage in global politics as well as checked the advance of the main Islamic party PAS for two decades by his adoption of policies deemed as progressively Islamic. With Anwar Ibrahim at his side both leaders developed universities, academic institutions, economic structures, social policies and a cultural revolution that saw dress codes of the *tudung* (women's head dress) change almost overnight the Malaysian scenery.

I, therefore, suspect that the deliberate choice of Middle Eastern and Central Asian revivalism of mosques was an attempt to identify Malaysia as the new center of Islamic civilization. Amidst the dictatorial regimes of Kings, Generals, Colonels and Presidents as in Saudi Arabia, Libya, Iraq, Egypt and Indonesia, 'moderate Malaysia' seemed a plausible cradle for the new birth. Coupled with an architectural profession which is more passive and empty of ideas, the post-modern revolution in the West had opened the door of revivalism. History saw local architects caving in to the exotic ideas of revivalism proposed by the clients. Anyway, revivalism usually means huge expenses and thus, high commission; the 'holy grail' of contemporary architecture. The irony is that the image that has come out of this equation was a new idea of Islamic imperialism as seen in the palatial like buildings with a 'Malay-Muslim' garb.

Thus, the Putra Mosque was a possible attempt to push the Malay-Islamic agenda in order to herald Malaysia as the new center of Islam in the world and at the same time redefine the national identity more towards a single ethnic variant.

CONCLUSION

It can, therefore, be seen that the political idea of Islam as propounded by individual leaders have a profound effect on the type of architecture used for the mosque. From the progressive and relaxed expression of the National Mosque, the imperial grandeur of the Putra Mosque and finally to the humble unpretentious expression of the Rusila Madrasa, each building holds key lessons for the student of architecture and history. Although there are many more political ideas yet to be explored in this new field of academia, it is fitting at this point to reflect that architecture is and always shall remain the realm of politics rather than whimsical attitudes and thoughts of the designers. Hence, in dealing with such an important subject as Islamic architecture or specifically mosque architecture architectural graduates should do well to understand that the other studio which was never offered in their curriculum was that of political idealism and social values.

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